

Kiro: A Design Fiction to Explore Social Conversation with Voice Assistants

RONDA RINGFORT-FELNER, University of Siegen, Germany

MATTHIAS LASCHKE, University of Siegen, Germany

SHADAN SADEGHIAN, University of Siegen, Germany

MARC HASSENZAHN, University of Siegen, Germany

Soon, voice assistants might be able to engage in fully-fledged social conversations with people, rather than merely providing a voice-operated interface to functionality and data. So far, not much is known about designing such "social" voice assistants and the potential social experiences, which could and should emerge in everyday situations. In the present paper, we created a design fiction to explore a sophisticated social voice assistant in the context of the car. Based on models from psychology and psychotherapy, we designed the fictional "virtual passenger" Kiro. We created a website for Kiro (<http://www.heykiro.com/>), distributed it, and collected responses in various ways (e.g., comments). We further ran a market research-type focus group. In general, we found people to accept Kiro as a conversational partner but not as a replacement for human-human conversations. We suggest designing social voice assistants in a way to enable novel types of socially fulfilling, yet distinct human-machine conversations.

CCS Concepts: • **Human-centered computing** → **HCI design and evaluation methods; Interaction paradigms; Natural language interfaces; User studies.**

Additional Key Words and Phrases: design fiction, voice assistants, conversational agents, research through design, social conversation, transportation

ACM Reference Format:

Ronda Ringfort-Felner, Matthias Laschke, Shadan Sadeghian, and Marc Hassenzahl. 2022. Kiro: A Design Fiction to Explore Social Conversation with Voice Assistants. *Proc. ACM Hum.-Comput. Interact.* 6, GROUP, Article 33 (January 2022), 21 pages. <https://doi.org/10.1145/3492852>

1 INTRODUCTION

Voice assistants (VAs) whether in the form of smart speakers (e.g., Amazon Alexa, Google Home) or smart-phone-based personal assistants (e.g., Apple Siri, Microsoft Cortana) are becoming more prevalent in our everyday lives finding their way into our homes or cars. The common notion about such VAs is that they are "virtual butlers" who can be delegated particular, simple tasks [58], such as playing a song or checking the weather. Although they are often placed in social spaces (e.g., kitchens) [47] and their human-likeness imply social interactions [19], their current functions and interactions are limited to task-based conversations. However, with advances in machine learning and other forms of "artificial intelligence", VAs might be able to converse in a way beyond responding to brief commands. The more flexible and various conversations become, the more VAs can serve quasi-social functions [15] and provide fulfilling, that is enjoyable and meaningful, social

Authors' addresses: Ronda Ringfort-Felner, ronda.ringfort@uni-siegen.de, University of Siegen, Germany; Matthias Laschke, matthias.laschke@uni-siegen.de, University of Siegen, Germany; Shadan Sadeghian, shadan.sadeghian@winfo.uni-siegen.de, University of Siegen, Germany; Marc Hassenzahl, marc.hassenzahl@uni-siegen.de, University of Siegen, Germany.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

© 2022 Association for Computing Machinery.

2573-0142/2022/1-ART33 \$15.00

<https://doi.org/10.1145/3492852>

experience, such as socializing or emotional disclosure. Instead of delegating tasks, people may start to confide in their assistants, ask for an opinion, or simply engage in chit-chat. Thus, VAs might fulfill people's social needs, which, if designed properly, can have positive emotional (e.g., reducing stress), relational (e.g., enhancing relational closeness and intimacy), and psychological outcomes (e.g., greater self-affirmation) [29] in everyday life, as well as promote human's well-being from a long-term perspective [27].

Although people already engage in social interactions with VAs (e.g., let them tell jokes, greet their guests, or perceive them as their "best friend" [72]), VAs remain designed to mostly perform practical tasks. Social functions serve as a mechanism to foster trust or to create a better user experience when performing a practical task [10]. They are not primarily about creating and fostering socially fulfilling experiences to increase well-being. Consequently, the potential and value of meaningful social conversations with VAs in everyday life remain largely unexplored – in terms of design and users' potential responses.

Of course, empirically exploring the value of fully-fledged "social" VAs (sVAs) is difficult. On the one hand, the market solely focuses on predominantly practical applications (beyond chatbot Replika [38]), thus it is quite difficult to change the preconceived perception people have of voice assistants [14]. On the other hand, the available technological possibilities do not yet allow for elaborate social conversations. Although some studies (e.g., [56, 69]), already use approaches to investigate and articulate different futures (e.g., design fiction) to explore social dimensions of VAs, they leave open how laypeople would respond to the offer of a realistic sVA presumably available on the market.

Consequently, the present paper's main objective is to create a convincing near-future vision of an sVA and to empirically explore its possibilities and challenges. To do so, we conducted research through design (RtD e.g., [80]) and design fiction [17]. In HCI, design fiction is used as a strategy to explore the design and potential impact of future technologies [6, 18]. In general, design fiction cannot remain vague or abstract. Their strength is to provide a detailed vision of a potential future technology in context to allow for insights on behalf of the designers and critical responses from potential users. Of course, not every context is appropriate for having social conversations with VAs. For the present study, we focus on the car as an application area. In Germany, 44% of people use their car on a daily basis, mainly for commuting [74]. In fact, a car is an ideal place for both, superficial (e.g., gossip) and in-depth conversations (e.g., on matters of life or difficult decisions) due to the intimate space shared for a specific period [41]. However, many people drive alone [9]. Given the pervasiveness of in-vehicle VAs [45, 57], potential technological advancements, as well as the suitability of the car as a place for conversations, it seems likely that future in-vehicle VAs will offer more socially-oriented types of conversations.

This paper presents a design fiction of an in-vehicle sVA called *Kiro*. *Kiro* draws on theoretical models of successful human-human conversations from psychology and psychotherapy (e.g., [62, 65]). An initial online survey served as inspiration for potential scenarios and attributes of *Kiro*. To initiate a critical discourse, we presented *Kiro* through a product website pretending that *Kiro* was already available on the market. To empirically explore responses, we ran a "marketing" focus group with potential users as well as spread the concept through an online press article, an online discussion space, social media (LinkedIn, Facebook, XING), and offered an e-mail contact on the website.

This paper's contribution is twofold: first, it provides a compelling future vision of an in-vehicle sVA brought to life through design fiction. Second, it gathers empirically grounded insights into the possible experiences that drivers imagine to have with such an sVA, their reservations, as well as expectations. We take this up to propose some implications for the design of fulfilling social interaction with a non-human counterpart.

In the following, we will briefly detail existing research. We then present Kiro and the design process in detail, as well as the results of our empirical explorations. Finally, we will discuss our findings and reflect on future work.

2 RELATED WORK

There are three broad areas our design fiction builds upon: (1) the value of social conversations with machines, (2) available research on VAs, and (3) the car as a concrete application area for using VAs for predominantly socially motivated types of conversations.

2.1 Social Conversations with Machines

Since the development of Eliza in 1966 [76], having social conversations with machines is a topic. Other than transactional, that is, task-based conversations, social conversations (e.g., small talks with friends) are about "to build, maintain, and strengthen positive relations with one or more interlocutors" [14, S. 475]. Having this type of conversation can, for example, lead to common ground [13], trust and rapport [11], or can help people to form and refine their social reality [23]. Available research already shows that conversations with machines have social benefits for the humans who practice them. For example, in one study, Ho and colleagues [29] investigated the psychological, rational, and emotional effects of self-disclosure triggered in conversations with a chatbot. Surprisingly, chatbots and humans were similarly effective in generating psychological benefits. Takayama and colleagues [73] investigated the social aspects of human-agent conflicts and showed that people value agents as a source of facts and rely on their evaluations and opinions. In general, potential benefits of social conversations with machines (e.g., social robots) are mainly considered in application fields, such as health care, for example, for autism therapy (e.g., [12, 59]), as companions for older adults to reduce the feeling of loneliness through emotional support (e.g., [64]), or in educational contexts, for example, for teaching social skills (e.g., [75]). All in all, there seems to be good reasons and value in considering socially fulfilling conversations (as opposed to task-based conversations) a future design goal for VAs used in everyday life.

2.2 Voice Assistants

VAs such as Apple's Siri, Amazon Alexa, or Google's Assistant are conversational user interfaces (CUI) with which users can interact via speech [66]. They can be embedded in various objects, such as smartphones, smart speakers, or cars [50, 61]. Although individual functions and features differ, they often follow the similar notion of a "virtual butler", which responds to simple voice commands to perform practical tasks, such as checking the weather, setting reminders, playing music, or starting applications [3, 58, 61]. There is increased interest within HCI to explore how people use and perceive VAs (e.g., [3, 19, 46, 66]). Here, research has shown that people engage mainly in limited task-based conversations. Nevertheless, now and then, VAs are also used socially. People use them to have fun, make them tell jokes, entertain their guests, or even describe them as their "best friend" [72] – even if this is not their actual purpose.

