

## Artificial Intelligence-based Assistants

Rainer Schmidt  
Munich University of  
Applied Sciences  
[rainer.schmidt@hm.edu](mailto:rainer.schmidt@hm.edu)

Rainer Alt  
Leipzig University  
[Rainer.alt@uni-leipzig.de](mailto:Rainer.alt@uni-leipzig.de)

Alfred Zimmermann  
Reutlingen University  
[alfred.zimmermann@reutlingen-university.de](mailto:alfred.zimmermann@reutlingen-university.de)

### 1. Introduction

As an important general-purpose technology, Artificial Intelligence (AI) enjoys broad attention in numerous industries and for many use cases due to recent technological advancements in areas such as image detection, translation, and decision support [1], [2]. Many companies expect to gain a competitive advantage from AI [3], and the solutions for AI-enabled processes, products, and business models are continuously becoming more sophisticated [4]. AI-based assistants are an important and particularly innovative field in this development. They leverage AI in two ways.

First, virtual personal assistants and chatbots such as Amazon Alexa and the Google Home [5] redefine the interaction of human beings with applications by replacing the standard user interface via mouse, keyboard, and screen with voice. They are linked with computer hardware, in particular smart speakers that are provided by many of the big tech companies and have seen a broad diffusion. For example, figures for 2019 report an installed base of 100 million for Amazon's Alexa speakers and an installed base of 500 million each for Google Assistant and Apple Siri systems [6]. This population is expected to grow further, for example, global speaker shipments in the fourth quarter of 2020 alone comprise almost 60 million units. In addition, in July 2020 a total of 100'000 compatible smart home devices were listed for Amazon's Alexa, emphasizing the key role of these systems to access a broad variety of services. Second, AI-based assistants may be seen as services or software, that replaces activities that were previously performed by humans [7]. An example is the concept of robotic process automation where software assistants handle interactions among application systems.

AI-based assistants unlock business value through automating processes, intensifying the interaction with the customer, reducing errors, speeding up interactions. Following the understanding that information

systems are socio-technical in nature, AI-based assistants should be framed as a step toward humanizing technology and working environments. Recent research [8] shows that AI-based assistants evolve towards digital platforms in themselves by creating a rich ecosystem with skill providers, and device vendors. Direct and indirect network effects within and between these groups may be observed [8], which opens further strategic venues for applications in practice and research in academia. The success of AI-based assistants may be described with the various offerings from the big tech providers (e.g. Alexa, Cortana, Siri) and numerous chatbots created with the open-source development kits. For example, the Alexa universe already comprises 47'000 applications, referred to as "skills" [9]. This is also linked to a growth of application fields and interaction modes, which explains why assistant platforms are also recognized as general-purpose technologies [2]. Following the understanding that information systems are socio-technical in nature, AI-based assistants should be framed as a step toward humanizing technology and work environments in the digital economy. This opens the stage for many research questions that shall be addressed in the minitrack.

### 2. Goal of Minitrack

Based on the first event 2021 with 14 submissions [10], the minitrack "Artificial Intelligence-based Assistants" promotes the scientific exchange on AI-based assistants for the Digital Economy. The minitrack enables researchers to present and discuss innovative approaches, methodologies, models, processes, and related aspects. to design, implement, deploy, operate and optimize AI-based Assistants for the Digital Economy. The minitrack addresses also broader aspects such as platform and ecosystems of AI-based platforms. The AI-based Assistants minitrack deals with the following topics, but was also open to other topics.

- Applications of AI-based assistants in the digital economy

- Platforms and ecosystems of AI-based assistants
- Methods and models to design, develop, implement, deploy, manage and monitor AI-based assistants
- Methods, tools and approaches to capture the user behavior e.g. process mining and derive recommendations for actions
- New business models and processes based on AI-based assistants
- Fundamental questions on the use of AI-based assistants
- Research on the transparency of the behavior of AI-based assistants
- Integration of AI-based assistants with services and platforms
- Social and business implications of the use of AI-based assistants

### 3. Accepted Papers

Twelve papers were submitted to the minitrack, with six accepted after a rigorous review process with two phases.

In their paper “Consumer Adoption of Artificial Intelligence: A Review of Theories and Antecedents”, Ransome Bawack and Kathleen Desveaud investigate the motivations of people to adopt technologies powered by AI in their everyday lives. The authors analyze publications found in Harzing’s Journal Quality List. The most widely used theoretical perspectives are the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT). The most studied antecedents are perceived usefulness, perceived ease of use, and trust.

