

The relevance of user-participation experiments in web design

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Abstract

User experiments play a fundamental role in the development of web design within Human-Computer Interaction (HCI). These experiments allow researchers and designers to directly observe user experiences and reactions, providing valuable insights into user preferences, behaviors, and interactions. By incorporating user-centric approaches, web designers can identify strengths and weaknesses in web design, leading to the creation of more informed and user-friendly interfaces, better suiting use by humans. This report investigates the relevance of user-participation experiments in web design by analysing two studies: an evaluation of *Popular eReaders* and an investigation into the effects of music relating to user focus (*Binaural Beats*). These experiments highlight the significance of considering different aspects of the UX design and demonstrates how user involvement in the form of experiments can contribute to more effective and engaging web design.

Introduction

The first report focuses on the evaluation of popular eReaders using a scenario-based approach. It compares four branded eReaders and examines their usability and performance, with a particular emphasis on navigation within books. The study highlights the importance of user-based design and provides insights into the strengths and weaknesses of different eReaders.

The second study explores the effects of music on participants' focus by analysing their conscious and brain activity responses. It investigates various music stimuli, including binaural beats, classical music, and popular music, and examines their impact on performance and emotional responses. The findings suggest that certain types of music, such as somber tones and familiar popular music, can improve focus, while binaural beats may cause discomfort and hinder focus. The study underscores the potential applications of music stimuli in affective computing studies.

Experiment 1 – Popular eReaders

Summary

This report presents an evaluation of eReaders using a scenario-based approach. The traditional method of evaluating electronic consumer goods focuses on comparing the latest models based on various features and price, often performed by product experts. However, this study aims to evaluate the quality and usability of eReaders within a limited budget range from the perspective of a user interested in a new product or technology.

The evaluation compares four branded eReaders: Barnes & Noble Nook 1st Edition (Device A), Kobo Touch (Device B), Amazon Kindle 4G (Device C), and Sony PRS-600 (Device D). The evaluation tasks simulate a busy person who does not read the manual, and the primary differentiating factor among the eReaders is found to be navigation within books.

The report provides background information on the rise of eReaders, their advantages over other devices, and previous studies on e-reader usability and technical specifications. It also discusses the methodology used in this evaluation, where eReaders were sourced second-hand within a specific price range.

The participants, primarily computer science students, evaluated the eReaders in pairs, with one operating the device and the other acting as a scribe. The evaluation tasks involved performing various actions on the devices and rating their performance on a Likert scale.

The results of the evaluation show that device A (Nook) performed the worst in terms of navigating to a specific section of a document, while devices B (Kobo) and C (Kindle) performed similarly. Device D (Sony) fell between the best and worst devices. Statistical analysis confirms the significance of the differences between devices A and B.

Overall, the report provides insights into the usability and performance of eReaders based on a scenario-based evaluation approach. It highlights the importance of navigation within books as a key factor in distinguishing between different eReaders.

Experience

“The tasks were undertaken by participants in pairs, with one of them operating the device, and the other acting as a scribe, and then they would swap and repeat the tasks with another device.” (Gedeon, 2014). As a participant of this experiment, I was tasked with operation of the given device and scribing.

As far as experiments go, this was straightforward. The tasks were menial, and overall, none of the eReaders presented any significant issues. The scenario presented to us was that the eReaders were an unexpected gift and that they have not been opened for a reasonable amount of time. Our task was to figure out how to use them and return a survey based on how we found the experience.

In terms of the eReaders, whilst they all performed about the same when it came to reading the books – the user experience for some eReaders was less desirable than others. As part of the experiment, user manuals for the products were omitted and thus we had no way of directly knowing how to perform certain tasks. This highlighted the importance of user-based design, and the devices that ranked higher in the statistical analysis often had better designed user interfaces. My partner and I listed the experience of navigating between books as the largest differentiator between devices.

Overall, this was a basic experiment. I enjoyed the experience of using the various eReaders.

Advantages and limitations

Advantages of the experiment are as follows:

- A scenario-based approach. This emulates real-life usage of eReaders by individuals and provides practical insights into the quality and usability of eReaders that are relevant to everyday users.
- Comparison of multiple devices. The experiment compared four branded eReaders, providing a comprehensive evaluation of different devices within a specific budget range. This allows users to make informed decisions based on their preferences and needs.
- Real user evaluation: The evaluation process involved participants who acted as real users of the eReaders. This approach provides insights into how users interact with the

devices and their subjective experiences, adding a valuable user perspective to the evaluation.

Limitations of the experiment were notable:

- Small sample size: The experiment was conducted with only twelve participants, which may limit the generalisability of the results. A larger sample size would provide more robust and representative data.
- Limited range of eReaders: The experiment evaluated only four specific branded eReaders. There are many other eReader models available in the market, and the results may not be applicable to devices not included in the study.
- Adding on to the small sample size, a lack of diversity in participants was a rather large limitation. The participants in the experiment were predominantly computer science students, which may introduce a bias in terms of technological familiarity and preferences. Including a more diverse range of participants would provide a broader perspective.

