Alexa, Start My Day

The Experience of Integrating Voice-Activated Personal Assistants in Home Environments

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Abstract

Voice-activated personal assistants in the form of smart speakers have become one of the most impactful technologies that may significantly alter people's everyday life. The thesis researches how users experience the integration of this emerging technology in their home environments while investigating into the perceived usefulness of the device and the emotional processing behind the usage of the voice interface. For this, a mixed method approach of combining an autoethnography and in-depth interviews was used. Out of this, three major themes came up that are linked to each other through the uniqueness of the voice interface.

First, the users are adopting through a conscious habituation and modification process the personal assistant into their everyday life. Especially for simple and repeated practices that are short, spontaneous and easy to conduct, the integration of personal assistants was perceived as particularly useful.

Second, the usage of the personal assistant as a new technology is a highly emotional process. Depending on users' characteristics, which determine their belonging to either the group of early adopters or early majority, they experience different levels of playfulness and curiosity. Although these feelings decreased for all interviewees over time, the joy of using the personal assistant declined faster for users with a more superficial usage of just the basic functionalities compared to more technological affine users. Besides this involvement, a bonding relationship is created through the sensitivity of people towards voice. Interviewees started automatically to apply social rules to the personal assistant. This treatment of the device is connected to the concept of anthropomorphism which follows into the phenomenon of media equation where people unintentionally react to technologies as they would do to other interaction humans. In doing so, they even ascribe social rules to the device which intensifies the human-computer interaction even more. These two findings are connected to each other in the process of mutual shaping between the personal assistants and the users.

Third, with the placement of the personal assistant in private home environments and the emotional bonding, the perception of privacy issues has to be differentiated between

personal private and institutional privacy. While data collection and further usage from suppliers are hard to imagine for users, they are less concerned about a possible loss of privacy. Because of this low level of privacy literacy about how suppliers and third parties are using their data, they are also not taking any actions to secure them. On the contrary, users are more concerned about their privacy when the device is speaking without being asked. They perceive it as a direct intrusion into their social privacy which follows into a direct reaction of privacy protection. This concrete threat towards the device itself rather than in the supplier is grounded in the humanization of the personal assistant as it feels like another person that is suddenly disrupting private situations.

KEYWORDS: *Mutual shaping, media equation, voice-activated personal assistants, human-computer interaction, privacy awareness*

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1 History Repeats- Societal Change Through Innovations

Communication and information technologies are the most powerful forces when it comes to social, cultural and economic change of society. Consequently, there have always been new technologies in the history of innovation development that impact the lives of people. While some of them do not prevail and soon disappear, other groundbreaking technologies continue to play essential roles in our society. Technologies that seem to be indispensable today all had to run through a process of adoption, acceptance, and integration. Given that, within years these sublime technologies developed to fixed components in everyday lives through a mutual relationship between humans and machines. This transformation repeats continuously, from the telegraph to the television, to the current development of the internet, and its growing interconnectivity with peoples' environment (Mosco, 2004).

Although this process of integrating new technologies is never straightforward, some regularities and patterns can be seen in the diffusion of innovation. Across the range of various inventions in communication technologies repetitions exist, for instance, in how new products disseminate (Winston, 1998). The adoption of new technologies can be seen to pass several development stages accompanied by different types of user groups. In this innovation-decision process, different factors like social influences, exposure, and the anticipated utility of these innovations have an impact on the integration of new technologies. In this context, innovations are gradually moving from a niche market to a broader user community within social systems (Rogers, 2003).

Now, in 2018, the emergence of personal assistants, particularly in the form of smart speakers, has become one of the most impactful innovations that may significantly alter people's everyday experiences with technology. The most popular smart speakers are Amazon with its several variations of Echo, Google Home and Apple HomePod (Preston, 2018). All of these devices can be connected to other domestic appliances such as lights, thermostats, other media and gadgets to help people to control their homes smarter and more efficiently. With personalized verbal routines like "Alexa, start my day" users can further combine various functionalities with just one command. Being placed in social spaces and settings in home environments, like the kitchen or the living room, these environmental control and respond devices bring human-computer interaction to a new level – not only regarding usability but also emotionally (Porcheron et al., 2017). Moving from text-based to voice-activated input, a new interface for human-computer interaction was created to not only

react to single commands but also to whole sentences understanding the overall context. Moreover, they are continually improving while having the ability to self-learn through artificial intelligence and deep-learning algorithms (Këpuska & Bohouta, 2018).

However, with the integration of personal assistants in home environments also the overall debate about privacy issues regarding data collection and further utilization became even more ubiquitous (Zeng, Mare, & Roesner, 2017). Only recently, Amazon Alexa was at the center of public attention as the device was unintentionally recording a private conversation and sent it to a person within the contact list of the owner (Sacks, 2018). This was not the first incident where personal assistants caused privacy concerns. Not long ago, there also has been a discussion going on about Alexa starting to laugh suddenly without giving commands (Zeng et al., 2017).

Nonetheless, with more than 50 million predicted shipments and expected market growth of 56.3 million US dollars worldwide in 2018, *voice-activated personal assistants (VAPA)* are currently the fastest-growing consumer technology (Perez, 2018). Whereas Amazon Echo has been on sale in the United States since 2014, the device entered the European market at first in Germany and the United Kingdom in September 2016 (Trenholm, 2016). In the US, already 15.4% of the population owns an Amazon Echo and 7.7% a Google Home, whereas in Germany just 5.9% and 1.2% own these devices (Brandt, 2018). According to the latest forecasts, an upward curve can be seen in Europe as well while 13% plan to buy a smart speaker within the next months. This indicates that personal assistants in home environments are on the rise and what has been observed in the American market is now beginning to happen in Europe (telecompaper, 2017).

1.1 Research Problem

Personal assistants in home environments seek to transform tasks in everyday life by allowing the users to control the device through speaking (Griffith, 2018). As such, this pervasive technology has several functions, and the fields of applications are various while supporting consumers use of e-commerce, web search, applications and the control of smart home devices (Perez, 2018). Despite the immense market growth and increasing influence of personal assistants on everyday life, the actual user behavior is still unexplored and hidden. While a new era of technology through voice computing is on the rise, research about the integration and the experiences of personal assistants is mainly unexplored (Porcheron et al., 2017).

Although first studies on consumer perception, adoption, and use of VAPA including portable devices exist, there are currently no academic examinations focusing on personal assistants in the form of smart speakers. These devices occupy fixed positions in individuals' home environment and can be used as the primary interface for controlling smart home devices. As the environment and way of applications differ from most portable consumer technologies like smartphones, watches, and tablets, it is crucial to understand the experiences with this particular kind of personal assistant from different user perspectives. Personal assistants enter into the most private environment at home while providing unique processing of natural language input from users. This can be seen to change human-computer interaction quite radically as it develops a more intense interaction with personal assistants compared to most other devices (Perez, 2018).

According to Amazon, already half of a million people confessed their love to Alexa, and many people are used saying "good morning," "good night" or "thank you" to their personal assistants. Likewise, these people and others are often saying “she” instead of “it” when they are talking about personal assistants like Alexa. A reason for this might be that with smart speakers the interface almost disappears. This is why people feel easier familiarized with it and perceive the interaction differently than with other devices. However, even though these observations were already made, no research was done yet that investigates into the psychological phenomena and motives why users are doing this (Turk, 2016).

Prior studies that investigated into voice interaction just revealed that users prefer using VAPA in private locations. When they are in public, they avoid using VAPA as they are more careful in transmitting both private and non-private information. Although users are careful to share intimate details, they are at least more open to exchanging data in private settings. A reason for this is not only the social privacy at home but also the possible disruption of other people in public surroundings (Moorthy & Vu, 2015). However, it has not been examined yet how people experience somewhat “permanently” placed personal assistants in a private environment to see if the usage differs from portable devices (Efthymiou & Halvey, 2016; Mallat, Tuunainen, & Wittkowski, 2017; Moorthy & Vu, 2015).

This research will begin to shed light on the integration and experience of this emerging technology in the home environment. As this thesis is a first explorative work, based on related theories about human-computer interaction and technology adoption, it concludes about how personal assistants in the form of smart speakers are currently integrated and experienced in everyday life. It seeks to understand the perceptions of current users in

light of this increasingly popular technology. Subsequently, deriving from the research gap, the thesis focuses on answering the following research question:

RQ: How do people experience the integration of voice-activated personal assistants in their home environment?

