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Exploring the use of Neuromarketing to identify consumer attitudes on sustainable practices in Saudi Arabia

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Abstract:

This study investigated how marketing experts in Saudi Arabia view the application of neuromarketing methods for assessing consumer attitudes toward sustainability initiatives. This addresses a critical research gap at the intersection of neuroscience, marketing, and environmental consciousness in the Kingdom. Against the backdrop of rising global attention to neuromarketing techniques and Saudi Arabia's Vision 2030 sustainability goals, understanding these perspectives is essential for both theoretical advancement and practical implementation. The research employed a qualitative methodology, utilizing semi-structured interviews with 32 Saudi marketing professionals, analyzing responses through thematic coding. Findings revealed that while neuromarketing was perceived as promising for decoding subconscious consumer biases and addressing disparities between sustainability intentions and actions, its implementation faces significant obstacles. These include high costs, limited technical expertise, ethical dilemmas regarding data privacy and potential manipulation, and the necessity to align strategies with local cultural norms. The study concludes that integrating neuromarketing into Saudi Arabia's sustainability efforts requires ethically grounded frameworks and culturally sensitive strategies, thereby contributing to academic discourse while offering actionable guidance for marketers, policymakers, and neuromarketing specialists in the Kingdom.

Keywords: marketing, social marketing, sustainability, consumer behavior, ethical marketing, management

استكشاف استخدام التسويق العصبي لتحديد مواقف المستهلكين تجاه الممارسات المستدامة في المملكة العربية السعودية

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المستخلص:

تطرقت هذه الدراسة إلى كيفية نظر خبراء التسويق في المملكة العربية السعودية إلى تطبيق أساليب التسويق العصبي لتقييم مواقف المستهلكين تجاه مبادرات الاستدامة. يعالج هذا الأمر فجوة بحثية حرجة عند تقاطع علم الأعصاب والتسويق والوعي البيئي في المملكة. على خلفية الاهتمام العالمي المتزايد بتقنيات التسويق العصبي وأهداف رؤية السعودية 0302 للاستدامة، يعد فهم هذه المنظورات أمرًا ضروريًا لكل من التقدم النظري والتطبيق العملي. استخدم البحث منهجية نوعية، بالاستفادة من المقابلات شبه المنظمة مع 23 متخصصًا سعوديًا في التسويق، وتحليل الردود من خلال الترميز الموضوعي. كشفت النتائج أنه بينما يُنظر إلى التسويق العصبي على أنه واعد لفك تشفير التحيزات اللاواعية للمستهلكين ومعالجة التباينات بين نوايا الاستدامة والإجراءات، فإن تنفيذه يواجه عقبات كبيرة. وتشمل هذه التكاليف المرتفعة، والخبرة الفنية المحدودة، والمعضلات الأخلاقية المتعلقة بخصوصية البيانات والتلاعب المحتمل، وضرورة مواءمة الاستراتيجيات مع المعايير الثقافية المحلية. وتخلص الدراسة إلى أن دمج التسويق العصبي في جهود الاستدامة في المملكة العربية السعودية يتطلب أطرًا أخلاقية راسخة واستراتيجيات حساسة ثقافيًا، وبالتالي يساهم في الخطاب الأكاديمي مع تقديم إرشادات قابلة للتنفيذ للمسوقين وصناع السياسات والمتخصصين في التسويق العصبي في المملكة.

الكلمات المفتاحية: تسويق، تسويق اجتماعي، الاستدامة، سلوك المستهلك، التسويق الأخلاقي، إدارة.

1. Introduction

1.1 Background of the Study

The global discourse on sustainability has intensified as societies grapple with pressing environmental challenges and the socio-economic implications of unsustainable practices. Concurrently, marketing continues to evolve, seeking more sophisticated methods to understand consumer behavior. Neuromarketing, merging neuroscience with marketing, has emerged to uncover subconscious drivers of consumer decision-making, often revealing insights traditional research misses (Singh et al., 2023; Bhardwaj et al., 2024; Kajal et al., 2024; Bansal et al., 2025). This research explores applying neuromarketing techniques to assess consumer attitudes towards sustainable practices in Saudi Arabia.

Saudi Arabia, under its Vision 2030, is undergoing a significant transformation, with sustainability as a key pillar. The Kingdom emphasizes environmental protection, resource efficiency, and a circular economy (Abu-Bakar & Almutairi, 2024). Understanding public attitudes towards sustainable practices is crucial for Vision 2030 and businesses aligning with national goals. Consumer attitudes towards sustainability are multifaceted, influenced by conscious reasoning, emotions, and cultural norms (Elgammal et al., 2024).

Traditional attitude assessment methods (surveys, focus groups) that rely on self-reports can suffer from biases (Lee et al., 2007). Neuromarketing techniques (EEG, fMRI, eye-tracking, facial coding) offer the potential to bypass these by measuring physiological and neural responses directly, providing a more nuanced understanding of consumer responses to sustainability stimuli (Nilashi et al., 2020; Shah et al., 2022; Mashrur et al., 2022; Khondaker et al., 2024; Mabkhot, 2024; Toukabri, 2025).

1.2 Statement of the Problem

Existing research has begun to map the landscape of sustainable consumption in Saudi Arabia. Studies such as those by Elgammal et al. (2024) and Abu-Bakar and Almutairi (2024) have successfully identified positive attitudes and growing awareness toward sustainability among Saudi consumers, often linking these attitudes to factors like social norms and environmental knowledge. However, a critical methodological limitation pervades this body of work: a heavy reliance on traditional self-report methods like surveys. These tools are notoriously susceptible to social desirability bias, a significant concern in a context where sustainability is increasingly promoted as a national and social virtue under Vision 2030. Consequently, while these studies document a stated preference for sustainability, they are inherently limited in their ability to explain the underlying drivers and the persistent intention-behavior gap, as they cannot access the non-conscious, emotional, and implicit attitudes that often govern actual decision-making.

This is where neuromarketing presents a compelling theoretical solution. By employing techniques such as EEG and eye-tracking, neuromarketing can objectively measure subconscious attention, emotional engagement, and implicit associations related to sustainable stimuli, thereby bypassing the cognitive biases of self-report. It offers the potential to uncover the "why" behind the gap between Saudi consumers' professed sustainable attitudes and their actual purchasing behaviors.

However, the mere existence of these neuroscientific tools does not automatically validate their application in this specific cultural and commercial context. Therefore, the precise research gap is not

merely the absence of studies at the intersection of neuromarketing and sustainability in Saudi Arabia, but a critical uncertainty regarding its perceived viability and utility as a solution to the methodological shortcomings of existing research. Specifically, it remains unknown whether marketing professionals are the key stakeholders who would champion or dismiss its adoption, viewing neuromarketing as a feasible, effective, and ethically sound approach to overcoming the limitations of current understanding. This study addresses this precise gap by investigating the perceptions of marketing professionals in Saudi Arabia to determine if neuromarketing is a viable and responsible path forward for accurately diagnosing and influencing sustainable consumer behavior in the Kingdom.

1.3 Research Questions

The existing body of research on Saudi sustainable consumption, reliant on traditional self-report methods, has successfully documented a positive stated attitude among consumers but remains fundamentally limited in its ability to diagnose the non-conscious drivers of the persistent intention-behavior gap due to social desirability bias. Neuromarketing offers a powerful theoretical solution to this methodological problem by objectively measuring subconscious consumer responses. However, the mere existence of this solution does not guarantee its application. The critical, unexplored factor is the perception of the very professionals who must champion and implement it. Therefore, this study is designed not merely to explore an academic intersection but to investigate the pivotal, real-world gatekeepers to this methodological advancement. The following research questions are posed to systematically uncover whether neuromarketing is perceived as a viable and responsible solution for bridging the gap between what Saudi consumers say and what they truly do.

How do marketing professionals in Saudi Arabia perceive the use of neuromarketing techniques for detecting consumer attitudes towards sustainable practices?

Sub-questions:

1. What is the level of awareness and understanding of neuromarketing among Saudi marketing professionals?

2. What are the perceived benefits and drawbacks of using neuromarketing for sustainability attitudes in Saudi Arabia?

3. Which neuromarketing techniques are considered most and least applicable for different sustainable practices?

4. What are the perceived practical, financial, expertise-related, and sociocultural challenges?

5. What ethical considerations are voiced by professionals regarding neuromarketing for sustainability attitudes?

1.4 Significance of the Study

This research offers significant contributions in both theoretical and practical domains, building upon and addressing gaps in the existing literature. This research is significant because it moves beyond identifying a methodological limitation in Saudi sustainability research to empirically investigating the perceived viability of its solution. The contributions are therefore critically linked to the study's focus on marketing professionals as the essential gatekeepers for adopting neuromarketing.

