

Understanding the Role of Artificial Intelligence in User Experience & Consumer Behavior

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1. Abstract

With the ongoing shift towards digital solutions in almost every industry today, Branding and Marketing have found a new normal within the realm of Digital Marketing solutions. In the past, many tools and methods have been used to determine consumer patterns to study and enforce new marketing solutions to stay relevant to changing consumer behaviours and buying habits. With the relevant digital shift, more tools and methods have come into place to assist brands to find newer solutions to their marketing objectives and consumer research. Artificial Intelligence is one such tool that has made its presence very known in multiple industries for assisting in prediction and content generation. While the impact of AI is evident in determining consumer behaviour and creating personalized experiences, it also brings up a downside in the boundaries and limits towards data sourcing and collection. Amazon.com has been a key player in the space of data mining and machine learning. Their predictive analytics tool successfully helps their users with products aligned to their purchase patterns from their previous shopping experiences. The methodology of this research explores a diagnostic study and observation of the attention and meditation span of individuals during a customized and personalized shopping experience followed by a survey. The key observations indicate more attention and engagement levels in users who are more frequent with Amazon. This study also indicated the necessity of “Explainability” with suggestive products from the user's end.

2. Key Words

Artificial Intelligence, Customer Behavior, Digital Marketing, Machine Learning, Explainability

3. Introduction

In today's rapidly growing digital environment, brands through their products and services are enabling all possible tools and methods to keep up with the changing landscape in consumer patterns and behaviours. While the methods of understanding consumer behaviour and its importance of it were long established through traditional methods, with the rapid onboarding of digital marketplaces and online shopping, brands have a lot more data generated to analyze than before. Here, it's key for brands to utilize tools that can help in analyzing this data to help gain better customer insight. **Artificial Intelligence (AI)** is one such tool that has made its presence very known in multiple industries for assisting in prediction and content generation.

Companies today are hiring data scientists and technical programmers within their marketing teams, and it can be said that these professionals will take the reins in most marketing-related decisions going forward. Forbes council member Jason Hall quotes *"The internet is like a giant behavioural science laboratory, but there are so many data sets that humans alone can't possibly hope to analyze them all. That's where AI comes in."*

Within marketing, AI is leveraged to improve customer journeys and create effective touchpoints which contribute to their overall experience. The lack of guesswork and error within AI helps companies in improving their customer interactions. This can, for companies, boost ROI (return on investment), drive sales and attain better brand retention and perception. AI primarily works out of Big Data analytics and Machine Learning to gain better insight into targeted audiences. Here the more data, the better the functioning of the AI tool. That said, irrespective of all the efficient qualities AI does hone, Data being one of its prime components, also plays a factor in determining its role in ethical processes.

4. Literature Review

The International Journal for Research in Applied Science & Engineering Technology through Dr Manas Khatri published a relevant report in 2021 titled **"How Digital Marketing along with Artificial Intelligence is Transforming Consumer Behaviour?"**. The report, citing various existing academic sources, covers the function of artificial intelligence as a technology in the application of digital marketing. Here, the author compares AI to the human brain by how it is trained to complete tasks as "smart" as a human being. He compliments the time-based efficiency AI holds in producing results in comparison to traditional methods,

considering the rapid growth in data being collected today. The necessary technical highlights of AI are put forward where the aspects of “Big Data” collection and “Machine Learning” are quoted as the best reach to customer insights today with the growing increase in digital onboarding. The aspect of consumer insights is presented as a required catalyst to determine digital marketing solutions that can be catered to the same audience more efficiently. When it comes to how this is changing consumer behaviour, the author quotes the use of AI and big data in determining digital marketing tools and methods that can be implemented to suit the customer. Here he quotes how machine learning programs should make sure to eliminate errors in data and incorporate relevant AI-based decision-making marketing tools to improve consumer behaviour. While highlighting the benefits of efficiently using AI in digital marketing, the author also takes a quick look at the drawbacks and challenges that can be faced with AI in digital marketing today. Here he primarily quotes the importance of brands aligning these AI inputs with high standards of privacy and security with any platform to comply with the User Data Policy. He talks about how AI today has taken its own role in collecting user data which poses the biggest challenge to privacy, although he does feel this can be overcome. He mentions the key to customer loyalty with AI is consent and awareness of its use from the user’s perspective. He concludes the report by quoting how India being the 3rd highest country in terms of Internet Community can pave way for companies to boost their online marketing and improve customer relationships.

