Human Digital Twins for Sharing and Accessing Tacit Knowledge in University Research Labs

Simon Rapp
human-centered systems lab (h-lab)
Karlsruhe Institute of Technology (KIT)
Karlsruhe, Germany
EnBW Energie Baden-Württemberg AG
Karlsruhe, Germany
simon.rapp@kit.edu

Martin Feick
human-centered systems lab (h-lab)
Karlsruhe Institute of Technology (KIT)
Karlsruhe, Germany
martin.feick@kit.edu

Alexander Maedche
human-centered systems lab (h-lab)
Karlsruhe Institute of Technology (KIT)
Karlsruhe, Germany
alexander.maedche@kit.edu

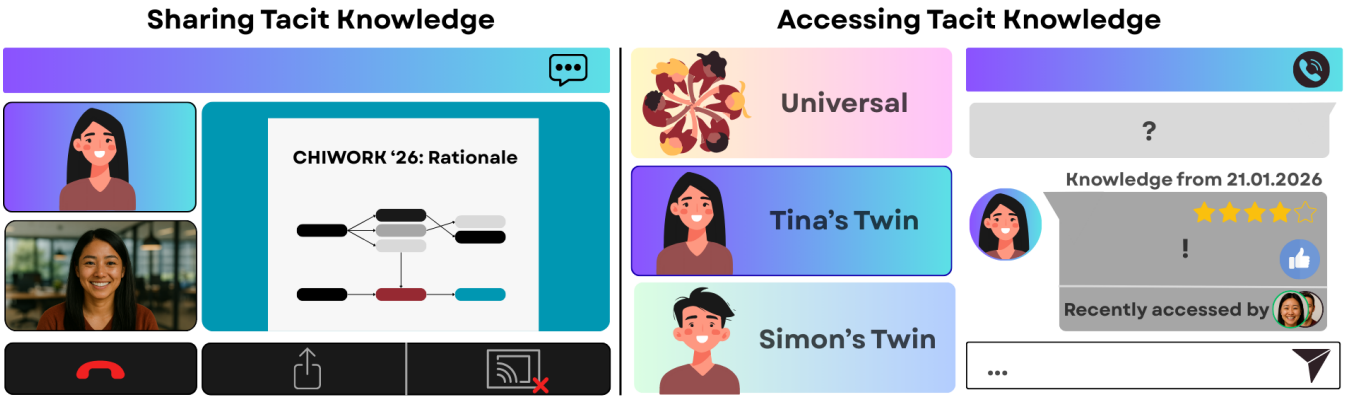

Figure 1: How workshop participants envisioned sharing and accessing tacit knowledge from Human Digital Twins. They envision multimodal, dialogical interactions with individual or universal Human Digital Twins, the ability to share files and screens, to inspect the recency of knowledge along with indicators of use, and mechanisms to provide feedback on responses.

Abstract

Tacit knowledge, such as understanding why research decisions were made in ongoing projects or knowing which approaches previously failed in similar studies, is essential to university research labs but often becomes inaccessible when experienced researchers leave. This is problematic because researchers often rely on asking the researcher who worked on a project. Recent advances in human digital twins (HDTs) offer new opportunities for preserving and mediating access to tacit knowledge beyond individual tenure. We conducted a participatory design workshop with six doctoral researchers using iterative 1-2-3-All design sequences for both sharing and accessing scenarios. Sketches and discussions highlight multimodal interaction and explanation needs, expectations of social presence, and the importance of embedding HDTs into existing workflows. Our findings provide design insights for systems that make individual expertise accessible and resilient across time and organizational change.

CHIWORK Adjunct '26, Linz, Austria

ACM ISBN 979-8-4007-2598-2/26/06
https://doi.org/10.1145/3805029.3818277

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)**.

