VOICE ASSISTANT USE: CHALLENGES FOR THE HOME OFFICE WORK CONTEXT

Jens Meissner
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Bettina Minder
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Ute Klotz
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Aurelio Todisco
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Michelle Murri
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Sabine Junginger
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Patricia Wolf
UNIVERSITY OF SOUTHERN DENMARK
Aysun Aytaç
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Matthias Baldauf
EASTERN SWITZERLAND UNIVERSITY OF APPLIED SCIENCES, Switzerland
Beat Tödtli
EASTERN SWITZERLAND UNIVERSITY OF APPLIED SCIENCES, Switzerland
Jon Rogers
NORTHUMBRIA UNIVERSITY, United Kingdom
Mike Shorter
NORTHUMBRIA UNIVERSITY, United Kingdom
Michael Doerk
LUCERNE UNIVERSITY OF APPLIED SCIENCES AND ARTS, Switzerland
Tom Ulmer
EASTERN SWITZERLAND UNIVERSITY OF APPLIED SCIENCES, Switzerland

ISSN 2466-7498 and ISBN 978-2-9602195-4-8

«Voice Assistant Use: Challenges for the Home Office Work Context»

Rationale and relevance: No other technology is spreading as rapidly in the home as voice assistants (VAs). Siri, Alexa, Google Assistant and Cortana have conquered living rooms, bedrooms and kitchens by becoming accessible via smart speakers such as Amazon Echo, Apple HomePod and Google Home. So far studies primarily take on a technological or a business perspective. Few investigations have been conducted about challenges of VA use in the home. Insights into challenges that employees have when using VA in home office settings are missing. As we give digital tools such as VA more agency in our lives, we must also gather more knowledge of what the included challenges are.

Methods: This paper provides qualitative empirical insights from an ethnographic household study and student journal study.

Results: The paper generates novel insights into the emerging issues associated with the use of VA in a home office work context. It advances our knowledge through its focus on the domestic office set-up, user experience, and privacy issues. The paper delivers a description of general themes that mainly interfere with the characteristics of home office work to raise consciousness regarding this delicate socio-technical arrangement.

Conclusion: People in the Home Office context must pay attention to the conscious use of VAs in their direct working environment to avoid distraction and secure privacy. Effective business applications of VA are rare but keep a significant upside potential for the future.

Key words: Virtual Assistants, Home Office, Work practices

Acknowledgements: To be added later

1. Introduction

The home office context is an office equipped with modern communication technology in the private home - a “living space became merged with our working environment” (Unterweger, 2021) and thus creating difficulties in “unplugging” for remote workers (WEF, 2020[1]). Without distinct office hours and changing location, dividing professional from private time can be challenging. Communication issues, technical infrastructure, environment mental wellness (Unterweger, 2021, Meissner et al., 2016), safety, and new marketing channels from smart- and AR/VR technology are some of the topics investigated in this context (Darda et al. 2021, Marikya et al, 2021). Work environments in the home office context also include smart home technology for remote work purposes, such as controlling the workplace conditions (Marikya et al., 2021). Voice assistants are "software agents that can interpret human speech and respond via synthesized voices“ (Hoy, 2018:81), i.e., "speech-driven interaction systems" (Ammari, 2019:3) partly based on the integration of complementary Artificial Intelligence (AI) technology to allow for user´s speech to become processed, interpreted and responded to in a meaningful way.

Interestingly, VA research mainly stems from information systems research and focuses predominantly on user research, Human-Computer interaction and interface design issues. Research about the domestic use of VA in private homes finds that VA use comes with challenges for its users, especially for families with young children. As nowadays, work takes increasingly part in the home office context, and research indicates that there will distraction and difficulties, but maybe also VA smart applications and new work solutions. Thus, this paper addresses the questions a) what kind of dynamics VAs facilitate in the home office context, b) what the concrete challenges for the home office user are, and c) how to

[1] https://www.weforum.org/agenda/2020/06/coronavirus-covid19-remote-working-office-employees-employers

cope with them. To answer these questions, we will firstly conduct a literature review bringing different theoretical streams together and clarifying the research need. We then describe the methodological approach for our empirical diary study on VA use in Switzerland. The findings are then presented as "general themes of VA use", which are discussed to answer the research questions and bring up the implications of this research.

2. Voice Assistant Use and Home Office Work

Studies on the challenges of using VAs in the home office context are scarce but there exist many studies on VA use in the home context in general (e.g., Ammari et al., 2019; Martin, 2017. Overall, VA users prefer doing simple, uncomplicated tasks with VA in the home: The Voice Report (Microsoft & Bing, 2019), for instance, lists 'Searching for a quick fact, playing music, looking for directions, getting the news and weather' as the top uses of digital assistants. While studies stress the great potential of VA for marketing purposes (Hofstetter & Farner, 2018), the above survey also found that users report concerns around digital assistants and voice enabled technology, especially in relation to data security (52%) and passive listening (41%) (Microsoft & Bing, 2019).

2.1 Challenges in the Home Context

Several recent studies investigate the use and challenges of voice assistants in the home context (e.g.,). Following the outbreak of the Coronavirus (COVID-19) pandemic, employees around the world needed to shift to remote working almost overnight. This created situations where people use VA in home office contexts. Research for example shows how the epidemic has changed the mindset of consumers toward health and safety regulations when they use VA as touchless interface to "increase the amount of contactless contacts in order to lessen the danger of infection" (Darda et al., 2021). The authors conclude that VA can offer a

sense of security and encouragement by allowing users to stay in touch with friends and family while also benefiting from COVID-19 diagnosis and support.

However, research also highlights a lack of VA-technology use cases that fit user needs (Brem et al., 2019; Antonopouloua and Begkos, 2020). Many studies therefore address this challenge by **proposing use cases** and presenting prototypes of web-based smart home solutions that can be controlled with voice commands, like household devices enabling location-independent access to IoT-based systems (Thapliyal et al., 2018; Amit et al., 2019; Jabbar et al., 2019). The use case for the home context requires a secure and expandable system, in which other areas of home automation functions can be integrated and accessed via a web-based central hub and where "users can easily control their office appliances with voice commands" (Chan & Shum, 2018). Other studies promote the development of solutions for seamless control over all home application (Similarly, Amit et al., 2019; Jabbar et al., 2019), propose VA-powered anti-theft system (Srikanth et al., 2019) or go as far as using voice-based emotion recognition systems for affective computing (Tao and Zhao, 2018) or combining voice- with iris recognition in smart doorbells concepts (Giorgi et al., 2919). The promise behind these propositions is an interconnected, save home world, controllable at simple voice commands over the internet "anytime anywhere" (Jabbar et al., 2019) and powered by solar panels (Amit et al., 2019).

However, with the growing number of IoT devises in the home, the challenges of operating them increases as users need to integrate different devices that should operate without interface (Pyae and Joelsson, 2018) for direct password entry or device management (Han et al., 2018), or different IoT devices and sensor types need to be paired (Han et al., 2018). Furthermore, voice input technology still faces considerable operational difficulties with voice distinction and error recognition (Komatsu and Sasayama, 2019, Khattar et al.,

2019) – apart from the fact that meaningful dialogue and natural interaction with a VA is not yet given (Ong et al., 2018; Santos-Pérez et al., 2011).