Experiment 2 – Binaural Beats

Summary

"Can Binaural Beats Increase *Your* Focus? Exploring the Effects of Music in Participants' Conscious and Brain Activity Responses" investigates the impact of different types of music on participants' verbal and physiological responses while identifying genuine and acted emotions from video clips.

The study aims to determine the music stimuli that can improve focus and be beneficial for managing day-to-day tasks. The experiment involved 22 participants who listened to six different music stimuli while their EEG signals were recorded. EEG is an abbreviation of electroencephalogram, which is “a test that measures the electrical activity of the brain.” (*Electroencephalogram (EEG)* 2021)

The music stimuli included binaural beats, classical music, and popular music. The video stimuli consisted of emotions displayed in genuine or acted form. Based on that, the participants' comments and EEG data were examined to understand the effects of the music

stimuli on their performance and emotional responses. The findings suggest that binaural beats, although believed to increase focus, can often cause discomfort and hinder focus.

On the other hand, music with a somber tone or familiar popular music with high valence can help improve focus. The report emphasises the importance of identifying music stimuli that enhance focus and its potential application in affective computing studies.

Experience

Due to this experiment making use of EEG, this was rather new to me. After being invited to take part in the experiment, we were briefed on the aim of the experiment and then I was instructed to sit in front of a monitor. Before the experiment started, I was asked to fill out a consent form. The experimenter fitted the EEG device on my head and after ensuring a proper fit, I was told to close my eyes for about ~15 seconds. This was to collect baseline data.

The music was to be played on a pair of active noise cancelling headphones, such that external noise was limited – these worked very well in my experience, essentially muting the computer hum. The music overall sounded very good to me. I did, however, find the binaural audio a bit strange as I believe it sounded a bit artificial.

Comments and data were collected via a website that was set up, which for the most part seemed very thorough in the data collected and easy enough to interface with.

Videos were also played, but as we were asked to comment about the emotions of the people in the videos it felt a bit far-fetched in relation to what they were testing earlier. I had wondered what the relationship between music, focus and emotions were – at least in this experiment.

Overall, the experiment was interesting, and it gave me an insight into the technology behind EEG.

Advantages and limitations

Advantages of the experiment are as follows:

- The experiment had very clear research objectives: The experiment had well-defined research objectives, such as investigating the neural correlates of music perception and examining the effects of different musical elements on brain activity.
- Robust experimental design: The experiment followed a rigorous design, incorporating appropriate control conditions and randomisation to minimise confounding factors and ensure reliable and valid results. This enhances the internal validity of the study. In particular, analysing the valence score of songs and balancing playback order such that biases are kept to a minimum.
- Wide selection of musical stimuli: The researchers in question presented a wide variety of music from popular music to classical.
- A good sample size. This study was done with 22 people and thus provided a decent base for the statistics.
- Ethical considerations: The study ensured all participants gave consent before having their brain activity measured and collected along with the potential risks involved with EEG technology.

Limitations of the experiment were notable:

- While efforts may have been made to select diverse music stimuli, the controlled laboratory setting of the experiment may not fully represent real-life music listening scenarios. Factors such as personal preferences, environmental context, and individual differences in music perception could affect the generalisability of the findings to everyday experiences.
- The stimuli may not fully capture the range and complexity of real-world music. Natural music listening experiences involve a wide variety of musical elements, including but not limited to items such as lyrics or language which may not have been adequately represented in the study. For example, a lot of people listen to music in another language that they often cannot understand, but it still sounds good.

Comparison

The two experiments had different goals, focusing on different aspects of the human experience. The eReader report emphasized user thought processes, while the Binaural Beats study focused on brain reactions. The experiments differed in terms of their use of kinetic and audio/visual elements, with the eReader report being more kinetic and the Binaural Beats study emphasizing audio/visual aspects.

The Binaural Beats experiment is objectively more well thought out. It had clear research objectives, a better-designed structure, and a more defined purpose, resulting in a more focused and meaningful experience. The experimenters had greater control over variables, employed more objective measurements, and built upon prior research to enhance their study.

The two experiments had some similarities in their approach. Both aimed to understand and explore specific aspects of human experiences. They involved participants engaging with technological devices (e-readers and headphones) as part of the experimental setup. Additionally, both experiments collected data from participants to analyze and draw conclusions from.

While the specific goals and focus of the experiments differed, they shared a common objective of investigating human responses and experiences within their respective domains.

Relevance of experiments in HCI Development

The experiments conducted in the studies highlight the value of involving users in the evaluation and design of web interfaces. By directly engaging participants and observing their experiences and reactions, researchers can gather valuable insights into user preferences, behaviours, and interactions. This user-centric approach allows for the identification of strengths and weaknesses in web design, leading to more informed and user-friendly interfaces.

The experiments also emphasise the importance of considering different aspects of the human, such as cognitive processes, sensory perception, and emotional responses, when evaluating web design (Young, 2019). By focusing on these aspects, researchers can gain a deeper understanding of how web users engage with and respond to web interfaces, leading to more effective and engaging designs.

The experiment on eReaders focused on

Overall, these experiments accentuate the significance of user-participation experiments in web design within the broader field of HCI. By actively involving users and incorporating their feedback, designers can create web interfaces that are better tailored to users' needs, preferences, and experiences.

References

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