The relationship AI has with Consumers is looked at in an interesting section of the article **“Artificial intelligence, firms and consumer behaviour: A survey”** by professors Laura Abrardi, Carlo Cambini and Laura Rondi from Italy in 2021. While the article looks at the role of AI in various economic aspects, it mainly questions its impact on consumer biases and what are the different factors that can continue to affect it. In this section of “AI and Consumers” the authors examine how AI is presently shaping consumer behaviour by highlighting how the system of collecting data from users through various methods (like search results, news content, and multimedia content) is in a way a “taken for granted” approach where the system has been normalized for AI tools. They cite the origin of the concept of “Algorithmic consumers” who have the information overload they face diluted by these AI tools to help them with faster decision-making processes. They quote that these algorithms assist customers to overcome behavioural biases and cognitive limits while still making rational choices. The use of machine learning technologies is criticized however from a customer’s perspective, where they highlight the aspect of “Algorithmic Unfairness” being a factor to users in terms of producing selection

biases. The large amount of data being processed here can serve unintended discriminatory and exclusion outcomes that could impact behavioural biases. While concluding the paper with prospective policy change regarding improving AI implications, the authors also state how while AI might contribute to shaping consumer behaviour and market relevance, it works out of a model of exploiting newly available and accessible data sources and pre-existing behavioural biases of human beings.

A study conducted at a university in Saudi Arabia by Laith T. Khrais published in Future Internet, MDPI, looks at the **Role of Artificial Intelligence in Shaping Consumer Demand in E-Commerce**. Here the author positions AI in marketing as a key tool to target individual buyers. He states the example of how AI has been incorporated across platforms that the customers use so, in the E-commerce experience, the platform and product listing is placed in a way to increase their likelihood of purchasing a product. He denotes this “hyper-personalization” as the key to influencing customer demand in E-commerce. He stresses how the application of AI in e-commerce influences customer retention and satisfaction and that customers are at the centre of change in the adaption of AI in e-commerce. The power AI holds leads the author to examine the role it plays outside its upsides, where he opens the aspect of AI from an ethical standpoint. In particular, the study looks at the defining role of “Explainability” in AI and what it needs to be to fulfil consumer demands within the e-commerce industry. Explainability in AI refers to the interpretability and comprehensibility of the input received from AI data that is being suggested/directed to the user. It basically questions the “why” of AI reasoning. He explains the effect of the “Black box” in AI, where he holds these AI tools responsible for the decisions they generate. Through this study, the author puts together research contributing to Explainable Artificial Intelligence models. Creating a need to further examine the requirement for explainable AI systems in e-commerce. Here, improving Machine Learning is key to making the AI actions reasoned and justified.

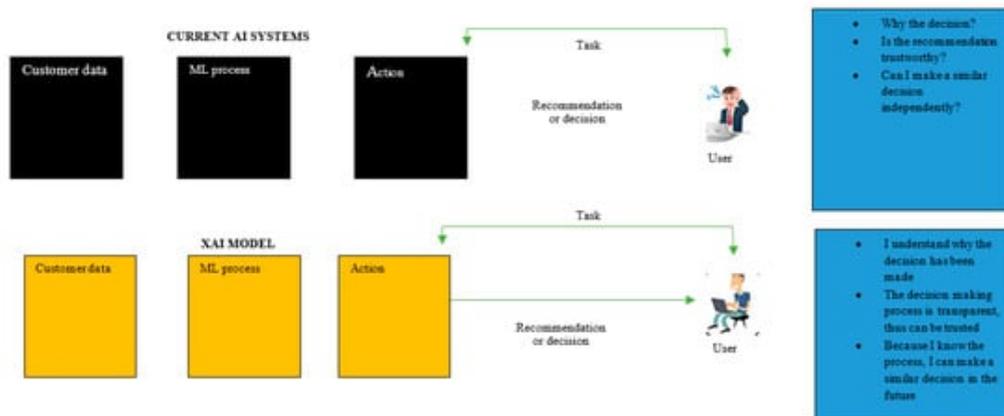


Figure 1 Authors analogy showing the differences between present-day AI and Explainable AI models.

While there is relevant documentation of AI marketing present, Alexis Perrier in his book **Effective Amazon Machine Learning** covers an entire chapter on Amazon Machine Learning (AML) and **Predictive Analytics**. Predictive Analytics is used within Amazon for a multitude of customer-related features and its key feature is problem-solving through machine learning. The chapter gives an overview of AML and its positioning within the technical realm of AI.