However, the majority of research on social functions of VAs focuses on improving practical use cases through social elements (e.g., [10, 25, 32, 70, 79]) rather than on designing for fulfilling social conversations with VAs. For example, Chattaraman et al. [10] used a friendly and informal conversational style as a means to increase performance in a pragmatic task (i.e., online shopping), and Karatas et al. [32] uses social dialogue in the car to reduce cognitive load. In general, in-vehicle VAs are extensively studied due to their ability to convey information through auditory resources and consequently reduce drivers' cognitive load or increase safety [7, 32, 39, 40, 78, 79]. In this sense, social elements such as small talk [40], emotion expression [78], the creation of digital "personalities" [7], or robots on the dashboard as emotional companions [8, 55, 79] are used practically as means

to reduce task load or to improve the user experience, trust in, and acceptance of technology while driving.

To better understand how to design "truly" conversational agents, Clark et al. [14] investigated what people value in human-human conversation and how this should be incorporated in human-agent communication. Responses show that social elements are not taking effect on people due to technological limitations and a lack of "social dialogue systems" on the market. Consequently, laypeople perceive VAs predominantly as a tool or attendants and even question the potential benefits of engaging in social conversations with them. Recently, the chatbot Replika [38], an "AI friend that is always there for you" [54] opened the possibility to investigate social conversations with an on-market social conversational agent. Studies are already offering first insights into how Replika creates friendship through the collection of meaningful moments [54] or into the general experiences people have when using it [53]. Participants reported being put off chatting, feeling annoyed or disappointed cause it doesn't feel like a real conversation. In another study, Mensio et al. [51] provide first reflections upon the social and psychological risks (e.g., addiction, isolation, or change in personality) of non-human conversation partners by using the episode of the HBO series *Black Mirror* "Be Right Back" and the app Replika as a starting point. Recently, futuring approaches such as design fiction or critical design have been increasingly used to explore VAs' social dimensions. For example, Søndergaard and Hansen [69] explored how VAs are gendered. They suggest that future VAs should support social issues (matters of care, trust, and interdependency), rather than focusing on consumer-driven interactions. In a thought experiment, Seymour and Van Kleek [68] described a future voice assistant with a "soul", which builds a reciprocal relationship with its user. Based on the experiment the authors discuss the difficulties of forming a friendship with machines, because of the developer and potential ideologies embedded into such social machines. Luria et al. [47] explored the design space of future socially more sophisticated agents in the home and discussed some emerging design implications, such as the need for a primary user or assigning a clear role to the agent. Moreover, Rogers et al. [63] explored a series of plausible and preferable futures for a voice-enabled internet and passionately called for a more intense reflection on this type of technology.

Our work extends this design research and explores more deeply a future vision of an sVA in a concrete, meaningful application area – the car – in confrontation with laypeople.

2.3 The Car as an Application Area for sVAs

Mobility practices, such as commuting to work, shopping, or traveling to visit loved ones, are an integral part of at least the first world's everyday lives. People spend a noticeable amount of time in their cars, mainly for commuting [27]. While the car is often experienced as a retreat, it can also be a valuable place for social experiences, such as having conversations [22, 24]. For example, Laurier and colleagues [41] conducted a comprehensive study of "driving together". They found the car to be an ideal place for good and even deep conversations due to its intimate space, the seclusion from the surrounding world, and the dedicated time. Increasing automation will allow drivers to even more engage in conversations [60]. Given the suitability of the car as a social place, it is not surprising that there are already a considerable number of concepts designed to connect with others (e.g., friends) while driving (e.g., [22, 30, 34]). However, these concepts draw on human-human communication and require people's availability, either as a passenger or remotely through communication technology. Availability is, thus, restricted by different destinations or times. With the increase in the use and prevalence of in-vehicle VAs [45, 57], as well as the progress in conversational technologies, the adequacy of the car as a place for conversations, and the lack of availability of human counterparts, a desire for meaningful social interactions in the car (both in present vehicles as well as in future autonomous vehicles) without the need for a human counterpart

seems likely. Based on this, we found the car to be an ideal application area for our design fiction exploring the notion of an sVA.

3 KIRO – A DESIGN FICTION OF AN IN-VEHICLE SOCIAL VOICE ASSISTANT

In this paper, we use design fiction to empirically explore the potentials and pitfalls of a future sVA. We chose the car as a meaningful, concrete application area to provide and discuss a detailed, contextualized, and thus, authentic vision of an sVA. In the following, we will first present our methodological approach. We then further detail the development of Kiro and accompanying materials (e.g., website) and present responses from laypeople gathered through various channels.

3.1 Some Notes on Design Fiction

Design fiction is an already established approach in Human-Computer Interaction (HCI). It is to explore possible futures [35, 42]. In general, design fiction does not search for a "solution" to a problem. Instead, it enables designers and potential audiences to imagine not-yet-existing technologies and speculate about their broader implications, such as societal impact or individual consequences [5, 17]. It is about provoking discussion and reflection to provide insights into probable, plausible, possible, or preferable futures and the challenges of the present. Coulton and colleagues [18] described design fiction as a "world-building" activity, the construction of a fictional world in which a future technology can plausibly exist and makes sense. Typically, design fictions invoke such worlds through a miscellany of media and artifacts (e.g., marketing materials, feature prototypes) called "diegetic prototypes". Together, those prototypes are used to build the world [17]. Plausibility is essential to suspend disbelief about a potential future [16]. The combined materials should make it easy to understand and access the world and "encourage people to think critically about issues that the design embodies" [17, S. 9]. In general, design fiction is only a loosely defined family of methods [42]. More specific approaches exist, such as Lindley and colleagues' [43] *Anticipatory Ethnography*, where design ethnographers treat imagined practices as if they were real. Lindley and colleagues suggest different types of studying design fiction further. One is to study "the content of a design fiction"; another especially relevant to the present paper is to study "how an audience interacts with or perceives a design fiction" [44, S. 246].

3.2 Our Approach

In this paper, we used design fiction, in line with Coulton et al. [17, 18] to explore a near-future technology and its impact on people's everyday lives to inform the design and to anticipate possible consequences of future sVAs. Design fiction as a method allowed us to focus on a potential vision of social experiences created and mediated through a VA, which is neither technically feasible nor common practice today. In this way, it challenges the current socially established perception of VAs and provides initial insights into an alternative vision of the future – one in which the first in-vehicle sVA, a "virtual passenger", is available on the market. Our study comprised of three phases (see Table 1 for an overview): We first created a "preferable" future vision of an in-vehicle sVA, called Kiro, using models from psychology and psychotherapy and a collection of potentially positive social experiences gathered through a survey. Second, we created several artifacts (e.g., technical 3D model, product descriptions, FAQs) and combined those into a product website from a fictional start-up company. Finally, we initiated discussions by confronting laypeople with the vision through a focus group and different online channels, such as an online press article, online discussion space, e-mail contact on the website, and social media (LinkedIn, Facebook, XING). Through the latter, we explored the emerging feelings and thoughts of people as a response to Kiro. In the following, we will present each step in detail.

Table 1. Process

	Step 1: Vision Building	Step 2: World Building	Step 3: Confrontation
Goal	Creation of a preferable vision of an in-vehicle sVA	Manifestation of the vision	Initiation of a critical discourse; examine potentials and pitfalls of the vision
Inputs	Models from psychology and psychotherapy Positive anticipated experiences of 6 individuals	Results of step 1	Result of step 2
Methods	Anticipatory ethnography	Design fiction as world building	Focus group Internet reactions: -Social media (Facebook, LinkedIn, XING) -Discussion space (Spectrum) -Online article -E-Mail reactions
Results	General functions Positive anticipated experiences and opinions	Fictional product website	Thoughts, feelings, and reaction of people being confronted with the vision

3.3 Step 1: Vision Building

3.3.1 Models from Psychology and Psychotherapy.

To create a meaningful, grounded, and authentic design fiction of Kiro, we used theoretical models from psychology and psychotherapy for inspiration. Specifically, we used the models from Sachse [65] and Rogers [62], which address the "design" of positive conversations and relationships. Originally intended for human-human interaction, we used these approaches to explore Kiro's potential general functions and the way it might interact with drivers through natural speech and non-verbal means of communication.

Complementary Relationship Design: We used "Complementary Relationship Design" by Sachse [65] to create a positive and well-being-oriented relationship between the future in-vehicle sVA and its human counterpart. Sachse formulates six central relationship motives, namely recognition, importance, reliability, solidarity, autonomy, and boundaries/territoriality, which people seek to satisfy in their interaction with other humans. The motives refer to getting relevant information about oneself from other people (recognition and importance), about the quality of the relationship (reliability and solidarity), and about the degree of self-determination in the relationship (autonomy and boundaries/territoriality). A complementary behavior creates a need-satisfying experience and, thus, leads to improved well-being.

Inspired by these six relationship motives, Kiro was designed to provide positive verbal feedback on the abilities and attractiveness of its human conversation partner (recognition). It expresses its interest through verbal and potentially non-verbal responses, for example, by simulating attention and "eye contact" through a rotating light (importance). Moreover, Kiro visualizes "thinking" about upcoming joint trips to show that the relationship is stable and consistent over time (reliability). Lastly, to provide users the freedom to decide whether to drive alone or together with Kiro, it does not need to permanently be installed in the car (boundaries/territoriality).