Based on the primary functionalities of personal assistants to facilitate everyday tasks, the first sub-question focuses on the understanding in which way personal home assistants transform past activity patterns into new processes (Hoy, 2018).

SQ1: How does the integration of the personal assistant change daily practices and routines?

People are particularly sensitive when interacting through voice. This natural form of communication evokes social schemes in the minds of individuals that differentiate from the emotional processing and reactions compared to other devices (Purington, Taft, Sannon, Bazarova, & Taylor, 2017). Therefore, SQ2 is focusing on the feelings and emotions that come along with the usage of personal assistants.

SQ2: How do users experience the relationship between them and the personal assistants?

With the adoption of personal assistants in private home environments also the collection of intimidate data and possible abuse of them became a topic of discussion in public (Zeng et al., 2017). While recently some controversial discussed events came up regarding data collection and further usage, SQ3 is examining how users perceive privacy issues concerning personal assistants.

SQ3: How do users experience the integration of the personal assistant in the light of privacy issues and data surveillance?

Regarding their versatile functionalities, personal home assistants can be used in many different ways. Depending on individual's needs, attitudes, and time spent with new technologies, their usage may differ from others (Perez, 2018). Likewise, depending on where they fit within the categories of "innovator, early adopter, early majority, late majority or laggard" (Rogers, 2003, p.22), people may have different experiences of the integration

process. Therefore, the fourth sub-question researches how different kinds of people experience personal home assistants.

SQ4: How do experiences differ between people from different stages of usage?

To answer these research questions, the following chapter first provides a theoretical framework including already existing social scientific theories that help to understand the integration and usage of personal assistants, not only from a behavioral but also emotional perspective. In doing so, this research follows the overarching concept of practice theory taking into account people as well as kinds of materials on an equal basis. This mindset provides an even more profound understanding of the human-computer relationship between VAPA and individuals by combining various elements of the user experience. Next, the methods chapter argues why the original mixed method approach of combining an *autoethnography* and in-depth interviews was used to research the integration of personal assistants in home environments creatively. It further explains the system behind the choice of utilizing *constructivist grounded theory* and describes all steps that were taken to analyze and interpret the collected data. Afterward, the key findings of the modification of existing routines and the development of new practices, the unique human-computer relationship, and the complex privacy dilemma will be shown in the results chapter. In the last chapter of the conclusion, these three main pillars will be connected with each other to understand the overall experience of using personal assistants finally.

1.2 Scientific and Social Relevance

Personal assistants in the form of smart speakers are still a quite new technology in home environments. Although they are developing and disseminating quickly, people's perception, attitude, and behavior towards VAPA have not been examined yet. Currently, a limited amount of researches exist on these devices, mainly investigating into speech interaction and voice computing in general and how users perceive them in real-world social settings (C. Nass & Brave, 2005; Porcheron et al., 2017). However, this is just one aspect of how people experience the integration of personal assistants in everyday life. Although several models can be adopted from studies about other innovations, first exploratory work in the form of qualitative methods has to be done to understand the technology of personal home assistants. Therefore, the thesis is relevant as a new frontier study related to the NWO funded research of Jason Pridmore, Daniel Trottier and their US colleagues on this topic, contributing

to the overall development of the project *Mapping Surveillance Dynamics in Emerging Mobile Ecosystems*.

Moreover, the thesis has also social relevance as it contributes to the understanding of why people use this novelty technology of personal assistants and how it developed to such a central device in many peoples home. Therefore, how voice-activated personal assistants are adopted and accepted needs to be examined from a *consumer-centric perspective*. In doing so, this research examines the mutual relationship between users and the technology itself to understand overall impact on society and how people are participating in a specific ecosystem that these devices represent in the era of the *internet of things* (Shah, 2016).

Additionally, the research of the daily experiences with personal assistants is relevant for the further development of these devices. Speech interaction is still error-prone, and companies are steadily working on their products to improve the usability (Strutner, 2017). To some extent, this master thesis helps to elaborate on how users currently experience the integration of personal home assistants to enhance their future developments. This knowledge is useful for companies to understand which features are essential, how they perceive the overall experience of usage, and what concerns emerge while integrating the device in private home environments.

2 Theoretical Framework

In this theoretical framework, I elaborate the central concepts and theories that are needed to understand the experiences of integrating personal assistants in home environments. First of all, *practice theory* is introduced to comprehend how personal assistants become part of daily practices and how these transformations simplify previous ones. Next, to understand the dissemination and adoption of personal assistants, I explain the *innovation diffusion* and the different variations of the *technology acceptance* and *usage models*. Moreover, I describe the phenomenon of *media equation* through speech interaction and how personal assistants are embedded in the internet of things including emerging privacy issues. Based on these concepts, I developed my study design and operationalized the research process as described in the methodology.

2.1 Practice Theory

To grasp how users experience personal assistants, it is essential to understand which problems these devices solve and how they help to fulfill specific tasks. If personal assistants are embedded and experienced in everyday life, they can develop into useful and fully integrated devices for daily practices (Ebling, 2016). To understand this integration, practice theory helps to articulate the world as a network consisting of the different elements of *materials*, *competencies,* and *meanings* (Shove, 2003; Shove, Pantzar, & Watson, 2012). It is a framework for empirical research and offers a system for interpreting the experiences with personal assistants as a social phenomenon shaped by cultural and economic sources (Reckwitz, 2002). Accordingly, social practices emerge, shift, and disappear while people combine things, mental activities, skills, knowledge, emotions, and cognitive status in accumulated individual decisions. All elements exist independently and are utilized in several actions that develop to practices. Depending on different situations, structures of practices can be changed as a dynamic process. If specific patterns and practices are frequently used, they are developing into routines as fixed components in everyday life (Shove et al., 2012).

Utilizing practice theory opens up a way to systematically comprehend, analyze and conceptualize complex social practices and routines to understand the interdependencies between various elements (Shove et al., 2012). Furthermore, practice theory helps to understand the motivations behind actions and why individuals perform them with certain technologies. With this, the aspect of convenience and simplification plays a vital role in the acceptance of new practices (Shove, 2003). This overall approach will help to understand the

ongoing process of adopting personal assistants at home into existing practices, routines and the emergence of new ones. By that, elements like other home devices, user motivations, languages, emotions, and knowledge need to be interconnected with the personal assistant to see in which practices they are embedded, what tasks they simplify and how they change previous routines (Shove, 2003).

Practice theory has its origins in the early formulations of Bourdieu (1976) and Giddens (1984). Bourdieu (1976) claims that practices are unconsciously embedded in individuals daily life. These practices include schemes that are automatically applied in different situations. In doing so, performances of the schemes can vary when elements like the used devices or the social surroundings change. In this case, the fundamental practice still exists but has transformed. Giddens (1984) indicates that practices are conscious actions in everyday life to reduce uncertainty and to create security through repetition and recursive social activities. Patterns are created through the interconnection of single physical and social elements that formed the feeling of flow and a structure in social situations (Giddens, 1984).

Based on these theories Schatzki (1996) elaborated and summarized previous findings and tried to extend them. He explains practices as a nexus of doings and sayings that combine and organize different activities. Building upon Giddens (1984), he claims that those practices are temporal, flexible and open to adding new elements like new technologies. Further, he states that practices are not stand-alone actions but can overlap, emerge and counteract with other practices (Schatzki, 2002). Reckwitz (2002) also develops and discusses practice theory while carving out the essential elements:

> A ‘practice’ (Praktik) is a routinized type of behavior, which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge (Reckwitz, 2002, p. 246).

Practices give actions a structure and are the smallest unit of social analysis. Individuals act as carriers and crossing points of body and mind in practices. He further points out that technologies play an important role in the explanation of practices in daily life as they change with the implication and consumption of devices (Reckwitz, 2002; Warde, 2005). Moreover, Geels (2002) adds to this that new technologies are mostly linked to already established technologies as add-ons or *hybridizations*. In this particular case, this symbiosis of old and new can also be seen with smart speakers, which are closely related to the use of smartphones and connected explicitly to smartphones through an app. This *technological*

transition is a process of shifting and changing socio-technological elements in existing practices (Geels, 2002). Furthermore, there is a connection with practice theory to the *actor-network theory (ANT)* as all practices are conducted in changing and dynamic situations, contexts, and surroundings with single interconnected elements (Schatzki, 2002; Warde, 2005). To research the experience of personal home assistants as a new technology in already existing practices, the principle of translation, coming from Actor-Network Theory, complements the framework of practice theory. Both perspectives come from the same root emphasizing that materials matter in ways that eliminate or reduce predetermined distinctions between human and non-human actors (Shove, 2003; Shove et al., 2012).