Keywords

Knowledge Management, Human Digital, Twin Tacit Knowledge

ACM Reference Format:
Simon Rapp, Martin Feick, and Alexander Maedche. 2026. Human Digital Twins for Sharing and Accessing Tacit Knowledge in University Research Labs. In *Adjunct Proceedings of the 5th Annual Symposium on Human-Computer Interaction for Work (CHIWORK Adjunct '26), June 22–25, 2026, Linz, Austria.* ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3805029.3818277

1 Introduction

Imagine Tina, who is about to complete her PhD after several years of successful research. Over time, she has developed extensive expertise in her domain. Some of this expertise is explicit knowledge, such as theories, methods, and documented procedures, that is captured in publications, project documentation, or research protocols. However, much of Tina's expertise is tacit knowledge that is difficult to articulate and rarely written down [19]. For example, while publications describe the final methodology and results, they

typically do not capture why certain research decisions were made, which approaches were previously attempted but abandoned, or how problems during data collection were resolved. As a result, when a new doctoral researcher inherits Tina's project, important contextual knowledge about prior decisions, failed attempts, and practical workarounds is often missing. This loss of tacit knowledge is a recurring challenge in university research labs, where expertise is closely tied to individual researchers and their day-to-day experiences [2, 4]. When experienced researchers leave, valuable knowledge often leaves with them [14, 19]. Tina's professor perceives her as 'too good to go.' While she acknowledges her well-deserved completion and future career prospects, she simultaneously recognizes the organizational challenge her departure creates. Her aspiration is not limited to onboarding a new doctoral researcher trained by Tina, who can continue her work, but rather to ensuring that her accumulated expertise becomes accessible to the entire research group. In her view, the value of Tina's tacit knowledge lies in enabling all (future) doctoral researchers to benefit from it, thereby strengthening collective performance and resilience beyond individual replacement [19]. That is why Tina's professor would like to have a digital copy of her, to which Tina shares her tacit knowledge and which can be accessed by others, as shown in Figure 1. Today, tacit knowledge in university research labs is primarily shared through informal interaction or captured via resource-intensive codification processes such as interviews [6, 11, 14], while alternative systems focus on locating knowledgeable individuals rather than preserving their situated expertise [20]. **However, these approaches either scale poorly, remain episodic, or fail to support continuous knowledge sharing and access embedded in everyday work**. We therefore explore Human Digital Twins (HDTs) as person-bound, continuously evolving representations through which researchers can share and access situated tacit knowledge in university research labs. While the idea of HDTs may seem futuristic, recent advances in Artificial Intelligence (AI) have made this increasingly plausible. Emerging technologies now enable the creation of highly realistic representations of an individual's cognitive patterns, voice, and appearance [8, 13, 22]. By keeping Tina, at least in digital means, her tacit knowledge would remain findable and accessible to others. Building on this vision, our work explores how HDTs could support knowledge management in university research labs. Specifically, we investigate: ***(1) How, when, and where would researchers share their tacit knowledge with a HDT?*** and ***(2) How, when, and where would researchers access tacit knowledge from HDTs?***

In this work, we present meta-level design insights from a participatory design workshop with doctoral researchers, focusing on sharing and accessing tacit knowledge through HDTs in everyday research work. Our findings aim to inform future HDTs-based knowledge management systems that keep individual expertise findable and accessible while preserving its person-bound, situated, and evolving character.

2 Background

2.1 Accessing Tacit Knowledge

Tacit knowledge is often exchanged informally in day-to-day work and transferred across generations of employees. Prior research has long examined how to support these naturally occurring practices, as well as how to codify tacit expertise so it can be shared at scale and asynchronously [6, 11, 18]. Such codification typically relies on trained analysts who conduct interviews, observations, or thought-mapping [7, 11]. At the same time, other research argues that attempts to explicitly capture tacit knowledge are fundamentally limited and instead propose designing systems that help locate and connect knowledgeable people rather than codifying their expertise [20]. This aligns with research on transactive memory systems, which emphasizes knowing who knows what within a group [24]. In emerging AI-mediated work settings, however, this "who" increasingly includes AI systems as active collaborators or co-workers [1]. Rather than codifying tacit knowledge, this perspective suggests mediating access to it through interaction. Related work on Ubiquitous Research Preservation (URP) frames automated knowledge capturing and retrieval as a way to preserve research knowledge across everyday scientific work [3]. While URP provides a broader framework for research preservation, including questions of capture, retrieval, governance, and sharing, our work narrows this perspective to tacit knowledge in university research labs. We extend this line of work by examining HDTs as a concrete interactional mechanism through which such knowledge might be shared with and accessed by others over time.