Researchers also studied **user perspectives and real-life experience** of VA use: Individual preferences, unpredictable daily live and living situations of users are highlighted as being challenging for existing technical solutions (Tsiourti, 2018; Sanders and Martin-Hammond, 2019). Sanders and Martin (2019) for example highlight different understandings of autonomy of VA health assistant users that range from individualized interaction only in case of crisis to VA giving regular feedback on the basis of personal medical data. Home office contexts are often organized in an individual way, relating to individual values and preferences for daily practices. Thus, they can be assumed to be similarly challenging for standard VA components. So far, we yet lack more in-depth insights about challenges of using VA with IoT installations in the home office context. We do not know how and why people integrate VA as part of their IoT home system and have little understanding of how successfully VA is integrated into everyday home office scenarios of users.

VA use also includes challenges in relation to **privacy protection and data security**: VAs constantly listen in to activate when the "wake word" is spoken (Burym et al., 2020), and are equipped with technologies that (can) monitor activities to collect, record and transfer all kinds of data to an external information domain, which inspired some authors to pointedly ask: "Alexa, can you keep a secret?" (Dunin-Underwood, 2020:101). VAs, once introduced into a home, can connect to other devices like smart phones, cars, televisions, microwaves, fridges, and even toothbrushes partly autonomously and without full transparency about protection of privacy (Newman 2018; Ammari et al., 2019) and without asking all parties (e.g., guests) for giving consent for recording (Kuruvilla, 2019). Research shows that VA devices can be easily compromised (Javed, Rajabi (2020), He et al., 2021) while there is a lack of transparent privacy information, what can make risk assessment for users difficult

(Elahi et al., 2019. Solutions for protecting privacy are needed both on an engineering level and on the level of legislation for users to have confidence in VA (Pfeifle, 2018; Furey and Blue, 2018). Finally, VA use allows behavioral profiling, which can be used for online targeted ads or government surveillance programs (Samarasinghe and Mannan, 2019). We don't have a good understanding yet of how this affects the home office, where work policy expands into the home context.

A glimpse into the use of VA in the home office context offer studies that explore the integration of Alexa into control- or optimizing health systems such as air pollution control systems (Ilievski et al, 2018) or home-based exercise-stress management, care systems (Vora et al, 2017; Shamekhi et al, 2017; Tironi et al., 2019) or distress calls (Principi et al., 2013). It comes as no surprise that the "free hand" control of technology devices is emphasized as one of the highlights for future deployment of VA, while challenges that come along voice inputs are inefficient text browsing, or errors when trying to put text into desktops and smartphones via VA (Pradhan et al., 2018). This study will contribute with experiences of how employees integrate VA in their home office context and by discussing respective user experience-, perceived security- and work policy challenges.

2.2 Challenges in the Conceptual Foundation of VA

The empirical results presented in the studies referred to above are important, but equally important is the connection to the existing theory or its adaptation or further development (Alvesson & Kärreman, 2011). This subsection attempts to point out the three most important theories that are related to the study conducted.

Brause & Blank (2020) relate the use of smart speaker assistants in households to domestication theory (see also Röser, 2015; Röser & Peil, 2012; Berker, 2006; Pantzar, 1997)**.** This is about "'taming the wild' (ICT)" in the domestic sphere (Haddon, 2011: 312; see also Gauntlett & Hill, 2005). Originally, domestication theory consists of four processes,

namely appropriation, incorporation, objectification, and conversion, which explain how information and communication technology finds its place in the household. The now possible spatially distributed use of voice assistants blurs the boundaries of the household. This leads the authors to propose **an extension of the previous domestication theory**, what they call "externalisation". A challenge that comes with such an externalization is the “re-negotiation of privacy in a space that has traditionally been considered as private – the home” (ibid:761).

Pradhan, Findlater & Lazar (2019) make the link **to anthropomorphism**, the attribution of human characteristics to the VA. They find that the participants in their study personify the VA on one occasion and objectify it on another. The authors refer to the findings of Lopatovska & Williams (2019) that friendly responses to Alexa such as "please", "thank you", "have a nice afternoon" could constitute personification, but were described by the participants as thoughtless, social interactions.

This is where Ghosh (2021) brings in the topic of **conversational search systems**, pointing out that current commercial VA do not live up to the expectation of a complex search query based on a conversation in natural language. Ghosh (2021) states that in his study, VA users report that they were interrupted when formulating longer search queries, and that the search query context was misunderstood. This implies that the user must reformulate the search queries into smaller, less complex queries and re-establish the context by asking repeatedly.

2.3 Specific Challenges of Home Office Work

The term "home office work" means partially working from home and therefore differs from "teleworking", which describes working exclusively from home (Cooper & Kurland, 2002). The possibility of performing part of the contractually agreed work at home brings with it several advantages and disadvantages for the users, which can be divided into the categories

of performance (work-specific advantages and disadvantages) and individual life design (advantages and disadvantages relating to life-domain balance) (Meissner et al., 2016:20; Meissner, Gentile & Sprenger, 2015; Meissner, Meissner, 2009).

If the home office situation is adequate, productivity can be increased through better concentration with undisturbed work (Harpaz, 2002; Gajendran & Harrison, 2007; Gisin, Schulze, Knöpfli & Degenhardt, 2013). This requires that an appropriate working atmosphere and selection of appropriate tasks. Furthermore, many studies report on the positive effect of making work more flexible in terms of time and place (Greer & Payne, 2014; Gisin et al., 2013; Gajendran & Harrison, 2007). The flexibility supports the development and perception of independence as well as autonomy and increases the feeling of being better able to cope with professional demands through flexible time allocation on home office days. In addition, the release from company-specific formalities such as the dress code and the improved privacy in the home office were found to reduce stress, which in turn has a positive influence on productivity. These work-specific advantages of working from home lead to higher job satisfaction and self-motivation (Gisin et al., 2013; Hill, Ferris & Märtinson, 2003).

The downsides of working from home result from too frequent, inappropriate withdrawal to the home office or the ill-considered organization of home office days. The work-specific disadvantages can be divided into the areas of connectedness, social pressure and additional effort (Greer & Payne, 2014; Hill et al., 2003; Harpaz, 2002). Insufficient connectedness is defined as a lack of informal exchange with colleagues, impeded cooperation and a loss of team spirit as a result of working from home. In this regard, regular home office users reported home office day surveys (Degenhardt, Gisin & Schulze 2014) that the person working in the home office is forgotten in the company on site and does not receive all the information relevant to them. This can have a negative impact on career development (Leslie et al., 2012). Further, additional expenses arise when too little attention

is paid to the organization of the home office day and the home office itself. There are reports of inadequate infrastructure, high self-organization, coordination and organization efforts as well as monetary costs that have to be borne by the employee (e.g., rent, electricity or printing paper). Finally, social pressure can arise if working in a home office is insufficiently anchored in the organizational culture and home office users have the "burden of proof", which creates unnecessary pressure and gives the impression that more and harder work must be done in the home office to justify it (Gisin et al., 2013).

In life organization, an unfavorable home office situation leads to health and recovery risks if a clear demarcation between work and private life fails, because there is no clear conclusion to the home office day (Vittersø et al., 2003). Then, there are reports of social losses that can result from isolation and loneliness due to poor networking and an exaggerated "finch culture" (no longer leaving the house) in the home office (Gisin et al., 2013; Cooper & Kurland, 2002). The compatibility of work and private life also has its limits and can quickly turn to a disadvantageous if attempts are made to reconcile home office and raising small children. Moreover, the presence of the person working in the home may cause additional work for family members living in the same household. In addition, the possibility of working in a home office creates search efforts for the entire team, because in unfavorable cases it is not always clear who is where at any given time (Weichbrodt et al., 2013).