Accordingly, technological changes in practices are not only technical but social as well as embedded in a *heterogeneous network*. Personal assistants cannot be analyzed solely by their technical aspects without evaluating their socio-cultural background and non-technical elements of production. This perspective enables us to see more unexpected conclusions as different entities are connected to each other to reconstruct situations (Tatnall & Gilding, 1999). This integration of personal assistants in a home environment connects social element and objects of existing practices and routines and displaces or transforms previous processes. This key concept of *translation*, coming from the actor-network theory, explains changes within heterogeneous networks and supports the understanding of how various elements are brought into relation for a particular action. This translation of various elements into practice can also be seen when personal assistants solve problems or change existing daily processes (Law, 1992). Personal assistants, for instance, translate specific morning routines like reading news, entering appointments into the calendar or adjusting the thermostat into a new digitalized practice to accelerate and simplify them (Hoy, 2018). It also changes the way people are using services like online shopping in future (Mallat et al., 2017). Thus, the dissemination of new technologies in time and space depends on the individuals and how they respond to the new possibilities through translating innovations for their practices and needs (Tatnall & Gilding, 1999).

2.2 Innovation Diffusion

When looking at the dissemination of new technologies from a societal level, there are general patterns how innovation gradually spreads from one niche to following domains and other market niches. This cumulation of niches involves experimentations, learning processes, and adjustments as the various individuals that are reached stepwise are adopting the innovation differently (Geels, 2002). This diffusion of innovation is “the process by which an

innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p.5).

To elaborate on how people are experiencing the integration of personal assistants, it needs to be taken into account that the process of people, industries, and social systems adopting new technologies is never straightforward. The perception of uncertainty about how the actual usage of the innovation would look like plays a vital role in the process of adoption for individuals, groups, and organizations. Through *information-seeking activities* about how an innovation solves a problem the level of uncertainty can be reduced, and the decision whether a new technology is adopted or rejected can be accelerated. Individuals seek to understand how technologies function, why they work and which advantages or disadvantages their usage have in certain situations. This process of innovation diffusion can be seen as a social change that includes the four main elements of the innovation itself, the communication channels, the time it takes and the social systems the individuals belong to (Mahajan & Peterson, 1985).

It is crucial for understanding to take the attributes of the different social systems and cultures into account as they can facilitate or impede this process. However, every individual reacts differently to innovations as the diffusion is closely related to social status, personal preferences, and educational background. Plotting the frequency over time, a *bell-shaped curve* (see dark grey graph in figure 1) of adopters can be seen. This curve rises slowly and then accelerates to a maximum until half of the individuals in a social system have adopted the innovation. Afterward, it increases at a gradually slower rate until the small rest of the individuals finally adopt the new technology (Rogers, 2003, 2010). Consequently, new technologies are entering the market through different stages that are accompanied by the groups of "innovators, early adopters, early majority, late majority, and laggards" (Rogers, 2003, p.22). Influenced by different expressions of attitudes like optimism, innovativeness, discomfort, and insecurity towards the innovation, people have to pass the stages of persuasion, decision, implementation, and confirmation before using them. The same data can also be displayed in an *S-shaped curve* showing the cumulative number of adopters within a market (see light grey graph in figure 1). This curve puts adopters into different categories, depending on their personal traits, attitudes and the time they need to adopt innovations. Depending on their type, users have different expectations for the performance and usage of a technology (Rogers, 2003).

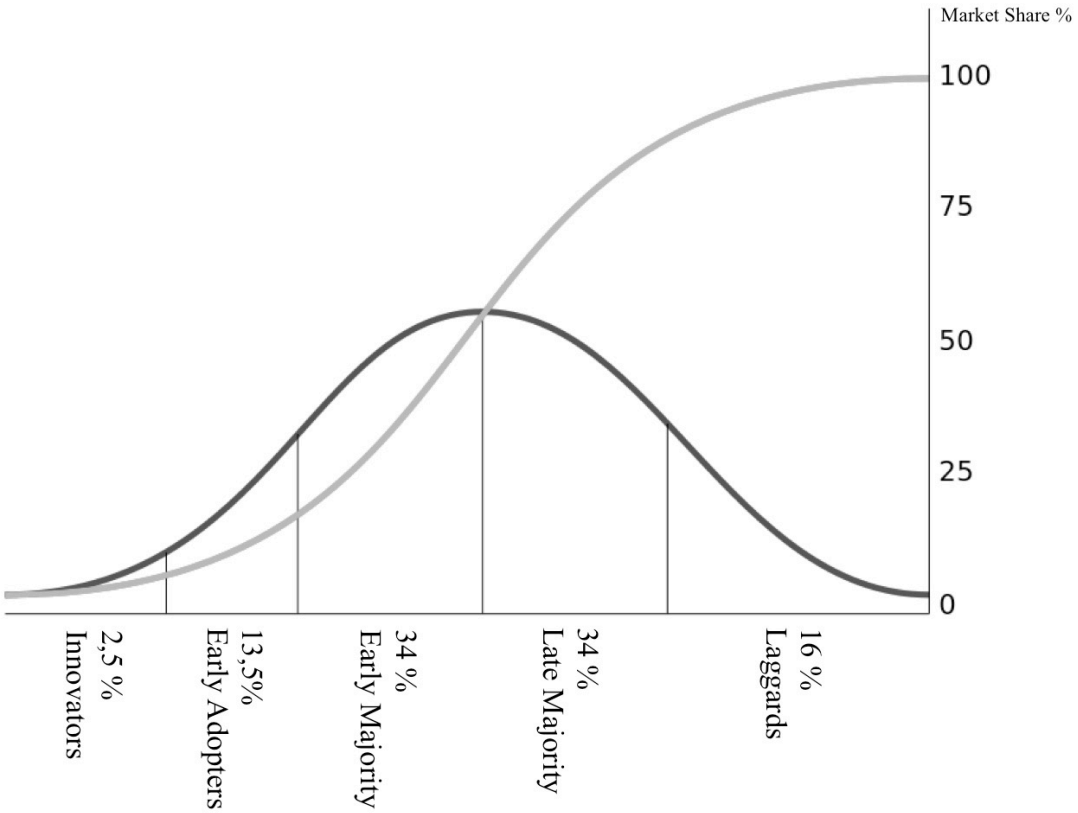

Figure 1 Adopter distribution (Rogers, 2003)

In this process of innovation diffusion, innovators and early adopters are the change agents in the spread of new technologies, the early and late majority represents the mainstream users where large parts of society are starting to experience and integrate new devices. Innovators and early adopters usually feel more comfortable in using new technologies even if not all functionalities work and the performance is not entirely convincing. Additionally, their novelty-seeking behavior and openness to innovations usually result in a more frequent and intense usage. This also means that they use technologies more experimentally and innovatively to explore various new functions. Their curiosity is based on the fact that innovators and early adopters often have a high level of innovativeness that motivates them to use new technologies even when their potential value is uncertain, and the functionalities are not fully developed yet. In comparison, the group of the early majority tends to feel more insecure and discomfort while using new technologies. This more negative and skeptical attitude results in a more suspicious use of just the basic functions instead of figuring out new ways of integration (Son & Han, 2011).

2.3 Technology Adoption and Usage Models

Another model, which is related to the innovation diffusion, is the more user-centric *technology acceptance model (TAM)*. It is one of the most frequently used theories in the research of information systems to understand the adoption of upcoming technologies. Initially, it was used to predict how employees adopt technologies in working environments. Today, it has been expanded, amended and modified through various studies of different target groups and has often been applied to new technologies to comprehend the integration or rejection of them in society (Davis, Bagozzi, & Warshaw, 1989; Lai, 2017). Although there exist even more theories that are related to the concept of technology acceptance like the *theory of reasoned action (TRA), technology readiness (TR),* and the extensions of the technology acceptance model *TAM2* and *TAM 3,* this framework mainly focuses on the original TAM and the *unified theory of acceptance and use of technology (UTAT),* which summarizes the most important constructs of all models (Davis, 1989; Lai, 2017; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh & Davis, 2000; P. F. Wu, 2012). The latest version of the UTAT model was proposed by Venkatesh, Thong, and Xu (2012). A reason for the frequent use of these models is the theoretical simplicity and the robustness of their standardized measurements (King & He, 2006; P. F. Wu, 2012). Thus, the models have developed to the most convincing and significant theories elaborating on user perceptions through *ease of use* and *perceived usefulness* (Davis, 1989). These various conceptualizations about the acceptance of technologies can also be applied to VAPA to understand the process of their integration in daily life like it was done with several information technologies before.