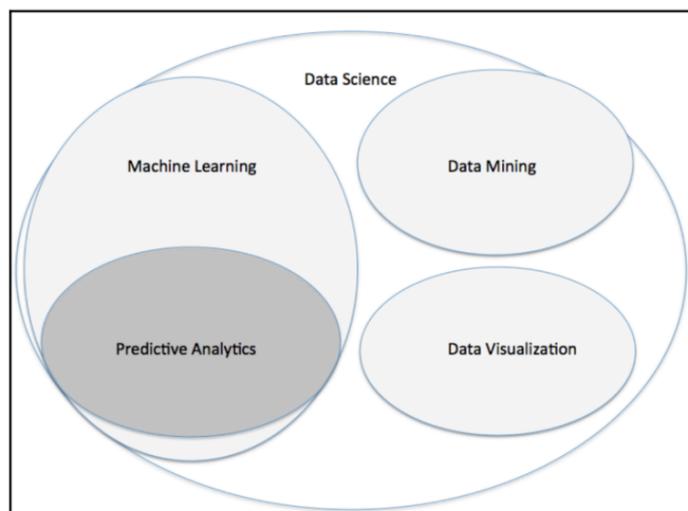


Figure 2 Positioning Predictive Analytics within AI - Source "Effective Amazon Machine Learning"

The author describes Predictive Analytics as the art of predicting future intentions based on past observations. This requires data to be organized in a certain way with the outcomes well defined. Predictive Analytic applications can range from predicting consumer behaviour to health, financial markets, and natural events like earthquakes. Here the element of supervised learning is key where data is continuously fed to train the model.

One can see Predictive Analytics in Amazon's e-commerce platform through suggestive product recommendations, where based on the customer's purchase history and browsed data, recommended products are featured to curate a more personalized shopping experience. This also helps predict and make educated guesses about consumer behaviour and purchase habits. This can go beyond just increasing sales for Amazon.

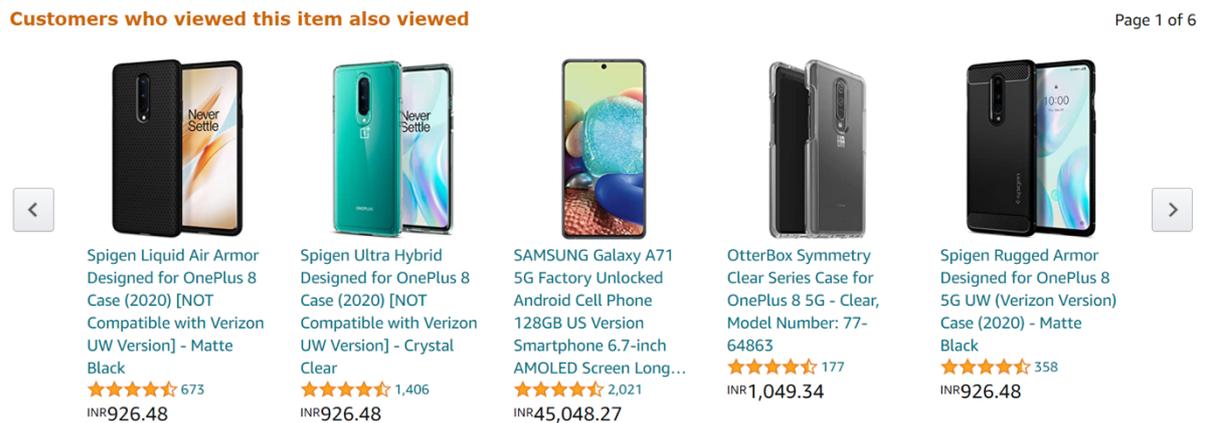


Figure 3 Recommended products suggested to users through predictive analytics

5. Objective

The objective of this research is to look at the implication of AI from a user's perspective while capturing their cognitive responses interacting with the AI. Given the wide use of Amazon's Predictive Analytics tool through their Machine learning algorithms, one part of this research would look at incorporating its present-time use from the user/consumer perspective.

6. Research Methodology

6.1 Design of Experiment & Sampling Technique

To understand the subject of this field from the perspective of the human brain, for the methodology of this research, a sample size of 6 individuals (3 male, 3 female) were asked to shop for a certain task on Amazon.com from their respective devices. The age range of participants was from 23 years to 39 years. The task required them to add items to their cart based on the shopping requirement and budget. Everyone had up to 30 mins to complete their

task during which their phone/laptop screen was recorded, and they had an EEG monitor connected to their head. The EEG device captured their attention and meditation levels during their task.