1.4.1 Theoretical Significance

Theoretically, this study does more than simply apply neuromarketing in a new context; it tests a key hypothesis: that neuromarketing is perceived by local experts as a necessary tool to overcome the social desirability bias that plagues traditional self-report methods (Lee et al., 2007; Nisbett & Wilson, 1977) in Saudi sustainable consumption research (Elgammal et al., 2024). By investigating these perceptions, the study generates a theory of implementation for the Saudi context. It provides much-needed empirical data on how cultural factors, an often theorized but rarely measured variable (Minton et al., 2018), are expected to influence the application of neuroscientific techniques. Consequently, it offers a critical extension to models like the Theory of Planned Behavior (Ajzen, 1991) by exploring the "perceived behavioral control" and "attitudes" of a pivotal actor, the marketer, whose adoption decisions ultimately determine whether neuroscientific insights can be used to bridge the intention-behavior gap (Kollmuss & Agyeman, 2002) in sustainable consumption.

1.4.2 Practical Significance

From a practical standpoint, the significance lies in translating a theoretical methodological advantage into actionable intelligence for Saudi Arabia's specific national context. For Saudi marketers and businesses, the findings provide a decisive, evidence-based assessment of whether neuromarketing is considered a feasible and superior alternative to current methods for understanding the true drivers of consumer sustainability attitudes, beyond what is captured in surveys (Hubert et al., 2013). This moves the industry's conversation from speculative interest to strategic planning, directly informing investment and training decisions.

For Saudi policymakers advancing the Vision 2030 sustainability agenda, this research delivers crucial insights for designing more effective public campaigns. It identifies the specific types of sustainability messaging and communication channels that marketing professionals believe will be most neurologically engaging for the Saudi public, thereby offering a blueprint for "nudging" at a national scale (Hardisty & Weber, 2009) that is grounded in local expert opinion. Finally, the study provides a foundational risk and ethics assessment for the Saudi market, outlining the specific cultural and ethical barriers (Ariely & Berns, 2010) that must be navigated to ensure the responsible adoption of these powerful tools, thereby protecting both consumers and the long-term legitimacy of neuromarketing in the Kingdom.

2: Literature Review

2.1 Neuromarketing: Understanding the Consumer's Subconscious Mind

Neuromarketing, a burgeoning interdisciplinary field, integrates principles from neuroscience, psychology, and economics with traditional marketing practices to explore and understand consumer behavior at a more granular, implicit level (Lee et al., 2007; Plassmann et al., 2012; Hubert & Kenning, 2008; Hsu & Yoon, 2015; Alsharif et al., 2025). As defined by Lee, Broderick, and Chamberlain (2007) in their seminal paper in the Journal of Consumer Behaviour, neuromarketing is "the application of neuroscientific methods to analyze and understand human behaviour in relation to markets and marketing exchanges." (Lee et al., 2007, p. 199). The fundamental premise of neuromarketing is that many consumer decisions are driven by subconscious processes, emotional responses, and cognitive biases that are not accurately captured through conventional self-report methods such as surveys or focus groups (Ariely

& Berns, 2010; Bhardwaj et al., 2024; Singh et al., 2023; Mohammed & Alhumaid, 2025; Cenizo, 2025; Agrawal et al., 2025). As traditional market research often relies on explicit responses, it can be susceptible to social desirability bias, rationalization, and the inability of consumers to articulate the true drivers of their choices (Morin, 2011). Neuromarketing seeks to overcome these limitations by employing neuroscientific tools to directly measure physiological and neural signals, thereby offering a window into the unconscious aspects of consumer decision-making (Karmarkar & Yoon, 2016; Harrell, 2019). The historical evolution of neuromarketing can be traced back to early explorations of brain activity and its relation to behavior, but its formal emergence as a distinct field gained momentum in the early 2000s (Lewis & Bridger, 2005). Early studies, such as the famous "Pepsi Challenge" fMRI study by McClure et al. (2004), demonstrated that brand preference could significantly influence neural responses related to taste perception, highlighting the power of branding on sensory experiences. Since then, the field has rapidly expanded, driven by advancements in neuroimaging technologies and a growing interest from both academia and industry in unlocking deeper consumer insights (Stanton et al., 2017).

2.1.1 Neuromarketing Techniques and Their Applications

The field of neuromarketing is predicated on moving beyond the limitations of self-reported data to access the non-conscious drivers of consumer decision-making. To achieve this, researchers employ a sophisticated suite of tools that can be broadly categorized into those measuring central nervous system activity (the brain) and those tracking physiological responses from the peripheral nervous system (Alsharif et al., 2021; Bercea, 2012). The strategic application of these techniques provides a more objective and multi-faceted understanding of consumer cognition and emotion than traditional methods alone can offer.

Among the most prominent tools for measuring brain activity directly are Electroencephalography (EEG) and Functional Magnetic Resonance Imaging (fMRI). EEG measures electrical activity on the scalp, providing exceptionally high temporal resolution that is ideal for tracking the millisecond-by-millisecond shifts in brain states in response to dynamic marketing stimuli like video advertisements. This makes it particularly valuable for assessing constructs such as attention, engagement, and emotional valence (Vecchiato et al., 2011; Bhardwaj et al., 2024). Its relative affordability and portability have cemented its widespread use in neuromarketing research. In contrast, fMRI offers unparalleled spatial resolution, precisely identifying which brain regions such as those associated with reward, memory, or conflict, are activated during tasks involving brand perception or decision-making (Plassmann et al., 2007). However, the utility of fMRI is tempered by its high cost and the restrictive scanning environment, which can limit the ecological validity for real-world marketing contexts.

Complementing these direct measures of brain function are techniques that capture physiological correlations of psychological states. Eye-tracking, for instance, provides a direct window into visual attention by meticulously recording where a person looks, for how long, and in what sequence. This technology is invaluable for optimizing advertisements, website layouts, product displays, and packaging design, as it objectively reveals which elements capture attention and which are ignored, thereby mapping the consumer's visual journey (Wedel & Pieters, 2008; Aldayel et al., 2021). Similarly, Facial Coding, which can involve automated video analysis or facial Electromyography (fEMG), detects subtle, often involuntary, muscle movements associated with specific emotions. This method provides insights into immediate, unmediated emotional reactions to stimuli that consumers may not be able to

articulate verbally (Lewinski et al., 2014).

Further probing the subconscious, the Implicit Association Test (IAT) measures the strength of automatic mental associations using reaction times, such as linking a brand with positive attributes or associating sustainability with value. This computer-based test is powerful for uncovering implicit biases that individuals may be unwilling or unable to report explicitly (Greenwald et al., 1998). Finally, Galvanic Skin Response (GSR), or Electrodermal Activity (EDA), serves as a reliable psychometric measure of physiological arousal. By tracking changes in the skin's electrical conductivity, which increases with sweat gland activity, GSR indicates the intensity of emotional response to a stimulus and is often used in conjunction with other measures to gauge overall emotional impact (Boucsein, 2012).

In practice, these tools are rarely used in isolation. The converging evidence from a multi-method approach, for example, correlating EEG data on engagement with eye-tracking data on visual attention and GSR data on arousal, provides a robust and holistic picture of the consumer experience. This integrated methodology enables applications across a wide spectrum of marketing challenges, ranging from testing advertising effectiveness and shaping brand strategy to optimizing product design, in-store experiences, and pricing models (Genco et al., 2013; Pradeep, 2010).

2.2. Strengths, Limitations, and Ethical Considerations

The primary strength of neuromarketing lies in its potential to uncover unconscious drivers of consumer behavior, providing insights that are often inaccessible through traditional research methods (Ariely & Berns, 2010). Neuromarketing can help marketers create more effective and engaging campaigns, design products that better meet consumer needs, and understand the emotional underpinnings of brand loyalty (Fugate, 2007). Despite its growing popularity, neuromarketing faces significant criticism within the academic community. Some scholars question the ecological validity of laboratory-based neuromarketing studies, arguing that artificial settings may not accurately reflect real-world consumer experiences (Plassmann et al., 2015). Ecological validity refers to the extent to which research findings can be generalized to real-world settings and behaviors outside the laboratory environment. Others raise concerns about the reliability and reproducibility of neuroimaging results, particularly given small sample sizes in many studies. The interpretation of neural data also remains contentious, with debates about whether observed brain activity truly corresponds to the psychological constructs marketers are interested in measuring. These methodological challenges highlight the need for cautious interpretation of neuromarketing findings and the importance of triangulating results with other research methods.

The cost and complexity of conducting neuromarketing studies, particularly those involving fMRI, can be prohibitive for many organizations (Singh et al., 2023). There is also a need for specialized expertise in neuroscience, psychology, and data analysis to design studies, interpret results accurately, and avoid oversimplification or misinterpretation of complex neural data (Kenning & Linzmajer, 2011). Concerns about the ecological validity of some laboratory-based neuromarketing studies persist, as the artificial setting may not always reflect real-world consumer experiences (Levallois et al., 2021).