Primarily, users are motivated to use specific technologies because of their promised functions and secondly, for the usability to perform particular tasks. These motivations are influenced by external factors like user's personality traits and characteristics but also cognitive factors, the technology design, the resulting usability and the support options of the suppliers (Davis, 1989). In the case of personal assistants, completing tasks with a voice interface is often perceived as easier and faster than with the keyboard. (Moorthy & Vu, 2015). These external factors help determine whether individuals will have a positive or negative attitude concerning perceived usefulness and ease of use towards a new device. This, in turn, influences the gradual acceptance or rejection of the future behavior intention and actions that belong to it. Given this, users are willing to spend time on understanding difficult technologies if they provide added value and functions. While users tend to adopt technologies even if they are complicated, no amount of ease of use compensates a system that does not fulfill what it is meant to be. Therefore, ease of use not only affects the attitude

towards technology directly but also impacts perceived usefulness. Overall, both factors affect the general attitude towards a technology which in turn influences the actual usage and behavior or rejection (Davis, 1989). An overview of the TAM can be seen in *figure 2*.

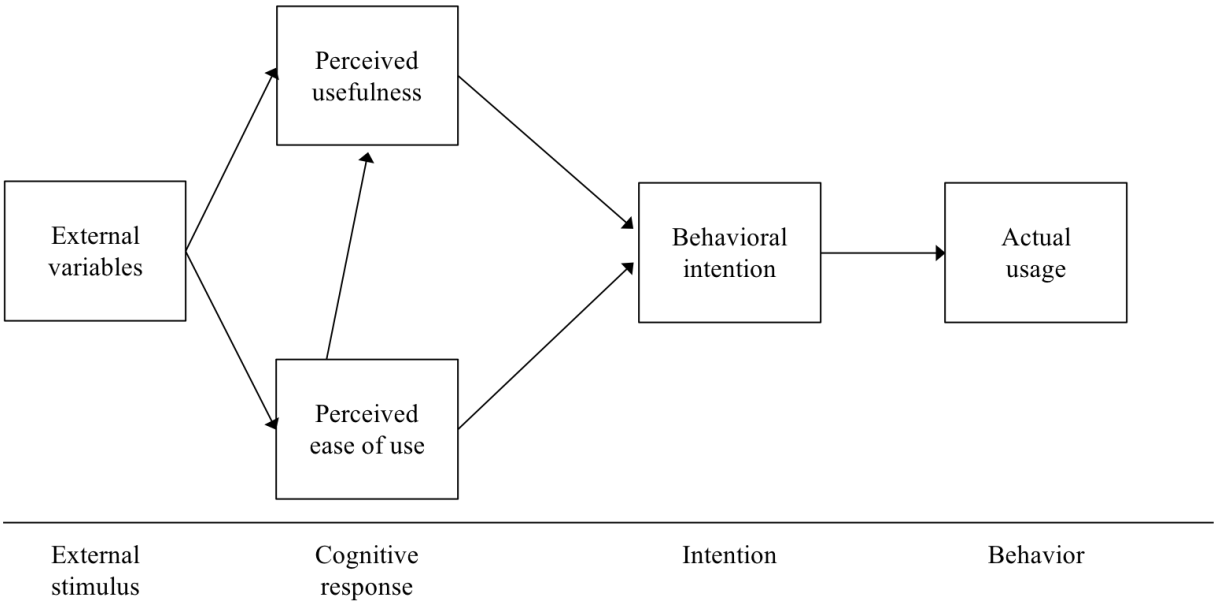

Figure 2 The technology acceptance model (TAM) (Venkatesh et al., 2012)

Furthermore, the UTAUT, as an extension of TAM, focuses even more on motivational and behavioral patterns of technology adoption. Out of this, the user's *performance expectancy* is made up of the perceived benefits of performing a particular activity with the technology and the *social influences* of the personal surrounding. Moreover, it takes into account how much time and endeavors a person is willing to spend for the usage of a particular technology (Venkatesh et al., 2012). This demonstrates that the use of technology is not only influenced by an individual's attitude about the technology, but also by *social signals* coming from their personal environment of other people. If people are surrounded by innovators and early adopters they are more likely to also belong to this group and to use innovations. Especially family is playing an important role in the *personal innovativeness* as they pass on certain values to individuals. This, in turn, impacts then the general future interest of adopting new technologies. Therefore, children with parents or siblings that have a high level of innovativeness tend to belong to the groups of innovators and early adopters when they get older (Cotte & Wood, 2004).

Furthermore, authors describe that *facilitating conditions* play an important role, referring to consumers' perception of the resources to use the technology appropriately. All

factors again influence the behavioral intention which results in the final use or rejection. Aside from demographic attributes like gender or age, the general experiences with technologies and the voluntariness of use are decisive for the adoption of technology. For example, when people decide on their own to integrate a new technology like a personal assistant at home, the probability to accept it as a new device is higher compared to someone who did not incorporate it of their own will (Lai, 2017; Moorthy & Vu, 2015; Venkatesh et al., 2012; Venkatesh et al., 2003).

When looking at the most current model of *UTAUT 2,* it incorporates three new constructs to focus on the user context even more while leaving out *voluntary use.* First, the *price value,* which is about the trade-off between the perceived benefits of the technology and the monetary costs for using them. Second the *habit,* which is linked to daily routines and how specific automatic behavior including the technology is conducted. Moreover, previous experiences with other technologies have an impact on how well people integrate new technologies into their habits in daily life (Venkatesh et al., 2012). The third new construct is the *hedonic motivation,* which is about "the fun or pleasure derived from using a technology" (Venkatesh et al., 2012, p.161). An overview of all the factors of the UTAUT 2 influencing the adoption of technology can be seen in *figure 3.*

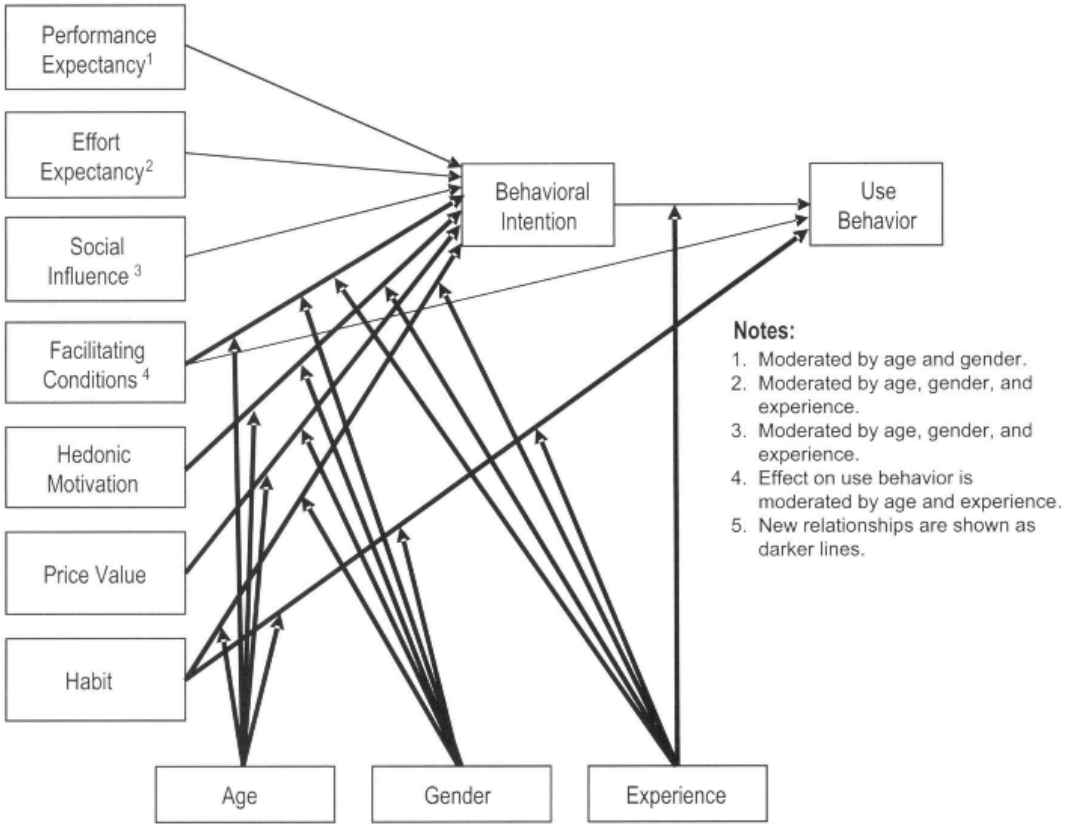

Figure 3 Unified theory of acceptance and use of technology 2 (UTAUT 2) (Venkatesh et al., 2012)