2.4 Up to here and now…

Until here, we can note that earlier research provides the description of valuable use cases, user perspectives and real-life experience of VA use. Concerns of privacy protection and data security have been raised. The future use of VA in the home office context is seen to be associated with new applications and use cases, often related to strong business cases for companies. Regarding the conceptual foundations of VA, we saw an extension of the previous domestication theory, a strong link to anthropomorphism, and with that the

attribution of human characteristics to the voice assistant, also relating to conversational search systems. Lastly, we described the characteristics identified by research on home office work with its advantages and disadvantages to be able to connect VA effects to this specific work environment.

Until here, we now know a little bit more about the dynamics, challenges and coping strategies of users related to VA use in the home office contexts. Yet, we also found that a systematic empirical exploration of the link between VA use and home office work challenges is still missing.

3. Research Design

Given the lack of earlier studies, a qualitative explorative research approach was chosen to answer the research questions (Flick, 2003). Data collection took place in two studies ('ethnographic study' and student household study').

3.1 Ethnographic Household Study (Mobile Diary and Semi-structured Interviews)

The ethnographic household study was planned as a field study and forced to be transferred into remote ethnography due to the Covid-19 pandemic. We conducted a four-week diary study using a mobile diary app combined with weekly semi-structured interviews held via Zoom. With the ethnographic study we aimed to understand how our participants use the VA and incorporate it into their everyday lives, whether they develop new practices and routines (Haslanger, 2018; Shove & Pantzar, 2012; Reckwitz, 2013), if and how it affects the interactions and relations around the house (Holloway, 2012; Obrist, Bernhaupt & Tscheligi, 2008; Bolger, Davis & Rafaeli, 2003; Knoblauch, 2001; Brown, Sellen & O'Hara, 2000). Since this time of the pandemic, the Swiss government had issued a home office obligation (FOPH, 2022).

Participants were recruited via the research team's network, LinkedIn, the project website, local newspapers and media channels of the hosting university. Selection criteria were a) being interested in using a VA in the house or already using one b) willing to document and share the experiences of using the VA c) living in the German speaking part of Switzerland. Of the 68 people interested to participate in our study, 31 households completed the necessary consent steps and were eligible to take part in the diary study, among them were individuals, couples, families, and shared flats.

Participants were prepared to the study via participants handbook and onboarding workshops on Zoom. The diary study ran from March 5th through May 28th 2021. 31 participants, divided into four cohorts, self-documented their experiences and thoughts over four weeks via the mobile diary app. The self-documentation was mainly based on prepared activation tasks. They received nine tasks over four weeks which encouraged them to interact with the VA in pre-defined ways, try new commands or simply share their thoughts on the (new) relations and interactions with and around the device. Participants completed these tasks by uploading photos (Ayala & Koch, 2019; Pink, 2013), videos or notes on the app. In addition, the always-accessible 'My Diary-Spontaneous Thoughts' task encouraged them to make spontaneous entries throughout the four weeks to capture any incidents, surprising moments or thoughts they wanted to share with the researchers. In total, 480 data entries were uploaded (see Table 1).

Table 1: Number of data entries in ethnographic houshold study

Target Group	Photos	Videos	Notes	Total
TG 1 **9 Participants**	43	28	109	**180**
TG 2 **7 Participants**	15	13	43	**71**
TG 3 **9 Participants**	22	76	50	**148**
TG 4	14	34	33	**81**

6 Participants				
Total Data Entries	**94**	**151**	**235**	**480**

In their weekly interviews, researchers encouraged participants to reflect on the entries and experiences of the past week which provided in-depth data in the form of approximately two to five pages of interview transcripts per interview and week (Flick, 2003). Three and six months after the end of the diary study, follow-up interviews were conducted to understand the long-term changes towards the use of VA.

3.2 Student Journal Study

In addition to the ethnographic household study, we collected qualitative data from 110 undergraduate students via a journaling platform which was designed to support students' health and self-management. This group already showed professional self-management attitude, works in a home-like setting and will approach the labor market in next one to three years. Thus, this group matched well to completement the existing empirical base from the first study. The students were studying in various programs of the hosting university throughout the academic year in 2021. They explored ways of using VA to support their creativity and self-management and reported it in the form of self-assessment journal notes.

3.3 Data Analysis and Quality Criteria

The transcribed semi-structured interviews of the ethnographic household study as well as the data from the student journal study resulted in 5362 quotes. These were each coded in teams of two researchers (analysis group of eleven researchers), supported by the analysis software MAXQDA. For the coding procedure, very generic predefined categories from literature (e.g. ‘perceptions’, ‘expectations’, ‘data protection issues’,…) were used and involved multiple interpreters to ensure credibility of the data analysis (Alvesson & Kärreman, 2011; Meissner & Sprenger, 2011; Flick, 2003) and to increase interpretative validity (Lincoln and Guba,

1985). In a first step two researchers worked through the material from every participant and assigned codes to the predefined categories. Each researcher went through the interviews and coded with the MAXQDA individually. Afterwards, both researchers came together and compared the allocation of text fragments and codes. They discussed the codes until they arrived at a common understanding. This first-level coding allowed for summarizing data through labelling units of meaning (Miles and Huberman, 1994:69), leading to a high degree of communicative validation regarding the qualitative results.

In the second step, we defined explanatory 'pattern codes' (Miles and Huberman, 1994:69). This involved condensing and iterative refining by first level codes by two researchers who then again validated their versions. From this, researchers arrived at the definition of topics and subtopics across all categories. In the final step, five researchers discussed the outcome of the 'pattern codes' and looked for links between those topics and subtopics (ibid 70-71), which were called 'general themes' (e.g. "ecosystem ambivalence", "(mis)trust", or "new social management", see Figure 1). Those themes were visualized to see the connections between the (sub)topics and contained the highest level of interpreted shared meaning the researchers would get from the empirical material. The themes are explained below.