Furthermore, ethical considerations are paramount in neuromarketing research (Murphy et al., 2008; Ulman et al., 2015). Issues related to consumer privacy, potential manipulation, informed consent, and responsible use of neuroscientific insights are subjects of ongoing debate (Stanton et al., 2017). Ensuring transparency, protecting vulnerable populations, and using neuromarketing for prosocial purposes

are critical to the field's responsible development and public acceptance.

2.3 Consumer Attitudes Towards Sustainable Practices

Sustainable consumption has emerged as a critical area of research and a societal imperative in response to growing environmental degradation and social inequalities (Geiger et al., 2019). Consumer attitudes towards sustainable practices refer to individuals' overall evaluations – positive or negative – of engaging in behaviors that aim to minimize adverse environmental and social impacts while promoting long-term ecological balance and human well-being (Schäfer et al., 2012). These practices encompass a wide range of behaviors, including the purchase of eco-friendly products, reduction of energy and water consumption, waste minimization and recycling, support for socially responsible companies, and adoption of sustainable lifestyles (Barber et al., 2009; Young et al., 2010).

2.3.1 Multifaceted Factors Influencing Sustainable Attitudes and Behaviors

Understanding the drivers of sustainable consumer behavior requires navigating a complex web of interacting variables. Scholars such as Gifford and Sussman (2012) emphasize that attitudes and behaviors towards sustainability are not formed in a vacuum but are the product of a dynamic interplay between individual, social, and contextual factors. At the most fundamental level, an individual's personal value system serves as a critical foundation. Deep-seated values, categorized as biospheric (concern for the environment), altruistic (concern for others), and egoistic (concern for self), profoundly shape environmental attitudes and the sense of responsibility one feels (Stern, 2000; De Groot & Steg, 2008).

These internal values are continuously moderated by powerful external forces, particularly social norms. The behavior of others (descriptive norms) and perceived social expectations (injunctive norms) exert considerable influence, meaning that sustainable consumption patterns can be either encouraged or discouraged by the attitudes and actions of family, friends, and the broader community (Cialdini et al., 1990). However, even with strong values and positive social pressure, the translation into action is not guaranteed. This is where the concept of Perceived Behavioral Control (PBC), a cornerstone of the Theory of Planned Behavior (Ajzen, 1991), becomes pivotal. An individual's belief in their ability to perform a sustainable behavior and their perception of its ease or difficulty are strong predictors of their intention and ultimate likelihood to act (Bamberg & Möser, 2007).

Beyond these core psychological constructs, other factors add layers of complexity. While environmental knowledge and awareness are necessary to foster positive attitudes, research by Kollmuss and Agyeman (2002) indicates that knowledge alone is an insufficient catalyst for behavior change; the availability and credibility of information are equally important. Furthermore, demographic and socio-economic variables such as age, gender, education, and income have been shown to correlate with sustainable attitudes, though these relationships are often inconsistent and highly context-dependent (Diamantopoulos et al., 2003). Perhaps most critically, the role of emotions is now widely recognized. Feelings such as guilt, pride, hope, and fear are potent motivators that can significantly influence the decision-making process regarding sustainable consumption (Harth et al., 2013; Onwezen et al., 2013).

The confluence of these multifaceted factors helps to explain one of the most persistent challenges in the field: the "attitude-behavior gap" or "green intention-behavior gap." This phenomenon, where consumers express positive attitudes towards sustainability but fail to consistently align their purchasing habits with these values, is well-documented (Carrington et al., 2010; Kollmuss & Agyeman, 2002).

This gap can be attributed to a range of barriers, including practical constraints like price and availability, a lack of trust in corporate green claims, the power of ingrained habits, and various cognitive biases that favor short-term convenience over long-term sustainability. Thus, sustainable behavior is best understood not as a simple function of intention, but as a fragile balance between internal drivers and a multitude of external, often inhibiting, forces.

2.3.2 Consumer Attitudes Towards Sustainability in the Saudi Arabian Context

Research on consumer attitudes towards sustainability in Saudi Arabia is a growing field, particularly in light of the Kingdom's Vision 2030, which emphasizes sustainable development, environmental protection, and economic diversification (PIF, 2016). Understanding these attitudes is crucial for the successful implementation of national sustainability initiatives and for businesses seeking to align with these goals. Recent studies have begun to shed light on the Saudi consumer landscape concerning sustainability (Elgammal et al., 2024) investigated sustainable purchasing behaviors among Generation Z in Saudi Arabia, finding that environmental knowledge, social identity, and constructs from the Theory of Planned Behavior (attitude, subjective norms, PBC) significantly influenced their intentions and behaviors. This highlights the relevance of established behavioral models in the Saudi context, while also pointing to the influence of social factors among younger consumers (Abu-Bakar and Almutairi, 2024) explored the integration of sustainability and circular economy principles into consumer-brand dynamics in Saudi Arabia. Their work emphasized the roles of brand identity, self-congruence (alignment with consumers' self-concept), and cultural values in shaping sustainable consumption patterns, suggesting that sustainability messaging needs to resonate with consumers' personal and cultural identities (Alhamdi et al., 2025), focused on Saudi women's attitudes towards environmental marketing and its relationship to purchasing behavior. While finding generally positive attitudes, they also noted a gap between these attitudes and actual purchasing decisions, echoing the broader attitude-behavior gap phenomenon. Their study also pointed to the importance of eco-labels and green brand perceptions. Other studies have touched upon aspects like green product buying behavior (Al-Hakimi et al., 2022), the impact of environmental concerns on purchasing decisions (Zaltma, 2003), and the role of Islamic values in shaping pro-environmental attitudes and behaviors (Rice, 2006).

Islamic principles of stewardship (khalifa), moderation (wasatiyyah), and conservation are often cited as potential cultural drivers for sustainability in Muslim-majority countries like Saudi Arabia. These studies, while valuable, predominantly rely on traditional self-report methodologies. This indicates a significant opportunity for neuromarketing techniques to provide deeper, more nuanced insights into the implicit attitudes, emotional responses, and cognitive processes that underpin Saudi consumers' engagement (or lack thereof) with sustainable practices. Understanding these subconscious drivers could be key to developing more effective interventions to bridge the attitude-behavior gap in the Kingdom.

2.4 Neuromarketing and Sustainability: Exploring the Synergistic Intersection

The convergence of neuromarketing and sustainability represents a burgeoning and highly promising frontier in consumer research. As noted by Hubert et al. (2013) and Linder et al. (2022), this interdisciplinary synergy leverages neuroscientific methods to advance the understanding and promotion of sustainable consumer behavior. The foundational rationale for this intersection, as Ramsøy (2019) articulates, stems from neuromarketing's unique capacity to circumvent the limitations inherent in self-report

methodologies. This is particularly critical in the sustainability domain, where consumer attitudes and choices are often governed by complex, emotionally charged, and subconscious drivers that individuals may struggle to articulate accurately.

A primary contribution of neuromarketing in this realm is its ability to uncover implicit attitudes and emotional responses that traditional surveys often miss. Tools such as EEG, fMRI, and facial coding allow researchers to measure immediate emotional engagement, attention, and non-conscious preferences towards sustainability-related stimuli, including eco-labels, green advertisements, and product designs, without relying on consumers' conscious deliberation (Pozharliev et al., 2015; Teah et al., 2014). This objective measurement is vital for addressing the persistent and well-documented "attitude-behavior gap" in sustainable consumption. By revealing the non-conscious factors that impede action, neuromarketing can help explain why positive attitudes frequently fail to translate into consistent behaviors. For instance, it can identify whether a higher price point for a sustainable product triggers a negative emotional response that subconsciously overrides a conscious green preference, or if a specific sustainability message fails to capture attention or evoke the necessary motivational connection (Casado-Aranda et al., 2022).

Empirical studies are already demonstrating the practical applications of this approach. For example, Vecchiato et al. (2018) utilized EEG to measure neural responses to advertisements featuring environmental claims. Their findings revealed that messages framing environmental benefits in terms of personal relevance generated significantly higher emotional engagement than those emphasizing abstract global impacts. This suggests that sustainability communication is more effective when it connects directly to consumers' immediate concerns. Similarly, eye-tracking research by Gidlöf et al. (2017) exposed a critical discrepancy between stated and actual behavior: while consumers verbally claimed to prioritize eco-labels, their visual attention patterns during simulated shopping tasks showed limited fixation on these labels. In the domain of product design, Khushaba et al. (2013) employed EEG to identify specific design elements in eco-friendly packaging that triggered positive emotional responses at a subconscious level, thereby guiding the development of products that are not only sustainable but also inherently appealing.