Person-centered Conversation Therapy: In addition, we picked three basic attributes of successful relationships from Rogers' [62] "Person-Centered Conversation Therapy", namely (1) empathy (empathetic understanding), (2) unconditional positive attention (acceptance, appreciation), and (3) congruence (authenticity, genuineness) as further inspiration. Inspired by these three basic

Table 2. Models from psychology and psychotherapy and how they informed the design of Kiro

Model	Motives Attitudes	Description	Inspiration for Kiro's design (Design implication)
Complementary relationship design (Rainer Sachse)	Recognition	Humans strive for positive absolute feedback about themselves as a person, e.g., about their own abilities or attractiveness.	Kiro provides positive and "honest" verbal feedback on the abilities and attractiveness of the human counterpart after an acquaintance period.
	Importance	Humans strive for feedback on their meaning and importance to their counterpart, e.g., by expressing interest or attention in interaction.	Kiro provides undivided attention, is interested, never forgets anything, "reflects" on past trips and topics discussed, and takes them up on the next trip.
	Reliability	Humans strive for stability, resilience and consistency in social relationships and a respective feedback on this, e.g., through actions such as joint activities or joint planning of future activities.	Kiro provides unrestricted availability, shared driving experiences, and visualizes "thinking" about upcoming joint trips to show that the relationship is stable and consistent over time.
	Solidarity	Humans strive for feedback on the fact that the counterpart supports whenever it is needed.	Kiro provides support during the ride by giving advice, tips, or emotional commitment.
	Autonomy	Humans strive for making their own decisions and their acceptance of the counterpart.	Kiro accepts the attitude of its counterpart and merely provides tips, advice, suggestions, or ideas.
	Boundaries/territoriality	Humans strive for defining their own domains (e.g., my car) that are determined by a boundary and to determine who crosses it.	Kiro is not permanently installed in the car (portable device) and allows the user to decide whether and when the personal retreat space "the car" should be shared.
	Person-centered Conversational therapy (Carl R. Rogers)	Empathy	Empathetic understanding. The "real" understanding of a person and his/her values, motives, wishes, and fears.
Unconditional positive attention		Acceptance, sympathy, or appreciation of the feelings and expressions of the interaction partner.	Kiro accepts its counterpart without judgement or prejudice. No forcing of an own opinion.
Congruence		Authenticity, genuineness, and/or transparency. Contributing one's own into the relationship.	Kiro has an own "life story" that it can bring into the relationship (consists of a record of its first journey (the delivery to the user) and the subsequent experiences).

attributes, Kiro empathizes with the driver, behaves positively and unbiased towards the driver, and contributes to the relationship through its own novel and diverse topics. Table 2 gives a detailed overview of the motives and attributes and how they informed the design of Kiro.

3.3.2 Co-design: Positive Anticipated Experiences.

With the help of anticipatory ethnography [44], we further refined our preliminary vision of Kiro together with potential users and added a story to the fiction [48]. The goal was to explore positive (i.e., meaningful, enjoyable) experiences and specific social use cases people could imagine

having with Kiro. To do so, we used an online survey asking participants to imagine using Kiro in everyday life and to describe their (imaginary) positive everyday experiences with Kiro. Participants were informed about Kiro's basic features (e.g., perfect communication partner, shares feelings, not permanently installed in the car) through a product description and were encouraged to imagine that they had already spent several trips with Kiro. To stimulate imagination, we asked seven questions (e.g., "*What do you like about Kiro?*", "*How did Kiro change your car ride?*" or "*Which experience with Kiro do you remember most?*"). The participants were recruited through snowball sampling, which started in the closer circle of relatives and acquaintances of the first author. They were selected based on their frequent car use and their openness to fictional imaginations. Participants were required to use their cars more than four days per week to ensure personally relevant contributions. In total, six individuals (4 female, 2 male, age: 25 to 59 years, median=27) participated. All participants were German and had a heterogeneous background (e.g., an accountant, an IT specialist, students). They all lived in partnerships with no children, except one had three children. In sum, we collected 50 positive statements. A thematic analysis [4] was used to structure the content and sort it by similarity.

In general, the participants imagined Kiro as a perfect companion and friend who is always attentive and understanding, never becomes angry or hurt, and knows exactly what to say or to do. Several participants imagined Kiro as resolute and non-judgmental. For example, P3 wrote: "*It feels good to have someone who listens and does not judge, no matter what nonsense is going through my head*". Moreover, Kiro was appreciated as "someone" who never bores, has incredible knowledge, and always new and exciting topics to share. Concerning experiences and situations, the participants often imagined themselves talking with Kiro on their daily commute, especially sharing their feelings and worries (e.g., about dissatisfaction at work or an unresolved dispute). One participant wrote: "*It's so good just to have someone to talk to (...). After all, I wouldn't call my girlfriend in the morning just to tell her that my night sucked and that I was dreading the stress at work*" (P6). The participants imagined that Kiro would encourage them (e.g., to apply for a new job), calm them down (e.g., before an upcoming presentation), or cheer them up verbally or by activities (e.g., after a bad exam by driving to a nice place). In other statements, the participants imagined how Kiro's stories and knowledge further educate them. For example, P2 and P4 described how they would discuss and philosophize with Kiro about ideologies, religion, or politics, and P6 imagined practicing small talk with Kiro to overcome social shyness. In addition, experiences were created in which Kiro showed wonderful routes or new places. One participant wrote: "*He [!] knows my interests and leads me to great destinations, I would have never known about without Kiro*" (P6). Two participants (P2, P5) imagined using Kiro on joint holiday trips, where it enriched the trip with its knowledge or entertained the children. Moreover, P1 imagined positive shared music experiences with Kiro and P2 how Kiro reminds of topics, which had been part of an earlier conversation with a friend.

In sum, the participants did not regard Kiro as a perfect copy of a human being but as different. They saw themselves debating issues they would not necessarily talk about with other people or having conversations to improve their weaknesses to enhance their relationships with other humans. Besides, they expected Kiro to be uniformly in a constant good mood, to cheer them up, and to be a good listener who never judges them. For a fellow human, this would require rather superhuman social powers. A machine, though, was expected to provide this strongly idealized form of social interaction and experience.

3.4 Step 2: World Building

To materialize the vision of Kiro, we followed the approach of *Design Fiction as World Building* [17]. By mimicking companies, which typically publish their new technical products on websites



Fig. 1. Different realistic images of the product serving to promote Kiro on the website in a credible way.

(e.g., [38, 49, 52, 67, 71]), we created a product website (www.heykiro.com) launching Kiro as the new product of a start-up company from Dallas called Springfield Technology. Product websites typically use various media, such as text, images, and animations, and include, for example, detailed information about product features, functionality, the technology, or the science behind the product. Besides product descriptions, we created a series of realistic images and animations of the product itself, placed in the car or at home (Figure 1).

We designed Kiro as a puck-like shaped device (ca. 48x17mm) with a disc at the top, which simulates eye contact through a moving light and a rotating key ring on the underside to allow carrying like a keychain. Additionally, we designed a suitable charging station as a keyholder at home, on which Kiro displays its "thinking" as simple outlines of the content of a past conversation and upcoming ones.

Based on a brief review of existing websites promoting new products, we created seven pages combining different artifacts. Figure 2 shows an excerpt. (Please, visit the website www.heykiro.com for all details.) We created a cover page that teases the product with the catchy phrase, "*Never ride alone - Meet Kiro, the world's first sociable AI.*" Further pages described the product, with realistic images, animations, and technical features, as well as how to interact with Kiro. We used quotes from the anticipated experiences survey (see above) to enhance the vision with fictional testimonial statements, such as "*Driving a car is a whole new experience since I got Kiro*", as well as fictional user stories. The psychological models of Sachse and Rogers were provided as the scientific basis of Kiro on a page titled "science". We described the vision and story behind Springfield Technology on a further page to support the story of a start-up company launching a new product. Additionally, we provided a pre-order option. We offered the "*Kiro Social Car Companion Kit*" for 309 Euro and enriched the imagination with information about the content of the box, the product dimensions, or fictional information about delivery and payment. Finally, we created typical frequently asked questions (FAQs) (e.g., "*Where does Kiro have to be placed in the car?*" or "*What if I lose my Kiro?*") and related answers.

To address ethical and legal issues and to inform visitors about the fictional nature of the offer, we added the following note under "General Terms and Conditions": "The website [heykiro.com](http://www.heykiro.com) is a fictional product website that was created for research purposes. All displayed content is for demonstration and research purposes ONLY and does not exist in reality".

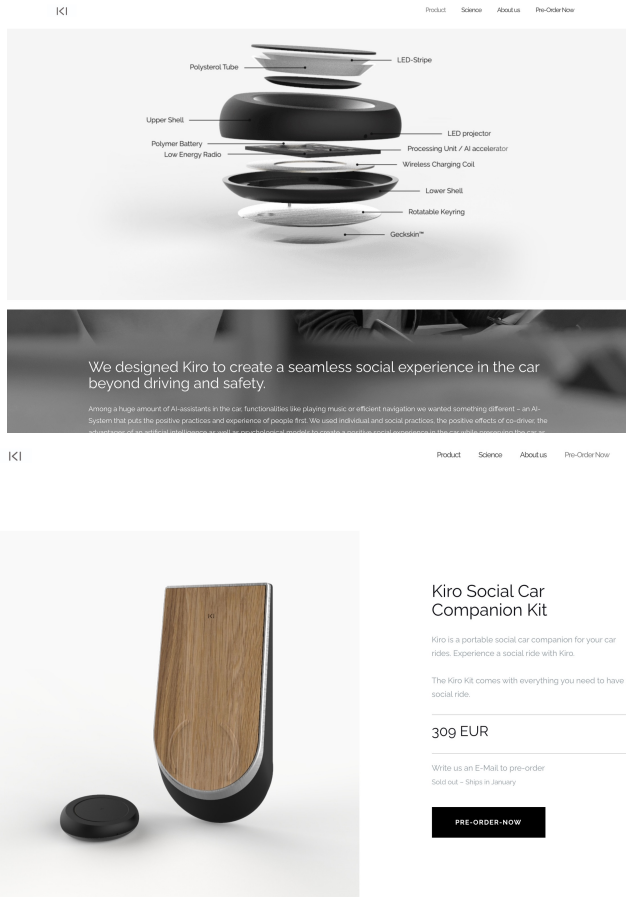


Fig. 2. Parts of the fictitious product website.

