Understanding Generative AI in the Professional IT Landscape

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1 Introduction

In an era defined by rapid technological advancements, generative Artificial Intelligence (AI) has emerged as a transformative force within the IT industry. The deployment of generative AI (GAI) technologies offers opportunities for innovation, efficiency, and creativity. However, it simultaneously raises critical questions regarding the preparedness and adaptation of IT professionals to harness these tools effectively.

In the EDU-AI project (*Adapting Computing Education for an AI-Driven Future: Empirical Insights and Guidelines for Integrating Generative AI into Curriculum and Practice*), we investigate the application of generative AI by IT professionals. The primary objective in this report is to deliver a comprehensive analysis of generative AI's impact on professional competencies, relevant for IT professionals.

In the remainder of this report, the authors provide a brief background of relevant concepts, present key findings from conducted studies, discuss takeaways from the work so far, and conclude with a summary and recommendations for the work ahead.

The EDU-AI project encompasses multiple research studies aimed at:

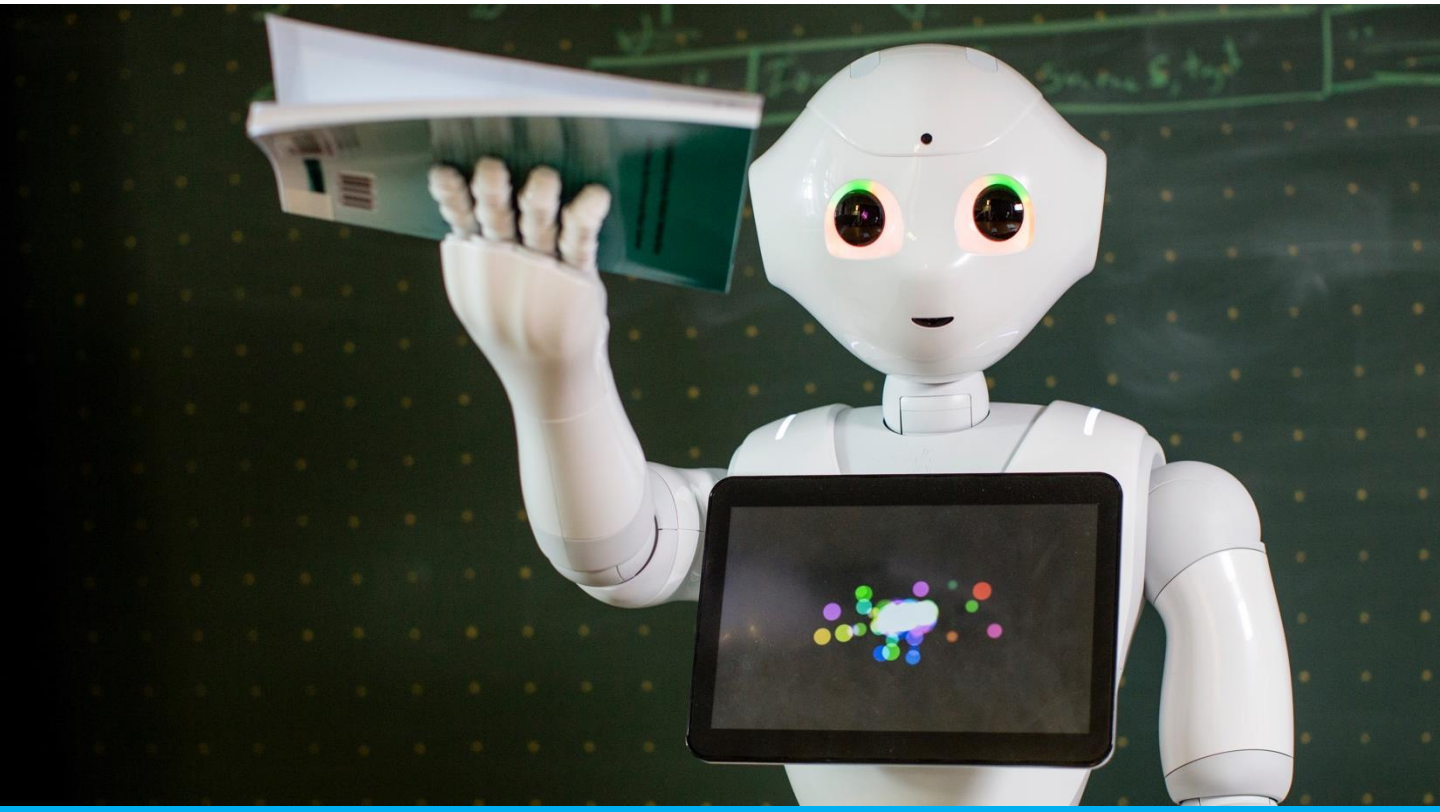
- ❑ Examining adoption patterns.
- ❑ Identifying advantages.
- ❑ Uncovering challenges.
- ❑ Defining the essential competency requirements for the effective use of generative AI technologies.