Overall, all models of technology acceptance and usage gave a suitable framework to elaborate on the motivations and behavioral intentions to integrate and use a personal assistant. With that, they enabled to understand the overall process of integration and the followed experiences in daily life. Although these theories were useful to understand the acceptance of technologies, they are also limited. These quantitatively focused findings solely measure certain factors influencing the adoption of innovations and miss a lot regarding depth in explanation and experience that this qualitative work responds to. Taking the nature of qualitative methods into account, this explorative work was done more in-depth and broad compared to previous studies. The research differs from previous findings as richer data were provided about the factors of the models, like the perceived usefulness and ease of use, to get a deeper understanding of the experiences with personal assistants. This change in method followed the implications for future research from several authors that called for a new theoretical treatment combining quantitative and qualitative methods (Bagozzi, 2007; Lee et al., 2003; P. F. Wu, 2012).

2.3.1 Intrinsic Motivation and Technology Adoption In Households

Another extension of the technology adoption model is the *model of adoption of technology in a household (MATH*). Contrary to the models mentioned above, which are mainly based on work environments, it is further relevant to understand how users adopt smart speakers in private settings. Therefore, this modification of the traditional model of TAM focuses on hedonic, social and utilized outcomes. It consists of the three major constructs of *attitudinal beliefs, normative beliefs* and *control beliefs.* The attitudinal beliefs include all thoughts about the personal use, utility for people within the household, the gained status, and the perceived fun while using the technology. The normative beliefs are about the opinions of family, friends and secondary sources like the television and newspapers that influences the own view of the user. Lastly, the control beliefs entail threats, costs, and doubts the adoption of technology brings along but also the perceived ease of use (Venkatesh & Brown, 2001). This is derived from motivational theories that differ between *intrinsic* and *extrinsic motivations* as the primary drivers of behavior (Vallerand, 1997; Venkatesh & Brown, 2001). Given that, "extrinsic motivation pertains to the achievement of specific goals whereas intrinsic motivation is the pleasure and satisfaction derived from a specific behavior" (Venkatesh & Brown, 2001, p.74).

These intrinsic motivations show the acceptance of technology as both a relational and an emotional decision (Agarwal & Karahanna, 2000). While the traditional technology acceptance model mainly discusses the extrinsic motivations of ease of use and perceived

usefulness, intrinsic motivations in the form of playfulness and joy further play a dominant role for the use of technologies in domestic spheres (van der Heijden, 2004). Besides successful performances of functionalities, this user experience positively stimulates the attitudes and behavior of individuals in the form of personal interest, having fun and feeling a fulfillment of joy (Agarwal & Karahanna, 2000). This view can be traced on the changed perception of capitalism. Besides the mainly known characteristics of capitalism like focusing on making a profit and being competitive, there is also the perspective that it is fun. This so-called *soft capitalism* points out that capitalism also includes the feeling of commodity, excitement, and curiosity that comes along with different relations of various elements. Those interconnections that come along with fun evolve from the uncertainty of the innovations today's capitalism supports (Thrift, 2005). The home enjoyment is the natural habit of people while the private home environment is more associated with enjoyment. This makes the use of technology more hedonic oriented than at workplaces, where the perceived usefulness is more dominant (van der Heijden, 2004).

In addition to these findings, Venkatesh (2000) takes individual differences into account as another determinant for the adoption of new technology. He examined that people with a particular interest in technology tend to have a higher level of playfulness and therefore more intrinsic motivation that results into a more significant acceptance and usage of the device (Venkatesh, 2000). Thereby, the concept of playfulness can be seen in two ways. First, like a quite stable personal trait or characteristic, which can be changed slowly over time. Second, as a state of mind during a specific situation, which focuses on specific experiences with the technology that can change faster. Both definitions explain perceived playfulness with users' attitude towards the technology and the followed behavior formed by intrinsic motivation, their own experiences and the surrounding (Hackbarth, Grover, & Yi, 2003; C. Nass & Moon, 2000).

Regarding playfulness, the feelings of curiosity, current delimitation and control additionally play an essential role for a good user interface (Agarwal & Karahanna, 2000; Moon & Kim, 2001) and relates to the individual experiences where mood, involvement, and personal satisfaction contribute to a positive attitude towards the technology (Webster & Martocchio, 1992). The beliefs about new technology are shaped by all the experiences a person makes while being engaged (Agarwal & Karahanna, 2000). However, not only the experience in the form of playfulness influences the technology acceptance but also the negative feeling of anxiety. Nonetheless, the individual attitude and the intrinsic motivation of usage can change over time. Besides the general interest in new technology and having the

character of being playful, a growth of familiarity can also increase situational playfulness over time (Hackbarth et al., 2003).

2.4 Media Equation Through Speech Interaction

As the interface of personal assistants is based on speech interaction, it is important to understand how users generally perceive voice communication and which effect it has when machines are talking to them. Their so-called *speech-based natural user interface* is said to enable a way of interaction that seems logical to people as it works through intuitive actions that relate to people's usual behavior. Through the natural voice and improvement of contextualization, irrational social proximity is created that adds an emotional component to the usage of functionalities (López, Quesada, & Guerrero, 2018). A reason for this is that speech is fundamental to human communication and the primary way to express emotions, information and to build relationships. As it is processed in the same parts of the human brains, humans make very low distinctions between machines and human voices. Therefore, it is hard for people to suppress natural responses towards machines. They are particularly sensitive toward speech and mostly respond intuitively to social situations. When users are interacting with VAPA, they tend to automatically respond as they would do in social situations (Nass & Brave, 2005). As of this, users even ascribe human characteristics to such systems which are further influencing their opinion and behavior towards the device (Nass & Brave, 2005; Złotowski et al., 2018). This phenomenon, where media entities like personal assistants are involuntarily treated like humans, is called *media equation*. People are reacting to technologies as they would toward real persons in daily actions. This reaction, where users apply social rules to technologies is mostly spontaneous and instinctive (Krämer & Hoffmann, 2016).

Media equation is further related to the concept of *anthropomorphism*, "the attribution of human-like characteristics to nonhuman entities" (Złotowski et al., 2018, p.1). This means that just a minimum of *humanized cues* is already enough to trigger a cognitively, socially and effectively the application of social rules and overlearned scripts from human-human interaction to technologies (Złotowski et al., 2018). Although previous authors like Nass and Moon (2000) claim that both concepts cannot be equated as people are not admitting that they attribute humanized characteristics to machines even when they are socially interacting with them, the recent research examined that there is an existing connection.

An explanation for this paradox is the *model of dual anthropomorphisms* and the differentiation between implicit and explicit anthropomorphism. Whereas people are most

reluctant to admit that they treat technologies explicitly in a social manner, they are implicitly describing these phenomena while talking about the actual usage of the technology. Reasons for the denial of explicit anthropomorphism are that first they are not aware of this and second this habit is not aspirational for them and their social surrounding. In contrast, when people are generally talking about their user experiences the automatic social treatment of technology becomes implicitly apparent. This explains why even people with technological know-how have certain emotions towards the device as media equation and implicit anthropomorphism happens unconsciously (Złotowski et al., 2018).

This overall phenomenon of media equation through anthropomorphism can be explained in the light of evolution where everything that shows interactional behavior needs a social reaction. However, through the development of communication media, these social scripts, where humans have learned that anything that has human characteristics, should be treated like a human became dysfunctional. So if a computer is interacting with a natural voice, people still recognize it as a human-typical attribute and respond to it like to real human beings. Through the backdrop of media equation, in this process, voice interaction and the ability to have natural conversations are even stronger social attributions than a human-like shape of objects (Yohan, Kim, & Shin, 2016).