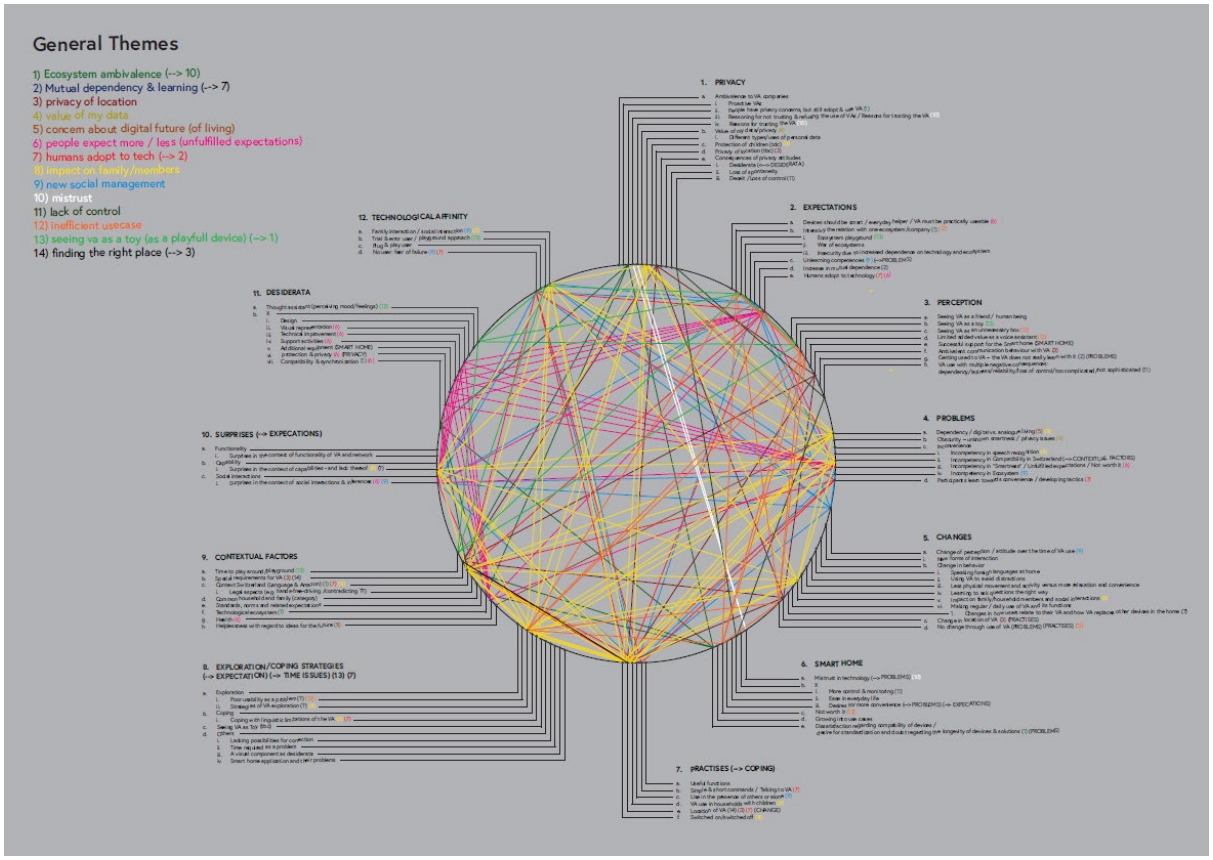

Figure 1: All general themes as network

Quality criteria in qualitative social research are, according to Mayring (2002), the documentation of the procedure, argumentative validation of interpretation, rule-governedness, proximity to the subject, communicative validation, and triangulation. All these quality criteria have been matched in this research by using diverse data collection streams, bringing empirical findings from diverse media together and ensuring that qualitative content always was interpreted by several researchers achieving a high degree of inter-coder reliability.

4. General Themes Description

To consider answers and hypotheses to the research questions, a first an overview of our empirical findings is necessary. We summarized it in fourteen general themes described below.

1. Ecosystem ambivalence: This theme contains the consideration of benefits, costs and satisfaction level regarding the dependency on different ecosystems. User decisions are made based on experiences and assumptions related to compatibility issues**.** The technologically competent participants are more patient with the device; they somehow try to overcome the dependency issues.

«Even now, if you want to buy additional hardware, I first have to check what is supported, before I can consider anything. Since I have a lot of other devices from Apple, (...) if there's a voice assistant at all in the future, I will buy the one from Apple and sell the one from Google again. Just to integrate the whole thing. That is really the biggest hurdle for me at the moment.» *(TG3_18\W4_TG3_18 – 29.04.20201_transcription Position: 4 – 4)*

2. Mutual dependency and learning: VA and household members use a trial-and-error approach or external help that signifies mutual dependencies - whereby humans and VA learn to achieve better performance or surprising results. Mostly, VA is used for tasks that proved to work well.

«*It's just annoying when you're in the shower and then it switches off and you can't switch it on again. That's why I've got used to it by now. It suits me, I adapt my behavior by integrating more and more devices into everyday life, so the dependency somehow becomes greater, right? »* *(TG1_08\W2_TG1_08 - 19_03_2021_transcription Position: 19 - 19)*

3. Privacy of location: Various feelings of privacy depending on the location of VA, e.g., in different rooms at home, in the car or in public. They range from unsafe, embarrassing to challenging and acceptable. Over time these feelings change, and the VA becomes more acquainted.

«My boyfriend was working, so I was home alone. But I realise that I feel uncomfortable using VA when he is at home, because I feel that it is still very unfamiliar.»

(TG_RCC_Modul362\rccj_3949b25016b7_VA2 Position: 2: 1178 - 2: 1416).

4. (Unclear) Value of my data: Existing awareness of value of data among some of the participants, e.g., approval of the trade off as the perceived benefit exceeds the (data) cost. For better results, some study participants agree to share more of their data with the tech companies while others turn off their VAs, as they do not see any benefit.

"I also feel insecure about my data security and don't want Google to be able to listen to me all the time. I think if I needed the voice assistant more regularly in my everyday life, I wouldn't have such a big inhibition threshold about it. All those smartphones and laptops can also listen in on you. But if I don't need the voice assistant anyway, I can switch it off". *TG3_18\W2_TG3_18_Audio - 15.04.2021_transcription Position: 9 – 10.*

5. Concern about digital future (of living): This theme contains mainly dystopian descriptions of fully digitalized future (e.g., deskilling, dependencies, dehumanization) stated mostly by student home study participants. Concerns that people will become lazier and be less competent and unlearn social skills or handwriting are raised.

«I can also imagine that this will only make humanity more lazy and incompetent. With the support of VAs, various activities can be lost - such as social contact during phone calls, writing shopping lists, etc. The absence of such routines could lead to a loss of competence and practice.» *(TG_RCC_Modul362\rccj_ab049b45b26d_VA3 Position: 4: 205 - 4: 919).*

6. People expect more (unfulfilled expectations): Overestimated expectations leading to disappointment in relation to VA capabilities, especially usability, speech recognition, installation and compatibility. The discovery of 'smart' functions is perceived as nice surprises which are rare.

«To put it badly, I also always think when the voice assistant says "I don't understand what you mean" - what do you understand anyway?. It's very annoying.» *(TG3_19\W1_TG3_19_Audio - 08.04.2021_transcription, Position: 28 – 28).*

7. Humans adapt to technology: Participants adapt their behavior for overcoming the limitations of VAs and to be able to use it effectively (e.g., switching between languages, use of command-like expressions, the use of English in the home settings, moving closer to VA to be understood). The most drastic adaptation strategy is to change everyday spoken language (Swiss German) to High German for communication with the VA.

«In addition, you always have to pronounce the commands in High German, which I find rather strange. And she constantly pings me again and asks me how she can help me.» *TG_RCC_Modul403\RCCJ_9~1 Position: 5: 88 - 5: 595*

8. Impact on family members: The impact of VA technology on family life is reflected in changes in a) shared behavior patterns (e.g. switching language to High German within the family, loss of privacy or spontaneity, VA quiz to lighten the mood)

«Just recently, we were a bit tired, we didn't talk much at the table, we looked into the void a bit, then I said, let's do a quiz again. Then we did a quiz, and that lightened the mood a bit, it was fun.» *TG1_09\W2_TG1-09_19_03_2021_transcription Position: 41 – 41*

b) the emergence of disadvantages for some family members in the use of VAs (children, language barriers)

"Our youngest doesn't think it's so cool because the program doesn't understand him. Probably the shrill child's voice.... And gets annoyed when Mummy always talks to the assistant and not to him". *TG1_03\W1_TG1_03 - 11.03.21_transcription Position: 27 – 27.*

and c) disruptions when the VA suddenly interferes with an ongoing human-to-human conversation in the home, on the phone or online. The interference then is not only local but extends to people outside the home (e.g., in a virtual meeting during home office work)

"Because he sometimes reacts suddenly and without direct commands. In conference calls, this is not so pleasant and also annoying, so I just want to be on the safe side. *TG3_18\W2_TG3_18_Audio - 15.04.2021_transcription Position: 9 – 10.*

«Sometimes when I spoke my friend's name, Alexa would become active. That was a little annoying.» *(TG_RCC_Modul362\rccj_759dc2991487_VA2, Position: 4: 1739 - 4: 2506),*

9. New social management: Using VAs, participants develop new behaviors and roles in the household. For example, one person often takes on the responsibilities of installing, controlling, maintaining, and developing VAs and managing their use.