3.5 Step 3: Confrontation

We confronted people with Kiro to empirically explore themes emerging around this vision. We used two different approaches – we ran a market research-type focus group and collected responses through various channels online. In the following, we present the methods and reflect key findings of both.

3.5.1 Focus Group.

The first author conducted a two-hour market research-type focus group with five participants (2 female, 3 male, age: 37 to 51 years, median=41) on the topic of "social conversational agents for driving". The participants were again recruited through snowball sampling, which started in the closer circle of relatives and acquaintances of the first author. The final participants were selected based on car ownership, frequent use of the car (more than four days per week), their professional backgrounds, and their basic interest in technical innovations. Participants had heterogeneous professional occupations, e.g., an architect, a business editor, and a stock exchange trader. Except for one participant, all had one or more children. All participants were German.

As an introduction to the focus group, the moderator (i.e., first author) informed the participants that the discussion would be about an sVA for the car to gain insights into the further design of in-vehicle sVAs. The fictional character of Kiro was not mentioned, i.e., participants were led to believe that Kiro and Springfield Technology is real to elicit factual instead of speculative responses. The necessity and ethical aspects of the deception in the study were considered in advance and resolved in the debriefing. After the introduction, the moderator encouraged participants to share their daily car ride experiences with the group. Subsequently, Kiro was introduced to the participants using the product website, keeping the story of an already functional product to be launched soon. In a group discussion, participants shared their first feelings and thoughts. In a further step, the moderator asked participants to imagine using Kiro during their initially presented car rides. Interesting topics were taken up by the moderator and discussed further. Finally, participants were debriefed. The moderator explained the methodological approach of design fiction and its objectives. Subsequently, participants were informed that Kiro is a fictional concept exclusively created for research purposes. The workshop ended with a dialogue about the participants' feelings and thoughts regarding the deception. The focus group was audio and video recorded and later transcribed. We conducted thematic analyses [4] to structure the content and sorted it by similarity.

Initially, participants were critical towards Kiro. They characterized Kiro as "uncanny", "queasy", or "untrustworthy". Participants feared being manipulated (P3, P4), losing control over the conversation (P3, P4), being spied on (P2, P5), or that personal data might be stolen and misused (P1, P2, P4). For instance, one participant explained: *"This thing gives me the creeps. Because I would then communicate with a machine (...) and become manipulable"* (P4). A bit more positive, P2 stated: *"Well, I'd be curious about that. Let's see what kind of a little guy this is. Yeah, but I still wouldn't open myself up to that thing, if I knew it was connected to the net"*.

Overall, participants (P1, P3, P4) questioned the necessity of Kiro because of their already existing social contacts. For instance, P4 mentioned: *"I'd rather call someone"*. Participants considered Kiro to be more useful for younger people who are presumably more familiar with such technology, for people with only a few social contacts (e.g., older adults), with communication problems (e.g., autistics), or for frequent drivers, who are bored on long-distance rides. One participant stated: *"(...) I can imagine that there are target groups for whom this is really good"* (P4). The participants wondered about with whom they would actually talk in a conversation with Kiro: *"I wouldn't know where the answers come from and how they are motivated. (...) Is it someone whose opinions I find valuable?"* (P4). One participant was concerned about what others might think about him talking to a machine: *"My first thought was whether I should be ashamed of talking to such a little thing because I might as well call my friends"* (P2).

While the notion of conversing about private and personal topics caused rejection, knowledge-driven and "factual" exchanges were more appreciated. For instance, participants saw Kiro as a conversational partner for cooking topics (P3), to learn languages (P1, P2, P4), or to suggest routes with beautiful landscapes (P4). P2, P3, and P5 could also imagine Kiro entertaining their children sitting in the back. In general, participants attributed functional and pragmatic capabilities to Kiro, such as music recommendations (P1, P2, P3), finding a parking space (P1, P5), or reading out and following the news during the ride (P2, P3, P4).

Overall, the thoughts and feelings of the participants towards Kiro were ambiguous. While the participants were critical about their own "social" use of conversations with Kiro, they could imagine Kiro for others. Here, the actual concerns of the participants concerning data misuse or manipulation lost importance, and the participants saw an obvious added value for an sVA. For themselves, however, the value was harder to determine. They referred to their "real" social contacts and conversing with Kiro was perceived as a "weakness", rather than as a "useful" enrichment. Consequently, safety concerns, as well as practical applications or superficial topics, gained priority.

However, despite all these concerns, all participants were very curious and could at least imagine trying out Kiro once. While Kiro's appreciation was mixed, the idea that it substitutes social contact rather than complementing it, seemed the most pronounced negative issue. This is in line with the results from the initial survey of positive experiences with an sVA (see above). Here positive conversations were often described as different from human-human conversations and not meant as a substitute but rather as a complement.

3.5.2 Further Responses.

We used four distinct ways to collect further responses towards Kiro.

Social Media: All authors and acquaintances of the first author shared Kiro on their personal Facebook, LinkedIn, and Xing networks with statements such as *"Artificial Intelligence designed to be good company in cars! Check it out!"* and distributed it on the social network. The posts gave no indication of Kiro being fictional. All in all, they gained 57 likes, 10 shares, and 9 comments – quite standard for private shares.

Discussion Space: Additionally, we used the online community platform Spectrum to open up a public discussion space. The link was integrated on the website and shared with people known by the first author. It invited participants to discuss three topics: *"A world with Kiro..."*, *"Would you like to have a car ride with Kiro?"* and *"What do you think and feel?"* Nine comments were created.

Online Article: Furthermore, we contacted the German online magazine for innovation "Technology Review", which published an article about Kiro on the topic *"How a portable digital assistant for the car could look like"* and thus made it available to a broad range of readers interested in technology. We received three comments, shares, and likes on Facebook and two messages via LinkedIn (a statement of interest from an industrial company and a compliment from an international design company).

E-Mail: Finally, we included an e-mail contact on the website to pre-order the "product" and as the support and contact opportunity and received three e-mails: an order from a UX research company in Germany, a statement of interest and an inquiry from an innovation department of a German radio station, who were interested in an exchange about the concept of Kiro and the "future of InCar-Audio". All three parties assumed the authenticity of the product. The respective persons were informed about the fiction and the methodology immediately after we received their e-mail. In the case of the radio station's innovation department, a one-hour videoconference followed, with the focus on in-car audio and Kiro's role in the context of radio. Three authors of this work and two people from the innovation department were involved.

A thematic analysis [4] was used to structure the responses and sort them by similarity. As expected, responses ranged from approval, interest, and curiosity to skepticism or rejection. Various topics such as safety, Kiro's role as an interlocutor, its design, and how a world with such a VA would look like emerged.

From a practical perspective, Kiro's design and portability were positively highlighted in several ways: *"The look of Kiro itself is quite nice. You can see it fitting to most car interior on the market"*. Another participant raised their interest as *"For me, it's like a wearable thing that you can easily take with you, what you have on your car key and it's very easy (...) it's a great format, compact and well thought out and I find that fascinating"*.

Especially one reader of the online article, however, found the notion of an artificial conversation partner appalling: *"Should I tell that thing about my day? Does it praise me? Does it worship me? (...) None of this I can imagine as a really positive influence while driving"*. He further expressed concerns about safety risks created through the imagined interaction with Kiro while driving. This strong rejection of social experiences in the car, as well as the safety concerns, encountered opposition from other people both as a response to the comment as well as in the online discussion. One

participant wrote: *"I think besides the entertainment point of Kiro the biggest advantage is the safety that we will gain through Kiro. (...) if you have something like Kiro the car ride will be safer and more intuitive!"*. However, both comments emphasize driving and not so much being social with a VA.

Especially the participants of the online discussion could imagine various enjoyable car rides. One participant wrote: *"Having a car ride with Kiro would be super interesting for me! Especially when I'm alone."* In this context the participants discussed various usage scenarios. One participant wrote: *"When I sing, he could guess what song it is, when I'm in trouble in an unknown city he could help me out with some small hints."* Further situations envisioned had been: listening to podcasts, laughing together, discussing the topics mentioned on radio further with Kiro. Moreover, one saw Kiro's potential in helping people to initiate conversations with fellow passengers in car-sharing and ride-sharing situations. Further perspectives were added by the feedback from the UX department and the radio station; while the UX department wanted to order Kiro to enhance presentations and workshops with clients, the radio station was interested in Kiro in relation to the "Future of In Car-Audio". What happens to radio, when virtual passengers become available for entertainment?