2.2 Human Digital Twins

HDTs extend traditional data-driven digital twins (DTs) by mirroring relevant aspects of a person into a dynamic digital representation, with the human individual serving as the underlying physical entity [5, 23]. In this paper, we use the term HDT to refer to a person-bound, continuously evolving digital representation that mediates access to their tacit knowledge. Prior research on HDT has examined the conceptual and ethical challenges of creating HDTs [8, 13], as well as potential psychological effects HDTs [9, 16, 17]. Beyond HDTs, recent work in HCI has explored related approaches that similarly aim to digitally represent individuals, including AI self-clones as well as personalized and embodied agents. For example, recent work on AI self-clones investigates how users create conversational agents that reflect their personality, values, and communication styles, and how interacting with these representations can support self-reflection and identity exploration [12]. Complementary research on personalized and embodied agents explores systems that can act on behalf of a person in social contexts. For instance, "Dittos" are embodied agents that resemble individuals in appearance and behavior and can represent them in meetings, contributing to social presence, trust, and decision-making processes [15, 21]. While these approaches also digitally represent individuals, HDTs are data-driven, continuously evolving, and support access to person-bound, situated knowledge (i.e., not only what is known, but how and why it is enacted). This distinguishes HDTs from personalized chatbots that primarily provide conversational access to user-specific data, attributed knowledge bases that organize source-linked information, and expert-finding systems that identify people rather than preserving an evolving representation of their tacit knowledge. Prior HCI work by Kernan Freire et al. [10] [11] suggests that conversational AI can continuously elicit tacit shop-floor knowledge through reflective dialogue supported by voice/text

interaction and data-driven visualizations in industrial settings. However, these systems are tailored to highly structured shop-floor settings, where tacit knowledge can only be shared and accessed at specific moments linked to production batches. By contrast, tacit knowledge in university research labs may differ, emerges continuously during unstructured tasks, and could in principle be shared and accessed at any moment [11, 14, 19]. Yet little is known about how researchers would actually want to engage with such systems during everyday work. We therefore take a fundamentally different perspective by examining tacit knowledge as a continuous, situational phenomenon in knowledge-intensive university research labs. Our work addresses this gap by examining how HDTs could support tacit knowledge sharing and access beyond process-driven manufacturing scenarios.

3 Participatory Design Workshop

To explore how doctoral researchers envision sharing and accessing tacit knowledge through HDTs, we conducted a participatory design workshop. We emphasize that the goal of the workshop was not to elicit tacit knowledge directly, but to explore how participants imagine interacting with HDTs that could support the sharing and access of such knowledge, acknowledging that tacit knowledge is often difficult to articulate without observing situated practice.

Recruitment & Participants. Participants were recruited from our institute, spanning three research groups. Invitations were sent via email to (post) doctoral researchers. The workshop was scheduled during regular working hours, and participation was incentivized with food and drinks. Six (post) doctoral researchers (N = 6; P1–P6) followed our invitation and participated in the participatory design workshop. Participants represented different backgrounds in terms of age (24–34 years), gender (2 female, 4 male), research field (Information Systems: P2–P5; Human–Computer Interaction: P1, P6), research experience (1–5+ years), and doctoral status (primarily doctoral researchers, with one postdoctoral researcher, P3).

Workshop Protocol. The workshop lasted approximately 90 minutes and was organized into two main phases, sharing and accessing, separated by a short break. In the beginning, participants reflected on and shared examples of tacit knowledge from their everyday (research) work. This was followed by a 1-2-3-All sequence focused on designing ways to share tacit knowledge with a HDT: participants first worked individually to reflect on how, where, and when they might transfer tacit knowledge to a HDT, then discussed and expanded their ideas in pairs, and subsequently in groups of three where they created and refined low-fidelity interface sketches illustrating potential sharing interactions. Finally, all participants came together to consolidate ideas and discuss the sketches. After a short break ($\simeq$ 10 minutes), the second phase applied the same 1-2-3-All structure to the topic of accessing tacit knowledge from HDTs, where participants designed and discussed interface concepts for accessing tacit knowledge from HDTs. Each step progressively built on prior ideas, ensuring iterative refinement and collaborative design throughout the participatory workshop.

Data and Analysis. During the workshop, we collected sketches and written notes, while one author took observational notes during the plenary discussions. After the workshop, the first author conducted an inductive review of the sketches and notes to identify recurring design expectations across the sharing and accessing scenarios. The resulting preliminary themes were discussed with the second author and refined through collaborative interpretation.