«The first point of contact in such situations is always my husband, whom I trust and, to be honest, it has always worked so far.» (TG1_02\W1_TG1_02 - 11.03.21_transcription Position: 37 – 38)

Parents are concerned about the interaction between VA and their children and take on a protective role.

«Looking to the future, we also need to watch how the voice assistant works with our son, not that it takes over.» (TG1_02\W1_TG1_02 - 11.03.21_transcription Position: 44 – 44)

10. (Mis)trust: This theme is about the participants not trusting the incomprehensible privacy regulations of VAs which is regarded as an obstruction towards transparency and security.

«I wouldn't mind sourcing everything from one shop. That could be a support / time saver. But data protection is not sufficiently considered. What happens to all the data that is suddenly bundled at Amazon & Co. One becomes a transparent person. Based on the VAs, it

can be determined when you are at home, whether you live alone, what your preferences are, how you are possibly doing health-wise.» *TG_RCC_Modul403\RCCJ_8~1 Position: 5: 88 - 5: 1111*

Participants also have a critical stance regarding their increasing transparency towards the ecosystem companies from the release of personal data.

«We just had a problem recently at work. There we had to say "hey what was going on that day". Something didn't work in our TimeTracking, and then you just go to Google or Microsoft and they already tell me where I was that day. It's really bad, isn't it? My work colleague said "oh 08:59 I was on the train, that's what my Google profile says and Microsoft tells me I was at such and such a meeting. Ah, I left this meeting earlier" Quite amazing, there I have my doubts again. I don't want to know that at all.» *TG2_10\W4_TG2_10 - 15.04.2021_transcription Position: 36 - 36]*

11. Lack of control: Study participants complain about a) the massive misinterpretation and failing interaction feedback by VA during the use.

« There are no possibilities to follow up on the result. So there is no feedback, there are no questions, no active questions, "Are you satisfied with my result?». *TG4_30\W3_TG4_30 - 21_05_21_transcription Position: 8 – 8.*

and b) the dependency on higher-level systems (internet, electricity) lead to a feeling of loss of control

« […] When the [internet] connection is gone, it's gone. Then I'm standing there and, in case of doubt, my blinds are down and I can't get my lights on.» *TG1_07\W3_TG1_07_26_03_2021_transcription Position: 89 – 89*

12. Inefficient use case: VA is perceived as an unnecessary box, with limited added value, incapable of fulfilling complex tasks. Simple functions such as timer function, listening to music are considered as useful and nice.

«Over the past few weeks, I have considered using VA for certain activities, but I have usually found that Siri does not offer very many functions or that they are not very well developed. I often forgot about using VA again.» *TG_RCC_Modul362\rccj_244ac0017a25_VA2 Position: 8: 151 - 8: 575*

13. Seeing VA as a toy (as a playful device): Since the VA still makes too many mistakes, it is perceived more as a toy than a friend or assistant:

«Interviewer: Back to the dialogue again. Could you have a conversation with the voice assistant and treat it as if it were your "friend"? Interviewee: Difficult, because in between there are always answers like "I don't know what you mean" or "I don't understand what I should do". I can't see the voice assistant as a person or as a counsellor. » *(TG1_02\W4_TG1_02_Audio - 01.04.2021_transcription, Position: 18 – 19)*

Participants adjust their expectations and take mistakes made by the VA with humor.:

«Now you just have to say it's fun when you can like that. You can say, "Cool, I can listen to music in my armchair by voice command". But you have to expect that it won't work at some point - because the more complex it is, the more likely it is that it won't work. It's just a bit like - it's a great toy, it's fun when it works.» *(TG1_08\W2_TG1_08 - 19_03_2021_transcription Position: 11 – 11)*

A central coping strategy is spending time on the ‘VA-playground’, mostly regarding smart home use.

14. Finding the right place: Moving VA to different locations for convenient entertainment or work support, e.g., additional speakers, better sound, different privacy issues.

«I tested a few new functionalities based on your tasks. Things like setting reminders were very successful and I will continue to use this. I have placed the voice assistant in the office and the appointment setting has helped me a lot.» *TG3_18\W2_TG3_18_Audio - 15.04.2021_transcription Position: 2 - 2,*

5. Discussion

In this section, we discuss the findings about the use of VA in the home office work context that relate to our research questions and the further implications for research.

5.1 VA Challenges in the Home Hoffice Work

Home office work bears the potential of higher productivity, flexibilization, and organizational commitment, health and recreational support, better work-life-balance, as well as increases in time autonomy. On the downside, decreased connectedness, necessary additional efforts, rising social pressure, health risks and social cost, and the incommensurability of private and work life were outlined. Now, what do the general themes (GT) identified in our study mean for this work context? Selected effects and linkages between these up- and downsides and the themes are outlined in the following Table 2.

Table 2: Effects of VA use on home office context

Home Office Context – assumptions in earlier research	**Important findings from General Themes (GT) in our study**
+ Higher productivity	- VA have the potential to further improve productivity in a positive use case - Mutual learning between VA and user takes time - VA user interface will likely be highly important in the future, thus the use leads to a better future readiness - VA use comes with uncertainty about data misuse or privacy breaches by ecosystem company - Lack of control in the case of VA use

	Related GT: 1, 2, 4, 5, 7, 11
+ Flexibilization of resources	- This aspect rather plays no role, but could be affected in the case of successful use applications like translation support or little games to break up the work day. - Mutual dependency between user and technology reduces flexibility. - Lack of control and inefficient use cases require rigid VA guidelines **Related GT: 2, 7, 11, 12, 13**
+ Organizational commitment	- According to our data, organizational commitment is not affected, except for active use of VA of companies in the home office context.
+ Health and recreational support	- Support could be strengthened, e.g., by app enhanced fitness offers, which are often gamified. **Related GT: 4, 6, 7, 11, 13**
+ Work-life-balance improved	- VA use adds complexity in dealing with additional technology. Use behavior needs to be learned, which comes with further challenges like privacy protection, thus work-life-balance especially in relation to family dynamics rather would be affected negatively. **Related GT: 2, 8, 9, 11**
+ Time autonomy increase	- This aspect is rather negatively affected, since the additional time for training VA use reduces time autonomy. - On the other hand, if a VA solution works (like home automation, specific apps), then it can support being more efficient. **Related GT: 3, 7, 10, 11, 13**

- Connectedness suffers	- Connectedness maybe improved by social apps that connects people, or by user group exchange with shared experiences. But many users are disappointed about the lack of smartness of applications. - Also, team components are missing or not going beyond group-based games, which are perceived as relatively dump or complicated. **Related GT: 6, 13, 14**
- Additional efforts	- For effective and efficient use, VA brings many new and time-consuming tasks to the home office context. To overcome the mistrust and efficiently use a device, it requires a lot of time to find out what works and what not. **Related GT: 2, 3, 4, 7, 9, 10, 11, 12, 13, 14**
- Social pressure of colleagues	- No effects observed.
- Health risks	- VA can cause some anger and stress in case of data misuse, lack of control, people are disappointed or feeling dominated by technology **Related GT: 4, 6, 7, 10, 11, 12, 13**
- Social costs like isolation	- VA use could lead to higher connectedness (see above) **Related GT: 6, 13, 14**
- Incommensurability of private and work life	- VA rather increases this aspect, since it adds complexity to the social home system. Managing a VA takes time that cannot be used for either family or work. **Related GT: 2, 8, 9, 11**

Based on these insights, we summarize:

VA use raises questions of domestication in the sense Brause & Blank (2020 pointed out that this technology must be adopted to the home office work context. It further

underlines how "'taming the wild' (ICT)" becomes a task in the domestic sphere as illustrated by Haddon, (2011). Since all four processes that constitute domestication (appropriation, incorporation, objectification, and conversion) are at play, a “re-negotiation of privacy in a space that has traditionally been considered as private – the home” is taking place – even if only implicitly.