One especially interesting theme emerged. One commenter described how groups of Kiro's might form, which exchange their thoughts and feelings in the same way as people do, leading to new connections among people. This hints at how people may tend to quickly attribute an independent social life to an sVA, just because it shows social behavior. Another participant focused more on interaction: *"When Kiro wants jazz music, it says 'Alexa, play jazz'. (...) Would I accept Kiro more as a social entity because he acts upon technology the same way I do? Or would I feel losing control over my car?"* as well as *"Finally, the end of awkward silence has arrived :D Or will it be awkward as well if you have nothing to talk about with your AI friend Kiro?"* All three comments show how in the perception of the participants, Kiro turns in something beyond what is normally thought of as technology. It also shows a certain uncertainty about the potential relationship participants will have with an sVA. Will it be more like another person (who has a social life, uses other technologies, has social expectations) or does it remain a machine after all? The participants seem to ask themselves, what kind of relationship might emerge.

All in all, the online responses to Kiro were rather positive. Most participants expressed curiosity and could imagine using an sVA such as Kiro as a social companion. The scenario of a car ride seemed appropriate and implied a number of usage scenarios, which already were mentioned in the initial survey. Kiro was envisioned to provide social experiences through conversations and joint activities, such as listening to podcasts and discussing their content. It had even been placed into more socially complex scenarios, such as acting as a conversation starter in car-sharing and ride-sharing with strangers. What is striking, however, is that even quite positive participants seem uncertain about the relationship that will emerge from interacting with an sVA. Is Kiro the end of "awkward silence" or will it just create experiences similar to the human-human conversation? Will Kiro use technology the same way people do, although it is a technology itself? While the notion to become social with a machine appeared interesting and stimulating, participants seemed slightly puzzled about whether the fact that the social partner remains a technology will negatively or positively impact their experiences.

4 DISCUSSION

The functions of today's VAs revolve around simple voice commands to perform tasks. Little is known about the potentials and value of socially fulfilling conversations with VAs in meaningful everyday situations. Through the design of a fictional in-vehicle sVA Kiro and its presentation to laypeople, we encouraged them to envision and critically reflect on the possibility to have social experiences with sVAs. Our findings showed diverse perceptions and thoughts.

Concerns and challenges: Kiro provoked critical responses especially in the focus group. Participants were concerned about data misuse, spying, manipulation, about safety concerns while driving manually (even though they already make phone calls or talk to people today), or saw no added value in Kiro's social functionalities due to having "real" (i.e., human) social contacts. Consequently, conversation topics revolved rather around "unimportant" mundane things (e.g., cooking) or practical ones (e.g., reading out news, finding a parking space). These topics were immediately perceived by participants as being both, safe and useful. Concerns such as data misuse, manipulation, or uncertainty about where the answers come from and whether they are valuable, might be directly attributed to the "developer" behind it [68]. Probably, participants doubted the trustworthiness of the technology, since the fictional developer "Springfield Technology" was unknown, thus no basis for trust existed to give participants a sense of security. They might also have negative associations with VAs in general due to existing experiences, such as with Amazon's Alexa. Precisely, concerns about data misuse or monitoring are already evident in past studies [33]. These concerns should not be interpreted as a rejection or lack of open-mindedness but must be addressed as a basic requirement. Especially given sVAs handle sensitive personal data, trust is of utmost importance. Design strategies, such as not storing data, only listening when the user really decides to, could be key to building a trusting relationship and build the basis for interaction with sVAs.

Especially the focus group participants saw Kiro in a rather practical, conventional light (e.g., to recommend songs, to read out news, to offer the best route), and struggled to imagine a valuable long-term relationship with Kiro. They mostly ignored potential social experiences (e.g., providing emotional support by sharing emotions and worries, talking about social life). Kiro thus reverted to an assistant and hint-giver rather than a friend. This, of course, could be a general preference of the participants. Decisive for this, however, could also be the concern about data misuse and the general lack of trust, both necessary for building personal relationships and for disclosure [28]. Furthermore, social functions, such as a conversation about personal life, did not appear to have obvious value to participants to adopt as a stand-alone function. Thus, especially focus group participants, construed Kiro as a mix of mainly practical and occasionally social functions. Given people's long-standing experience of using "things" for primarily practical purposes, it is reasonable for participants to have difficulties with thinking beyond this "utilitarian" use. Practical scenarios are just easier to imagine, whereas a social conversation with an sVA is a new and unfamiliar possibility [14]. Therefore, initial reactions tend to reflect concerns about social condemnation and loneliness, with feelings such as "creepiness," "discomfort," "uselessness," and lack of trust. To the participants, the psychological benefits of being social with a machine seemed to be more valuable for "other" target groups (e.g., elderly, lonely people), but for themselves. Here, social interaction with an sVA is rather perceived as a weakness and useless.

There are two aspects that we believe are crucial in this context: On the one hand, as Clark and colleagues note [14], there is a lack of available sVAs on the market that allows people to become acquainted with the social use of VAs. People are not aware of what social conversations with a machine have to offer and what positive (and negative) psychological effects this might have. In line with Kanda et al. [31], we believe that people's relationships with technological artifacts can change and evolve over time [28]. In this sense, engaging in yet uncommon social experiences with technology might require some time. Therefore, it seems important to build functional prototypes people can experience in their everyday life over a longer period of time. On the other hand, if sVAs are designed in "social competition" with real people, the question of necessity given the presence of real social relationships and stigmatization given the absence of social relationships seems quite reasonable. In line with Clark et al. [14] and Seymour and Van Kleek [68], we believe that social human-agent conversations must be approached from a

perspective other than substituting human-human-conversations. Social experiences with VAs need to be designed as new and complementary experiences rather than substitutes. For example, Aeschlimann and colleagues [1] suggest that the principles of human cooperation are different from the principles of human-computer cooperation. It is the responsibility of designers, manufacturers, and developers to highlight the unique qualities of quasi-social relationships with sVAs and to demonstrate that these types of experiences and relationships are different and not in competition with human-to-human experiences and relationships.

Ideas and potentials: Besides these critical issues, Kiro evoked positive responses and curiosity, especially in the anticipatory ethnography and the unprompted online responses. These provide insights into the potential of sVAs. Interestingly, and as already pointed out, positive participants did not perceive Kiro foremost as a substitute for a human conversation partner. Some even imagined Kiro to improve their existing human-to-human relationships. Consequently, the envisioned scenarios went beyond superficial or pragmatic issues. They instead evolved into rich situations, where Kiro motivates and encourages (before or after an event), helps to relieve stress, becomes an expert discussion partner (e.g., podcast or radio content), or supports reflection by remembering conversation topics people had with their friends. However, even to the most positive online commenters, a particular question remained open: What will be the exact nature of the relationship to a "machine", which offers social experiences.

These findings encourage further research into the psychological benefits of social experiences created in conversation with "machines" [29], such as sVAs. Additionally, we believe that the critical insights gained in this study are not a reason for abandoning sVAs; rather, they provide a useful outlook on the challenges designers and developers face when embedding "social" technology into people's daily lives. They are first hints at possible design strategies to create trustworthy and valuable social experiences through machines. Whether it will end up being a purely social application or a mix of practical and social functions remains open and should be investigated in further work.

4.1 Design Considerations

Our findings revealed a fundamental difference between whether one perceives an sVA as a substitute and imitation of human-human conversation or as a "different", a complement to already existing social experiences. Especially, participants who perceived Kiro as an imitation and replacement of a human conversation partner questioned its competence and potential value. In contrast, people who were positive towards Kiro perceived it as an enrichment to their social experiences and imagined idealized conversations, at least to some extent distinct from conversations they would have with other people. To support this through design, it seems crucial to create new, distinct types of social conversations. Consequently, to design the content and style of fulfilling yet distinct human-machine conversations acceptable to people will become a major future design challenge. A crucial prerequisite is to stop aiming at an increasingly more realistic imitation of human-human interaction by sVAs, but to create alternatives. How could a conversation with an sVA feel enlightening and social, yet avoid creating the impression that it copies human-human conversations and makes them obsolete?

Our findings indicate that a key to creating socially fulfilling, yet distinct conversations with sVAs might focus more on the fact that an sVA is a machine with particular machine-like attributes. Some approaches in Human-Computer Interaction (HCI) as well as in Human-Robot Interaction (HRI) already suggest not to imitate humans, but to focus on what is unique for each "species" [21, 26, 36, 37, 77]. This implies understanding technology, such as a VA as a social counterpart (and not as an interface or tool), however, with its own "interests", "needs", and "quirks" rooted in its very technological nature. Interestingly, there are a number of "social" superpowers [21, 77], which

are quite difficult to achieve for humans, yet easy to implement for machines, such as, unrestricted attention or endless patience. While a human is quickly distracted or bored, a machine is void of this "weakness". It can fully focus, without being distracted [21]. Keeping the psychological models in mind, we used as a basis for our design fiction, there might be several factors to guarantee successful interpersonal relationships, which can be better fulfilled by an sVA compared to a human being. An example is unconditional positive attention: While humans struggle with prejudices and conflicting emotions, a machine does not do so – unless a designer decides to implement it.

Based on the responses to Kiro, we suggest that further highlighting such machine-immanent capabilities through design could lead to an added value and higher acceptance of sVAs. Those participants who constructed Kiro as a social counterpart, yet with non-human, machine-immanent "superpowers" (e.g., being always in a good mood, infinite knowledge, being always there, getting never annoyed or never judges), imagined valuable social scenarios, which one might not have with fellow humans. For example, Kiro was seen as something which knows all the places and details, a passenger could not possibly know or as something which continuously listens attentively without judging or being annoyed.