4 Workshop Findings and Insights

In the following, we present the findings from our participatory design workshop. We begin by examining how participants envisioned sharing their tacit knowledge with a HDT, before finally exploring how they would access tacit knowledge from HDTs.

4.1 Sharing Tacit Knowledge

Figure 2 shows how the two groups of three participants each envisioned sharing tacit knowledge with a HDT. In the following, we report the key meta-level insights.

Motivation & Temporal Nature of Tacit Knowledge Sharing. Participants framed tacit knowledge sharing as both intrinsically and extrinsically motivated. While some emphasized the personal value of "teaching their future self" (P1), others highlighted collective benefits such as helping colleagues by "filling knowledge gaps" (P6). These motivational differences were also reflected in how participants envisioned agency in the interaction: some preferred to proactively share knowledge with the HDT, whereas others imagined a more system-initiated process in which the HDT requests missing knowledge. Importantly, participants viewed tacit knowledge sharing as a continuous activity embedded in daily office work rather than something that occurs at isolated moments. ***Companionship, Social Presence & Multimodality***. Across both groups, the HDT was imagined not as a static repository but as an accessible, always-available "knowledge companion" (P5). Participants envisioned interacting with the HDT through natural conversation, explanation, and demonstration, suggesting a desire for social presence and reciprocal engagement. Tacit knowledge sharing was understood as inherently multimodal: participants also wanted to talk to the HDT, show their screen, walk through files, and demonstrate processes.

4.2 Accessing Tacit Knowledge

Figure 3 shows how the two groups of three participants each envisioned accessing tacit knowledge from HDTs. In the following, we report the key meta-level insights.

Embeddedness, Social Presence & Temporal Reach. Participants conceptualized tacit knowledge access as something that "must seamlessly integrate" (P3) into their existing workflows and communication ecosystems (e.g., Microsoft Teams). Accessing tacit knowledge was linked to individuals: participants preferred to directly consult the HDT of colleagues for "context and trust" (P4). At the same time, they emphasized the importance of archiving the knowledge of colleagues they no longer know. ***Multimodal Explanation & Collective Navigation***. Participants described tacit knowledge access as a dialogical process. They expected HDTs to not only return information but also explain it through natural conversation (speech & text). Moreover, participants wanted to see who had previously used particular knowledge, assess its currency, and identify individuals who could further elaborate on it. In cases

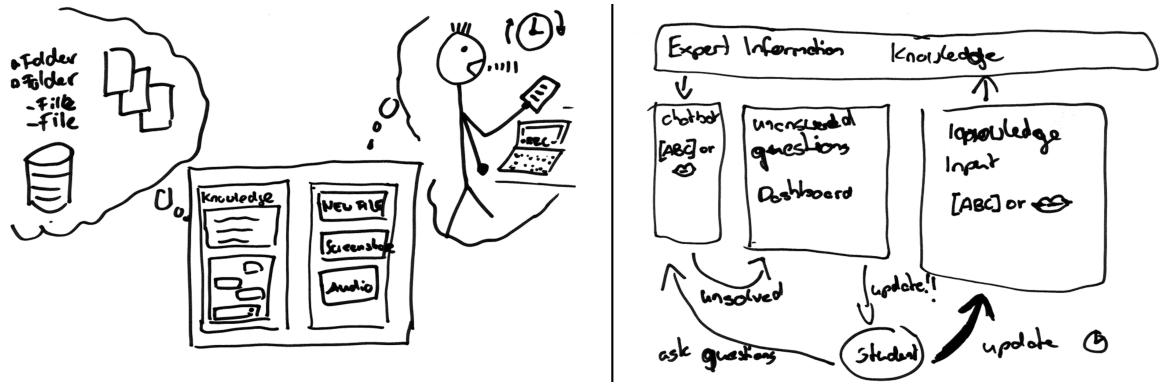

Figure 2: Two sketches created by the participants, illustrating how they envisioned sharing tacit knowledge with a human digital twin

where it was unclear which HDT holds the needed expertise, participants imagined a "universal HDT" (P2) giving answers or being capable of routing them to HDTs.