Moreover, the voice-computing interface as innovations in the context of human-computer interaction is perceived as particularly intuitive, almost barrier-free and easily accessible. Therefore, the emergence of speech control and voice activation not only changes but intensifies the human-computer relationship regarding emotional and social aspects (Nass & Brave, 2005). This power of speech interaction is also the reason why people are applying social scripts to the smart speaker even when they do not have a human-like appearance (Nass & Moon, 2000; Turk, 2016). People tend to automatically respond to voice-controlled technologies as they seem to be more like a human to human interaction and therefore more natural than other interfaces like touchscreens or keyboards (Ebling, 2016). In doing so, the phenomena of media equation is rather perceived by people with high expertise in technology. This is explained by the fact that experienced users are reacting more mindlessly and automatically than people who do not have that much know how (Johnson, Gardner, & Wiles, 2004).

In the case study of Purington et al. (2017), media equation also becomes apparent while analyzing customer reviews to which degree users indicate personification to Amazon Alexa. They were drawing on the *computer as social actors* (CASA) paradigm, "that people respond to technologies as though they were human, despite knowing that they are interacting

with a machine" (Purington et al., 2017, p.2854). In that case of applying deeply rooted social scripts, users are building a social construction with personal traits around the technology and apply norms like politeness to them. This is supported by the design choices of the smart speakers as people have to apply anthropomorphic interactions to the device when they want to control it. So in the case mindlessness is an explanation for CASA, too. Users think they have to treat non-human entities like other people when they have human-like characteristics. This is further enhanced by the smart speaker of Amazon that has the female name Alexa that is given to the personal assistant. However, the level of how much users are personifying the device depends on the number of social interactions they have with the smart speaker (Purington et al., 2017).

2.5 The Internet of Things and the Evolving Privacy Concerns

The concept of VAPA is not only about the idea of simplifying daily tasks but also about connecting physical objects in the home environment with the internet (Atzori, Iera, & Morabito, 2010). While using personal assistants at home, data is created that contributes to a bigger network of the internet of things. This global infrastructure adds artificial intelligence to people's everyday life through connecting existing and evolving information coming from various devices. Embedded in this system, these objects are communicating with each other to combine physical and digital components to create new data flows understanding everyday life (Wortmann & Flüchter, 2015). Although voice-activated technologies like Apple's Siri already exist for a couple of years, smart speakers are perceived as another game changer while developing to the primary interface to control the smart home (Nowak, 2018). These centralized communication hubs transform users' environments into interconnected and automated smart homes and act as bridges between the internet, third-party applications and domestic objects by voice. Overall, a *common operating picture* (COP) is created across various applications, platforms, and devices including a massive amount of data (Gubbi, Buyya, Marusic, & Palaniswami, 2013).

Personal assistants as interfaces, for instance, can be connected to light bulbs, climate control, and appliances to change the way to control them by voice (Zeng et al., 2017). These new functionalities form a smart environment that supports and enhances abilities that facilitate everyday life. However, while connecting real-world objects, computational elements, and the internet, also various data of the users are being collected (Wortmann & Flüchter, 2015). While permanently listening to *continuous speech stream* there are fixed trigger words like "Alexa" or "Hey Google" that activate the smart speakers for recording.

Then, as soon as the web-connected microphone perceives the digitized information, they will be transferred to third parties to get analyzed. This exchange of rich data is processed by servers that then formulate a response for the users (Zeng et al., 2017). In this process, the rich audio data not only include user's unique voice that can quickly identify persons like a fingerprint but also information from their surroundings. This unfiltered data-driven usage challenges society to keep the privacy and protection. Hence, the real-time interpretation and gathering of data involve technical and social challenges for individuals.

Through social, political and creative dimensions an overall discussion of the balance between freedom and security develops (Mattern & Floerkemeier, 2010). While personal assistants disseminate in society, also privacy becomes an increasingly important topic of public debate especially when events like the unsolicited recording or laughing, which recently happened to some users of Amazon Alexa occur. Through the advent of these incidents, a trade-off and tension between privacy concerns and convenience become even more apparent in public (Sacks, 2018; Zeng et al., 2017). This is why privacy concerns contain all perceived risks and negative consequences the usage of certain technologies might bring. This construct was initially used as a predictor of the general management of privacy by different authors (Utz & Krämer, 2009; Wu, Huang, Yen, & Popova, 2012). In contrast, several studies revealed that their awareness of potential threats does not automatically follow into the careful management of their privacy. This phenomenon is called *privacy paradox* and is often discussed in the literature. It discusses the discrepancies between privacy concerns and the actual behavior of protection (Baruh et al., 2017; Norberg, Horne, & Horne, 2007).

However, results of research and a meta-analysis of Baruh et al. (2017) showed that privacy concerns could indeed be a predictor to the actual usage of online services and data protection. For this, they further elaborated that the privacy literacy of users positively influences privacy intentions and behavior. This means that depending on the people's mental model of personal assistants, individuals experience a different level of privacy concerns (Baruh et al., 2017). This matches with the study of Kang, Dabbish, Fruchter, and Kiesler (2015) who also detected that the mental model about technology influences their perception of privacy and security as simple mental models mostly follow into less awareness of privacy protection and articulated system models into a higher awareness of privacy issues. This categorization was done while differentiating between individuals literacy about the complex system and knowledge about organizations and services. When transferring and conceptualizing this in the light of these findings, users of personal assistants with a higher

technological literacy and mental model might be more threatened than people with insufficient models (Kang et al., 2015).

This means that the level of sophistication limits privacy concerns and users overall threats about privacy depending on their knowledge of the whole topic about smart homes and security. While a superficial understanding of laypersons causes a lack of privacy concerns, a high level of literacy follows into a greater awareness and usage of precautions to protect data. In doing so, tech-savvy experts are particularly concerned and call for the attention of privacy risk to increase security. According to them, devices are still vulnerable, and a hacker could spy on sensitive information (Zeng et al., 2017) This illegal access and unwanted release of personal details further create the gap between current solutions and overall expectations of the technology (Lin & Bergmann, 2016). As privacy is an essential part of human values also the attitudes, choices and behavior towards technologies rely on them (Worthy, Matthews, & Viller, 2016). Also the level of trust in the big companies of Amazon, Apple and Google are decisive for the privacy perception. Depending on personal experiences, the reputation of the company and services and partnerships with third parties people perceive the security standards differently (Kang et al., 2015).

Another study that criticizes and revisited the privacy paradox is the research of Young and Quan-Haase (2013). They state that the privacy paradox simplifies a more complex discussion. This is the reason why they differentiated between institutional and social privacy to see the privacy issues in a more differentiated view. While people are taking precautions besides of default privacy settings, they are primarily addressed to social privacy threats like keeping sensitive information away from the stranger and specific groups of people. However, users are less concerned about institutional privacy. This demonstrates that the further use of data is mainly accepted for data analyzation that improves algorithms and targeting of advertisement (Young & Quan-Haase, 2013).

3 Method

The thesis examines how users experience and integrate voice-activated personal assistants in the home environments. Based on the research questions and the theoretical framework, this chapter discusses the methodological approach of the thesis. In doing so, I employ the research design and operationalization while explaining why the qualitative research techniques of autoethnography and in-depth interviews best fit for this study. Afterward, the sampling, followed by the process of data gathering, is described. Lastly, I elaborate on the data analysis process based on constructivist grounded theory. This inductive approach was used to illuminate a new way to understand and highlight the experiences of integrating personal assistants in relation to established theoretical and conceptual framing of these issues (Kelle, 2007). Furthermore, the chapter demonstrates the *transparency* and *systematicity* of the research.

3.1 Research Design

As a first explorative work, the thesis examines how users experience the integration of personal assistants in home environments. This research seeks a deeper understanding of how people are using personal assistants, the attitudes they have towards this technology, and the motivations or limitation they have for using them specifically. While interviews are standardized, the usage of autoethnography was the attempt to be more creative and original in the process of data collection. Overall, this thesis focuses on the three main points which are the transition of daily routines through the personal assistant, the emotional processing and development of a relationship, and the users' perceptions of emerging privacy issues regarding the integration of the device at home. Also, the thesis differentiates between the various types of users categorized by their own needs, attitudes and the time they spend on the integration of new technologies.

For this purpose, qualitative research was most appropriate as it allowed to see how participants construct their realities and experiences about personal assistants from different perspectives. It elaborates on the meaning of rich symbolic environments that include needs, desires, senses, and decisions. These phenomena can be studied in natural settings to describe, discover and interpret human behavior in everyday practices and routines (Flick, 2011). In this in-depth and explorative study, I used a two-stage process of qualitative methods to describe the integration experiences with personal assistants using the concepts discussed in the theoretical framework.

