Moving Beyond Clicks Without Clicks: The Challenges of Informed Consent in Implicit Interactions

JONATHAN LIEBERS*, TU Dortmund University, Germany

Implicit interactions in Human-Computer Interaction (HCI) leverage user behavior not primarily aimed at the system to enhance convenience and to enable automation. While efficient, these transparent interactions pose significant challenges for obtaining informed consent, as users are often unaware of the data processing occurring in the background. This paper explores the tension between seamless, implicit interaction and user autonomy. For this, I propose *gradual explication* as a mechanism to surface invisible processes through subtle feedback without disrupting the primary task. Furthermore, I discuss the feasibility of implicit consent agents and post-hoc consent models. I argue that making the implicit explicit is necessary to ensure valid informed consent, satisfying the requirements of users' informedness and usability while bridging the gap between user intent and system functionality.

CCS Concepts: • **Security and privacy** → *Privacy protections.*

Additional Key Words and Phrases: Privacy, Consent, Implicit Interactions

ACM Reference Format:
Jonathan Liebers. 2026. Moving Beyond Clicks Without Clicks: The Challenges of Informed Consent in Implicit Interactions. In *Proceedings of CHI'26 Workshop on Moving Beyond Clicks: Rethinking Consent and User Control in the Age of AI (CHI'26 Workshop: Moving Beyond Clicks).* ACM, New York, NY, USA, 3 pages. https://doi.org/10.1145/nnnnnnn.nnnnnnn

1 Implicit Interactions in HCI

Implicit interactions are a specific and important form of interaction in HCI. They are defined as "an action performed by the user that is not primarily aimed to interact with a computerised system but which such a system understands as input" [6]. These interactions occur frequently and relieve the user of some of the workload associated with them, as a computerised system can perform certain steps automatically without actively querying the user.

There exist many examples of such implicit interactions. For example, a user might enter a kitchen and their primary intention is to grab a coffee; once they enter the room, a smart home system might realize their presence and turn on the light automatically. Their primary intention to grab a coffee led them to turn on the room's lights without having to actively use a light switch [7]. Another example is to capture users' gaze patterns with an eye-tracker, to determine and model their interests while reading a text [1]. Subsequently, it is possible to enrich their search queries using their predetermined interests [1, 7]. Users' behavior can also regularly be used for implicit authentication, where their behavior acts as a replacement for a traditional password entry by having biometric properties [3]. Instead of having to rely on explicitly entering a password, their body movements or eye-gaze behavior can be used to determine

*Jonathan Liebers is a usable security and behavioral biometrics researcher at the Research Center Trustworthy Data Science and Security and TU Dortmund University. Before, he obtained his doctoral degree from the University of Duisburg-Essen on behavioral biometrics and implicit user authentication in extended realities. His research interests span from usable security and implicit authentication to machine learning and deep learning, and in particular, methods to predict attributes from people's behavior.

Author's Contact Information: Jonathan Liebers, jonathan.liebers@uni-due.de, TU Dortmund University, Dortmund, NRW, Germany.

Manuscript submitted to ACM

Table 1. Overview of implicit interaction scenarios mapped to the phases of gradual explication to the examples listed in the first Section. Silent monitoring happens during any implicit interaction, and a subtle signalisation can take place while doing so. Once a previously set threshold is crossed, the explication becomes more visible.

Scenario	Silent Monitoring	Subtle Signalisation	Thresholded Explication
Smart Home Lighting [7]	Application detects user presence in a room.	Ambient LED pulse on switch or soft chime.	Notification: "Lights turned on due to presence."
Interest Modeling [1]	System analyzes gaze patterns while reading.	Peripheral visual indicator (e.g., fading eye icon).	Toast: "Search results enriched based on reading interest."
Behavioral Biometrics in Virtual Reality [4]	System analyzes body movement signatures.	Slight haptic vibration of the controller while the identity is derived.	Security Alert: "Identity verified via movement."
Read Receipts in a Messaging App [2]	System detects message view time.	Brief animation (e.g., a wiggling checkmark).	Toast message: "Read receipt sent to sender."

their identity [4]. Another example is the automatic, implicit sending of a read receipt when users view a received message in their messaging application [2]. Users often interact with an intent towards their actual goal in their primary task, and a byproduct of that interaction is used for a different purpose, relieving the user of having to actively deal with it. Therefore, the transparent data processing associated with implicit interactions ranges from enabling simple convenience functions to biometric recognition, which are highly sensitive.

One central aspect is that implicit interactions are transparent to the user. It is usually not possible to realize that their interaction data is being used for a different purpose in the very moment of their interaction with the original intent. However, it is still imperative that users consent to their data being used for the respective purposes, especially as those can range to critical areas such as biometric recognition. Yet, how can one be properly informed about something that they potentially do not realize is happening? Thereby, a central challenge is how users' consent can be captured, since they do not necessarily understand the implicit consequences of their explicit actions and, in the first place, might not realize that an implicit interaction is occurring at all.

2 Informed Consent in Implicit Interactions

Since truly implicit interactions are transparent to the user, it is important that users' informed consent is always gathered. First, users should generally provide consent in advance, *before* the data is being used for a specific purpose. Therefore, users must be aware of data collection before implicit interactions occur to maintain autonomy over their digital footprint. Second, consent must always be informed. This necessitates that the user understands the scope, purpose, and potential consequences of the data processing, which stands in direct contrast to the invisible (transparent) nature of implicit interactions.