- Mutually, users must adopt to the VA technology to use it efficiently, which is highly time consuming and disappointments about the ‘not so smart’ technology is nearly guaranteed, making it a very unproductive endeavor at least at the beginning. As mentioned above, a lack of VA-technology use cases that fit user needs pointed out by Brem et al., 2019; Antonopouloua and Begkos, 2020 also apply to the home office use of VA.
- VA at the actual state use leaves open questions regarding privacy issues and data handling, thus resulting in a systemic lack of control, that most companies will likely not be willing to accept.
- VA use presumably does not have a clear effect on family dynamics and thus work-life-balance, since it needs scarce time resources to set up and train the user-technology-fit which cannot be use for either of the domains. Also, positive effects on both domains are not clearly identifiable – with the exception of home automation, which is nice, but not necessary to most home office users up to now.

Thus, we conclude that VA use in the home office context actually contains more risks than chances for the user and the respective company. Irritatingly, many individual users are willing to accept these risks, whereas organizations seem to prohibit this kind of technology, which is ‘permanent beta’ and thus never finished since its development.

5.2 Implications for practice research

Regarding practice, the VA use requires people at home to engage in a series of new management activities. If they want their VA to work for them, they first must work for it and train it, similar to the training a human personal assistant requires. This is perhaps the one little secret that is not really addressed in VA marketing. People are surprised when they find out how much time and effort it takes to be able to delegate tasks to the VA. This management activity never stops throughout the VA usage but is part of it. This means that the VA introduces and insists on management thinking and management practices that people typically apply outside their homes and pre-VA were able to leave in their offices and other workplaces. Is this the new home economics? Will there be courses how to tame and manage the VA? In the home office context, consciousness about this fact should be established. This insight points to the kinds of dynamics a VA introduces into the home office, but also one of the challenges. In our study, the ways user coped with this depended very much on their technical affinity, their view on efficiency and their general attitude towards management.

The empirical research showed that 'efficiency' should be split into a positive and a negative interpretation. For one subgroup, efficiency is positive and the reason for using a VA, it is closely connected with the conveniences and savings home automation promises. For a second group, efficiency is negative and an unwelcome intrusion into the way their private life is being "run" – these participants resist, even oppose to use a VA for that reason. In the home office context, this connotation of efficiency is highly relevant, since productivity usually counts in professional activities.

Also, research showed the need for deeper investigations around the code and theme related to social relations. Social interference and social interactions are really changed by this technology, so it is reasonably to hypothesize that also work-related collaboration will

change by implementing VA use. This again points to new dynamics that follow from the use of VA in the home office.

Methodologically, the analysis reveals some differences among participants of the in-home study and participants of the student journal study. The students partly had very skeptical attitudes towards VA technology. They were asked to document their attitudes towards this technology. However, this enriched the data set, as there were no such critical attitudes among the rather In-home study participants, who were basically open and curious to the technology due to their interest in participating. Further research needs to be able to contextualize the statements by the different groups. Also, the researchers identified some distortions within a target group by one member. Here, should a total of 18 comments by one participant be equally weighted than 1 comment total by another? To understand better if one person has an issue - which is fine - or if all participants have the issue - which is a stronger indication for something – we chose the means of communicative validation, but this could turn out to be a collective blind spot of the researcher team.

Lastly, in this research we focused on VA as voice interfaces towards information processing in the cloud. The term *voice assistant* seems to be a little misleading in the end. It is recommended to extent the abbreviation to the term Virtual Assisant, since focusing on voice only contains a general shortcoming. With virtual assistant, also other information systems could be taken into account, that also allow for e.g., gesture control, which becomes increasingly important in the empirical field.

6. Conclusions

The guiding question of this paper was, what kind of dynamics facilitate VAs in the home office context, and what the concrete challenges does this bring for home office user, and

how do they cope with it? To answer this question, our review of earlier research showed that there are fuzzy conceptions of VA around, and the research focuses strongly on (positive) use cases – which is a shortcoming since it does not investigate VA use in home setting on a broader scale.

Thus, we chose a qualitative social research setup as method to investigate the situation ethnographically in households, and by studying student journals. This enabled us to derive general themes that we used to discuss them in the home office work specifics. We then were able to basically answer the research question and discuss our findings, as well as highlight some implications of the results and the methodology.

We conclude by stating that this presentation of empirical results is research-in-progress and requires more reflection, input and the further study of details. However, by formulating this article, we made a big step in mapping the terrain that is addressed here – and regarding a socio-technological development that is still in its infancy phase.

7. References

Alvesson, M., & Kärreman, D. (2011). Qualitative Research and Theory Development: Mystery as Method. SAGE. https://doi.org/10.4135/9781446287859

Ammari, T., Kaye, J., Tsai, J. Y., Bentley, F. (2019). Music, Search, and IoT: How People (Really) Use Voice Assistants. *ACM Transactions on Computer-Human Interaction* (TOCHI), 26(3), 17. https://doi.org/10.1145/3311956.

Antonopoulou, K., & Begkos, C. (2020). Strategizing for digital innovations: value propositions for transcending market boundaries. *Technological Forecasting and Social Change, 156*. https://doi.org/10.1016/j.techfore.2020.120042

Ayala, R. A., & Koch, T. F. (2019). The Image of Ethnography—Making Sense of the Social Through Images: A Structured Method. *International Journal of Qualitative Methods*, *18*, 160940691984301. https://doi.org/10.1177/1609406919843014

Berker, T. (2006). *Domestication of media and technology*. Open University Press.

Brasser, F., Frassetto, T., Riedhammer, K., Sadeghi, A.-R., Schneider, T., and Weinert, C. (2018). VoiceGuard: Secure and private speech processing. *Proceedings of the Annual Conference of the International Speech Communication Association, INTERSPEECH*, 1303–1307. https://doi.org/10.21437/Interspeech.2018-2032.

Brause, S. R., & Blank, G. (2020). Externalized domestication: smart speaker assistants, networks and domestication theory. Information, Communication & Society, 23(5), 751–763. https://doi.org/10.1080/1369118X.2020.1713845

Bürgler, E. (2018). Smart Speaker sind in der Schweiz Ladenhüter. Retrieved April 24, 2019, from www.bazonline.ch/wirtschaft/smart-speaker-sind-in-der-schweizladenhueter/story/28762435

Burym N., Belenko M., Balakshin P. Research of Voice Assistants Safety//CEUR Workshop *Proceedings of the 12th Majorov International Conference on Software Engineering and Computer Systems*, December 10-11, Online & Saint Petersburg, Russia, 2020, Vol. 2893, pp. 1-6

Chan, Z. Y., and Shum, P. (2018). Smart office: A voice-controlled workplace for everyone. *Proceedings of the 2nd International Symposium on Computer Science and Intelligent Control*, 1–5. https://doi.org/10.1145/3284557.3284712.

Cooper, C. D. & Kurland, N. B. (2002): Telecommuting, professional isolation, and employee development in public and private organizations. *Journal of Organizational Behavior, 23(4)*, 511-532.

Darda, P., Nerlekar, V., Bairagi, U., Pendse, M., & Sharma, M. (2021).Usage of Voice Assistant in Time of Covid 19 as a Touchless Interface. *Academy of Strategic Management Journal*, 20(65), 1-13.