5 Discussion

Our findings position HDTs as person-bound and evolving representations of tacit knowledge that enable access through socially situated, dialogical interaction. Unlike prior work that used conversational AI to elicit tacit knowledge from shop-floor workers [10, 11], our findings suggest that doctoral researchers, like Tina, envision HDTs not as static chatbots or repositories but as socially present, multimodal companions embedded into their everyday workflows. Whereas tacit knowledge in shop-floor settings seems only possible to be shared and accessed at specific moments, researchers expressed a desire to share and access tacit knowledge continuously as it arises during day-to-day work. This contrast suggests that unstructured and knowledge-intensive research introduces distinct expectations around agency and interaction. Participants' mixed preferences for proactive versus system-initiated sharing suggest that future HDT systems may need to accommodate both user-initiated and system-initiated knowledge sharing. Their emphasis on explanation and demonstration further suggests that tacit knowledge capture should remain connected to ongoing work artifacts, such as files, rather than being treated as a separate documentation task. Accessing tacit knowledge through HDTs also appeared to require more than conversational retrieval. Participants emphasized transparency regarding whose knowledge a response draws on, how recent this knowledge is, and by whom it has been used. While prior work focuses on individual HDTs [8, 13], our findings extend this view by revealing that participants also envisioned a universal HDT capable of routing or answering queries when the relevant expert is unclear. This suggests that personal identity and trust remain central even when interacting with HDTs, yet highlights the complementary need for meta-level mechanisms that support navigation across knowledge from multiple (unknown) HDTs. Taken together, these findings point toward three initial design requirements for HDTs in knowledge-intensive work: 1) situated capture, where explanations and demonstrations can be attached to ongoing work artifacts; 2) contextualized access, where responses include indicators of knowledge holder, recency, and prior use; and 3) navigational access, where individual HDTs are complemented by routing mechanisms when the appropriate knowledge holder is unclear. While our findings are grounded in academic research settings, these requirements may also be relevant for other knowledge-intensive domains where tacit knowledge is continuously produced, shared, and revisited.

6 Limitations & Outlook

Our study offers early insights but is subject to several limitations. First, our findings are based on a single participatory design workshop with six doctoral researchers from one institute, which limits generalizability, particularly beyond academic contexts. The envisioned interactions with HDTs were speculative, meaning participants did not engage with functioning prototypes. Based on these insights, we are currently developing prototypes to explore these ideas with a broader range of knowledge-workers across different domains, allowing them to experience multimodal explanations, social presence, and workflow integration firsthand. Future work should also examine HDTs as socio-technical systems that require careful governance around consent, withdrawal, post-tenure access, provenance, and the marking of outdated or decontextualized knowledge. Ultimately, we plan to conduct longitudinal studies to understand how motivation, trust, and knowledge-sharing behaviors evolve when HDTs become part of everyday work.

7 Conclusion

This paper provides meta-level insights and proposes Human Digital Twins for supporting the sharing and accessing of tacit knowledge in university research labs. Through a participatory design workshop with doctoral researchers, we uncovered how participants imagine interacting with HDTs through socially present, multimodal, and workflow-integrated interfaces. These early findings highlight the potential of HDTs to make individual expertise more accessible and resilient across time and organizational changes. By foregrounding user expectations, motivational dynamics, and interactional needs, our work lays an initial foundation for designing future HDTs systems that support university research labs.

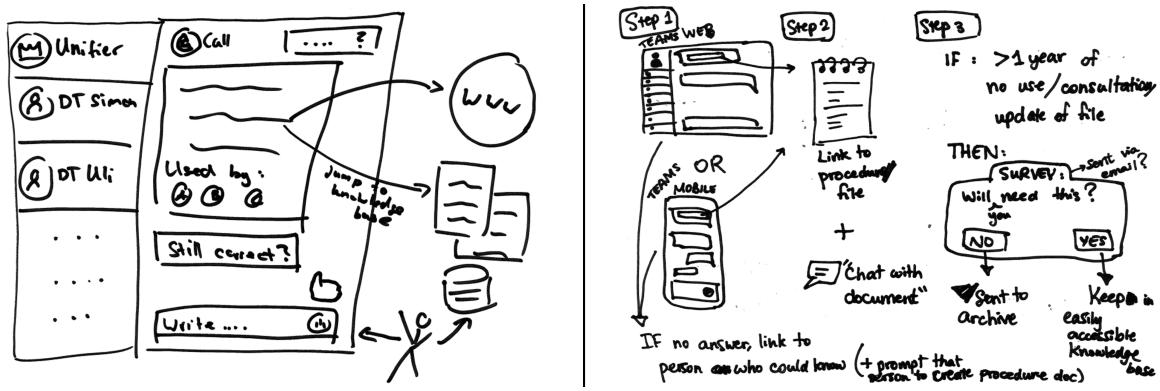

Figure 3: Two sketches produced by the participants, depicting how they imagined accessing tacit knowledge from human digital twins

Acknowledgments

The authors wish to acknowledge the use of ChatGPT in the writing of this paper. This tool was used to assist with improving the language in the paper. The paper remains an accurate representation of the authors' underlying work and novel intellectual contributions.