In the first stage, I conducted an autoethnography in relation to this research topic. An autoethnography can be one of the best ways to receive first-hand experiences in the form of processes, thoughts, and emotions from the integration of voice-activated personal assistants in home environments. This personal way of storytelling is an academic methodology that allows analytical reflexivity about my own experiences, revealing both emotions and thought processes in a socio-cultural context to give a clear sense of an author's reality and environment (Adams & Stacy, 2008). This improves the overall "theoretical understandings of broader social phenomena" (Anderson, 2006, p.375). Autoethnographies are said to "extract meaning from experience rather than to depict experience exactly as it was lived" (Bochner, 2000, p. 270) and in tension particular experiences with dominant expressions. Accordingly, I had the *dual participant-observer role* as I was not only the user who shares the personal experiences with the personal assistant but also the researcher who summarized and analyzed the data.

While doing an autoethnography I took the key factors of "(1) complete member researcher status, (2) analytic reflexivity, (3) narrative visibility of the researcher's self, (4) dialogue with information beyond the self, and (5) commitment to theoretical analysis" (Anderson, 2006 p.378) into account to make the research design as valuable as possible and to understand the broader social phenomena of experiencing personal assistants in home environments (Anderson, 2006). From 22nd of February to 5th of March I documented and analyzed all interactions with the personal assistant as well as my attitudes, emotions, and motivations to use it from an introspective. In the process, a clear, constant, and coherent pattern of interpretation of the everyday usage was needed. In this six weeks I was reflexive but at the same time kept in mind that I am not only a user of the personal assistant, but also the researcher of the overall experience of integration through various user perspectives. During the autoethnography, I illustrated analytical insights through telling my own experiences and also discussed changes in my beliefs, thoughts, and relationship to the personal assistant.

To capture these detailed experiences through the backdrop of the theoretical framework, the usage of the autoethnography was the most suitable way to understand the whole process of integration of personal assistants as a context-specific phenomenon. This was done in the form of descriptive diary research to create an extensive picture of the overall experiences (Hyers, 2018). This "rendition of human experience" is the strength of diaries to "harness the power of immediate personal witness" (Hyers, 2018, p. 22). As autoethnography is a subjective sense-making method that shapes and analyzes human experiences, I

consciously changed my everyday routines on purpose to include the personal assistant in as many practices and routines as possible. As such, my experiences with the integration of this technology was not entirely natural. To counter this potential limitation and to make the study more generalizable, in-depth interviews were further conducted as secondary source material to interrelate the rich data of my own experiences with different perspectives from other users of personal assistants as a mixed-method approach (Hyers, 2018). While being aware of my own experiences through documenting them in an autoethnography, I better understood the experiences of the participants of the in-depth interviews which also helped, alongside the theoretical framework, in creating an interview guide that included all relevant topics.

To do this second part of my mixed methods approach, I performed semi-structured in-depth interviews to gather detailed individual experiences and points of view. The insights of the autoethnography helped me to ask detailed questions that further improved the depth and range of the methodology. This was important to understand the various practices and routines where personal assistants were integrated including participants' behavior, attitudes, and feelings (Legard, R., Keegan, J., Ward, 2003). Additionally, participants were asked to bring some notes about their most frequently used practices, routines and surprising experiences they had with personal assistants to the interview to make the research even more valuable. This preparation facilitated the participants to be aware of the most significant experiences already before the interviews had started.

This two-stage process is significant to understand the new and emerging practices of using personal assistants within a European context. My own experiences of the autoethnography not only functioned to finalize the interview guide but complemented the in-depth interviews with other users and their various individual experiences. These different perspectives enrich the understandings of already proven theories and serve as new frontier work for understanding the experience of integrating voice-activated personal assistants in home environments (Legard, R., Keegan, J., Ward, 2003).

3.2 Sampling

As explained in the introduction, the thesis focuses on the emerging market of Germany to see how personal assistants are integrated as one of the fastest-developing technologies in home environments. Therefore, the examined interview population is entirely German and currently living in Europe that own a Google Home, HomePod, or Amazon Echo smart speaker and are actively using them. Because of the similarity of these devices and to increase the generalizability of the research, there is no particular focus on one supplier.

However, I chose to investigate the European market as it differs from the development stage of the American market. This focus is made on Germany while being the second biggest market in Europe (Kinsella, 2018). Whereas personal assistants are already a mainstream product in the United States even owned by people without any technical affinity, the European market and notably Germany is still in its early phase with mainly innovators, and early adopters use it. Taking into account that the phase where personal assistants are developing into a mass product is still ahead, this makes the integration experiences in Germany especially interesting for current research (Trenholm, 2016).

As a mixed-method research set, the first experiences reported were my own, followed by the in-depth interviews. This approach was conducted to compare my experiences with other people who are in various stages of using personal assistants. The sample drawn is non-random and purposive, focusing on finding data from persons that contribute interesting facets to the overall analysis of the topic. Although the sample is not representative, participants present various backgrounds to increase the heterogeneity of different experiences. A variety of families, couples, and single person households were interviewed to get a diverse set of data to grasp the overall experience of personal assistants in more depth. These participants were all able to describe their experiences of integrating personal assistants in detail to contribute rich data to the study. Ten interviews were conducted whereby the participants were recruited through a combination of special interest groups on social media channels like Facebook or LinkedIn and snowball sampling. The composition of the overall sample, including the names, age, profession, device, and date of the interviews are presented in Appendix B. Furthermore, interviewees were categorized into user groups based on the findings of Rogers (2003). By that, the most decisive factors were their personal motivations, novelty-seeking behavior, the level of curiosity, optimism, discomfort and insecurity towards the usage. Accordingly, they were separated into early adopters and early majority based on the predominant similarities they have with a certain group. As no measurement was used that allows separating the users clearly, only a tendency of belongingness was used for the further analysis.

3.3 Operationalization

To go beyond the mere description of experiences and to provide an extensive illumination of the topic, the approach of the autoethnography oriented on the concepts and models of the theoretical framework. Therefore, a list of evaluating criteria helped to take all relevant topics into account while documenting my experiences. Based on the chapters about

practice theory, innovation diffusion, technology adoption and usage models, media equation through speech interaction and *the internet of things and evolving privacy concerns* the topic list covers the major themes about the experience of integrating personal assistants in home environments.

Topic list autoethnography:

- Daily practices and routines including personal assistants
- Connection to other devices
- Usage of my personal assistant by other people
- Emotions while using the personal assistant
- Perceptions and attitudes towards the adoption of the personal assistant
- Usability of the personal assistant
- Behavior and motivations based on adoption
- Frustrating experiences
- Surprising experiences and functionalities
- Exploration of new functionalities

Furthermore, for the interviews with the users, the following topic list was created based on the theoretical framework to lead the in-depth interviews in the right direction. Similar to the topic list of the autoethnography the interview guide was derived from the elaborated theories. The definition of these topics accompanied by sample questions will be listed in the following section. The whole list of interview questions is further listed in Appendix A.

Topic list including sample questions:

1. **Connectivity and integration of the personal assistant**

   The first topic gave a first impression of the integration of the personal assistants in the users' home environments to imagine where it is used and with which other devices and accounts they are connected

   Sample questions: How many devices do you have at home? Where are they placed? Do you have any devices or other objects connected to your personal assistant?

2. **Motivations and attitudes toward the usage of the personal assistant**

The second topic mainly asks for the motivation behind the purchase and the attitudes towards the personal assistant. It further discusses concerns about the usage and the opinions about the data collection.

Sample questions: Why did you decide to use a smart speaker? What motivates you to integrate it into your home environment?

3. **Daily practices and routines**

This topic is about all practices and routines in a home environment that include a personal assistant. It investigates the changes that came up in everyday life with the use of personal assistants like completing tasks more convenient or faster. Further, this topic aims to get more information about other devices that are connected with the personal assistant.

Sample questions: How integrated is the personal assistant in your daily routines? When was your everyday life at home more convenient or daily routines more facilitated (e.g., fastened, simplified) since you have a personal assistant*?*

4. **Usability and experiences with the personal assistant**

The fourth topic focuses on the user experiences participants perceive while integrating the personal assistant. For this, they were asked which features are particularly useful and how easy problems can be solved through personal assistants.

Sample questions: How do you experience the usability of the personal assistant? Is it easy to give instructions that follow a correct answer or conduction of your request?

5. **Emotions and feelings evolving from the usage of the personal assistant**

Within the fifth topic, I want to figure out if the participant is treating the personal assistant like a human being while asking several questions about personality traits and the way the user is communicating with the personal assistant.