Degenhardt, B., Gisin, L., & Schulze, H. (2014): Schweizerische Umfrage "Homeoffice 2013" - Teil 1: Vergleich der Rahmenbedingungen aus der Sicht der nie, unregelmässig und regelmässig alternierend im Homeoffice Arbeitenden. Hochschule für Angewandte Psychologie FHNW. Olten. Retrieved November, 19, 2021from http://www.fhnw.ch/aps/ifk/projekte/aktuelle-projekte/copy_of_Homeoffice--2013..

Dunin-Underwood, A. (2020). Alexa, can you keep a secret? Applicability of the third-party doctrine to information collected in the home by virtual assistants. *Information & Communications Technology Law*, *29*(1), 101–119. https://doi.org/10.1080/13600834.2020.1676956.

Elahi, H., Wang, G., Peng, T., and Chen, J. (2019). On transparency and accountability of smart assistants in smart cities. *Applied Sciences*, *9*(24), 5344. https://doi.org/10.3390/app9245344.

Flick, U., von Kardorff, E. & Steinke, I. (Eds.) (2003): Qualitative Forschung. Ein Handbuch. Reinbek b. Hamburg. Rowohlt.

Furey, E., and Blue, J. (2018). She knows too much–voice command devices and privacy. *2018 29th Irish Signals and Systems Conference (ISSC)*, 1–6. https://doi.org/10.1109/ISSC.2018.8585380.

Gajendran, R. S. & Harrison, D. A. (2007): The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences. *Journal of Applied Psychology,* 92(6). pp1524-1541. https://doi:10.1037/0021-9010.92.6.1524.

Gauntlett, D., & Hill, A. (2005). *Tv living: Television, culture and everyday life* (Transferred to digital printing). Routledge.

Ghosh, S. (2021). "Can You Search for Me?": Understanding and Improving User-System Dialogues for Complex Search Tasks. Proceedings of the Association for Information Science and Technology, 58(1), 173–184. https://doi.org/10.1002/pra2.446

Giorgi, R., Bettin, N., Ermini, S., Montefoschi, F., and Rizzo, A. (2019). An iris+voice recognition system for a smart doorbell. *2019 8th Mediterranean Conference on Embedded Computing (MECO)*, 1–4. https://doi.org/10.1109/MECO.2019.8760187.

Gisin, L., Schulze, H., Knöpfli, D., & Degenhardt, B. (2013): Schweizerische Umfrage "Homeoffice 2012" - Aktuelle Bedingungen sowie Vor- und Nachteile aus Sicht von Routiniers. Hochschule für Angewandte Psychologie FHNW. Olten. http://www.fhnw.ch/aps/ifk/projekte/abgeschlossene-projekte/Homeoffice--2012/. Retrieved at 19.11.2021.

Glaser, E. (2017). Wie viele Dialekte gibt es in der Deutschschweiz? Retrieved April 24, 2019 from www.linguistik.uzh.ch/de/easyling/faq/glaser-wieviele-dialekte.html

Greer, T. W. & Payne, S. C. (2014): Overcoming telework challenges: outcomes of successful tele-work strategies. *The Psychologist-Manager Journal,* 17(2). 87-111.

Haddon, L. (2011). Domestication Analysis, Objects of Study, and the Centrality of Technologies in Everyday Life. Canadian Journal of Communication, 36(2). https://doi.org/10.22230/cjc.2011v36n2a2322

Han, J., Chung, A. J., Sinha, M. K., Harishankar, M., Pan, S., Noh, H. Y., Zhang, P., & Tague, P. (2018). Do you feel what I hear? Enabling autonomous IoT device pairing using different sensor types. *2018 IEEE Symposium on Security and Privacy* (SP), 836–852. https://doi.org/10.1109/SP.2018.00041.

Harpaz, I. (2002). Advantages and disadvantages of telecommuting for the individual, organization and society. *Work Study: A Journal of Productivity Science, 51*(2-3), 74–80. https://doi.org/10.1108/00438020210418791

Haslanger, S. (2018). What is a Social Practice? *Royal Institute of Philosophy Supplement*, *82*, 231–247. https://doi.org/10.1017/S1358246118000085

He, Z., Rajput, M. N., & Ahamad, M. (2021, June). Compromised Computers Meet Voice Assistants: Stealthily Exfiltrating Data as Voice over Telephony. In *2021 51st Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN)* (pp. 519-530).

Hill, E. J., Ferris, M. & Märtinson, V. (2003): Does it matter where you work? A comparison of how three work venues (traditional office, virtual office, and Homeoffice) influence aspects of work and personal/family life. *Journal of Vocational Behavior* 63. 220-241.

Hofstetter, R. (2018). Voice first Barometer. Farner Consulting. Luzern: University of Lucerne, Switzerland.

Holloway, D., & Green, L. (2012). Using Ethnography to Understand Everyday Media Practices in Australian Family Life. In A. N. Valdivia (Ed.), *The international encyclopedia of media studies: Media history and the foundations of media studies.* John Wiley & Sons. https://doi.org/10.1002/9781444361506.wbiems097

Hoy, Matthew B. (2018). Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants, *Medical Reference Services Quarterly*, 37:1, 81-88, https://doi.org/10.1080/02763869.2018.1404391

Ilievski, A., Dojchinovski, D., Ackovska, N., and Kirandziska, V. (2018). The application of an air pollution measuring system built for home living. In S. Kalajdziski and N. Ackovska (Eds.), *ICT Innovations 2018. Engineering and Life Sciences* (pp. 75–89). Springer. https://doi.org/10.1007/978-3-030-00825-3_7.

Javed, Y., and Rajabi, N. (2020). Multi-Layer perceptron artificial neural network based IoT botnet traffic classification. In K. Arai, R. Bhatia, and S. Kapoor (Eds.), *Proceedings of the Future Technologies Conference (FTC) 2019* (pp. 973–984). Springer. https://doi.org/10.1007/978-3-030-32520-6_69.

Knoblauch, H. (2001). Fokussierte Ethnographie: Soziologie, Ethnologie und die neue Welle der Ethnographie. *Sozialer Sinn*, 2(1), 123–141.

Kuruvilla, R. (2019). Between you, me, and Alexa: On the legality of virtual assistant devices in two-party consent states. *Washington in Law Review*, *94*(4), 2029–2055. https://digitalcommons.law.uw.edu/cgi/viewcontent.cgi?article=5095&context=wlr

Leslie, L. M., Manchester, C. F., Park, T.-Y., & Mehng, S. A. (2012): Flexible Work Practices: A Source of Career Premiums or Penalties? *Academy of Management Journal* 55(6), 1407-1428. https://doi:10.5465/amj.2010.0651.

Li, S., Garces, E., and Daim, T. (2019). Technology forecasting by analogy-based on social network analysis: The case of autonomous vehicles. *Technological Forecasting and Social Change*, *148*, 119731. https://doi.org/10.1016/j.techfore.2019.119731.

Lincoln, Y., & Guba, E. G. (1985). *Naturalistic inquiry.* Newbury: Sage.

Marcos Santos-Pérez, Eva González-Parada, & and José Manuel Cano-García. (2011). AVATAR: An Open Source Architecture for Embodied Conversational Agents in Smart Environments. In J. Bravo, R. Hervás, & V. Villarreal (Eds.), *Lecture Notes in Computer Science: Vol. 6693. Ambient Assisted Living* (pp. 109–115). Springer Berlin Heidelberg.

Marikyan, D., Papagiannidis, S., Ranjan, R., & Rana, O. (2021, November). Working in a Smart Home-office: Exploring the Impacts on Productivity and Wellbeing. In *17th International Conference on Web Information Systems and Technologies (WEBIST 2021)* (pp. 275-282). SciTePress.