Echoing findings in literature from the field of social robotics [21, 77], we believe that by exploiting machine-immanent yet social "superpowers" through design, sVAs can make more sense – not as a substitute for other people, but as a novel, complementary form of social interaction. Although this approach does not solve challenges relating to the lack of functional systems available or the absence of trust, it is a first step to enhance the opaque value by imitating humans through enriching different types of social interaction.

4.2 Methodological Reflection

In this paper, we used design fiction to explore the future of sVAs. To do so we created Kiro and confronted people with a potential vision. Our design fiction is critical because it questioned people's settled notion of what VA is. Throughout the design process of Kiro, design fiction was helpful to focus on the design of the relation between drivers and Kiro and to think about specific details, regardless of technological limitations. It helped us to tell a compelling story of Kiro in everyday life. The psychological and psychotherapeutic models in combination with the positive anticipated experiences were valuable inspirations to create the vision of Kiro. Furthermore, our design fiction provided an open space for reflection. This means, our website promoting Kiro offered the general vision of having a conversation with an in-vehicle sVA but left enough freedom to imagine different types of human-agent conversations, such as a substitute for interpersonal conversation or as a rather new genre of conversations; as an assistant, advisor or friend. Such a reflective space is helpful to gain valuable insights into how people might relate to future sVAs and how to facilitate particular relationships and experiences through design. In this sense, creating the fiction itself provided crucial insights into the design space of future sVAs.

We empirically informed and explored our design fiction in various ways. This is not necessarily a part of design fiction as a method and its lack is a recent critique of design fiction [20]. The combination of a focus group and free responses to various elements of the fiction (e.g., article, social media postings) enabled us to gather quite different valuable perspectives beyond our own reflections. All in all, an explicit empirical exploration of responses as an integral part of design fiction is valuable and should be considered more often in HCI. Obviously, responses gathered through the approaches used in the present paper are never unbiased or representative. For example, participants in the focus group had been more critical than commentators in the online discussion. These differences are easily explained by reasons, such as the format itself or self-selection. Nevertheless, diversity of people is valuable in such studies to generate in-depth knowledge through design fiction and diverse perspectives and responses. Despite the use of various

formats (e.g., focus group, online discussion space, online article), the overall sample size and number of responses were relatively small and rather homogeneous. This and the above-mentioned issues, however, do not question the insights per se but rather their generality. Empirical studies of design fictions often target incidence (i.e., does a phenomenon exist) rather than prevalence (i.e., how common or frequent is a phenomenon). In this sense, all gathered responses towards a design fiction should be treated as indicative only. They are thought-provoking inspirations for the further development of the respective design space and the generation of hypotheses about how to best design sVAs. Thus, the insights gathered in course of our empirical study are valuable. Nevertheless, our findings could be extended and supported in further studies with a larger and more heterogeneous sample.

Finally, most participants (especially those attending the workshop and the e-mail recipients) assumed the authenticity of the product. This is necessary to provide insight into their "real" concerns and interests. However, this "disguise" has ethical implications which need to be sensibly managed [2, 18]. All participants in our study were carefully debriefed and informed about the purpose and fictitious nature of Kiro at the end. None of the participants were harmed by the deception; instead, participants expressed their interest in the idea of Kiro and the applied design fiction approach, which was seen as valuable in research.

5 FINAL THOUGHTS

Of course, Kiro remains a fiction. Participants could only imagine and reflect about conversations with a machine, not actually experience it. In reality, having such conversations might feel quite different from what was imagined. In this sense, participants speculated in the same way, we speculated about Kiro. However, we believe design fictions such as the present, still to be immensely valuable, because they push designers to challenge existing perceptions and urge us to think in detail about desired and problematic experiences created or mediated by the technology, before actually developing it. It helps to explore issues around the potential use of a technology – either positive and negative – very early on. This research into future, not-yet-existing technologies, marks design's prospective nature. In this view, design is not just a mere way to make existing technologies more beautiful, understandable, or acceptable. It becomes a method of producing knowledge about alternative futures, thereby providing crucial input to answering the question of how our future with technology ought to be. The present design fiction explored the quite modest notion of having socially fulfilling conversations with non-human conversation partners. It contributes empirically grounded insights into the possible experiences that drivers envision with in-vehicle sVAs, their reservations as well as expectations, and suggests some design implications for the design of socially fulfilling interactions with non-human counterparts. It concludes that this vision might be even desirable, given that the conversation is designed differently from what humans would have with each other. To achieve this, we could make use of machine-immanent social superpowers. This may not provide a full answer to the question of whether we really ought to design for social human-machine experiences, yet it further points at possible routes to explore further. Future work will use more longitudinal, field-oriented methods to investigate whether this other kind of relationship can actually contribute to socially fulfilling relationships and lead to increased well-being. Kiro is, thus, a starting point for the certainly (controversial) debate about the relationships and the roles, we want to ascribe to future sVAs. Slave, attendant, mentor, friend, or rather something different, not-yet-existing – a social relationship only to have with a machine.

6 ACKNOWLEDGMENTS

This work was in part supported by the German Federal Ministry of Education and Research (BMBF), project GINA (Grant: 16SV8095).

REFERENCES

- [1] Sara Aeschlimann, Marco Bleiker, Michael Wechner, and Anja Gampe. 2020. Communicative and social consequences of interactions with voice assistants. *Computers in Human Behavior* 112 (2020), 106466. <https://doi.org/10.1016/j.chb.2020.106466>
- [2] Eric P.S. Baumer, Timothy Berrill, Sarah C. Botwinick, Jonathan L. Gonzales, Kevin Ho, Allison Kundrik, Luke Kwon, Tim LaRowe, Chanh P. Nguyen, Fredy Ramirez, Peter Schaedler, William Ulrich, Amber Wallace, Yuchen Wan, and Benjamin Weinfeld. 2018. What Would You Do? Design Fiction and Ethics. In *Proceedings of the 2018 ACM Conference on Supporting Groupwork*. Association for Computing Machinery, 244–256. <https://doi.org/10.1145/3148330.3149405>
- [3] Frank Bentley, Chris Luvogt, Max Silverman, Rushani Wirasinghe, Brooke White, and Danielle Lottridge. 2018. Understanding the Long-Term Use of Smart Speaker Assistants. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 2, 3 (2018), 1–24. <https://doi.org/10.1145/3264901>
- [4] Ann Blandford, Dominic Furniss, and Stephann Makri. 2016. Qualitative HCI Research: Going Behind the Scenes. *Synthesis Lectures on Human-Centered Informatics* 9, 1 (2016), 1–115.
- [5] Julian Bleecker. 2009. Design Fiction: A short essay on design, science, fact and fiction. *Near Future Laboratory* (2009).
- [6] Mark Blythe. 2014. Research through Design Fiction: Narrative in Real and Imaginary Abstracts. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 703–712. <https://doi.org/10.1145/2556288.2557098>
- [7] Michael Braun, Anja Mainz, Ronee Chadowitz, Bastian Pfleging, and Florian Alt. 2019. At Your Service: Designing Voice Assistant Personalities to Improve Automotive User Interfaces. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery. <https://doi.org/10.1145/3290605.3300270>
- [8] BYD Company Ltd. 2012. Qin: A social robot for a new plug-in hybrid vehicle. *China Car Times* (2012).
- [9] Center for Sustainable Systems. 2019. *Personal Transportation Factsheet*. Technical Report. University of Michigan.
- [10] Veena Chattaraman, Wi Suk Kwon, Juan E. Gilbert, and Kassandra Ross. 2018. Should AI-Based, Conversational Digital Assistants Employ Social- or Task-Oriented Interaction Style? A Task-Competency and Reciprocity Perspective for Older Adults. *Computers in Human Behavior* 90 (2018), 315–330. <https://doi.org/10.1016/j.chb.2018.08.048>
- [11] Christine Cheepen. 1988. *The Predictability of Informal Conversation*. Bloomsbury Publishing PLC; First Edition (1. November 1988). 132 pages.
- [12] Seong-Jin Cho and Dong Hyun Ahn. 2016. Socially Assistive Robotics in Autism Spectrum Disorder. *Hanyang Medical Reviews* 36, 1 (2016), 17. <https://doi.org/10.7599/hmr.2016.36.1.17>
- [13] Herbert H. Clark. 1996. *Using Language*. Cambridge University Press. 446 pages. <https://doi.org/10.1017/CBO9780511620539>
- [14] Leigh Clark, Nadia Pantidi, Orla Cooney, Philip Doyle, Diego Garaialde, Justin Edwards, Brendan Spillane, Emer Gilmartin, Christine Murad, Cosmin Munteanu, Vincent Wade, and Benjamin R. Cowan. 2019. What Makes a Good Conversation? Challenges in Designing Truly Conversational Agents. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. 1–12. <https://doi.org/10.1145/3290605.3300705> arXiv:1901.06525
- [15] Mark Coeckelbergh. 2011. You, robot: On the linguistic construction of artificial others. *AI and Society* 26, 1 (2011), 61–69. <https://doi.org/10.1007/s00146-010-0289-z>
- [16] Paul Coulton, Joseph Lindley, and Haider Ali Akmal. 2016. Design Fiction: Does the search for plausibility lead to deception?. In *Proceedings of DRS 2016, Design Research Society 50th Anniversary Conference*, Vol. 1. 1–16. <https://doi.org/10.21606/drs.2016.148>
- [17] Paul Coulton, Joseph Lindley, and Rachel Cooper. 2019. *The Little Book of Design Fiction for the Internet of Things*. Lancaster University. 50 pages.
- [18] Paul Coulton, Joseph Lindley, Miriam Sturdee, and Mike Stead. 2017. Design Fiction as World Building. In *Proceedings of the Research Through Design Conference*. 164–179. <https://doi.org/10.6084/m9.figshare.4746964>
- [19] Benjamin R. Cowan, Nadia Pantidi, David Coyle, Kellie Morrissey, Peter Clarke, Sara Al-Shehri, David Earley, and Natasha Bandeira. 2017. "What Can i Help You with?": Infrequent Users' Experiences of Intelligent Personal Assistants. In *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services*. Association for Computing Machinery. <https://doi.org/10.1145/3098279.3098539>
- [20] Judith Dörrenbächer, Matthias Laschke, Diana Löffler, Ronda Ringfort, Sabrina Großkopp, and Marc Hassenzahl. 2020. Experiencing Utopia. A Positive Approach to Design Fiction. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. arXiv:arxiv.org/abs/2105.10186 [https:]
- [21] Judith Dörrenbächer, Diana Löffler, and Marc Hassenzahl. 2020. Becoming a Robot - Overcoming Anthropomorphism with Techno-Mimesis. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–12. <https://doi.org/10.1145/3313831.3376507>
- [22] Kai Eckoldt, Marc Hassenzahl, Matthias Laschke, and Martin Knobel. 2013. Alternatives: Exploring the Car's Design Space from an Experience-Oriented Perspective. In *Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces*. Association for Computing Machinery, 156–164. <https://doi.org/10.1145/2513506>