2 Background

2.1 What is generative AI?

Generative AI refers to a type of Artificial Intelligence that can produce new content, such as text, images, music, and more, by learning patterns from existing data. Using advanced models like Generative Adversarial Networks (GANs) or Transformer-based architectures, generative AI systems are trained on large datasets to understand the structure and nuances of the information they are provided with. Once trained, these systems can create original content that mimics the data they were trained on.

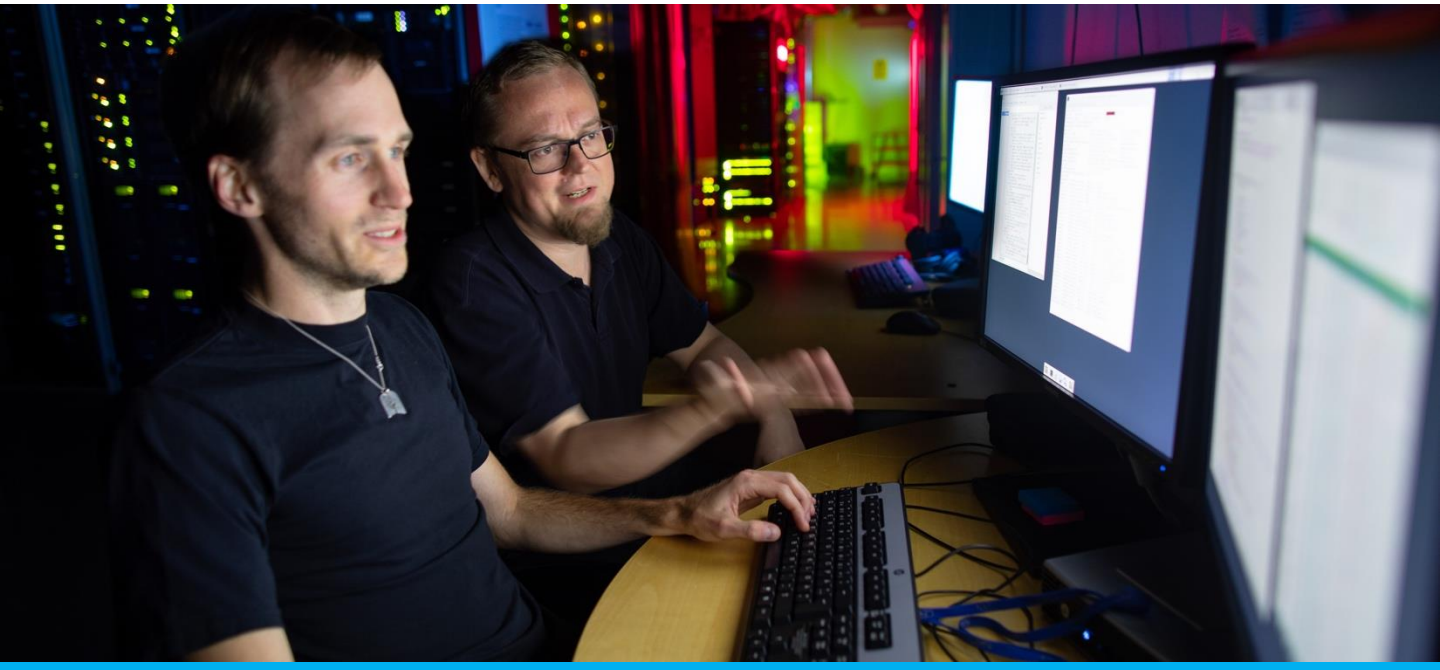
Generative AI has diverse applications, from generating artwork, music, and literature to designing new molecules for drug discovery and optimizing materials. It also improves machine learning by creating synthetic data to enhance training datasets. However, as generative AI evolves, it presents both opportunities and challenges, including ethical concerns about misinformation and deepfakes, as well as the need for substantial computational resources. Its development is poised to revolutionize technology interaction while requiring careful consideration of its societal impacts.