References

[1] Marios Constantinides, Himanshu Verma, Shadan Sadeghian, and Abdallah El Ali. 2025. The Future of Work is Blended, Not Hybrid. In *Proceedings of the 4th Annual Symposium on Human-Computer Interaction for Work (CHIWORK '25)*. Association for Computing Machinery, New York, NY, USA, Article 28, 13 pages. doi:10.1145/3729176.3729202

[2] Paul Dourish and Victoria Bellotti. 1992. Awareness and coordination in shared workspaces. In *Proceedings of the 1992 ACM Conference on Computer-Supported Cooperative Work* (Toronto, Ontario, Canada) *(CSCW '92)*. Association for Computing Machinery, New York, NY, USA, 107–114. doi:10.1145/143457.143468

[3] Passant Elagroudy, Pascal Knierim, Albrecht Schmidt, Paweł W. Woźniak, and Sebastian S. Feger. 2023. I (Don't) Know What You Did Last Summer: A Framework for Ubiquitous Research Preservation. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI EA '23)*. Association for Computing Machinery, New York, NY, USA, Article 164, 6 pages. doi:10.1145/3544549.3585754

[4] Nataliya Galan. 2023. Knowledge loss induced by organizational member turnover: a review of empirical literature, synthesis and future research directions (Part II). *The Learning Organization: An International Journal* 30, 2 (02 2023), 137–161. doi:10.1108/TLO-09-2022-0108

[5] Michael Grieves and John Vickers. 2017. *Digital Twin: Mitigating Unpredictable, Undesirable Emergent Behavior in Complex Systems.* Springer International Publishing, Cham, 85–113. doi:10.1007/978-3-319-38756-7_4

[6] Claire Gubbins, Siobhan Corrigan, Thomas N. Garavan, Christy O' Connor, Damien Leahy, David Long, and Eamonn Murphy. 2012. Evaluating a tacit knowledge sharing initiative: a case study. *European Journal of Training and Development* 36, 8 (11 2012), 827–847. doi:10.1108/03090591211263558

[7] Lukas Hoerner, Michael Schamberger, and Freimut Bodendorf. 2023. Using Tacit Expert Knowledge to Support Shop-floor Operators Through a Knowledge-based Assistance System. *Computer Supported Cooperative Work (CSCW)* 32 (2023), 55–91. doi:10.1007/s10606-022-09445-4

[8] Jessica Huang, Ig-Jae Kim, and Dongwook Yoon. 2025. Mirror to Companion: Exploring Roles, Values, and Risks of AI Self-Clones through Story Completion. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. Association for Computing Machinery, New York, NY, USA, Article 413, 15 pages. doi:10.1145/3706598.3713587

[9] Angel Hsing-Chi Hwang, John Oliver Siy, Renee Shelby, and Alison Lentz. 2024. In Whose Voice?: Examining AI Agent Representation of People in Social Interaction through Generative Speech. In *Proceedings of the 2024 ACM Designing Interactive Systems Conference* (Copenhagen, Denmark) *(DIS '24)*. Association for Computing Machinery, New York, NY, USA, 224–245. doi:10.1145/3643834.3661555

[10] Samuel Kernan Freire, Evangelos Niforatos, Chaofan Wang, Santiago Ruiz-Arenas, Mina Foosherian, Stefan Wellsandt, and Alessandro Bozzon. 2023. Lessons Learned from Designing and Evaluating CLAICA: A Continuously Learning AI Cognitive Assistant. In *Proceedings of the 28th International Conference on Intelligent User Interfaces* (Sydney, NSW, Australia) *(IUI '23)*. Association for Computing Machinery, New York, NY, USA, 553–568. doi:10.1145/3581641.3584042

