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Mobile notifications as an information medium: an ethnographic study of mobile human-information interaction attitudes of Egyptian and German higher education students

Research – Literature review
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Abstract

This study explores the impact of mobile notifications on the information behavior and interaction attitudes of higher education students in Egypt and Germany. Using an ethnographic approach, the research investigates how mobile notifications serve as a crucial medium for information delivery, transforming user interaction with information. The study identifies significant challenges posed by the influx of notifications, such as information overload, distraction, and stress. It also examines the skills and strategies students employ to manage and prioritize notifications, emphasizing the need for improved mobile information literacy (MoIL). Interviews and observations reveal varied user engagement with notifications, highlighting the dual role of notifications as both end-point information containers and triggers for deeper information-seeking behavior. The findings suggest that while notifications enhance efficiency and immediacy in accessing information, they also necessitate new coping

mechanisms to mitigate negative impacts. This research contributes to the field of information behavior by offering insights into the effective use of mobile notifications and proposing better notification system designs to foster enhanced information literacy in an increasingly connected world.

Keywords
Mobile Notifications, Information Behavior, Human-Information Interaction (HII), Ethnographic Study, Higher Education Students, Mobile Information Literacy (MoIL)

4. Literature review

4.1 Information Retrieval and Notifications

Notifications have prompted a shift from traditional linear information retrieval models to more dynamic, nonlinear models (Foster, 2004). Instead of following a fixed order, users now receive and respond to information as it arrives. (Lachmann et al., 2018). This nonlinear approach is indicative of notifications becoming an integral part of daily life, facilitating easier and more passive information acquisition. Push notifications are designed to influence user behavior by delivering timely and relevant information, thereby increasing engagement and knowledge. (Gavilan, 2022). This dynamic information flow has become a crucial research area for understanding the impact of notifications on user information behavior, especially from information-seeking and cognitive perspectives (Pham, Nguyen, Hwang, & Chen, 2016; N. J. Stroud, Peacock, & Curry, 2020). Intelligent notification systems aim to enhance user responsiveness by determining the optimal time and context for delivering information, taking into account user preferences and context (Abhinav & Mirco, 2017). The drawbacks of notifications in information seeking include their potential to narrow the scope of information, influencing users' behavior in ways that may only sometimes be beneficial (Burford & Sora, 2014). Most mobile users show significant reliance on their phones, frequently checking for notifications and experiencing distress without their devices, indicating a strong attachment and addiction to mobile notifications (Balakrishnan & Loo, 2012).

4.2. Impact of Mobile Notifications on Users

Mobile phones typically use auditory notification cues that are intrusive and demand immediate attention (Rebecca, Peter, & Johan, 2001). Users prioritize

suppressing alerts rather than deferring them to minimize unwanted interruptions, often attributing their preferences to the content of the notifications rather than contextual factors (Tianshi, Haines, Miguel Flores Ruiz De, Jason, & Jeffrey, 2022). Users often receive multiple simultaneous notifications from different applications and do not assess them individually. The arrival of a notification can prompt the user to review and handle other notifications, affecting the attention given to new notifications. Therefore, it is crucial to consider the broader notification stack framework rather than focusing solely on individual notifications, especially for applications requiring prompt responses (Liam, Stuart, & Roger, 2019). Pielot et al. found that, on average, mobile users receive 63.5 notifications per day, primarily from messaging and email apps, which are viewed promptly even when the phone is in silent mode due to social pressure. More notifications are associated with negative emotions but also contribute to a stronger sense of connection with others. While avoiding interruptions may be effective for professional communication, managing expectations for personal communication is crucial (Pielot, Church, & Rodrigo de, 2014). Users interact with notifications not only during tasks but also before and after tasks for various motivations beyond mere distraction (Xi-Jing et al., 2023). Despite recognizing the disruptive potential of notifications, many users choose to use them for the perceived benefit of increased awareness (Shamsi & Horvitz, 2010).

4.3. User Perceptions and Preferences

Studies indicate that participants are most receptive to notifications during routine tasks and exercise, particularly in settings such as colleges, libraries, and streets, with communication apps being the most used except during bedtime, sleep, exercise, and religious activities (Abhinav et al., 2017). However, notifications often arrive at inconvenient times, causing disruptions rather than benefits. Mehrotra proposes a framework for intelligent notifications that considers users' context and preferences to improve timing and delivery (Abhinav, 2017). The timing and content of notifications, user activity, and response time significantly influence the likelihood of notifications being opened (Prasanta, Ming, James, & Soochang, 2017). Users engage with notifications not only during tasks but also before and after tasks for various motivations beyond mere distraction, with 12 distinct motivations identified (Xi-Jing et al., 2023). The perception of notifications

varies, with some individuals appreciating their user-friendly nature while others find them insignificant (Licoppe, 2010). Notifications on the Socially app were seen as beneficial for staying informed about friends' activities but intrusive for casual users. User goals influence preferences; those wanting to stay updated found notifications helpful, while casual users found them annoying (Vihavainen & Kaisa, 2013).