2.2 What is professional IT landscape?

The professional IT landscape refers to the dynamic and complex environment in which Information Technology professionals operate. This environment encompasses a broad range of technological advancements, industry standards, regulatory frameworks, and market demands that shape how IT services and solutions are developed, deployed, and maintained. Key elements of the professional IT landscape include hardware and software infrastructure, cloud computing, cybersecurity measures, data management practices, and emerging technologies such as artificial intelligence and blockchain. Professionals within this landscape must navigate these elements while adhering to best practices, ensuring compliance with regulations, and continually updating their skills to remain competitive in a rapidly evolving field.

Moreover, the professional IT landscape often include collaboration and interdisciplinary work. IT professionals can work closely with stakeholders from various sectors, including business, healthcare, education, and government, to implement technology solutions that address specific needs and challenges. This collaborative approach is important for driving innovation, improving efficiency, and enhancing the overall quality of IT services. Additionally, the IT landscape is influenced by global trends and economic factors, which can impact the availability of resources, talent, and investment in technology projects.



3 Results

3.1 Generative AI for IT professionals

Key findings

- ❑ Heterogeneous Impact of Generative AI Technologies
- ❑ Shifts in Required Competencies
- ❑ Workplace Dynamics and Professional Development

The introduction of generative AI technologies has significantly enhanced efficiency and productivity in IT environments, although the impact varies across professional contexts. This widespread adoption has shifted the competencies required of IT professionals, with a growing need for expertise in generative AI, machine learning, natural language processing, and data analytics. IT professionals must also enhance digital literacy, prompt engineering, and soft skills like critical thinking, problem-solving, and ethical awareness. The integration of generative AI has changed workplace dynamics, potentially dividing AI-adept and non-AI-adept professionals and altering organizational power structures. Continuous professional development through training and self-directed learning is essential to stay relevant amidst ongoing challenges such as biased decision-making and inaccurate outputs.

Study summary in Appendix 1

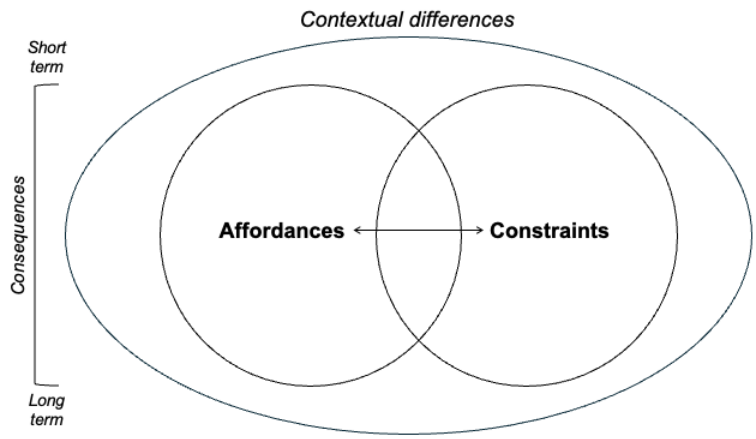
3.2 Generative AI in HCI

Key findings

- ❑ Short-Term vs. Long-Term Consequences
- ❑ Affordances vs. Constraints
- ❑ Contextual Differences and Design Considerations

When considering the affordances and constraints of generative AI, it is crucial to examine both short-term and long-term impacts. Short-term impacts, like lesson preparation and job transformation, are testable. Long-term impacts are speculative but potentially transformative, such as using generative AI becoming an essential skill. The features of generative AI can be seen as both advantages and disadvantages depending on the context; for example, improved algorithms can enhance identification of automated software (bot detection) but also facilitate cyber fraud. Contextual differences and design considerations are essential for implementing generative AI, requiring attention to ethical and legal considerations, such as ownership, plagiarism, and accountability, and designing systems with human intervention to ensure accountability.