Figure 4 Participants during doing their task while EEG recorder measures their attention levels

The task required the participants to shop for a personal trip to the mountains where they would spend a week. The task mentioned was as follows:

“Use up to 30 mins to complete the below task. You can use google or other platforms for research purposes, however, the item should be purchased on the Amazon app alone

Situation 1: You are going on a trip with your friends to the mountains for a week, It's May and the weather is pleasant. This is your first time, and you need to equip yourself with all items that are required for a mountain expedition. You have a Rs 20,000 or under as your budget for the shopping for this trip on Amazon.com. Finish this task once you have added all items to your cart and you are ready to proceed to check out.”



Figure 5 Screenshot of live EEG reader during the task with the attention level shown in red and meditation levels in green

Along with the budget and time duration, they were to look for products that would interest them and add them to their cart. Once the task was over, each participant filled out a survey to share their experience. The survey comprised questions relating to their shopping preferences along with details from their task and experience. Besides Name, Age, and Gender, the survey questions consisted of the following:

1. Preferred mode of shopping – Online or Offline
2. Reason for this mode of shopping
3. For online shopping, what is your preferred hardware? – Phone/Ipad or Laptop/Computer
4. Rate the following in terms of your personal purchasing decision-making – 1 to 5
 - Price
 - Reviews
 - Brand
 - Suggested Product by Amazon
5. Most trusted online shopping website
6. Most used online shopping website
7. How often do you shop on this site?
8. How often do you window shop online?
9. How often add items to your Amazon wish list?

10. Rate the experience of the shopping task – 1 to 5
11. How easily were you able to find the items you were looking for? – Easily, Not Easy, Both
12. Did you search for any of these products from the task in the last month? (On any website)
13. With each product selected did you feel satisfied/happy at the end after adding to the cart
14. Did you purchase any product for this task because you wanted to or because you knew about it?
15. Did you purchase any product for this task because amazon suggested it?
16. If you had to describe your emotional journey while on your shopping experience, how would you describe it?
17. If you actually had the 20k, would actually purchase these items in your cart?
18. Do you like that amazon suggests recommended products to you?

At the end of the test session, each participant shared the recording of their phone/laptop screens during the task duration as well as screenshots of the final shopping basket

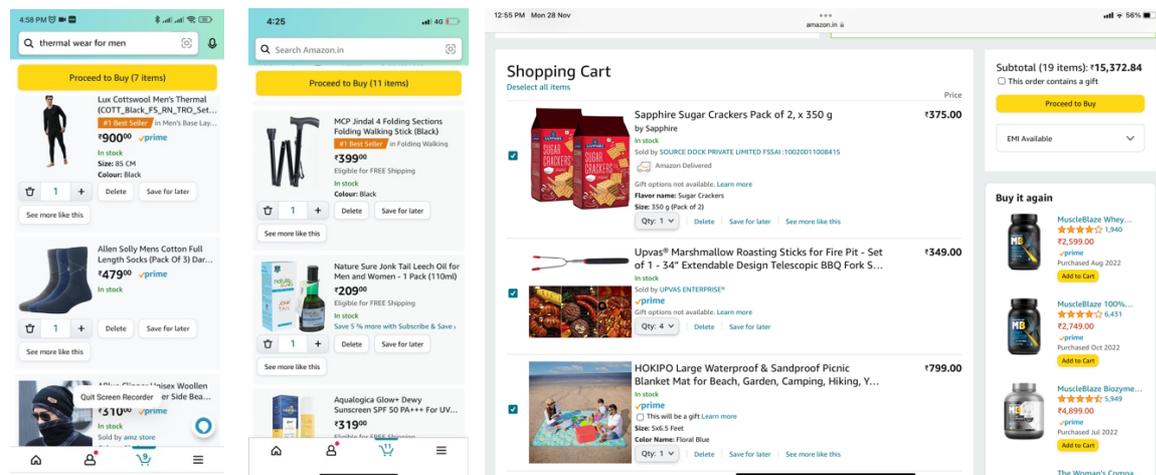


Figure 6 Screenshots of participant's final shopping baskets

7. Findings and Discussion

The data received from each respondent consisted of 3 parts:

- EEG reading of their task duration
- Screen recording of their task
- Questionnaire responses post task

From these responses, a diagnostic study-based approach was taken about observing and viewing the data collected.