2513523

- [23] Suzanne Eggins and Diana Slade. 1997. *Analysing Casual Conversation*. 224 pages.
- [24] Dimitrios Gkouskos, Ingrid Pettersson, Marianne Karlsson, and Fang Chen. 2015. Exploring User Experience in the Wild: Facets of the Modern Car. In *Design, User Experience, and Usability: Interactive Experience Design*. 450–461. https://doi.org/10.1007/978-3-319-20889-3_42
- [25] Michal Gordon and Cynthia Breazeal. 2015. Designing a Virtual Assistant for In-Car Child Entertainment. In *Proceedings of the 14th International Conference on Interaction Design and Children*. Association for Computing Machinery, 359–362. <https://doi.org/10.1145/2771839.2771916>
- [26] Marc Hassenzahl, Jan Borchers, Susanne Boll, Astrid Rosenthal-von der Pütten, and Volker Wulf. 2021. Otherware: How to Best Interact with Autonomous Systems. *Interactions* 28, 1 (2021), 54–57. <https://doi.org/10.1145/3436942>
- [27] Marc Hassenzahl, Matthias Laschke, Kai Eckoldt, Eva Lenz, and Josef Schumann. 2017. It’s More Fun to Commute” —An Example of Using Automotive Interaction Design to Promote Well-Being in Cars. In *Automotive User Interfaces*, Gerrit Meixner and Christian Müller (Eds.). Springer, 95–120. <https://doi.org/10.1007/978-3-319-49448-7>
- [28] Horst Heidbrink, Helmut E. Lück, and Heide Schmidtman. 2009. *Psychologie sozialer Beziehungen* (sozial-, p ed.). W. Kohlhammer GmbH. 221 pages. <https://books.google.de/books?id=WzibZu7S2s0C>
- [29] Annabell Ho, Jeff Hancock, and Adam S Miner. 2018. Psychological, Relational, and Emotional Effects of Self-Disclosure After Conversations With a Chatbot. *Journal of Communication* 68, 4 (2018), 712–733. <https://doi.org/10.1093/joc/jqy026>
- [30] Oskar Juhlin. 2011. Social Media on the Road: Mobile Technologies and Future Traffic Research. *IEEE Multimedia* 18, 1 (2011), 8–10. <https://doi.org/10.1109/MMUL.2011.16>
- [31] Takayuki Kanda, Takayuki Hirano, Daniel Eaton, and Hiroshi Ishiguro. 2004. Interactive Robots as Social Partners and Peer Tutors for Children: A Field Trial. *Human-Computer Interaction* 19, December (2004), 61–84. <https://doi.org/10.1207/s15327051hci1901>
- [32] Nihan Karatas, Soshi Yoshikawa, and Michio Okada. 2016. NAMIDA: Sociable Driving Agents with Multiparty Conversation. In *Proceedings of the Fourth International Conference on Human Agent Interaction*. Association for Computing Machinery, 35–42. <https://doi.org/10.1145/2974804.2974811>
- [33] Andreas M. Klein, Andreas Hinderks, Maria Rauschenberger, and Jörg Thomaschewski. 2020. Exploring Voice Assistant Risks and Potential with Technology-based Users. In *Proceedings of the 16th International Conference on Web Information Systems and Technologies*. 147–154. <https://doi.org/10.5220/0010150101470154>
- [34] Martin Knobel, Marc Hassenzahl, Melanie Lamara, Tobias Sattler, Josef Schumann, Kai Eckoldt, and Andreas Butz. 2012. Clique Trip: Feeling related in different cars. In *Proceedings of the Designing Interactive Systems Conference*. 29–37. <https://doi.org/10.1145/2317956.2317963>
- [35] Sandjar Kozubaev, Chris Elsdén, Noura Howell, Marie Louise Juul Søndergaard, Nick Merrill, Britta Schulte, and Richmond Y. Wong. 2020. Expanding Modes of Reflection in Design Futuring. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–15. <https://doi.org/10.1145/3313831.3376526>
- [36] Lenneke Kuijer. 2019. Automated Artefacts as Co-performers of Social Practices: Washing Machines, Laundering and Design: Nature, Materials and Technologies. *Social Practices and Dynamic Non-Humans: Nature, Materials and Technologies* (2019), 193–214. https://doi.org/10.1007/978-3-319-92189-1_10
- [37] Lenneke Kuijer and Elisa Giaccardi. 2018. Co-Performance: Conceptualizing the Role of Artificial Agency in the Design of Everyday Life. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, Vol. 1–13. Association for Computing Machinery. <https://doi.org/10.23943/9781400890354-008>
- [38] Eugenia Kuyda. [n. d.]. Replika. <https://replika.ai/>
- [39] David R. Large, Gary Burnett, Ben Anyasodo, and Lee Skrypchuk. 2016. Assessing Cognitive Demand during Natural Language Interactions with a Digital Driving Assistant. In *Proceedings of the 8th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*. Association for Computing Machinery, 67–74. <https://doi.org/10.1145/3003715.3005408>
- [40] David R. Large, Leigh Clark, Gary Burnett, Kyle Harrington, Jacob Luton, Peter Thomas, and Pete Bennett. 2019. "It’s Small Talk, Jim, but Not as We Know It": Engendering Trust through Human-Agent Conversation in an Autonomous, Self-Driving Car. In *Proceedings of the 1st International Conference on Conversational User Interfaces*. Association for Computing Machinery, 7. <https://doi.org/10.1145/3342775.3342789>
- [41] Eric Laurier, Hayden Lorimer, Barry Brown, Owain Jones, Oskar Juhlin, Allyson Noble, Mark Perry, Daniele Pica, Philippe Sormani, Ignaz Strebel, Laurel Swan, Alex S. Taylor, Laura Watts, and Alexandra Weilenmann. 2008. Driving and ‘Passenger’: Notes on the Ordinary Organization of Car Travel. *Mobilities* 3, 1 (2008), 1–23. <https://doi.org/10.1080/17450100701797273>
- [42] Joseph Lindley and Paul Coulton. 2015. Back to the Future: 10 Years of Design Fiction. In *Proceedings of the 2015 British HCI Conference*. Association for Computing Machinery, 210–211. <https://doi.org/10.1145/2783446.2783592>
- [43] Joseph Lindley and Dhruv Sharma. 2014. An Ethnography of the Future. *Strangers in Strange Lands* (2014).