3 Explicating the Implicit Interaction Process

One way to address the concerns that originate from the transparency of implicit interactions lies in explicitly explaining the process at the beginning of the interaction. This is because users need to know what is happening and when it occurs. Since the interaction is implicit and transparent, it is difficult for users to stay informed, as they remain unaware of which specific actions the system is processing. Therefore, some form of explication is required to bridge the gap between user action and system interpretation. Table 1 provides an overview of possible explications of the aforementioned examples. Such cues make the process visible and raise awareness without disrupting the primary task.

To manage this, I propose a concept of *Gradual Explication* to make these processes visible. This principle functions in stages: starting with *Silent Monitoring*, where the underlying system primarily performs sensing, moving to *Subtle Signalisation*, where the system provides an indication of processing the implicit interaction, and finally reaching

Thresholded Explication, where the system explicitly informs the user. A practical example is the user entering a kitchen with the primary intention of grabbing a coffee; at first, the system silently monitors the user's presence. Once it recognizes the user, an ambient LED pulses or a soft chime is played. The user is now becoming aware that their presence triggered an action by the system. The whole interaction can now be explicated by notifying the user via audio or a smartphone notification that the lights were turned on due to their presence. A threshold decides whether this strong explication really should take place, as the importance of an explication in this scenario might be rather low.

An interesting consideration is whether every implicit interaction should experience an explication the first time it occurs. This could be accompanied by an informed mechanism to dismiss future notifications, such as a "do not remind me again" option. Furthermore, this raises the question of whether consent could be captured post-hoc. One possibility could be to capture consent after the explication; if the user rejects consent, the prior data collection would be rendered unusable and actions would be reversed. However, this necessitates that the data must not leave the device and would be immediately deleted upon rejection, and stands in contrast to acquiring consent before the interaction.

4 Towards Implicit Consent Mechanisms

To further reduce the burden on the user, I consider the potential of moving towards implicit consent mechanisms. AI models could be leveraged to transfer the user's prior consent behavior to new future consent dialogues without the user paying explicit attention, leading to implicit consent approval. This is partly enabled by tools such as Consent-o-matic, which could be adapted for these implicit workflows [5], where users specify in advance to what purposes they consent. The specification could also be derived by an AI model, with the AI sharing this information with the underlying systems. Also, it is important to specify the threshold level, based on the nature of the data and its purpose. For example, users might primarily seek explication when the employed data is sensitive (e.g., biometric data). An AI model could also deduce this preference from previously shared consents and help the decision making.

Nevertheless, implicit consent presents significant challenges, as the law (e.g., EU-GDPR) generally mandates that consent must be informed and obtained in advance. This creates a paradox: while informed consent is legally required, users usually do not read lengthy texts or privacy policies, questioning whether their consent is truly "informed" in practice. Here, explication could serve as a solution, teaching the user better about the nature of the implicit interaction to achieve a higher degree of actual informedness compared to explicit, traditional, text- and click-based agreements.

References

[1] Georg Buscher, Andreas Dengel, and Ludger van Elst. 2008. Query expansion using gaze-based feedback on the subdocument level. In *Proceedings of the 31st Annual International ACM SIGIR Conference on Research and Development in Information Retrieval* (Singapore, Singapore) *(SIGIR '08)*. Association for Computing Machinery, New York, NY, USA, 387–394. doi:10.1145/1390334.1390401

[2] Roberto Hoyle, Srijita Das, Apu Kapadia, Adam J. Lee, and Kami Vaniea. 2017. Was my message read?: Privacy and Signaling on Facebook Messenger. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 3838–3842. doi:10.1145/3025453.3025925

[3] Markus Jakobsson, Elaine Shi, Philippe Golle, and Richard Chow. 2009. Implicit Authentication for Mobile Devices. In *Proceedings of the 4th USENIX Conference on Hot Topics in Security (HotSec'09)*. USENIX Association, USA, 9.

[4] Jonathan Liebers, Patrick Horn, Christian Burschik, Uwe Gruenefeld, and Stefan Schneegass. 2021. Using Gaze Behavior and Head Orientation for Implicit Identification in Virtual Reality. In *Proceedings of the 27th ACM Symposium on Virtual Reality Software and Technology* (Osaka, Japan) *(VRST '21)*. Association for Computing Machinery, New York, NY, USA, Article 22, 9 pages. doi:10.1145/3489849.3489880

[5] Midas Nouwens, Rolf Bagge, Janus Bager Kristensen, and Clemens Nylandsted Klokmose. 2022. Consent-O-Matic: Automatically Answering Consent Pop-ups Using Adversarial Interoperability. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, Article 238, 7 pages. doi:10.1145/3491101.3519683

[6] Albrecht Schmidt. 2000. Implicit human computer interaction through context. *Personal Technologies* 4, 2-3 (2000), 191–199. doi:10.1007/BF01324126

[7] Barış Serim and Giulio Jacucci. 2019. Explicating "Implicit Interaction": An Examination of the Concept and Challenges for Research. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 1–16. doi:10.1145/3290605.3300647