Investigating the adoption of neuroscience technology among marketing professionals: A survey on the intention to use neuromarketing tools

Letizia Alvino
University of Twente
Carolina Herrando
University of Zaragoza
Agata Leszkiewicz
UNIVERSITY OF TWENTE
Céline Horsten
University of Amsterdam
Henry Robben
Nyenrode Business Universiteit

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The application of neuroscience tools in marketing is increasing. However, there are still barriers of adoption for such technologies (e.g., costs and time of experiments, trust in the field, etc.). Thus, it is still unclear which factors can limit or promote the adoption of neuroscience technology in marketing. The aim of this study is to investigate the determinants of intention to use neuromarketing tools among marketing professionals. We study the effect of attitude, subjective norms, perceived behavioural control, perceived usefulness, and perceived ease of use on marketing professional's intention to use neuromarketing tools. Based on our results, we find that attitude, subjective norms, and perceived usefulness positively influence the intention to use neuromarketing tools. However, perceived behavioural control and perceived ease of use do not significantly impact the intention to use neuromarketing tools. Our study contributes to both academia and business by shedding light on which individual and social factors influence a professional's intention to use neuromarketing tools.

Keywords: *Neuromarketing, Marketing Professionals, Behavioural Intentions*

Track: *Marketing Strategy & Theory*

1. Introduction

A growing number of companies and researchers alike rely on the power of neuroscience technology to study consumer behaviour. The use of neuroscience technology in marketing is categorized as consumer neuroscience (mostly used in academia) or neuromarketing (Lee, Chamberlain and Brandes, 2018). Neuromarketing promises to contribute to an effective *understanding of consumer behaviour and decision-making processes, thereby improving existing marketing theories* (Plassmann et al, 2015; Scholte et al., 2022). In recent years, both business and academia have made use of neuroscience technologies for marketing purposes. For instance, the number of neuromarketing studies has more than tripled in the last years compared to 2004 (Alvino et al., 2020). We have also seen an increase in the number of companies that have a neuromarketing division (e.g., Nielsen) or provide neuromarketing services (Royo-Vela and Varga, 2022).

From the marketing literature, much effort has gone into examining how neuroscience technologies can be used to study consumer behaviour in different contexts (e.g., branding, advertising). Despite the growing interest and application in neuromarketing, it is still unclear which factors affect the adoption of neuromarketing tools or technologies. Integrating neuromarketing tools in marketing research requires investments in terms of time, budget, and human capital. For instance, acquiring neuromarketing tools might take between €100 and €1M, depending on the tool (Alvino et al., 2020). In addition, these technologies are highly sensitive to movements and artefacts, so acquiring low-cost neuroscience tools might impact the accuracy and the types of measurements (e.g., an eye tracker of €100 is usually fixed and not portable). While designing neuromarketing experiments, we also need to consider the preparation time for each participant (e.g., between 15 minutes. to 1 hour) considering a minimum sample size of 30 participants (Alvino et al., 2020; Ramsøy, 2019; Vozzi et al., 2021). Finally, there are still personal and social factors that limit the application of neuromarketing tools. For instance, professionals might have doubts about the validity and effectiveness of neuromarketing (e.g., Are neuromarketing tools effective? Or is neuromarketing trustworthy?). Thus, we aim to understand which factors can limit or promote the intention to use neuroscience technology in marketing. The following research question guided our study: *Which are the determinants for marketing professionals of the intention to use neuromarketing tools?*

To answer this question, we conducted a survey to analyse the factors affecting the intention to use neuromarketing tools based on a sample of 141 marketing professionals (both

academia and business). Investigating which factors affect the decision to use neuromarketing tools can help 1) facilitating the application of these tools in both business and research and 2) identifying (individual and social) inhibitors and promoters of neuromarketing tools. We hope this study can provide a baseline for academia and business alike to determine whether or not marketing professionals can successfully implement neuromarketing in a company's marketing operations based on their beliefs, assessment, evaluation of the results and attitudes towards using neuromarketing tools.