- [44] Joseph Lindley, Dhruv Sharma, and Robert Potts. 2014. Anticipatory Ethnography: Design Fiction as an Input to Design Ethnography. In *Ethnographic Praxis in Industry Conference Proceedings*. 237–253. <https://doi.org/10.1111/1559-8918.01030>
- [45] Victor Ei-Wen Lo and Paul A. Green. 2013. Development and Evaluation of Automotive Speech Interfaces: Useful Information from the Human Factors and the Related Literature. *International Journal of Vehicular Technology* (2013). <https://doi.org/10.1155/2013/924170>
- [46] Ewa Luger and Abigail Sellen. 2016. “Like Having a Really bad PA”: The Gulf between User Expectation and Experience of Conversational Agents. In *Proceedings of the 2016 CHI conference on human factors in computing systems*. 5286–5297. <https://doi.org/10.1145/2858036.2858288>
- [47] Michal Luria, Judeth Oden Choi, Rachel Gita Karp, John Zimmerman, and Jodi Forlizzi. 2020. Robotic Futures: Learning about Personally-Owned Agents through Performance. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference*. 165–177. <https://doi.org/10.1145/3357236.3395488>
- [48] Trieuvy Luu, Martijn Van Den Broeck, and Marie Louise Juul Søndergaard. 2018. Data Economy: Interweaving Storytelling and World Building in Design Fiction. In *Proceedings of the 10th Nordic Conference on Human-Computer Interaction*. Association for Computing Machinery, 771–786. <https://doi.org/10.1145/3240167.3240270>
- [49] Mayfield Robotics. [n. d.]. Explore the Technology Behind Kuri, The Home Robot. <https://www.heykuri.com/explore-kuri/#feature-cap-touch-sensors>
- [50] Michael McTear, Zoraida Callejas, and David Griol. 2016. *The Conversational Interface: Talking to Smart Devices*. Springer, Cham. 444 pages. <https://doi.org/10.1007/978-3-319-32967-3>
- [51] Martino Mensio, Giuseppe Rizzo, and Maurizio Morisio. 2018. The Rise of Emotion-Aware Conversational Agents: Threats in Digital Emotions. In *Companion Proceedings of the The Web Conference 2018*. International World Wide Web Conferences Steering Committee, 1541–1544. <https://doi.org/10.1145/3184558.3191607>
- [52] Moov. [n. d.]. Moov™ Fitness Coach. <https://welcome.moov.cc/>
- [53] Andreea Muresan and Henning Pohl. 2019. Chats with Bots: Balancing Imitation and Engagement. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–6. <https://doi.org/10.1145/3290607.3313084>
- [54] Neb Nima, Trisha Lee, David Molloy, and Katie Clarke. 2017. Being Friends With Yourself: How Friendship Is Programmed Within The AI-Based Socialbot Replika. <https://mastersofmedia.hum.uva.nl/blog/2017/10/25/being-friends-with-yourself-how-friendship-is-programmed-within-the-ai-based-socialbot-replika/>
- [55] NIO. 2019. nomi – In-car AI system. (2019).
- [56] Emmi Parviainen and Marie Louise Juul Søndergaard. 2020. Experiential Qualities of Whispering with Voice Assistants. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–13. <https://doi.org/10.1145/3313831.3376187>
- [57] Hannah Paxton. 2019. State of In-Car Voice Assistants. <https://rain.agency/state-of-in-car-voice-assistants/>
- [58] Sabine Payr. 2013. Virtual Butlers and Real People: Styles and Practices in Long-Term Use of a Companion. In *Your Virtual Butler. Lecture Notes in Computer Science*. Vol. 7407. Springer, Berlin, Heidelberg, 134–178. <https://doi.org/10.1007/978-3-642-37346-6-11>
- [59] Paola Pennisi, Alessandro Tonacci, Gennaro Tartarisco, Lucia Billeci, Liliana Ruta, Sebastiano Gangemi, and Giovanni Pioggia. 2015. Autism and social robotics: A systematic review. *Autism research : official journal of the International Society for Autism Research* 9, 2 (2015), 165–183. <https://doi.org/10.1002/aur.1527>
- [60] Ingrid Pettersson and I. C. MariAnne Karlsson. 2015. Setting the stage for autonomous cars: A pilot study of future autonomous driving experiences. *IET Intelligent Transport Systems* 9, 7 (2015), 694–701. <https://doi.org/10.1049/iet-its.2014.0168>
- [61] Martin Porcheron, Joel E. Fischer, Stuart Reeves, and Sarah Sharples. 2018. Voice Interfaces in Everyday Life. , 12 pages. <https://doi.org/10.1145/3173574.3174214>
- [62] Carl R. Rogers. 2000. Die Grundhaltungen der Personenzentrierten Gesprächstherapie. <https://www.carlrogers.de/grundhaltungen-personenzentrierte-gespraechstherapie.html>
- [63] Jon Rogers, Loraine Clarke, Martin Skelly, Nick Taylor, Pete i Thomas, Michelle Thorne, Solana Larsen, Katarzyna Odrozek, Julia Kloiber, Peter Bihr, Anab Jain, Jon Arden, and Maximilian von Grafenstein. 2019. Our Friends Electric: Reflections on Advocacy and Design Research for the Voice Enabled Internet. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–13. <https://doi.org/10.4324/9781849774604-12>
- [64] Alessandra Maria Sabelli, Takayuki Kanda, and Norihiro Hagita. 2011. A Conversational Robot in an Elderly Care Center: An Ethnographic Study. In *Proceedings of the 6th International Conference on Human-Robot Interaction*. Association for Computing Machinery, 37–44. <https://doi.org/10.1145/1957656.1957669>
- [65] Rainer Sachse. [n. d.]. Komplementäre Beziehungsgestaltung: Plananalyse und Klärungsorientierte Psychotherapie. http://www.ipp-bochum.de/das_ausbildungskonzept/pkp-komp-bzg.htm

- [66] Alex Sciuto, Arnita Saini, Jodi Forlizzi, and Jason I. Hong. 2018. “Hey Alexa, What’s Up?”: Studies of In-Home Conversational Agent Usage. In *Proceedings of the 2018 Designing Interactive Systems Conference*. Association for Computing Machinery, 857–868. <https://doi.org/10.1145/3196709.3196772>
- [67] Senic. [n. d.]. Senic - Nuimo Control. <https://de.senic.com/nuimo-control>
- [68] William Seymour and Max Van Kleek. 2020. Does Siri Have a Soul? Exploring Voice Assistants Through Shinto Design Fictions. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–12. <https://doi.org/10.1145/3334480.3381809>
- [69] Marie Louise Juul Søndergaard and Lone Koefoed Hansen. 2018. Intimate Futures: Staying with the Trouble of Digital Personal Assistants through Design Fiction. In *Proceedings of the 2018 Designing Interactive Systems Conference*. 869–880. <https://doi.org/10.1145/3196709.3196766>
- [70] Brendan Spillane, Emer Gilmartin, Christian Saam, Ketong Su Su, Benjamin R. Cowan, Séamus Lawless, and Vincent Wade. 2017. Introducing ADELE: A Personalized Intelligent Companion. In *Proceedings of the 1st ACM SIGCHI International Workshop on Investigating Social Interactions with Artificial Agents*. Association for Computing Machinery, 43–44. arXiv:1409.0473 <https://doi.org/10.1145/3139491.3139492>
- [71] Spire Health. [n. d.]. Spire Health Tag | Make Your Clothes Smart. <https://spirehealth.com/pages/spire-health-tag-main>
- [72] Yolande Strengers, Jenny Kennedy, Paula Arcari, Larissa Nicholls, and Melissa Gregg. 2019. Protection, Productivity and Pleasure in the Smart Home: Emerging Expectations and Gendered Insights from Australian Early Adopters. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–13. <https://doi.org/10.1145/3290605.3300875>
- [73] Leila Takayama, Victoria Groom, and Clifford Nass. 2009. I’m Sorry, Dave: I’m Afraid i Won’t Do That: Social Aspects of Human-Agent Conflict. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 2099–2108. <https://doi.org/10.1145/1518701.1519021>
- [74] VuMA. 2019. *Bevölkerung in Deutschland nach der Nutzungshäufigkeit eines Autos (auch als Mitfahrer) in den Jahren von 2016 bis 2019*. Technical Report. Statista. Statista GmbH. <https://www.vuma.de/vuma-praxis/die-studie/>
- [75] Jinping Wang, Hyun Yang, Ruosi Shao, Saeed Abdullah, and S. Shyam Sundar. 2020. Alexa as Coach: Leveraging Smart Speakers to Build Social Agents That Reduce Public Speaking Anxiety. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, 1–13. <https://doi.org/10.1145/3313831.3376561>
- [76] Joseph Weizenbaum. 1966. ELIZA—a Computer Program for the Study of Natural Language Communication between Man and Machine. In *Commun. ACM*, Vol. 9. Association for Computing Machinery, 36–45. <https://doi.org/10.1145/365153.365168>
- [77] Julika Welge and Marc Hassenzahl. 2016. Better Than Human: About the Psychological Superpowers of Robots. In *International Conference on Social Robotics*. 993–1002. <https://doi.org/10.1007/978-3-319-47437-3>
- [78] Kenton Williams and Cynthia Breazeal. 2013. Reducing Driver Task Load and Promoting Sociability through an Affective Intelligent Driving Agent (AIDA). In *Human-Computer Interaction – INTERACT*, Winckler M. Kotzé P., Marsden G., Lindgaard G., Wesson J. (Ed.). Vol. 8120. Springer, Berlin, Heidelberg, 619–626. https://doi.org/10.1007/978-3-642-40498-6_53
- [79] Kenton J. Williams, Joshua C. Peters, and Cynthia L. Breazeal. 2013. Towards leveraging the driver’s mobile device for an intelligent, sociable in-car robotic assistant. In *IEEE Intelligent Vehicles Symposium (IV)*. IEEE, 369–376. <https://doi.org/10.1109/IVS.2013.6629497>
- [80] John Zimmerman and Jodi Forlizzi. 2014. Research Through Design in HCI. In *Ways of Knowing in HCI*. Springer, New York, NY, 167–189. https://doi.org/10.1007/978-1-4939-0378-8_8

Received July 2021; revised September 2021; accepted October 2021