[11] Samuel Kernan Freire, Chaofan Wang, Santiago Ruiz-Arenas, and Evangelos Niforatos. 2023. Tacit Knowledge Elicitation for Shop-floor Workers with an Intelligent Assistant. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI EA '23)*. Association for Computing Machinery, New York, NY, USA, Article 266, 7 pages. doi:10.1145/3544549.3585755

[12] Donggun Lee, Suyoun Lee, Hyunseung Lim, and Hwajung Hong. 2026. Creating text-based AI clones of myself: Exploring perceptions, development strategies, and challenges. *International Journal of Human-Computer Studies* 208 (2026), 103692. doi:10.1016/j.ijhcs.2025.103692

[13] Patrick Yung Kang Lee, Ning F. Ma, Ig-Jae Kim, and Dongwook Yoon. 2023. Speculating on Risks of AI Clones to Selfhood and Relationships: Doppelganger-phobia, Identity Fragmentation, and Living Memories. *Proc. ACM Hum.-Comput. Interact.* 7, CSCW1, Article 91 (April 2023), 28 pages. doi:10.1145/3579524

[14] Sangwook Lee, Adnan Abbas, Yan Chen, Young-Ho Kim, and Sang Won Lee. 2026. CHOIR: A Chatbot-mediated Organizational Memory Leveraging Communication in University Research Labs. In *Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems (CHI '26)* (Barcelona, Spain). ACM, New York, NY, USA, 1–23. doi:10.1145/3772318.3791314

[15] Joanne Leong, John Tang, Edward Cutrell, Sasa Junuzovic, Gregory Paul Baribault, and Kori Inkpen. 2024. Dittos: Personalized, Embodied Agents That Participate in Meetings When You Are Unavailable. *Proc. ACM Hum.-Comput. Interact.* 8, CSCW2, Article 494 (Nov. 2024), 28 pages. doi:10.1145/3687033

[16] Kana Misawa and Jun Rekimoto. 2015. ChameleonMask: a human-surrogate system with a telepresence face. In *SIGGRAPH Asia 2015 Emerging Technologies* (Kobe, Japan) *(SA '15)*. Association for Computing Machinery, New York, NY, USA, Article 5, 3 pages. doi:10.1145/2818466.2818473

[17] Kana Misawa and Jun Rekimoto. 2015. Wearing another's personality: a human-surrogate system with a telepresence face. In *Proceedings of the 2015 ACM International Symposium on Wearable Computers* (Osaka, Japan) *(ISWC '15)*. Association for Computing Machinery, New York, NY, USA, 125–132. doi:10.1145/2802083.2808392

[18] Davi Nakano, Jr Muniz, Jorge, and Jr Dias Batista, Edgard. 2013. Engaging environments: tacit knowledge sharing on the shop floor. *Journal of Knowledge Management* 17, 2 (03 2013), 290–306. doi:10.1108/13673271311315222

[19] Ikujiro Nonaka and Hirotaka Takeuchi. 1995. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation.* Oxford University Press, New York, NY.

[20] Dick Stenmark. 2000. Leveraging Tacit Organizational Knowledge. *Journal of Management Information Systems* 17, 3 (2000), 9–24. doi:10.1080/07421222.2000.11045655

[21] Teerapaun Tanprasert, Jiamin Dai, John Tang, Kori Inkpen, Edward Cutrell, and Joanna McGrenere. 2025. FamilyDittos: Reimagining Intergenerational Interaction through Mimetic Agents. *Proc. ACM Hum.-Comput. Interact.* 9, 7, Article CSCW419 (Oct. 2025), 31 pages. doi:10.1145/3757600

[22] Jon Truby and Rafael Brown. 2021. Human digital thought clones: the Holy Grail of artificial intelligence for big data. *Information & Communications Technology Law* 30, 2 (2021), 140–168. doi:10.1080/13600834.2020.1850174

[23] Fanny Vainionpää, Marianne Kinnula, Atte Kinnula, Kari Kuutti, and Simo Hosio. 2022. HCI and Digital Twins – A Critical Look: A Literature Review. In *Proceedings of the 25th International Academic Mindtrek Conference* (Tampere, Finland)

(Academic Mindtrek '22). Association for Computing Machinery, New York, NY, USA, 75–88. doi:10.1145/3569219.3569376

[24] Daniel M. Wegner. 1987. *Transactive Memory: A Contemporary Analysis of the Group Mind*. Springer New York, New York, NY, 185–208. doi:10.1007/978-1-4612-4634-3_9