2. Theoretical Background and Development of Hypotheses

Warshaw and Davis (1985) described behavioural intention as "*the degree to which a person has formulated conscious plans to perform or not perform some specified future behaviour*". Several theories have been used to study a person's intention to use technology or tools (Teo, 2011). The most used frameworks to understand determinants of intentions are the Theory of Planned Behaviour (TPB; Ajzen, 1991) and the Technology Acceptance Model (TAM; Davis, 1989). In this study, we use both these theories to investigate which factors affect the intention of marketing professionals to use neuromarketing tools. We examined the intention to use neuromarketing tools as dependent variable due to its close link to actual behaviour (Teo, 2011). To our knowledge, this is the first quantitative study to investigate the intention of marketing professionals to use neuromarketing tools by integrating both the TAM and TPB constructs as direct determinants of intention to use neuromarketing tools, as suggested by Gorgiev et al. (2020).

2.1 Theory of Planned Behaviour

According to the TPB, there are three main determinants of intentions, namely attitude, subjective norm, and perceived behavioural control (Dangelico et al., 2022). *Attitude* is described as a person's beliefs, assessment and (favourable or unfavourable) evaluation of the results that can be derived by a given behaviour (Ajzen, 1991). Next, *subjective norms* can be defined as a individual's perception of the social pressure to comply (or not) with a behaviour (Ajzen, 1991). *Perceived behavioural control* refers to the perception of how simple (or difficult) is for a person to perform a behaviour, or the degree of difficulty to carry out a behaviour (Ajzen, 1991). Overall, a person with a positive attitude, high subjective norm, and behaviour control ultimately tends to perform a specific behaviour (Zhang et al., 2019). This suggests that having a positive attitude towards neuromarketing can increase a professional's

intention to use neuromarketing tools into marketing practices (Gorgiev, 2020). Similarly, people who are impacted favourably by subjective norms are more likely to engage in that behaviour (Dangelico et al., 2022). Hence, if a professional perceives that using neuromarketing tools is accepted by their friends or colleagues then they will be more likely to use them. Finally, perceived behavioural control is the conscious decision of an individual to exert effort in engaging in a particular behaviour (Conner, 2001). This suggests that if a professional have a higher PBC, they are more likely to try harder to perform that target behaviour, compared to professionals with lower PBC levels) (Amireault, Godin and Vohl, 2008). As a result, we developed the following hypotheses:

H1: *A positive attitude towards neuromarketing tools positively influence marketing professionals' intention to use neuromarketing tools*

H2: *A higher subjective norm toward neuromarketing tools positively influence marketing professionals' intention to use neuromarketing tools*

H3: *Higher perceived behavioural control toward neuromarketing tools positively influences marketing professionals' intention to use neuromarketing tools*

2.2 Technology Acceptance Model

The TAM is used to investigate the elements that influence the acceptance of new technology (Davis, 1989). According to this theory, *behavioural intentions are predicted by attitudes towards that technology*, which are the result of perceived ease of use perceived usefulness (Teo, 2011). Perceived ease of use concerns a person' perception of how much effort is required in using a technology, or also the perceived complexity (simple or complex) to adopt such technology (Davis et al., 1989). A higher perceived ease of use of a technology can be seen as a barrier to its adoption, as it requires a person's time and effort to use it (Hill et al., 1987). Instead, an individual is more likely to learn and use a tool that they perceive as less demanding and time consuming (Davis, 1989). This reasoning suggests that if a professional perceives that using neuromarketing tools is relatively easy, that their intention to use such tools also increases. *Perceived usefulness* is defined as the degree to which a person believes that using a technology would improve their productivity (Davis et al., 1989). Thus, it concerns the expected overall impact of using a technology on the job performance or outcome in terms of potential benefit or disadvantage that derives from using such technology or tools (Teo, 2011). This reasoning suggests that if a person perceives that using neuromarketing tools can enhance their job performance, they will be more likely to adopt such tools. Based on the literature reviewed, we formulated the following hypotheses:

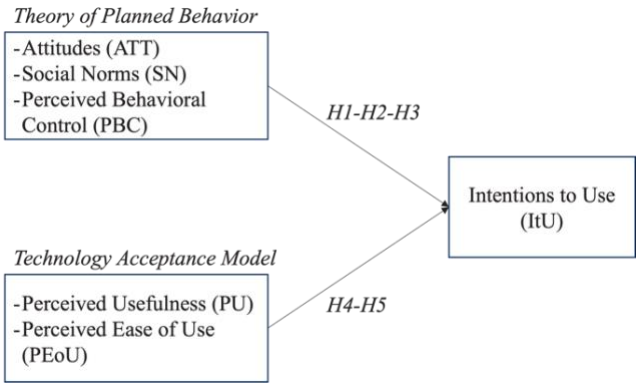
H4: A higher *perceived usefulness of neuromarketing tools positively influences influence marketing professionals' intention to use neuromarketing tools*

H5: A higher *perceived ease of use of neuromarketing tools positively influence marketing professionals' intention to use neuromarketing tools*

3. Methodology

The data used for this analysis were collected through an online survey. The recruited participants were either professionals or academics from the marketing sector. Hence, marketing experience was a prerequisite for participation in this study. A total of 233 responses were collected and after checking for inconsistencies the final sample size contained 141 fully completed questionnaires. Out of the 141 participants (average age 38.35) 66.7% were male; 66.75% are active in academia and 64.5% in business. The educational background of the participants showed they were mainly from marketing (64.5%), followed by neuroscience (14.2%), psychology (10.6%) and a combination (10.6%).

Figure 1. Conceptual model



Before testing the proposed conceptual model, we ran a correlation analysis among all items, which showed that correlations between different TPB and TAM items range from low to high. Furthermore, the Kaiser-Meyer-Olkin value (KMO=0.871) and a statistically significant Bartlett test of sphericity indicate that our data is suitable for factor analysis. Next, we conducted an exploratory factor analysis (Hair et al., 1999; Kaiser, 1974) with SPSS 27 using the Principal Component extraction with Oblimin rotation. The findings show that each item loaded onto its factor, except for an SN1 item, which loaded to the PBC factor. We have removed this item from the subsequent analysis.

We argue that the proposed measurements in our model (Figure 1) have sufficient content validity. Our survey has been created following a rigorous literature review; its length and

ease of completion have been checked by several experts. Furthermore, the validity and reliability of measurement scale have been checked with partial least squares (PLS) using SmartPLS 3 software (Ringle, Wende and Becker, 2015). All our constructs have values of Cronbach's alpha above .70 and composite reliability above .60, indicating an acceptable internal consistency (Nunnally and Bernstein, 1994; Nunnally, 1978; Fornell and Larcker, 1981). Finally, the HT/MT (Heterotrait/Monotrait) ratio between correlations (Henseler et al., 2015) has confirmed the discriminant validity of our constructs. We see that the correlations between the construct items are higher than the correlations that measure other constructs (see Table 1). Furthermore, the correlations between the independent variables and our DV of interest, Intentions to Use (ItU), are statistically significant and strong. Several independent variables correlate strongly with each other (e.g., PBC and PEoU, r = .702, p<.01), however, the variance inflation factor (VIF) statistic is well below 3 for all considered regressors, confirming that multicollinearity is not severe.