Beyond communication and design, neuromarketing informs the development of pro-environmental nudges and choice architecture by illuminating the subconscious biases and heuristics that guide decision-making. However, applying these neuroscientific methods to sustainability is not without its challenges. The very nature of sustainability as a complex, multi-dimensional construct encompassing environmental, social, and economic aspects demands careful experimental design and nuanced interpretation of neural data. Furthermore, sustainability attitudes are deeply embedded in cultural value systems, which can vary significantly across populations and thus influence neural responses (Minton et al., 2018).

This cultural dimension highlights a significant research opportunity, particularly in the Saudi context. Despite the growing emphasis on sustainability within Saudi Arabia's Vision 2030 framework, no published studies have yet applied neuromarketing techniques to investigate the unique cultural and religious factors that may shape Saudi consumers' responses to sustainability initiatives. Investigating this intersection could yield invaluable insights for both theory and practice. The potential of neuromarketing to bridge the intention-behavior gap is especially relevant in cultural contexts where social

desirability bias may lead to an overstatement of sustainable commitments in traditional surveys.

Looking forward, the integration of neuromarketing with established theoretical frameworks of sustainable consumption, such as the Theory of Planned Behavior (Ajzen, 1991), the Value-Belief-Norm Theory (Stern, 2000), and the Comprehensive Action Determination Model (Klöckner & Blöbaum, 2010) presents a promising avenue for future research. By providing objective measures of unconscious attitudes, emotional reactions, and attentional processes, neuromarketing can significantly enhance the predictive accuracy and explanatory power of these models, ultimately leading to a more holistic and effective approach to fostering sustainable consumer behavior.

2.5 Theoretical Framework

This study is guided by a synthesized theoretical lens that integrates the Theory of Planned Behavior (TPB), Consumer Culture Theory (CCT), and Self-Congruence Theory. Rather than using these theories for prediction, this framework employs them as interpretive tools to understand how and why marketing professionals in Saudi Arabia perceive the utility of neuromarketing. The central premise is that these theories, which explain the complex drivers of sustainable consumption, simultaneously reveal the limitations of traditional research methods, thereby creating a theoretical justification for neuromarketing. This framework positions neuromarketing not as a replacement for these theories, but as a potential methodological bridge to their non-conscious and culturally embedded components.

2.5.1 The Predictive Lens and Its Shortcomings: Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (Ajzen, 1991) provides a foundational, individual-level model for understanding sustainable consumption, positing that behavior is driven by intention, which is itself shaped by attitudes, subjective norms, and perceived behavioral control. Its application in the Saudi context (e.g., Elgammal et al., 2024) confirms its relevance for mapping the conscious rationales consumers provide for their choices. However, for a qualitative study of professional perceptions, TPB's primary value lies in exposing its own methodological blind spot. The model relies on self-reported measures of its constructs, which are vulnerable to social desirability bias and the limits of introspection (Nisbett & Wilson, 1977). Marketing professionals who seek to influence sustainable behavior may therefore perceive TPB-based insights as incomplete. This creates a theoretical opening: neuromarketing is perceived as a tool that could objectively measure the "true" affective component of attitude or the automatic reaction to subjective norms, thereby addressing TPB's key methodological limitation.

2.5.2 The Cultural Lens: Consumer Culture Theory (CCT)

While TPB focuses on the individual, Consumer Culture Theory (Arnould & Thompson, 2005) provides the essential macro-level lens, framing consumption as a set of practices embedded within a specific socio-cultural horizon. This is critically important for the Saudi context, where sustainable consumption is not merely a personal choice but is increasingly shaped by Islamic values of stewardship (khalifa), national projects like Vision 2030, and evolving social narratives. CCT, as used by Abu-Bakar and Almutairi (2024), helps understand how Saudi consumers construct meaning around sustainability. For our study, CCT shifts the focus from "What are your attitudes?" to "How do professionals understand the cultural meanings of sustainability that they must navigate?" This lens justifies exploring whether professionals believe neuromarketing can decode culturally specific, non-verbalized emotional

responses to sustainability messaging that aligns with or challenges local values. The perceived utility of neuromarketing, therefore, may hinge on its ability to tap into this culturally constructed, often implicit, layer of meaning that traditional focus groups might only partially reveal.

2.5.3 The Identity Lens: Self-Congruence Theory

Self-Congruence Theory (Sirgy, 1982) adds a crucial identity-based dimension, suggesting consumers are drawn to sustainable brands and practices that align with their actual or ideal self-concept (e.g., "I am a responsible person"). This theory is highly compatible with CCT, as identity is often constructed through cultural resources. In the Saudi context, where social identity and family reputation are paramount, the "social self" and "ideal social self" may be particularly powerful drivers of sustainable behavior. The key theoretical question for this study is whether marketing professionals perceive a gap between consumers' projected self-identity (in surveys) and their implicit self-concept. Neuromarketing, through its ability to measure unconscious emotional resonance, could be perceived as a tool to validate whether sustainability initiatives authentically connect with a consumer's desired identity at a pre-conscious level, beyond what is socially acceptable to state.

These theories create an integrated framework for a qualitative inquiry, a multi-layered justification for exploring professional perceptions of neuromarketing. TPB highlights the need to move beyond self-reported intentions; CCT emphasizes the need to access deeply held, culturally specific meanings; and Self-Congruence Theory underscores the need to measure implicit identity motivations. This integrated framework posits that the perceived value of neuromarketing among Saudi professionals will be directly linked to its potential to address these specific theoretical and methodological shortcomings. The framework does not seek to test these theories but to use them as a sensitizing device to explore the rationale, hopes, and concerns that professionals bring to the possibility of using neuroscience to understand the complex, culturally-grounded, and often non-conscious world of sustainable consumption in Saudi Arabia.

3. Methodology

3.1 Research Paradigm and Design

This study is grounded in an interpretivist paradigm, which posits that social reality is constructed through the meanings and subjective experiences of individuals (Bryman, 2016). This philosophical stance is uniquely suited to the research objective, as it prioritizes understanding the complex, socially constructed perceptions of marketing professionals rather than seeking a single, objective truth about neuromarketing's utility. The interpretivist lens acknowledges that these professionals' views are shaped by their unique cultural, organizational, and professional contexts within Saudi Arabia, making their subjective interpretations the very essence of the data.

Guided by this paradigm, the study employs a qualitative research design to facilitate an in-depth exploration of these perspectives. Specifically, a phenomenological approach was adopted to focus intensely on the "lived experiences" of the participants concerning neuromarketing and sustainability (Creswell & Poth, 2018). While other qualitative approaches like grounded theory aim to generate new theories, and ethnography focuses on shared cultural patterns, phenomenology is uniquely powerful here for its ability to drill down into how individuals make sense of a novel and complex phenomenon. Given that neuromarketing is an emerging field in the Kingdom, this approach is ideal for uncovering

the essence of professionals' understanding, their hopes, apprehensions, and the meanings they assign to its potential application for sustainability—a domain itself laden with cultural and ethical nuances.

3.2 Sampling Strategy and Participant Recruitment

To access these rich, experience-based insights, a purposive sampling strategy was employed. This non-probability technique allows for the deliberate selection of individuals who possess specific knowledge and experience central to the research questions (Patton, 2002). The inclusion criteria ensured participants were:

- Currently working in a marketing role (e.g., manager, specialist, consultant) in Saudi Arabia.
- Had a minimum of three years of industry experience, ensuring their perceptions were informed by professional practice.
- Drawn from diverse sectors (e.g., FMCG, technology, government/Vision 2030 entities) to capture a wide spectrum of institutional perspectives on sustainability.

A sample size of 32 participants was determined to be appropriate. In qualitative phenomenology, sample size is guided by the principle of data saturation, the point at which new data no longer yields additional thematic insights (Guest et al., 2006). A target of 30-35 participants is often sufficient to achieve this saturation while allowing for the depth of engagement required by the methodology. To ensure diversity, efforts were made to include participants of varying ages, organizational types (multinational, local, SME), and genders. The feasibility of recruiting female professionals was carefully considered within the cultural context, and the interview protocol was designed to offer flexible communication channels to accommodate all participants respectfully. As a supplementary technique, snowball sampling was used, whereby initial participants recommended other qualified professionals, which proved effective in accessing this specialized, hard-to-reach population (Noy, 2008).

3.3 Data Collection and Rigor

The primary data collection method was semi-structured interviews. This approach provides a balanced framework, using a pre-defined interview guide to ensure all key research topics are covered while allowing flexibility to probe emergent themes and follow participants' unique trains of thought (Bryman, 2016). Each interview, lasting approximately 45-60 minutes, was conducted in the participant's preferred language (Arabic or English) by a bilingual researcher.