Figure: Humble & Cajander (2025)



Study summary in Appendix 2

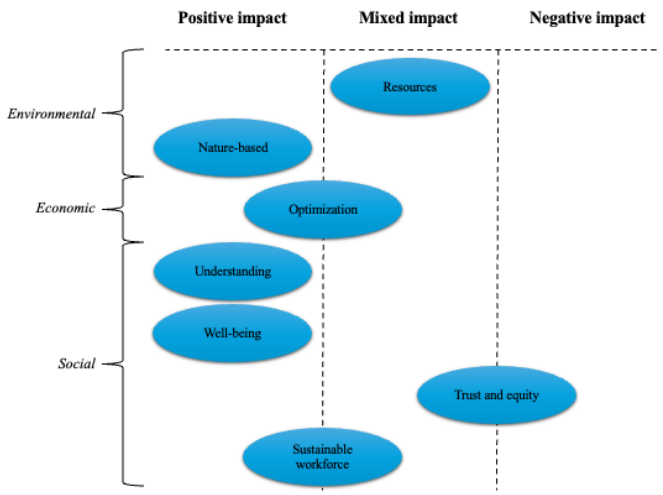
3.3 Generative AI and sustainability

Key findings

- ❑ Environmental Impact
- ❑ Economic Impact
- ❑ Social Impact

Generative AI holds promise for environmental sustainability through nature-based solutions, optimizing resource use and energy efficiency, but faces significant energy demands for computational tasks. Economically, it can improve efficiency in design, accounting, and management, saving time and resources, but requires balancing economic gains with human values for sustainable benefits. Socially, it can automate repetitive tasks, potentially reducing burnout and increasing focus on human-centered work. However, it may also increase workloads and undermine trust due to the black box-nature of many generative AI systems. Responsible implementation could enhance affordability, quality, accessibility, and supporting self-realization and artistic expression through human-AI collaborations.

Figure: Humble & Mozelius (2024)



Study summary in Appendix 3

3.4 AI-integrated tools and Flow

Key findings

- ❑ Enhancing Flow
- ❑ Workplace Training
- ❑ AI as a Partner

Tools like GitHub, Copilot and ChatGPT are transforming the way we work, enhancing the feeling of Flow by providing quick feedback and clear goals. However, true Flow is still dependent on task and environment. With the growing adoption of AI, workplaces need to prioritize training in ethics, collaboration with AI, and data science, as current solutions struggle to keep pace with rapid changes. Additionally, self-directed learning remains challenging for many. Generative AI is not just a tool anymore; it's evolving into a partner in brainstorming, problem-solving, and decision-making, reshaping our approach to work and innovation.

Study summary in Appendix 4

4 Discussion

4.1 Adoption Patterns

The adoption of generative AI (GAI) has varied significantly across different sectors and regions. In the realm of IT, professionals in many countries, including Sweden and New Zealand, have been early adopters. This adoption is driven by the need to enhance work engagement, productivity, and learning outcomes, reflecting an evolving professional landscape. In Human-Computer Interaction (HCI), the shift towards GAI is redefining user experience (UX) design and teaching practices, illustrating how GAI is being integrated into both industry and education. Meanwhile, in the context of sustainability, GAI has been highlighted as an opportunity for optimizing processes and for developing sustainable products, showing a more gradual but impactful adoption pattern.

4.2 Advantages

The primary advantages of GAI across the studies in this report include increased productivity, enhanced learning, and innovative problem-solving. For IT professionals, GAI facilitates better work engagement and competency development, essential for thriving in digital workplaces. In HCI, GAI offers improved UX design and educational support, fostering more intuitive and efficient systems. Additionally, previous research has noted GAI's role in sustainability, with the possibilities to optimize resource management and reduce energy consumption, showcasing its potential to drive both economic and environmental benefits.

4.3 Challenges

Despite its advantages, the adoption of GAI is not without challenges. IT professionals face issues related to the integration of GAI into socio-technical work dynamics, design issues, and need for new competencies. HCI research highlights ethical considerations, data biases, and potential misuse of GAI, which raise important questions about the future of work and creativity. In the sustainability domain, the energy consumption required for training and operating GAI models, along with the risk of unintended biases, poses significant challenges. Moreover, the potential overreliance on GAI could undermine human oversight and holistic approaches to sustainability.