4.4. Notification Management Strategies

Users employ various strategies to handle notifications, such as disabling notifications, uninstalling applications, using the do-not-disturb mode, muting devices, or physically distancing themselves from their gadgets. However, few users modify their notification settings, meaning default settings by manufacturers significantly influence how alerts impact users (Alexandra, Dominik, & Henze, 2018). Notifications can cause stress due to excessive information. Requests for notification permissions on iOS often need more clarifications, leading to uninformed decisions, whereas requests with explanations are more likely to be approved. Users rarely modify their notification settings, even if they do not align with their preferences (Westermann, Sebastian, & Wechsung, 2015). Some studies indicate that not all notifications should be treated equally by mobile operating systems. The current generation of notifications needs more diversity and adequately meets most smartphone users' needs and preferences (Jonas & Katsumi, 2013). Effective design and timing for delivering notifications are crucial, considering the broader notification stack rather than focusing solely on individual alerts, especially for applications requiring prompt responses (Liam et al., 2019).

4.5. Information literacy's role in utilizing notifications as an information medium.

Among many literacies, Information literacy services is an umbrella term. The information literacy field has evolved as various scientific domains, including health, business, research, health, data, and digital literacy, have become interested in it. Onyancha (2020) identified 42 variants of literacies from 1975-2018, including digital, media, and computer literacies. Information literacy is considered a "meta-literacy" as it involves understanding how information is produced, disseminated, and consumed, as well as specific content (Ibenne,

Simeonova, Harrison, & Hepworth, 2017; Mackey & Jacobson, 2011; Oberg, 2017). Information literacy could be considered as "an essential human information interaction component, with lines drawn from Information-seeking behavior and HEC. Information literacy is concerned with achieving synergy between human and computer capabilities to optimize the interaction with information, why and how users should act in a certain way, and attempting to optimize information seeking" (Elzalabany, 2024). Matula (2020) suggests that Mobile Information literacy (MoIL) refers to the abilities and proficiencies required to efficiently search, analyze, utilize, and distribute information in a mobile setting. This setting differs from desktop scenarios because of the constraints of mobile devices and the user's desire for prompt and pertinent information retrieval. He proposes that the skills of MoIL reside in the overlapping intersection of digital and information literacy.

Information literacy is essential for users to handle smartphone notifications efficiently. This requires the utilization of cognitive abilities to effectively prioritize and disregard notifications, as well as a comprehensive comprehension of their design and functionalities (Liam et al., 2019; N. Stroud, Cynthia, & Alexander, 2019), in addition to the general requirement for information literacy. Additional skills are required to utilize notifications as an information medium, such as promptly recognizing the origin of the notification, assessing its significance and pertinence, ranking various categories of notifications, and comprehending the functionality and customization options of notification systems (Andrew, 2012; Atilla, 2020; Kristin Van, Cédric, Verbrugge, & Marez, 2015; Liam et al., 2019). Users can effectively manage the intricate and diverse notification layers on their devices with the assistance of these skills (Gustavo & Luis, 2016; Yung-Ju, Yi-Ju, Yi-Hao, Hsiu-Chi, & Tzu-Hao, 2017). Alireza Sahami et al. (2014) emphasize three critical information literacy skills when dealing with mobile notifications: the ability to identify essential and pertinent notifications, the ability to configure notification settings (including the use of blacklists), and the ability to balance the advantages of notifications with their potential for disruption and distraction. Also, the ability to customize notification settings (Alexandra et al., 2018). Pielot et al. (2014) point out that users must possess the necessary abilities to handle large amounts of notifications properly, maintain a balance between the positive and negative impacts of notifications, and utilize them efficiently for information

retrieval and social connectivity. Critical thinking is also essential to dealing with notification information (Burford & Sora, 2014; Chua, Radhika Shenoy, & Goh, 2011; Westermann, Wechsung, & Sebastian, 2016). In addition, the ability to keep track of tasks and multitasking is proven to be essential in this paradigm (Shamsi & Horvitz, 2010).