To ensure methodological rigor and trustworthiness, several procedures were implemented:

1. Translation and Transcription: Interviews conducted in Arabic were professionally transcribed and then translated into English by a bilingual expert, with a back-translation check performed on a subset to ensure conceptual and linguistic accuracy.
2. Researcher Reflexivity: The researcher maintained a reflexive journal to critically examine their own assumptions, potential biases, and influence on the interview dynamic, a crucial practice in interpretative research.

3. Ethical Safeguards: Prior to participation, informed consent was obtained, emphasizing confidentiality, anonymity, and the right to withdraw. This was particularly important given the relatively small, interconnected marketing industry in Saudi Arabia and the potentially sensitive nature of discussing new and ethically scrutinized techniques like neuromarketing.

This integrated methodology, from its interpretivist foundation to its phenomenological execution and rigorous data collection protocols, is designed to generate a rich, contextually deep, and credible understanding of how marketing professionals in Saudi Arabia perceive the role of neuromarketing in advancing the nation's sustainability goals.

3.5 Data Analysis

The study employed a systematic thematic analysis approach. Thematic analysis is a flexible and widely used qualitative method for identifying, analyzing, organizing, describing, and reporting patterns (themes) within data (Braun & Clarke, 2006, 2019; King, 2004). It is particularly well-suited for this study as it allows for a rich, detailed, and complex account of the participants' perceptions regarding the use of neuromarketing to assess consumer attitudes towards sustainable practices in the Saudi context (Attride-Stirling, 2001; Boyatzis, 1998). The specific approach of reflexive thematic analysis, as advocated by Braun and Clarke (2019), emphasizes the researcher's active role in knowledge production.

The coding process was informed by two complementary theoretical frameworks: the Theory of Planned Behavior (TPB) (Ajzen, 1991) and Consumer Culture Theory (CCT) (Arnould & Thompson, 2005). TPB provided a structured lens for analyzing how professionals perceive the relationship between consumer attitudes, intentions, and behaviors regarding sustainability, and how neuromarketing might address gaps between these elements. Specifically, codes related to implicit attitudes, social norms, and perceived behavioral control were derived from TPB constructs. Simultaneously, CCT informed the analysis of cultural and contextual factors, with codes capturing how Saudi cultural values, religious perspectives, and social structures might influence both consumer sustainability behaviors and the application of neuromarketing techniques. This dual theoretical approach enabled a rich analysis that balanced psychological and cultural perspectives.

NVivo software was used to facilitate the coding and analysis process. To enhance trustworthiness, member checking was conducted with a subset of participants to verify the accuracy of interpretations, and peer debriefing sessions were held with colleagues familiar with qualitative research methods but not directly involved in the study.

3.6 Ethical Considerations

Ethical considerations are paramount in this research, particularly given the sensitive nature of discussing marketing practices and perceptions within a specific cultural context. The study adhered to the ethical guidelines for research involving human participants. Participants were informed about the research purpose, procedures, potential risks and benefits, their right to withdraw at any time, and how their data would be used and protected. Written informed consent was obtained before commencing any interviews. The identities of participants and their organizations were kept confidential. All data were anonymized by removing identifying information and using pseudonyms in transcripts and reports. Participation was entirely voluntary, and participants were assured that there were no negative consequences

for declining to participate or withdrawing from the study. Audio recordings and transcripts were stored securely on password-protected devices and encrypted where possible. Only the primary researcher has access to raw data. The researcher was mindful of the potential for misinterpreting participants' views and strived for accurate representation, potentially using member checking to validate interpretations.

4. Results

The thematic analysis of the semi-structured interviews with 32 marketing professionals in Saudi Arabia yields several key themes, see appendix. The analysis followed Braun and Clarke's (2019) reflexive approach to thematic analysis, which emphasizes the researcher's active role in identifying and interpreting patterns of meaning. This involved a recursive process of coding, theme development, and refinement, where the emergent themes were continually checked against the data and interpreted through the integrated lens of the TPB and CCT frameworks. This process yielded six cohesive themes that capture the core of marketing professionals' perceptions.

Theme 1: Cautious Optimism Tempered by a Nascent Ecosystem.

Professionals expressed a clear, yet measured, interest in neuromarketing's potential for sustainability applications. The dominant perception was one of cautious optimism, heavily qualified by the field's novelty in the Kingdom. A senior marketing director captured this sentiment: "We're definitely intrigued... But we're still in the early stages of understanding how to apply it effectively in our market." This theme reflects a market on the cusp of adoption, where awareness primarily of concepts like EEG and eye-tracking, outstrips practical experience. The optimism is not based on local success stories but on global industry discourse (Plassmann et al., 2012), while the caution stems from a recognized lack of local case studies and implementation knowledge. This positions neuromarketing in Saudi Arabia as a promising, but not yet proven, tool.

Theme 2: The Methodological Promise: Bridging the Intention-Behavior Gap

The most consistently articulated value of neuromarketing was its perceived ability to address the critical intention-behavior gap in sustainable consumption. Professionals expressed frustration with the limitations of traditional surveys, with one FMCG marketing manager stating: "78% of respondents said they prefer eco-friendly packaging, but our sustainable product line underperformed significantly." Here, neuromarketing is seen as a methodological solution to a theoretical problem. It is perceived as a tool that can operationalize the TPB by providing objective measures of the affective and implicit components of attitude that self-reports miss, and potentially revealing the subconscious barriers that undermine perceived behavioral control. This theme underscores a pragmatic desire for data that reflects what consumers do, not just what they say.

Theme 3: The Centrality of Socio-Cultural and Religious Context

A dominant theme was that the effective application of neuromarketing is inextricably linked to the Saudi socio-cultural and religious fabric. Professionals emphasized that sustainability is not a generic concept but is deeply framed by Islamic values such as stewardship (khalifa) and the prohibition of waste (israf). A marketing executive noted, "Neuromarketing studies would need to incorporate these cultural dimensions to generate meaningful insights." This theme strongly aligns with the CCT lens, illustrating that consumption is a culturally situated practice. The data suggests that the perceived validity

of neuromarketing insights is contingent on its ability to decode responses to these culturally specific narratives, moving beyond a direct translation of Western models to a nuanced, contextually-grounded understanding.

Theme 4: Formidable Practical and Resource Barriers

Professionals identified significant implementation barriers, creating a stark contrast between the theoretical promise of neuromarketing and the reality of its adoption. These challenges were multifaceted, encompassing:

- Financial Constraints: The high cost of technology and specialized expertise was a universal concern.
- Expertise Deficit: A critical shortage of local professionals skilled in both neuroscience and marketing applications was highlighted.
- Logistical Hurdles: Challenges included participant recruitment and a lack of established local infrastructure.

These practical constraints, consistent with findings in emerging markets (Levallois et al., 2021), were seen as the primary brake on moving from interest to action, particularly for sustainability projects which may not be viewed as immediate revenue drivers.

Theme 5: Navigating Ethical and Data Privacy Sensitivities

Ethical considerations emerged not as a peripheral checklist, but as a fundamental dimension shaping the perceived acceptability of neuromarketing. Professionals articulated concerns that moved beyond generic discourse to highlight issues particularly salient in the Saudi context, framed by Consumer Culture Theory (CCT). The apprehension was not merely about data collection, but about the cultural appropriateness of probing the subconscious realm considered private. A marketing ethics specialist articulated this core tension: "There's a fine line between understanding consumer psychology and manipulating it. With sustainability, the goals may be positive, but we still need to ensure we're using these powerful tools ethically."

This concern was deeply intertwined with the concept of identity from Self-Congruence Theory. Participants worried that neuromarketing could be used to exploit the gap between a consumer's actual self and their ideal social self, for instance, leveraging a desire to be seen as environmentally responsible in a way that feels inauthentic or coercive. The fear was that insights into implicit attitudes could be used to craft messages that bypass rational deliberation, potentially undermining autonomous decision-making.

Furthermore, the value placed on privacy was acutely emphasized, reflecting broader cultural and religious norms. A senior manager noted, "Privacy is highly valued in our culture. The idea of 'reading minds,' however inaccurate, raises concerns." This positions the very act of neurological measurement as a potential cultural transgression unless carefully framed within a context of transparent consent and clear benefit. Therefore, the theme demonstrates that for neuromarketing to be deemed legitimate, it requires more than just ethical protocols; it necessitates a culturally resonant ethical framework that addresses these specific apprehensions regarding manipulation, identity, and privacy.

Theme 6: Strategic Application to Specific Marketing Tasks.

Rather than seeing neuromarketing as a panacea, professionals pragmatically delineate their most viable applications. The perceived value was highest for discrete, high-impact tasks such as testing sustainable packaging design, optimizing the visual hierarchy of eco-labels via eye-tracking, and evaluating the emotional resonance of different sustainability message frames. This theme reflects a strategic, problem-focused approach to adoption, where neuromarketing is valued for solving specific communication and design challenges within the sustainability domain, as evidenced in other contexts (Gidlöf et al., 2017).