4.4 Competence Requirements

Competency development is a crucial aspect of GAI adoption. For IT professionals, developing competencies related to AI integration is vital for maintaining work engagement and productivity. This includes understanding socio-technical dynamics and enhancing learning processes. It is also essential to understand the ethical considerations surrounding GAI to be able to navigate potential data biases and create intuitive and ethically informed designs. The sustainability field requires competencies in managing the environmental impacts of GAI and integrating AI-driven insights into sustainable practices, emphasizing the need for interdisciplinary approaches and continuous learning.

5 Conclusion

This report and included studies illustrate the transformative impact of generative AI across various domains related to the professional IT landscape, highlighting both the potential benefits and challenges. For IT professionals, generative AI offers opportunities for enhanced work engagement and professional development, while Human-Computer Interaction research underscores the importance of ethical and efficient AI-powered designs. In the context of sustainability, generative AI presents a double-edged sword, offering innovative solutions and optimization benefits alongside significant energy consumption and bias challenges. Addressing these issues requires a balanced approach that fosters competency development, ethical considerations, and interdisciplinary collaboration, ensuring that the integration of generative AI contributes positively to professional practices and societal goals.

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Clear, T., Cajander, Å., Clear, A., McDermott, R., Bergqvist, A., Daniels, M., Divitini, M., Forshaw, M., Humble, N., Kasinidou, M., Kleanthous, S., Kultur, C., Parvini, G., Polash, M., & Zhu, T. (2024, July). A Plan for a Joint Study into the Impacts of AI on Professional Competencies of IT Professionals and Implications for Computing Students. In *Proceedings of the 2024 Innovation and Technology in Computer Science Education V. 2 (ITiCSE 2024)* (pp. 757-758). ACM. https://doi.org/10.1145/3649405.3659527

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Appendices

Appendix 1

Study on generative AI for IT professionals

Summary

This study investigates the impact of AI on IT professionals' work practices, focusing on employee work engagement and the implications for computing students and curricula. Initiated in Sweden, New Zealand, and Scotland, the study addresses the increased use of AI in IT workplaces and the associated effects on motivation, learning, productivity, and accountability. IT professionals, being early adopters of AI, provide insights into how AI influences work engagement, which is critical for future IT professionals to develop necessary competencies for thriving in digital workplaces.

The study aimed to explore how work engagement is connected to professional development and competency acquisition. Through interviews with IT professionals, the research addresses questions about AI's influence on work engagement, socio-technical work dynamics, and the integration of AI in professional competencies and learning processes. The goal was to understand these dynamics better and to inform the design and assessment of computing curricula.

Using a combination of literature review and qualitative research methods, the study analyzes interview data to identify challenges and new needs in the professional practices of IT professionals. Results include global findings on the competencies required due to AI integration, which should inform policy, curriculum development, and assessment design.

Publications

Clear, T., Cajander, Å., Clear, A., McDermott, R., Bergqvist, A., Daniels, M., Divitini, M., Forshaw, M., Humble, N., Kasinidou, M., Kleanthous, S., Kultur, C., Parvini, G., Polash, M., & Zhu, T. (2024, July). A Plan for a Joint Study into the Impacts of AI on Professional Competencies of IT Professionals and Implications for Computing Students. In *Proceedings of the 2024 Innovation and Technology in Computer Science Education V. 2 (ITiCSE 2024)* (pp. 757-758). ACM. https://doi.org/10.1145/3649405.3659527

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Appendix 2

Study on generative AI in HCI

Summary

In Human-Computer Interaction (HCI) research, generative AI (GAI) signifies a transformative phase that broadens how humans engage with digital systems. This shift is reshaping industries, particularly in user experience (UX) design and sales performance effectiveness, while also presenting educational opportunities like AI-driven tutoring and enhanced teaching practices. However, integrating GAI brings challenges such as ethical considerations, data biases, and potential misuse, raising questions about the future of work and creativity. By examining affordances and constraints, this literature review explores the actionable capabilities and limitations of GAI systems in HCI, offering insights essential for developing intuitive, efficient, and ethically-informed AI-powered designs. While recent literature reviews address GAI and HCI intersections in design work, UX design, and human-computer co-creativity, they often overlook these aspects through the lens of affordances and constraints. This study fills that gap, providing a foundational resource for future research and technology design practices.