Table 1. Descriptive statistics and correlations

	Mean	Std. Deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Intentions to Use	0	1	1														
Attitudes	0	1	.658**	1													
Social Norms	0	1	.567**	.455**	1												
Perceived Behavioral	0	1	.362**	.247**	0.019674	1											
Perceived Usefulness	0	1	.626**	.704**	.391**	.280**	1										
Perceived Ease of Use	0	1	.233**	.211*	-0.145	.702**	.233**	1									
NTuse	0.36	0.482	.341**	.208*	0.052	.609**	.337**	.367**	1								
age	38.35	11.583	-0.055	-0.043	-0.141	0.122	0.051	0.005	.311**	1							
male	0.67	0.473	0.089	0.149	-0.048	.184*	0.099	.191*	.250**	.364**	1						
Academic	0.667	0.473	-0.083	-.235**	0.006	-0.045	-.185*	0.013	-0.031	-0.093	0.011	1					
Business	0.645	0.48	.227**	.251**	-0.028	.273**	.209*	.280**	.280**	0.162	0.042	-.524**	1				
Marketing	0.645	0.48	0.096	.212*	.222**	-.254**	0.058	-.381**	-.244**	0.028	-0.021	-.304**	-0.023	1			
Psychology	0.106	0.309	-0.085	-0.083	-0.155	0.061	0.027	0.102	0.123	-0.058	-0.049	0.098	-0.033	-.465**	1		
Neuroscience	0.142	0.35	-0.054	-.212*	-0.073	.237**	-0.154	.185*	0.075	-0.023	0.029	.287**	-0.081	-.548**	-0.14	1	
Combination	0.106	0.309	-0.004	-0.006	-0.107	0.066	0.058	.281**	.171*	0.041	0.049	0.049	0.16	-.465**	-0.119	-0.14	1

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 ' ' 1.

4. Results

We test our hypotheses with a linear regression model, with ItU as DV, the PBC and TAM constructs as main IVs, and a rich set of controls to account for respondent-level observed heterogeneity:

(1) $ITU = \beta_0 + \beta_1 * ATT + \beta_2 * SN + \beta_3 * PBC + \beta_4 * PU + \beta_5 * PEoU + \gamma Z + \varepsilon_i$

where *ATT, SN, PBC, PU, PEoU* are the factors corresponding to respective constructs with associated coefficients β, Z represents our control variables, and $\varepsilon_i \sim N(0, \sigma^2)$ is the error term. For completeness, we estimate several regression specifications: 1) a model with control variables only (M0); 2) a model with TBP constructs and controls (M1); 3) a model with TAM constructs and controls (M2); 4) our target model, presented in Equation (1), including

TPB and TAM constructs, as well as controls. The results presented in Table 2 are generally robust across different model specifications.

Consistent with the TPB theory, we see that ATT and SN coefficients are positive and statistically significant (β_1=.268, p<.01 and β_2=.33, p<.001 respectively). Therefore, more positive attitudes about neuromarketing tools lead to stronger intentions to use, and higher levels of social pressure measured by subjective norms also lead to stronger intentions to use. Therefore, we find empirical support for our Hypothesis 1 and Hypothesis 2. The coefficient for the PBC is positive for the TPB model (M1) and the target model (M3), although it is statistically significant only in the former case (β_3=.153, p<.05). The high correlation between PBC and PEoU might be one of the reasons why the β_3 coefficient becomes statistically not significant in our target model M3, when TAM factors are added to the M1 specification. Therefore, our Hypothesis 3 is not supported. Focusing on the elements of the TAM model, we find that PU is positively related with the ItU (β_4 =.226, p<.01) and is statistically significant, thus supporting Hypothesis 4. However, neither our TAM model specification (M2) nor our target model (M4) have found a statistically significant relationship between PEoU and ItU neuromarketing tools. Therefore, our Hypothesis 5 is not supported.