Rainer Schmidt, Rainer Alt, and Alfred Zimmermann adopt intelligence to shed light on the structure and dynamics of assistant platforms and their ecosystem in their paper “Ecosystem Intelligence for AI-based Assistant Platforms”. They derive a network-based conceptual model of Amazon’s Alexa assistant platform and ecosystem, showing that skills are a key unit of modularity. The authors also suggest that the Alexa ecosystem’s topology may be generalized using the criteria reflexivity, symmetry, variance, strength, and centrality of the skill coactivations. The paper also identifies three paths to create and capture value on AI-based assistant platforms. As a paper from the minitrack chairs, the review of this paper was handled outside of this minitrack.

In their paper, Nika Mozafari, Melanie Schwede, Maik Hammerschmidt, and Welf H. Weiger investigate user reactions to service failure and recovery in

interactions with humanoid service robots. First, they investigate how users attribute failures committed by humanoid service robots. Second, the authors analyze whether responsibility attribution varies depending on service robot design. They find evidence for the self-serving bias in a service robot context. The authors discuss consequences for applications of humanoid service robots and implications for further research.

The fourth paper is titled “When Do Customers Perceive Artificial Intelligence as Fair? An Assessment of AI-based B2C E-Commerce Services”. Helena Weith and Christian Matt present the results of 20 in-depth semi-structured customer interviews in the context of B2C e-commerce services and identify 19 AI fairness rules along four interrelated dimensions: procedural, distributive, interpersonal, and informational.

To pave the way for creating Conversational Agents (CAs) that exhibit a particular personality, Rangina Ahmad, Dominik Siemon, Ulrich Gnewuch, and Susanne Robra-Bissantz systematically analyze existing studies in their paper “A Framework of Personality Cues for Conversational Agents”. The authors develop a framework on how to imbue CAs with personality cues and organize the underlying range of expressive variation. In this way, the authors provide an overview of CA personality cues in verbal and non-verbal language and support practitioners in designing CAs with a particular personality.

Finally, Fabian Reinkemeier and Ulrich Gnewuch investigate the lack of user trust as a key barrier to the widespread use of voice commerce in their paper “Match or Mismatch? How Matching Personality and Gender between Voice Assistants and Users Affects Trust in Voice Commerce”. The authors draw on similarity-attraction theory to investigate how trust is affected when VAs match the user’s personality and gender. They reveal that a personality match increases trust, while the effect of a gender match on trust is non-significant.

### 4. Acknowledgements

We wish to thank all authors who submitted papers to the Artificial Intelligence-based Assistants minitrack for having shared their work with us, the (virtual) participants creating fruitful discussion, as well as the members of the AI-based Assistants Program Committee, who made a remarkable effort in reviewing the submissions. We also thank the organizers of HICSS 2022 for their help in organizing this minitrack, which was conducted virtually for the second time.

## 5. References

- [1] McAfee, A., and E. Brynjolfsson, *Machine, Platform, Crowd: Harnessing Our Digital Future*, W. W. Norton & Company, New York, 2017.
- [2] Helpman, E., *General purpose technologies and economic growth*, MIT press, 1998.
- [3] Ransbotham, S., D. Kiron, P. Gerbert, and M. Reeves, “Reshaping business with artificial intelligence: Closing the gap between ambition and action”, *MIT Sloan Management Review* 59(1), 2017.
- [4] Russell, S.J., and P. Norvig, *Artificial intelligence: a modern approach*, Malaysia; Pearson Education Limited, 2016.
- [5] Kěpuska, V., and G. Bohouta, “Next-generation of virtual personal assistants (Microsoft Cortana, Apple Siri, Amazon Alexa and Google Home)”, *2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC)*, (2018), 99–103.
- [6] *Global Smart Speaker Unit Shipments 2016-2020*, Statista, 2021.
- [7] Alt, R., “Electronic Markets on robotics”, *Electronic Markets*, 2021, pp. s12525- 021- 00498–9.
- [8] Schmidt, R., R. Alt, and A. Zimmermann, “A Conceptual Model for Assistant Platforms”, *54th Hawaii International Conference on System Sciences (HICSS)*, (2021), 4024–4033.
- [9] Major, D.J., D.Y. Huang, M. Chetty, and N. Feamster, “Alexa, Who Am I Speaking To? Understanding Users’ Ability to Identify Third-Party Apps on Amazon Alexa”, *arXiv preprint arXiv:1910.14112*, 2019.
- [10] Schmidt, R., R. Alt, and A. Zimmermann, “Introduction to the Minitrack on Artificial Intelligence-based Assistants”, *Proceedings 54th Hawaii International Conference on System Sciences (HICSS)*, (2021), 4021–4023.