Each EEG reading per participant is portrayed through a line graph visual having one of the axis record their attention period and the other axis covering the time duration.

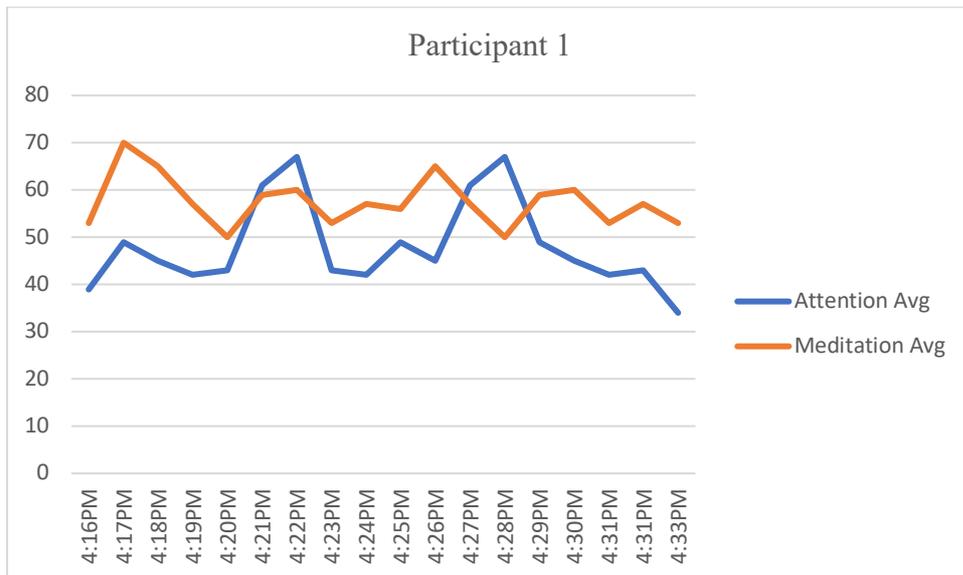


Figure 7 Line chart of EEG reading for Participant 1

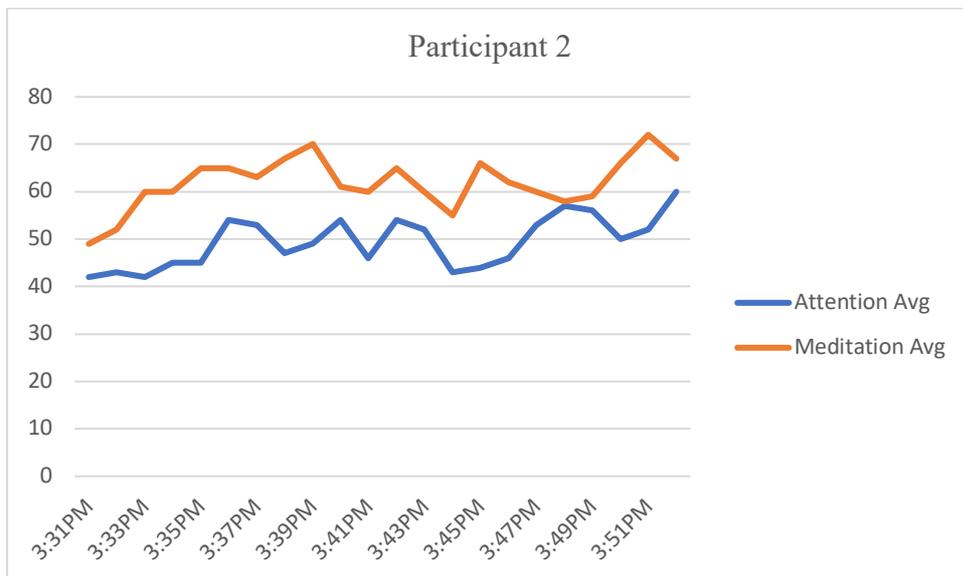


Figure 8 Line chart of EEG reading for Participant 2

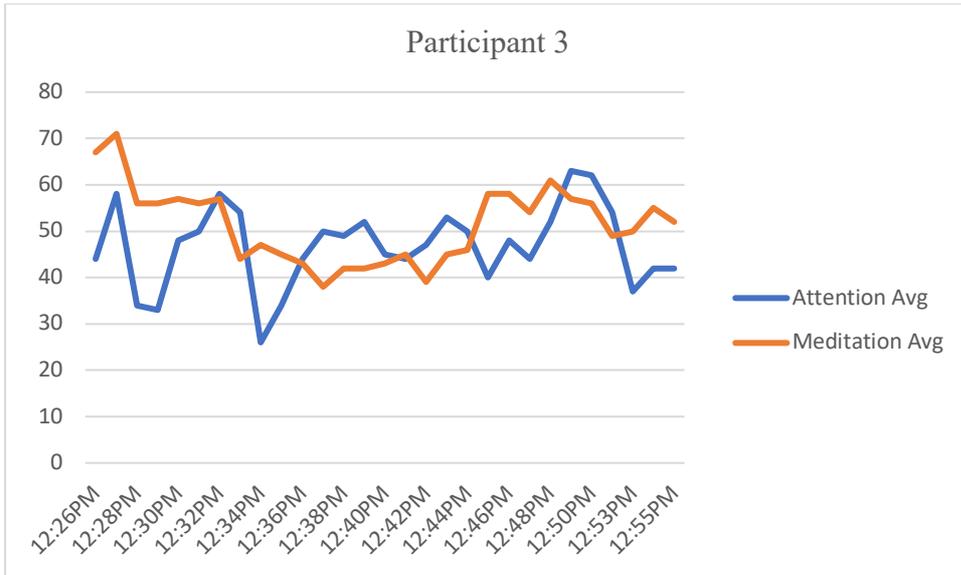


Figure 9 Line chart of EEG reading for Participant 3

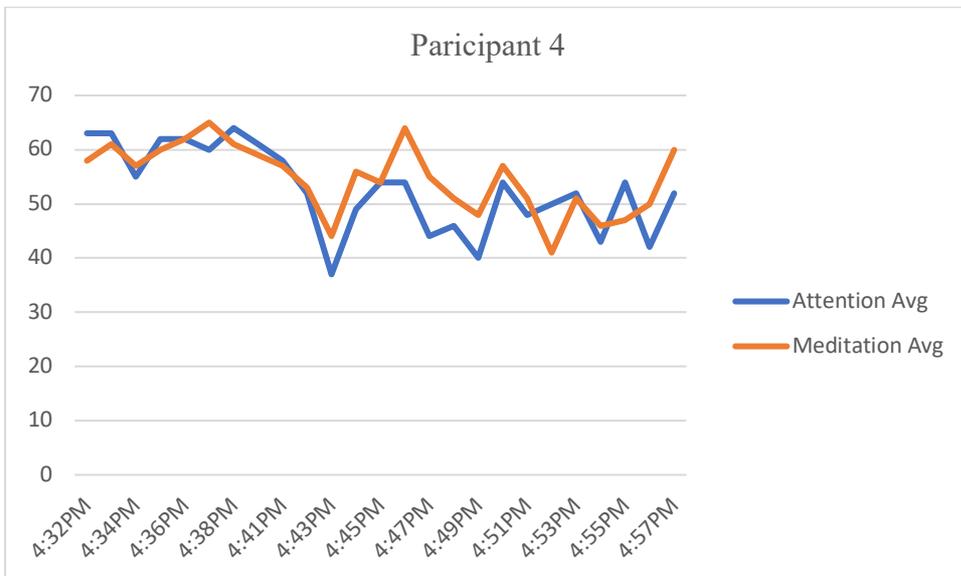


Figure 10 Line chart of EEG reading for Participant 4

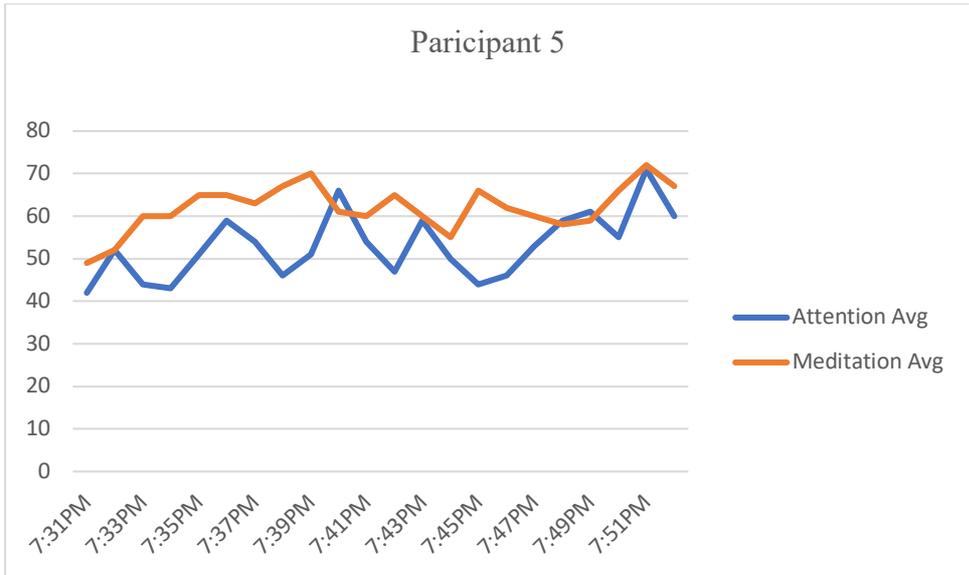


Figure 11 Line chart of EEG reading for Participant 5

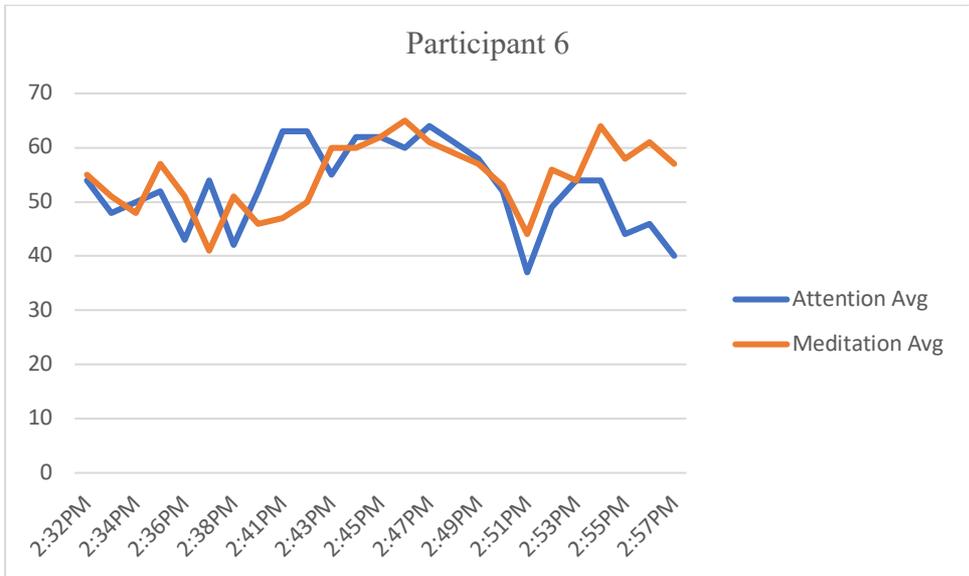


Figure 12 Line chart of EEG reading for Participant 6

When the Attention average (blue line) is above the Meditation Average (orange line), it can be said that the participant was actively engaged in their shopping experience or a particular product.

Further understanding of a user's interest vs passive searching can be derived from looking at the relationship between both lines.

- 1) Participant 2 has their meditation line entirely above the attention line, suggesting they were the most passive. Even when the blue line saw a bump it couldn't cross

orange, ergo they were convinced enough by the recommended suggestions. What is interesting to also note here, is the participant is not a regular Amazon user which can indicate Amazon does not have a sufficient data set to edit this user's algorithm to more personalized suggestions. As their attention span potentially increased towards the end, it could indicate the predictive analytics generated some form of personalized suggestion towards the end of their shopping experience based on the data it had collected since the start.

- 2) Participant 3's attention line has sustained periods of time where it is above their meditation. This can be inferred as the subject is not only interested in a suggestion but is also spending more time exploring that suggestion. This participant is a regular Amazon customer and has their feed personalized to their shopping preferences. This user spent more time engaging with the top 3 suggested products on the feed and spent time going through the suggested products on the product page as well.

From the survey, most of the respondents had Amazon as the most frequented online shopping website followed by Nykaa and Myntra. They categorized price, reviews, and Amazon-suggested products as the top-rated priorities for their purchase decisions. 2 main questions which bring in Amazon's prediction perspective to the users had many of them in favour of Amazon and its suggested products method.