Table 2. Overview of the estimated models and results

	M0 Controls	**M1 TPB, Controls**	**M2 TAM, Controls**	**M3 Target model TPB, TAM, controls**
Theory of Planned Behaviour				
Attitude		.414 (.071)***		.268 (.087)**
Subjective Norm		.354 (.066)***		.33 (.067)***
Perceived Behavioral Control		.153 (.075)*		.13 (.096)
Technology Acceptance Model				
Perceived Usefulness			.548 (.071)***	.226 (.082)**
Perceived Ease of Use			.054 (.077)	0.028 (.09)
Controls				
Use of neuromarketing (Y/N)	.838(.183)***	.302 (.16)+	.405 (.162)*	.232 (.162)
Age	-.021(.007)**	-.005 (.006)	-.015 (.006)*	-.006 (.005)
Gender: Male	.142 (.177)	-.009 (.131)	.065 (.149)	.011 (.13)
Background: Academic	.156 (.207)	.17 (.151)	.268 (.172)	.197 (.149)
Background: Business	.404 (.202)*	.218 (.149)	.306 (.171)+	.233 (.148)
Educaction: Marketing	.461 (.267)+	.072 (.196)	.445 (.229)+	.143 (.205)
Educaction: Psychology	-.132 (.336)	-.043 (.243)	-.108 (.279)	-.048 (.242)
Educaction: Neuroscience	.054 (.316)	.04 (.236)	.255 (.262)	.098 (.236)
Intercept	-.267 (.444)	-.204 (.322)	-.306 (.367)	-.234 (.321)
R^2	.219	.602	.476	.625
Adj R^2	.171	.568	.436	.587

N	141	141	141	141

Signif. codes: 0 '***' .001 '**' .01 '*' .05 '+' .1 ' ' 1.

5. Conclusions

Our study aims to analyse which factors affect the intention to use neuromarketing tools of marketing professionals (ItU), using both the TPB and TAM model. The results of our study show that attitude (*ATT;* for the TPB), subjective norms (*SN*; for the TPB) and perceived usefulness (*PU*; for the TAM) have a significant effect on a professional's ItU neuromarketing tools, thus supporting *H1*, *H2* and *H4*. We find that ATT can be a strong predictor of ItU, suggesting that people act in a way that is consistent with their opinions. Similarly, a positive SN highlights the importance of perceived social pressure about the use of neuromarketing tools. Both these results are in line with previous studies conducted on the effect of attitude on a professional's willingness to use neuromarketing tools (Gorgiev, 2020). Finally, our results show that higher PU is related to an increase in the ItU neuromarketing tools. This finding suggests that a professional who perceives these tools to be useful will be more likely to invest time and effort in the adoption of such tools, possibly because these tools might assist them in performing specific tasks more effectively. These results are in line with studies that use TAM to investigate the intention to use technology by professionals (Teo, 2011).

Our findings also show that perceived behavioural control (*PBC*; for the TPB) and perceived ease of use (*PEoU*; for the TAM) have no significant effect on ItU, thus this does not support *H3* and *H5*. This is not in line with previous studies, where both PBC and PEoU are found to be important predictors of ItU (Gorgiev, 2020). This might be due to the high correlation between the PBC and PEoU constructs, suggesting that PBC and PEoU might be related to one another. In addition, this finding might suggest that neuromarketing tools are not necessarily perceived as easy to use by marketing professionals, however, this might not be considered as a barrier of adoption of such tools. On the opposite, we can assume that even though these tools can be considered difficult to master, professionals are still willing to use them.

Overall, we believe that the findings presented in this study have several implications for scholars and practitioners. In terms of theoretical implications, our study adds to the marketing literature by integrating components of the TAM and TPB model to investigate the intention of marketing professionals to use neuromarketing tools. This gives insights into which are the most influential factors in explaining the acceptance level of neuromarketing tools for marketing professionals. For instance, our results show that subjective norms and

perceived usefulness of such tools are strong predictors of intention to use them. From a managerial perspective, the findings of this study provide managers with insights on the individual's factors that might increase (or decrease) marketing professionals' intent to adopt neuromarketing tools in the workplace. Thus, if companies want to promote the use of these tools for improving marketing strategy, it is important to reflect on the impact of the social environment (e.g., creating a system that supports cooperation) and individual's perception and belief about these tools (e.g., neuromarketing tools can enhance my performances). This will help defining how these tools can support a professional's marketing operations (e.g., advertising testing).

This study also has limitations. In our study we do not distinguish between different types of neuromarketing tools (physiological, neurophysiological). As neuromarketing encompasses different types of tools, each with different characteristics, costs, and limitations, we suggest that future research should focus on measuring marketing professionals' intention to use specific tools.

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