The study identifies affordances and constraints of GAI in HCI research through a scoping review of existing literature. The study aims to offer a balanced understanding of GAI's role in shaping HCI. Utilizing a scoping review approach, the study identifies evidence in HCI to determine potential affordances and constraints of GAI, informing research agendas and policy development. Including 37 papers, the study employs deductive theoretical thematic analysis, following Braun and Clarke's guidelines, to categorize findings into affordances and constraints. Findings offer valuable insights for practice and future research by highlighting identified themes, affordances, and constraints in the context of GAI in HCI.

The investigation identified seven key themes – improving algorithms, collaborative work, education support, truth issues, biases, ethical considerations, and consequences for job market – illustrating the varied applications and potential effects of GAI. The paper concludes with a novel conceptual model of GAI affordances and constraints, which informs future research, guides stakeholders' use and implementation; and provides design recommendations for GAI systems across various sectors.

Publications

Humble, N. & Cajander, Å. (Accepted). Rethinking Generative AI in Human-Computer Interaction – Review of Affordances, Constraints, and Implications. In *Proceedings of the 2nd International Conference on Education Research (ICER 2025)*. ACI.

Appendix 3

Study on generative AI and sustainability

Summary

Generative Artificial Intelligence (GAI), a subcategory of AI, has gained significant attention for its ability to create new content that closely mimics human-produced outputs, including images, text, and music. The potential implications of GAI on sustainability are complex and multifaceted. Positively, GAI can enhance process optimization, foster innovative solutions, and uncover patterns within large datasets relevant to sustainability. This can result in improved resource management, lower energy consumption, and the development of more sustainable products. On the other hand, the implementation of GAI also presents challenges, such as heightened energy consumption needed for training and operating these models, alongside the risk of unintended biases and consequences in the generated content. Furthermore, overreliance on GAI could diminish human oversight, potentially compromising comprehensive, interdisciplinary, and cooperative approaches to sustainability.

The aim of this study was to explore the potential impacts of generative AI on sustainability through a literature review of existing research. Utilizing a scoping review methodology, data were collected from the Scopus database during the spring semester of 2024. Keywords relevant to the study were strategically combined using Boolean operators. Papers identified through this search underwent a screening process, where inclusion and exclusion criteria were applied. Selected papers were then analyzed using thematic analysis, following the guidelines established by Braun and Clarke. The analysis was supported by a categorization matrix based on prior research on sustainability, aiding the deductive coding of the collected data.

The findings of this study highlight the significant impact GAI can have on various sustainability dimensions, including environmental, economic, and social aspects. This research contributes insights into understanding the potential societal implications of generative AI. The study's results offer theoretical contributions, practical implications, and future research recommendations in the field of generative AI and sustainability.

Publications

Humble, N., & Mozelius, P. (2024, December). Generative Artificial Intelligence and the Impact on Sustainability. In *Proceedings of the 4th International Conference on AI Research (ICAIR 2024)* (Vol. 4, No. 1, pp. 175-182). ACI. https://doi.org/10.34190/icair.4.1.3024

Appendix 4

Study on IT professionals Flow with AI

Summary

This study explores the impact of AI-integrated work tools on the Flow experiences of IT professionals, focusing on whether these tools facilitate or disrupt Flow states – characterized by deep focus and immersion. Despite AI's increasing role in automating routine tasks and enhancing productivity, its influence on sustaining long-term Flow states in professional settings is poorly understood. Distinct from workflow considerations, this research centers on Flow as a psychological state, investigating how AI tools influence key conditions for achieving Flow, such as balancing challenge and skill, clear goal-setting, and immediate feedback.

The study used semi-structured interviews and thematic analysis to gain insights into the experience of AI use from 12 IT professionals. The findings highlight that while AI tools streamline tasks and provide rapid feedback, their direct impact on facilitating or impeding Flow states remains minimal. Achieving Flow depended more on task complexity and work context than AI tool integration.

For achieving Flow among IT professionals, the study suggests the following design recommendations: 1) AI-integrated tools should prioritize features that facilitate goal clarity, 2) AI-integrated tools should adapt dynamically to the user's proficiency level and the complexity of the task, 3) the tools should provide immediate and iterative feedback, 4) exploratory behaviors without explicate goals should be supported by the tools, and 5) the tools should support seamless integration into existing workflows to minimize cognitive load and maintain immersion.

Publications

Lange, E. M., Cajander, Å., & Normark, M. (2025). Exploring flow in IT professionals' use of AI-integrated tools: Insights from interviews. In *Proceedings of the HCI International 2025 Conference*. Springer.

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