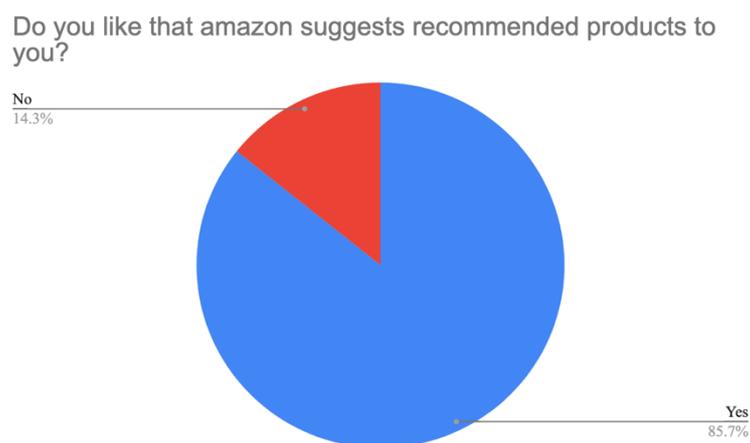


Figure 13 Pie chart of survey question

Did you purchase any product for this task because amazon suggested it

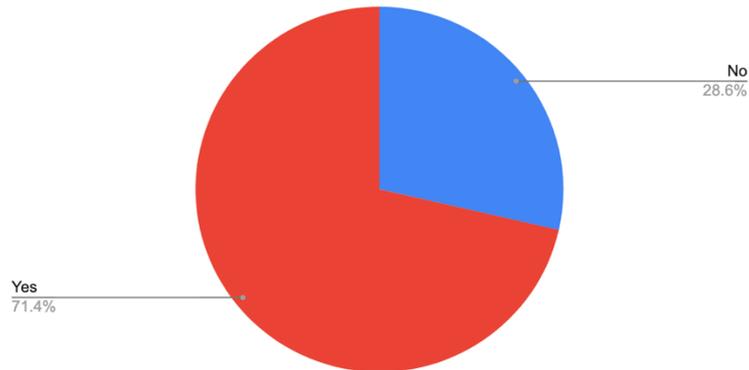


Figure 14 Pie chart of survey question

The same users who had a higher attention span during the task experience were the same ones who were frequent Amazon shoppers that had a more personalized experience.

8. Conclusion

Looking at the existing literature in existence around AI and its application through marketing and machine learning, it is evident that it is a sought-after tool for brands to equip to engage more successfully with their customers and attract new users. Through this methodology, an interesting observation from the diagnostic study indicates how the attention span of participants who were Amazon users had a higher attention span and was more engaged with their shopping experience. It in many ways indicates that having a more personalized experience can help in improving a customer's shopping experience. These users also happened to have more items within their shopping carts at check-out. Another interesting observation to note is that 4 out of the 6 respondents had searched for these products on other search engines before Amazon. When asked a few participants in person how they felt about that aspect, one responded with indifference while others showcased awareness of an AI-induced algorithm that is collecting their data. While they acknowledged that it does help their decision-making, it also makes them feel uneasy about what data is being collected. While looking at this experiment from a different lens, it is interesting to see from the literature review, the importance of Explainability in AI as well. For an E-commerce brand like Amazon, which have customers and users in equal demand, it is essential to understand the reasoning behind the suggestive product method which applies to new users as well.

9. Practical Implication & Scope of Future Research

The design of Artificial Intelligence stems from the working of the human brain. One reason for conducting this methodology keeping the EEG readings as a measuring tool was to look at how AI can map a user's attention level to gauge its algorithmic input level. Could analyzing the flow of user engagement with the shopping experience determine suggestive and predictive patterns that can create an even more engaging shopping experience? At the same time, can this indication of personalization of experiences be looked at further from the user/consumer's perspective? Here a potential round 2 of surveys can be explored with the same participants where the products they were engaging with at the attention average peaks can be brought up with them again to understand why they showed interest. Or link it to their previous purchases to try drawing out a pattern to bring about the notion of "Explainability" to the user as well.

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Appendix

- Survey Data –

https://docs.google.com/spreadsheets/d/1cyibXhevAWJJMeuTdCcaKyL3BEU7bq8BKUF7Gc68_dg/edit?usp=share_link

- Task EEG recording –

<https://drive.google.com/drive/folders/1qb68BZXcezArOyXKfpuRHABWk09P-NAP?usp=sharing>

- Recordings –

https://drive.google.com/drive/folders/1yDep3RncU-0wwJ5Q9VksmaXIFujf4U_S?usp=share_link