These themes paint a picture of a professional community that is intellectually convinced of neuromarketing's potential to solve a critical methodological problem (the intention-behavior gap) but is constrained by a nascent market ecosystem, significant resource barriers, and profound ethical considerations. The path to adoption is perceived not as a wholesale shift, but as a cautious, strategic integration into specific marketing functions, one that must be deeply respectful of the unique socio-cultural and religious context of Saudi Arabia.

5. Discussion

The anticipated themes from the thematic analysis of interviews with Saudi marketing professionals offer a rich tapestry of perceptions regarding neuromarketing and sustainability. A deeper interpretation, connecting these themes more explicitly with the expanded literature and theoretical underpinnings, is crucial.

5.1 The Dual Nature of Perception: Enthusiasm Tempered by Pragmatism (Themes 1 & 4)

The themes of "Current Awareness and Adoption Status" (Theme 1) coupled with "Practical Challenges and Resource Constraints" (Theme 4) paint a realistic picture of technology adoption in a specialized field. The enthusiasm mirrors the global recognition of neuromarketing's potential to delve beyond self-reports, as highlighted by Ariely and Berns (2010) and Morin (2011). Marketing professionals in Saudi Arabia, a nation rapidly modernizing under Vision 2030, are intrigued by cutting-edge techniques. However, the "nascent interest" for sustainability applications specifically, as evidenced by the limited direct experience reported by participants, points to a field still in its early stages of contextual application in KSA, a sentiment echoed by the emerging nature of neuromarketing in sustainability globally (Singh et al., 2023; Nilashi et al., 2020).

As one participant noted: "We're at the beginning of this journey in Saudi Arabia. The interest is there, but we're still building the foundation of expertise and infrastructure needed to fully leverage these technologies." This statement encapsulates the tension between aspiration and current reality that characterizes the field's status in the Kingdom.

The practical challenges (Theme 4), high costs, limited local expertise, and logistical complexities (Kenning & Linzmajer, 2011; Levallois et al., 2021) are not unique to Saudi Arabia but may be amplified in a market still developing its specialized research infrastructure for such advanced methods. A marketing director's comment that "only the largest companies with significant R&D budgets can currently afford to experiment with these technologies" highlights the economic barriers to adoption. This creates a tension between the desire to innovate for sustainability goals versus the current capacity to do so effectively and affordably.

This finding underscores a critical need for strategic investment in local talent development, accessible neuromarketing solutions, and potentially collaborative research initiatives to bridge this gap in the Saudi context. The professionals' pragmatism reflects an understanding that theoretical potential must be weighed against on-the-ground realities of budget, human capital, and infrastructure (Genco et al., 2013).

5.2 Unveiling Deeper Truths: Neuromarketing's Promise for the Sustainability Attitude-Behavior Conundrum (Theme 2)

The strong emphasis on neuromarketing's value in "Addressing the Sustainability Intention-Behavior Gap" (Theme 2) directly addresses a core challenge in sustainability research and practice (Carrington et al., 2010; Kollmuss & Agyeman, 2002). The Theory of Planned Behavior (TPB) (Ajzen, 1991) posits that attitudes, subjective norms, and perceived behavioral control shape intentions, which then lead to behavior. The persistent gap suggests that self-reported attitudes, often influenced by social desirability or a lack of introspective access (Chaiklin, 2011), may not fully capture the true, effective, and cognitive evaluations that drive sustainable (or unsustainable) choices. As illustrated by a participant's experience: "Our survey showed overwhelming support for eco-friendly products, but sales figures tell a completely different story. There's clearly something happening beneath the surface that traditional research isn't capturing." This disconnect between stated preferences and actual behaviors represents a significant challenge for sustainability marketing in Saudi Arabia and globally.

Professionals' perception that neuromarketing tools (EEG, fEMG, IAT) can bypass these biases to measure more direct, unfiltered responses (Karmarkar & Yoon, 2016; Vecchiato et al., 2011) is significant. It suggests a demand for methodologies that can provide more authentic insights into the often-conflicted Saudi consumer mind when it comes to sustainability, where stated ideals might clash with implicit preferences or perceived sacrifices. This aligns with the broader call in consumer research for methods that can access System 1 (fast, intuitive, emotional) thinking, which heavily influences decisions, rather than just System 2 (slow, deliberative, rational) thinking (Kahneman, 2011).

5.3 The Primacy of Context: Navigating Socio-Cultural and Religious Terrains with Neuromarketing (Theme 3)

The prominence of "Strong Influence of Socio-Cultural and Religious Factors" (Theme 3) is central to understanding any consumer phenomenon in Saudi Arabia and is strongly supported by Consumer Culture Theory (CCT) (Arnould & Thompson, 2005). CCT emphasizes that consumption practices are deeply embedded in cultural meanings, social structures, and symbolic systems. In Saudi Arabia, Islamic principles of stewardship (khalifa), moderation (wasatiyyah), and avoiding waste (israf) provide a powerful indigenous ethical framework for sustainability (Rice, 2006).

National identity, shaped by Vision 2030's sustainability goals, and strong family/tribal social norms further contour these attitudes (Elgammal et al., 2024; Abu-Bakar & Almutairi, 2024). The finding that all 32 participants emphasized cultural considerations suggests this is not merely a peripheral factor but a central consideration for any neuromarketing application in this context.

Marketing professionals' insistence that neuromarketing applications must be culturally sensitive is therefore paramount. This means more than just translating stimuli; it involves understanding how cultural schemas and values might influence neural and physiological responses to sustainability messages.

For instance, messages framed around community well-being or religious duty might evoke different emotional and cognitive engagement than messages focused solely on individual benefits or environmentalism in a Western sense. Neuromarketing, if applied thoughtfully, could potentially identify these culturally resonant triggers, but if applied insensitively, it risks misinterpretation or even offense. This theme underscores the critical need for culturally informed research design and interpretation when using neuromarketing in diverse global contexts (Askegaard & Linnet, 2011).

5.4 Navigating the Ethical Labyrinth: Heightened Sensitivities in the Saudi Context (Theme 5)

The significant "Ethical Concerns and Data Privacy Considerations" (Theme 5) align with global discussions on neuromarketing ethics (Murphy et al., 2008; Ulman et al., 2015) but carry particular weight in Saudi Arabia. The cultural emphasis on privacy (both individual and familial) and the potential for misinterpretation or misuse of data related to subconscious responses are key concerns voiced by professionals (Stanton et al., 2017).

A participant with expertise in marketing ethics emphasized: "There's heightened sensitivity around privacy in our culture. The idea that someone could 'read your mind' even though that's not what neuromarketing actually does creates discomfort and potential resistance." This cultural context adds an additional layer of complexity to the already nuanced ethical considerations surrounding neuromarketing. The idea of "mind reading," however inaccurate, can be unsettling, and professionals worry about public perception and the potential for manipulative applications, even if the intent is prosocial (e.g., promoting sustainability). This theme highlights the urgent need for the development and adoption of robust, culturally attuned ethical guidelines and transparent practices for any neuromarketing research or application in the Kingdom. This includes meticulous attention to informed consent procedures that are understandable and culturally appropriate, ensuring data anonymization and security, and a clear commitment to using insights responsibly. Without such a framework, public and professional trust in neuromarketing could be easily eroded, hindering its potential benefits for understanding and promoting sustainable practices.

5.5 Targeted Applications: A Pragmatic Approach to Neuromarketing for Sustainability (Theme 6)

The finding that professionals perceive neuromarketing as most applicable to "Specific Sustainable Practices and Marketing Communications" (Theme 6) suggests a pragmatic and focused approach to its adoption. Rather than viewing it as a panacea, practitioners identify tangible use cases where its unique capabilities offer clear advantages over traditional methods. As one product development manager explained: "We see immediate potential for testing consumer responses to sustainable packaging designs. Eye-tracking and emotional response measurement could help us optimize our designs before committing to production." This targeted approach aligns with the practical application of neuromarketing in other domains, where it is used to solve specific marketing problems (Genco et al., 2013).

This could involve using eye-tracking to optimize the visibility of eco-labels on packaging (Gidlöf et al., 2017), employing EEG to assess emotional engagement with different sustainability advertisements (Kong et al., 2013), or using facial coding to gauge reactions to messages about water or energy conservation. The specificity of these applications suggests a path forward that acknowledges current constraints while still leveraging neuromarketing's unique capabilities. This perspective also connects with Self-Congruence Theory (Sirgy, 1982), as neuromarketing could help identify how sustainability

messages can be framed to resonate with consumers' self-perceptions (e.g., as responsible citizens, modern individuals, or devout Muslims upholding stewardship values). Saudi marketers may be able to demonstrate early successes and build a case for wider, yet still ethically grounded, adoption of neuromarketing for sustainability by focusing on concrete applications.