Meissner, Jens O. (2009). Beziehungsherausforderungen in kommunikativ hybriden Arbeitsumgebungen. *Zeitschrift für Management*, (4/4), 307-326.

Meissner, Jens O. & Sprenger, Martin (2011). Mixing Methods in Innovation Research: Studying the Process-Culture-Link in Innovation Management. *Historical social research*, 36(1), 180-198.

Meissner, Jens O.; Gentile, Gian-Claudio & Sprenger, Martin (2015). Mobile Work @ Work: Zur Genese mobiler Arbeitsformen in Deutsch-Schweizer Unternehmen. *Wirtschaftspsychologie*, 16(4), 37-48.

Meissner, Jens O.; Weichbrodt, Johann; Hübscher, Bettina; Baumann, Sheron; Klotz, Ute; Pekruhl, Uli & Gisin, Leila (2016). *Flexible neue Arbeitswelt: Eine Bestandsaufnahme auf gesellschaftlicher und volkswirtschaftlicher Ebene.* Zürich: vdf Hochschulverlag AG.

Microsoft & Bing (2019). Voice report: Consumer adoption of voice technology and digital assistants. Retrieved April 22, 2019, from https://advertiseonbing-blob.azureedge.net/blob/bingads/media/insight/whitepapers/2019/04%20apr/voice-report/bingads_2019_voicereport.pdf

Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded* Sourcebook. Thousand Oaks, CA: Sage Publications.

Newman, N. (2018, November). *The Future of Voice and the Implications for News. Digital News Project*, Reuters Institute for the Study of Journalism, The University of Oxford, November 2018.

Obrist, M., Bernhaupt, R., & Tscheligi, M. (2008). Interactive TV for the Home: An Ethnographic Study on Users' Requirements and Experiences. *International Journal of Human-Computer Interaction*, *24*(2), 174–196. https://doi.org/10.1080/10447310701821541

Pantzar, M. (1997). Domestication of Everyday Life Technology: Dynamic Views on the Social Histories of Artifacts. *Design Issues*, *13*(3), 52–65. https://doi.org/10.2307/1511941

Park, CA: Sage.Lopatovska, I., Rink, K., Knight, I., Raines, K., Cosenza, K., Williams, H., Sorsche, P., Hirsch, D., Li, Q., & Martinez, A. (2019). Talk to me: Exploring user interactions with the Amazon Alexa. Journal of Librarianship and Information Science, 51(4), 1–14. https://doi.org/10.1177/0961000618759414

Pfeifle, A. (2018). Alexa, What Should We Do about Privacy? Protecting Privacy for Users of Voice-Activated Devices. *Washington Law Review*, *93*(1), 421–458.

Pink, S. (2013). *Doing visual ethnography* (3. ed.). SAGE Publ.

Pradhan, A., Findlater, L., & Lazar, A. (2019). "Phantom Friend" or "Just a Box with Information". Proceedings of the ACM on Human-Computer Interaction, 3(CSCW), 1–21. https://doi.org/10.1145/3359316

Pradhan, A., Mehta, K., and Findlater, L. (2018). “Accessibility came by accident”: Use of voice-controlled intelligent personal assistants by people with disabilities. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, 1–13. https://doi.org/10.1145/3173574.3174033.

Principi, E., Squartini, S., Piazza, F., Fuselli, D., and Bonifazi, M. (2013). A distributed system for recognizing home automation commands and distress calls in the Italian language. *INTERSPEECH*, 2049–2053.

Reckwitz, A. (2003). Grundelemente einer Theorie sozialer Praktiken / Basic Elements of a Theory of Social Practices. *Zeitschrift Für Soziologie*, *32*(4), 282–301. https://doi.org/10.1515/zfsoz-2003-0401

Röser, J. (2015). Rezeption, Aneignung und Domestizierung. In A. Hepp, F. Krotz, & S. Lingenberg (Eds.), *Medien • Kultur • Kommunikation. Handbuch Cultural Studies und Medienanalyse* (125-135).

Röser, J., & Peil, C. (2012). Das Zuhause als mediatisierte Welt im Wandel. Fallstudien und Befunde zur Domestizierung des Internets als Mediatisierungsprozess. In F. Krotz & A. Hepp (Eds.), *Medien • Kultur • Kommunikation. Mediatisierte Welten: Forschungsfelder und Beschreibungsansätze* (pp. 137–163). Springer VS (Verl. für Sozialwissenschaften). https://doi.org/10.1007/978-3-531-94332-9_6

Samarasinghe, N., & Mannan, M. (2019). Towards a global perspective on web tracking. *Computers & Security*, *87*, 101569. https://doi.org/https://doi.org/10.1016/j.cose.2019.101569

Sanders, J., and Martin-Hammond, A. (2019). Exploring autonomy in the design of an intelligent health assistant for older adults. *Proceedings of the 24th International Conference on Intelligent User Interfaces: Companion*, 95–96. https://doi.org/10.1145/3308557.3308713.

Shamekhi, A., Bickmore, T., Lestoquoy, A., & Gardiner, P. (2017). Augmenting Group Medical Visits with Conversational Agents for Stress Management Behavior Change. In P. W. de Vries, H. Oinas-Kukkonen, L. Siemons, N. Beerlage-de Jong, & L. van Gemert-Pijnen (Eds.), *Lecture Notes in Computer Science: Vol. 10171. Persuasive Technology: Development and Implementation of Personalized Technologies to Change Attitudes and Behaviors* (Vol. 10171, pp. 55–67). Springer International Publishing. https://doi.org/10.1007/978-3-319-55134-0_5

Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice: Everyday life and how it changes*. SAGE. http://site.ebrary.com/lib/uniregensburg/Doc?id=10568302

Srikanth, S., Saddamhussain, SK., and Siva prasad, P. (2019). Home anti-theft powered by Alexa. *2019 International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN)*, 1–6. https://doi.org/10.1109/ViTECoN.2019.8899464.

Tao, F., Liu, G., and Zhao, Q. (2018). An ensemble framework of voice-based emotion recognition system. *2018 First Asian Conference on Affective Computing and Intelligent Interaction (ACII Asia)*, 1–6. https://doi.org/10.1109/ACIIAsia.2018.8470328.

Tironi, A., Mainetti, R., Pezzera, M., and Borghese, A. N. (2019). An empathic virtual caregiver for assistance in exer-game-based rehabilitation therapies. *2019 IEEE 7th International Conference on Serious Games and Applications for Health (SeGAH)*, 1–6. https://doi.org/10.1109/SeGAH.2019.8882477.

Unterweger, J. (2021). everydAI-An AI assistant supporting balance between work and personal activities to increase wellbeing in the home office. Design for Interaction Programme, research report, Delft University of Technology, Netherlands. http://resolver.tudelft.nl/uuid:72f76f90-dab5-446a-b116-e5a78f985409

Vittersø, J., Akselsen, S., Evjemo, B., Julsrud, T. E., Yttri, B. and Bergvik, S. (2003): Impacts of home-based telework on quality of life for employees and their partners. Quantitative and qualitative results from a European survey. *Journal of Happiness Studies,* (4),2, 201-233.

Vora, J., Tanwar, S., Tyagi, S., Kumar, N., and Rodrigues, J. J. P. C. (2017). Home-based exercise system for patients using IoT enabled smart speaker. *2017 IEEE 19th International Conference on E-Health Networking, Applications and Services (Healthcom)*, 1–6. https://doi.org/10.1109/HealthCom.2017.8210826.