Mouse vs. Finger as Input Device: Does it Influence Information Memorization?

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The main objective of this research in-progress is to investigate how characteristics of input devices influence users' information memorization. Although the computer mouse is still a very popular input device (Taveira and Choi 2009), the growing popularity of tablets and smartphones promotes a different type of input device, namely touch screens.

Based on prior research in human-computer interaction and neuroscience, we investigate the extent to which the nature of the input device has an influence on users' experience, thereby also affecting their information encoding and memorization. According to Taveira and Choi (2009, p. 458), input devices "sense physical properties of the user (e.g., motions, touch, voice) and convert them into predefined signals to the computer." Input devices can be categorized as either direct (e.g., touch screen) or indirect (e.g., mouse) (Rogers et al. 2005). Direct input devices such as touch screens require the user to interact with the target object by virtually touching it with the finger(s).

Dijkerman and de Haan (2007) suggest that the somatosensory system is central to our understanding of touch and that different neural correlates are involved depending on the touch intention pursued (action-related vs. recognition and memory) and the stimuli (internal: body-related vs. object-related). For instance, the posterial parietal cortex (PPC) is suggested to be involved in exploratory object-related hand movement, while both the PPC and the insula are suggested to be involved in tactile object recognition (Dijkerman and de Haan, 2007). Research suggests that the brain areas used for processing different types of information are similar to the areas used for storing the information (Fiehler et al, 2007). For instance, PPC and insula are activated for retrieving the haptic information. Pasternak and Greenlee (2005) suggested that this haptic information can be used for recognition tasks.

We build upon prior research on the somatosensory system (tactile information processing) to argue that a touch input device will involve more cognitive and motor skills components than an indirect input device, leading to a richer information encoding and consequently to better information retrieval from memory. Our main hypothesis posits that there is a relationship between the type of input device used to perform a task and the information memorization of the task stimuli. Specifically, a direct input device facilitates information memorization.

In order to test this hypothesis, a one factor between-subject experimental study will be performed. Participants will be randomly assigned to either a "touch" or "mouse" input device condition. In each condition, participants will be asked to perform multiple product choices between two competing products, either using a touch screen or a mouse to interact with the products (images, characteristics, fictitious brand names, and logos). Following their product choices, participants will be asked to complete a brand recognition task. Using an Event-Related Potential (ERP) technique, participants will be randomly exposed to a set of brands to which they were exposed during their product choice task and a set of fictitious brands to which they were never exposed. Participants will be ask to indicate if they recognize the brands (yes, no). During the ERP task, neural activities will be recorded continuously from 32 electrodes using EGI's dense array electroencephalography (dEEG). A wavelet analysis of the ERP data will be done to compare the two groups. We expect that the touch condition is likely to generate a P300 with a higher amplitude and shorter peak latency due to the recognition of the somatosensory stimuli. The experiment will be conducted at HEC Montreal's Tech^{3}Lab. We plan to present preliminary results at the Gmunden Retreat.

To the best of our knowledge, no research has investigated how input devices influence information memorizarion. Thus, the proposed study contributes to theory development in information systems research and human-computer interaction. Furthermore, the proposed research sheds light on underlying neural mechanism explaining the relationship between input device and information memorization.

References

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