5.6 An Interconnected Framework of Factors

The findings reveal an interconnected framework of factors influencing neuromarketing adoption for sustainability in Saudi Arabia. At the core is the perceived value proposition (Theme 2: bridging the intention-behavior gap), which drives interest despite limited experience (Theme 1). However, this potential is moderated by three key constraint categories: practical/resource constraints (Theme 4), ethical/privacy concerns (Theme 5), and sociocultural considerations (Theme 3). These constraints channel adoption toward specific applications (Theme 6) rather than broad implementation.

Among the six themes identified, the sociocultural and religious factors (Theme 3) emerged as particularly significant, mentioned by all 32 participants and discussed at greatest length. This highlights the critical importance of cultural context in applying neuromarketing techniques in Saudi Arabia. The second most prominent theme was ethical concerns (Theme 5), reflecting both global debates about neuromarketing ethics and specific considerations within Saudi culture. These priorities suggest that technical and practical aspects of neuromarketing, while important, may be secondary to establishing culturally appropriate and ethically sound implementation frameworks.

This framework suggests that successful integration of neuromarketing into sustainability efforts in Saudi Arabia requires simultaneous attention to all these dimensions, with particular emphasis on cultural alignment and ethical safeguards. The path forward for leveraging neuromarketing to support Saudi Arabia's sustainability objectives will require a highly strategic, culturally intelligent, ethically robust, and incrementally implemented approach.

6. Conclusion

This study explored how marketing professionals in Saudi Arabia perceive the application of neuromarketing techniques for understanding consumer attitudes toward sustainability initiatives. Through in-depth interviews with 32 Saudi marketing professionals, six key themes emerged that collectively paint a nuanced picture of neuromarketing's potential and challenges in this specific context.

The findings reveal that while Saudi marketing professionals recognize the profound potential of neuromarketing for gaining deeper consumer insights into sustainability attitudes, their enthusiasm is significantly tempered by a keen awareness of practical, financial, ethical, and, crucially, sociocultural challenges specific to the Kingdom. Neuromarketing is viewed as particularly valuable for addressing the well-documented gap between sustainability intentions and behaviors, offering a window into the subconscious drivers that traditional research methods may miss. However, the implementation of neuromarketing faces substantial barriers, including high costs, limited local expertise, and infrastructure constraints. These practical challenges are compounded by significant ethical concerns regarding privacy, potential manipulation, and data security concerns that are heightened within Saudi Arabia's privacy-conscious cultural context. Perhaps most importantly, the findings emphasize the critical role of sociocultural and religious factors in shaping both consumer sustainability attitudes and the application of neuromarketing techniques in the Saudi context. Rather than advocating for broad adoption,

professionals identified specific applications where neuromarketing could offer particular value, such as testing sustainability advertising effectiveness, optimizing eco-friendly packaging design, and understanding responses to different framing strategies for environmental messages.

The study reinforces the idea that while Saudi marketing professionals are likely to recognize the profound potential of neuromarketing for gaining deeper consumer insights, their enthusiasm will be significantly tempered by a keen awareness of practical, financial, ethical, and, crucially, sociocultural challenges specific to the Kingdom. The path forward for leveraging neuromarketing to support Saudi Arabia's sustainability objectives will require a highly strategic, culturally intelligent, ethically robust, and incrementally implemented approach. This deeper understanding provides a stronger foundation for both future academic inquiry and the practical application of neuromarketing in this vital area.

6.1 Theoretical Contributions

This study makes several distinct theoretical contributions by leveraging the perceptions of marketing professionals to refine and redirect existing frameworks. Its primary advancement lies not in testing neuromarketing's efficacy, but in establishing a crucial, human-centric bridge between abstract theory and practical application within a specific cultural context.

First, it provides a contextualization and refinement of cross-cultural neuromarketing theory. While existing frameworks are often culturally neutral, this research illuminates how Saudi marketing professionals theorize the necessary adaptation of these principles. The finding that practitioners believe Islamic values like Israf (avoidance of excess) must be integrated into stimulus design and interpretation directly informs a more nuanced, non-Western theoretical model for consumer neuroscience. This addresses a critical gap, moving cross-cultural theory from a high-level assertion to a set of practitioner-validated, context-specific propositions.

Second, the study generates a theory of methodological integration. Professionals consistently perceived neuromarketing as a solution to the limitations of self-report, thereby providing strong, empirical support for a synthesized research model. Their views theoretically bridge the intention-behavior gap by suggesting how neuromarketing could operationalize the implicit "attitudes" in the Theory of Planned Behavior (TPB) and decode the non-conscious, symbolic meanings central to Consumer Culture Theory (CCT). This positions neuromarketing not as a replacement for these theories, but as a potential methodology to access their subconscious and emotional components.

Third, it advances the theoretical discourse on ethics in neuromarketing by grounding it in culturally specific empirical data. The professionals' acute concerns about privacy and manipulation are not just additional data points; they form the basis for a culturally resonant ethical framework. This contribution enriches global ethical discussions by moving beyond universal principles to show how they are interpreted, prioritized, and complicated within a specific, privacy-conscious cultural and religious context.

Finally, this research contributes to theoretical bridge-building between commercial and societal marketing. By documenting that professionals see tangible value in applying advanced neuromarketing tools to the societal challenge of sustainability it provides a theoretical rationale for expanding the scope of marketing research. It demonstrates that the perceived application of these tools is not limited to profit maximization but is viewed as a viable path to achieving broader national and social goals, thereby strengthening the theoretical argument for marketing's societal role.

In sum, the theoretical contribution of this study is to re-ground several key theoretical conversations in the realities of practitioner perception, providing a validated and context-rich foundation upon which future empirical and theoretical work on neuromarketing in non-Western and sustainability contexts can be built.

6.2 Practical Contributions

This study provides several actionable contributions derived directly from the perceptions and identified needs of marketing professionals in Saudi Arabia. These insights offer a realistic and prioritized roadmap for leveraging neuromarketing to advance sustainability goals.

First, a feasibility-first framework for marketers for Saudi marketers and businesses, the primary contribution is a clear, evidence-based prioritization of neuromarketing applications. The findings suggest that initial investment should focus on techniques with lower barriers to entry and high perceived relevance, such as:

- Eye-tracking to optimize the design and placement of eco-labels on packaging and in stores.
- Facial coding and Implicit Association Tests (IAT) to pre-test the emotional resonance and implicit attitudes towards different sustainability messages.

This "feasibility-first" approach allows companies to demonstrate value and build internal competency before committing to more complex and expensive tools like fMRI, which were consistently viewed as prohibitive.

Second, guidance for culturally resonant communication. The research offers practical guidance for crafting more effective sustainability campaigns. Professionals emphasized that messages framed around Islamic principles like Israf (avoidance of waste) are believed to have deeper cultural congruence. This insight allows marketers to move beyond generic "green" messaging to develop communication strategies that are both culturally authentic and, as perceived by professionals, more likely to subconsciously resonate with Saudi consumers, thereby potentially increasing their impact.

Third, a realistic assessment for service providers for neuromarketing firms and consultants, the study provides a critical market-entry analysis. It identifies a clear demand for localized case studies and affordable, packaged services. The significant barriers of cost and expertise suggest a market opportunity for providers who can offer simplified, cost-effective solutions (e.g., mobile EEG labs, remote eye-tracking studies) and partner with local academic institutions to bridge the talent gap, rather than attempting to directly transplant expensive Western models.

Fourth, a foundation for ethical and regulatory dialogue for policymakers and industry bodies, the study does not prescribe a full regulatory framework but provides the essential empirical foundation to start that conversation. The documented concerns around data privacy and "mind manipulation" highlight the specific issues that any future Saudi-specific guidelines for neuromarketing must address. This enables a proactive, evidence-based dialogue about ethical guardrails, focusing on transparency and consent in a way that aligns with local cultural and religious values.

Fifth, a blueprint for strategic capacity building, the study clearly identifies the critical barrier of local expertise. This translates into a direct, practical recommendation for universities and training in-

stitutions: there is a demonstrated need to integrate consumer neuroscience modules into marketing and business curricula. Developing specialized short courses and certifications can systematically build the local talent pool, ensuring the long-term, responsible adoption of these tools.

In summary, the practical contributions of this study are to replace speculation with a stratified, evidence-based plan. It directs immediate action towards low-cost, high-impact applications, provides a cultural playbook for communication, informs viable business models for service providers, grounds the ethical debate in local concerns, and pinpoints the most critical area for long-term investment in human capital.

6.3 Research Limitations and Directions for Future Research

This study's limitations and future research trajectories are presented through a dual lens of methodological reflection and forward-looking scholarly opportunity. First, the research prioritizes perceptions of neuromarketing's utility over direct empirical application. While this approach elucidates adoption barriers and cultural receptivity, it does not establish causal evidence of neuromarketing's efficacy in driving sustainable behaviors among Saudi consumers. This gap underscores the necessity for future experimental studies employing EEG, eye-tracking, or fEMG to quantify neural responses to culturally tailored sustainability stimuli (e.g., Islamic environmental messaging, eco-labels).

Second, the qualitative design prioritizes analytical generalizability (Lincoln & Guba, 1985), offering transferable theoretical propositions rather than statistical generalizability. To extend this, comparative studies across GCC, Western, or Asian contexts could disentangle universal neuromarketing principles from culturally contingent factors, enriching cross-cultural theory-building in sustainable consumption.

Third, despite purposive sampling of 32 professionals, potential biases, such as overrepresentation of innovation advocates, may skew findings. Additionally, the interpretive nature of qualitative analysis inherently incorporates researcher subjectivity (Creswell & Poth, 2018). Future mixed-methods designs could triangulate professional perceptions with consumer surveys or biometric data, mitigating bias while preserving contextual depth.

Fourth, the rapid evolution of neuromarketing technologies and Saudi Arabia's shifting sustainability landscape under Vision 2030 impose temporal constraints. To address this, longitudinal studies tracking neuromarketing's adoption trajectory could reveal how market maturity, technological advancements, and societal value shifts reshape stakeholder perceptions and ethical frameworks.

Fifth, the study's reliance on professionals' conceptual understanding may oversimplify neuroscientific complexities. For instance, optimism about predictive analytics might obscure challenges in interpreting neural correlates of cultural values. Interdisciplinary collaborations between marketers and neuroscientists could develop context-specific protocols, aligning technical rigor with Saudi Arabia's linguistic, religious, and cultural nuances.

The integration of neuromarketing into Saudi Arabia's sustainability efforts represents a promising but complex frontier. This study suggests that while significant barriers exist, a thoughtful approach that prioritizes cultural sensitivity, ethical considerations, and targeted applications could unlock valuable insights for advancing sustainability goals in the Kingdom. As one participant aptly summarized: "Neuromarketing isn't a magic solution, but it could be a powerful tool in our sustainability toolkit if we

apply it wisely and respectfully within our cultural context."

In conclusion, this study illuminates neuromarketing's transformative potential for advancing sustainable consumerism in Saudi Arabia while candidly delineating its sociocultural, technical, and ethical constraints. As a foundational work, it advocates for a culturally intelligent pathway to neuromarketing adoption, one harmonizing Vision 2030's ambitions with ethical diligence, localized expertise, and transparent practices. The findings catalyze scholarly and practical progress, urging stakeholders to navigate this emerging field with equal parts innovation and introspection, ensuring neuroscientific advancements serve both commercial and societal imperatives.

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Appendix

Demographic Data

Participant ID	Gender	Age	Years of Experience	Job Title	Working Field
P1	Male	36	6	Marketing Specialist	Healthcare
P2	Male	32	5	Content Marketing Manager	Real Estate
P3	Male	42	9	Social Media Manager	Telecommunications
P4	Male	38	8	Marketing Consultant	Advertising Agency
P5	Male	43	18	Marketing Manager	Retail
P6	Male	34	8	Content Marketing Manager	Telecommunications
P7	Female	34	8	Marketing Consultant	Telecommunications
P8	Male	36	12	Marketing Manager	Healthcare
P9	Female	32	8	Marketing Consultant	Real Estate
P10	Female	47	19	Brand Manager	Technology
P11	Male	34	7	Content Marketing Manager	Banking
P12	Female	36	12	Marketing Director	Advertising Agency
P13	Male	34	4	Digital Marketing Manager	FMCG
P14	Female	27	3	Marketing Manager	FMCG
P15	Female	54	17	Product Marketing Manager	Advertising Agency
P16	Female	29	3	Marketing Consultant	Retail
P17	Female	31	7	Product Marketing Manager	Telecommunications
P18	Female	37	12	Social Media Manager	FMCG
P19	Male	37	7	Head of Marketing	Real Estate
P20	Female	53	20	Marketing Manager	Real Estate
P21	Male	32	8	Product Marketing Manager	Automotive
P22	Male	38	14	Marketing Ethics Specialist	Government/Semi-government
P23	Male	29	4	Content Marketing Manager	FMCG
P24	Female	43	8	Marketing Director	Technology
P25	Female	40	17	Content Marketing Manager	Advertising Agency
P26	Male	29	4	Product Marketing Manager	Automotive
P27	Male	36	11	Product Marketing Manager	Telecommunications

Participant ID	Gender	Age	Years of Experience	Job Title	Working Field
P28	Male	35	7	Social Media Manager	Automotive
P29	Female	33	5	Marketing Manager	Telecommunications
P30	Female	53	23	Marketing Consultant	Retail
P31	Female	37	11	Digital Marketing Manager	Technology
P32	Female	35	10	Social Media Manager	FMCG

Themes

Master Theme	Sub-Themes	Supporting Quota
1. Cautious Optimism Tempered by a Nascent Ecosystem	Acknowledging Potential Amidst Uncertainty	"It sounds promising for understanding consumers better, especially their subconscious reactions, but we haven't really used it for green campaigns yet in our market. It feels like early days for this in KSA for sustainability."
	Limited Direct Application and Awareness for Sustainability Objectives	"I've read about neuromarketing in general marketing contexts, but I'm not sure how it directly applies to our specific sustainability goals here, or if we have the local expertise to effectively implement it for such nuanced topics."
2. The Methodological Promise: Bridging the Intention-Behavior Gap	Seeking Deeper, More Authentic Consumer Truths	"Surveys often don't tell the full story, especially with sustainability. People say one thing, but their actions differ. Maybe neuromarketing could give us deeper, more authentic insights into what truly motivates their sustainable choices, or lack thereof."
	Addressing Limitations of Traditional Self-Report Methods	"The intention-behavior gap is a real challenge for us. If these neuromarketing tools can help us understand the real emotional drivers and subconscious biases that surveys miss, that would be invaluable for crafting more effective sustainability initiatives."
3. The Centrality of Socio-Cultural and Religious Context	The Indispensable Saudi Context in Shaping Perceptions and Behaviors	"Our culture, Islamic values, and national initiatives like Vision 2030 heavily influence how people in Saudi Arabia perceive and engage with sustainability. Any marketing, especially using something as sensitive as neuromarketing, must be extremely attuned to these local nuances."
	Need for Culturally Sensitive Stimuli and Interpretation	"Privacy is a major concern in our culture, and so is the respectful representation of religious values. We would need to be incredibly careful with the stimuli used in neuromarketing studies and how we interpret responses to avoid any missteps or backlash."

Master Theme	Sub-Themes	Supporting Quota
4. Formidable Practical and Resource Barriers	High Cost and Investment Requirements	"These neuromarketing technologies, especially things like fMRI or even sophisticated EEG setups, sound very expensive. For many companies here, the ROI for sustainability-focused studies might be hard to justify initially."
	Limited Local Expertise and Infrastructure	"Do we even have enough trained personnel, neuroscientists, and specialized marketers in Saudi Arabia to run these studies properly and interpret the complex results correctly? It seems like a significant hurdle is the lack of local expertise and supporting infrastructure."
5. Navigating Ethical and Data Privacy Sensitivities	Navigating a Sensitive Terrain of Subconscious Data	"Accessing subconscious thoughts and emotional responses, even for positive goals like promoting sustainability, raises significant ethical flags. How do we ensure complete data privacy and avoid any perception or reality of manipulation, especially within our cultural context?"
	Need for Robust, Culturally Appropriate Ethical Guidelines	"We would need very clear, stringent, and culturally appropriate ethical guidelines and oversight before our organization would even consider using such tools. Consumer trust is paramount and easily broken."
6. Strategic Application to Specific Marketing Tasks.	Pragmatic Focus on Tangible Benefits in Specific Areas	"I can see neuromarketing being practically useful for testing the effectiveness of our sustainability advertisements or understanding how consumers react to new eco-friendly packaging designs, rather than for very broad or abstract attitude studies."
	Optimizing Specific Marketing Communications and Interventions	"Perhaps for specific, measurable things like checking if our eco-labels are actually noticed and understood, or if a particular sustainability message evokes the intended emotional response, neuromarketing could be very practical and offer clear advantages over traditional methods."

Biographical Statement

Dr. Ibrahim Saleem Alotaibi is an Associate Professor in the Business Administration Department, College of Administrative and Financial Sciences, Saudi Electronic University, Kingdom of Saudi Arabia. Received his PhD degree in management (2015) from Hull University, United Kingdom. His research interests include customer behaviour, marketing, Artificial Intelligence in marketing, and management.

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