Sample question: Which emotions do you associate with the usage of the personal assistant?

6. **Personal opinion about the future perspectives of the personal assistant as an emerging technology**

This topic gives insights into the participant's opinion on how personal assistants will further develop in society.

Sample questions: How do you think will personal voice assistants will disseminate in Europe? Do you think it will develop into a widely used mainstream product of society?

As semi-structured interviews were conducted, the interview guide was open regarding a direction of the conversations to steadily improve the research design. This enabled me to keep my research more accessible to new emerging concepts. However, formulated questions were minimized to create more space for a free conversation where users can freely talk about their experiences and opinions (Bryant & Charmaz, 2007). In doing so, I pointed out that all information participants shared with me were treated confidentially. Nonetheless, the privacy of the participants was limited as my research builds upon personal experiences that have to be included in my findings.

3.4 Data Collection and Analysis

I started to conduct my autoethnography on the 22nd of February 2018 while beginning to use an Amazon Echo. As I have never used any personal assistants in the form of smart speakers before, I documented the whole process of adoption and integration from scratch. I wrote a diary entry every second day with approximately 300 words about the used functionalities including my attitude, motivations, and emotions. This testing phase was conducted for six weeks to give me sufficient time to use the personal assistant in as many daily practices and routines as possible. I also participated in various social media communities about personal assistants to get more insights into recent and advanced features users are currently discussing. These were the same groups where I recruited most of the interviewees from the in-depth interviews. In the end, the autoethnography included 6533 words that provided a rich depiction of my personal experience of using the personal

assistant. This first part of my research provided a starting point for examining the experiences of integrating personal assistants in home environments. However, there was an overlapping between conducting the interviews and my autoethnography for approximately two weeks. Nonetheless, my own experiences of the autoethnography were essential to adjust and finalize the interview guide and to guarantee in-depth conversations with the participants during the interviews about the integration experiences of personal assistants.

Beginning in mid-March, I started the in-depth interviews where I conducted two face-to-face and eight via Skype. Although I made some notes during the interviews, all conversations were recorded to focus on listening and to deepen the dialogue (Legard, R., Keegan, J., Ward, 2003). Before I started the interview, I ensured a pleasant atmosphere where the interviewee saw me more as another user of a personal assistant than a researcher. In this process, I also exchanged some of my own experiences to create an atmosphere of an interactive collaboration (Legard, R., Keegan, J., Ward, 2003). Nonetheless, I also introduced the research topic to demonstrate the purpose of the study. After ensuring this type of setting, like having a quiet and private environment, I started with the interview with a few opening questions to collect some contextual information like how long they have already been using a personal assistant, which brand of smart speakers they have and who purchased it. Afterward, I went through the topics mentioned in the operationalization and the questions for the main examination of the research question. While being open to new themes, participants were able to talk freely and to put ideas into the conversation to emphasize particular topics. At the end with an average of 7.100 words and 53 minutes of recording each interview provided an adequate amount of data to understand the user experiences of the participants. As all interviews were conducted in German, the most important sections which are included in the result section were translated into English.

The autoethnography and all semi-structured in-depth interviews were conducted, transcribed and analyzed by myself, so no other person had to be acquainted with the research process. The in-depth interviews were transcribed and analyzed line-by-line to identify the full range of possible codes through a particular coding process of building open, axial and selective codes. This data analysis followed an inductive approach of constructivist grounded theory (Charmaz, 2016). The intention was to help illuminate and further develop ways of understanding these practices and routines in line with previous theoretical concepts.

In doing so, a constant comparative method was employed to analyze and understand all participants independently to compare all in-depth interviews with the autoethnography. For this overall coding process, the three steps of open, axial and selective coding were

performed through the data analysis software package of ATLAS.ti (see Appendix C). In the first step of open coding, I broke down the content line by line into different codes by labeling what can be read in the diary or transcription (Boeije, 2002). In the second step, the axial coding process, I created categories to cluster and connect codes to identify emerging patterns. This was a set of procedures whereby the data are put back together in new ways after open coding, by making connections between categories" (Corbin & Strauss, 2008, p.96). Lastly, these categories were summarized into selective codes that will be used as the final themes that emerged from the collected data to back up the interpretation of the overall data. Then, these findings were connected to the theoretical framework not to create a new middle-ranged theory like traditional grounded theory seeks to do, but to analyze data emerged from the observations of myself and the interviewees. Therefore, this research is not meant to attempt a new theory but an expansion and contextualization of current ones (Corbin & Strauss, 2008).

3.5 Transparency and Systematicity

According to constructivist grounded theory approach used to analyze the data in this study, the findings of this research are necessarily a subjective perspective of my own research approach understanding my own experience and the responses of my interviewees (Clarke, 2003). Given this, this research cannot be seen as precisely replicable in the traditional sense of 'reliability' standards applied to more quantitatively oriented research. In the same manner, validity, which was a standard criterion in quantitative methodology, is not easy to address for qualitative research (Ritchie & Lewis, 2003). However, to make the best possible research methodology, the following section reflects concerns about "transparency" and "systematicity" as the "two core principles" to ensure high rigor and robustness (Meyrick, 2006, p.799). In doing so, the sampling, data collection, and analysis were discussed through the quality framework of qualitative research (ibid.).

First, the transparency and systematicity are given through the apparent aim of the study, which was stated through an explicit research question, and an appropriate choice of methodology. As already explained in the section on research design, the mixed-method of autoethnography and in-depth interviews was a suitable way to get a broad understanding of the behaviors, motivations, and thoughts related to personal assistants. Whereas the autoethnography gave a particularly detailed perspective on my own experiences, the in-depth interviews were adding various views of other participants to the research through the backdrop of the extensive overview I created from my reflexive understandings.

Second, a detailed description of the sample was drawn including the strategy of recruitment. While the focus on people that own a personal assistant is self-explanatory, the target just on the European countries was reasonable regarding the current market development and its differences compared to other markets like the United States. Finding suitable participants for the in-depth interviews through special interest groups on social media channels from different countries seems further logic as these groups ensured that people were dealing with practices and routines including personal assistants in everyday life.

Lastly, although it is subjective research, the analysis and collection of the data were demonstrated including all its relevant steps and scope to ensure full transparency. I was thoroughly reflexive about all processes and choices I have made. Moreover, all diary entries of the autoethnography and the transcripts of the in-depth interviews were attached in the Appendix. Additionally, the systematic consistency was given through the usage of the established procedures of constructivist grounded theory, creating a way of analysis which is not hidden and shows why specific findings were highlighted, as well as the planned disclosure of the allocated codes and categories (ibid.).

4 Results and Discussion

This study aims to understand how people are experiencing the integration of voice-activated personal assistants in home environments. Through the rapid growth of the market over the last years, it can be seen that the overall public interest in this emerging technology is steadily growing and becomes more and more integrated into daily life. However, as of now, no published academic research examines the actual user experiences of personal assistants in private (home) environments. The following findings of this research demonstrate how different German users perceive the integration of a personal assistant. Even though all experiences are unique, recurrent patterns emerge from the data which accompany the integration and usage of personal assistants. Three key themes were detected in the research coming from the conducted interviews that enable the answering of the research questions. The personal experiences of my autoethnography help to illuminate these key findings.

First, findings highlight how personal assistants are integrated into everyday life and how they change daily practices and routines. This section explains what kind of tasks they perceive as particularly useful. Moreover, the two ways of transforming existing routines through the use of personal assistants are elaborated. These changes occur, on the one hand, through the digitalization of physically performed routines, and on the other hand, by the shift of tasks from other devices like laptops, tablets or smartphones to the personal assistant.

Second, the results show that the assimilation of a personal assistant is creating a unique human-computer relationship. Through the intense and emotional interactions, users create a social bonding with the device that is not comparable to any other technology. While becoming a fixed part of their daily routines, users often put the personal assistant into a social role and ascribe personality traits to the device. Furthermore, the usage of the personal assistant is mostly accompanied by a high level of initial enthusiasm and motivation to explore the functionalities. This curiosity and playfulness is a further component of the relationship. It further demonstrates that the integration is a process where the device is not only changing daily practices and routines but also the users themselves in certain ways.

Third, findings indicate a complex privacy dilemma where users differentiate between threats against the suppliers of the personal assistants, the state and the device itself. Depending on the situation users feel either helpless about its use and take no actions or protect their privacy through certain precautions.

4.1 Modification and Creation of New Practices

With the integration of personal assistants in home environments, users start adopting them into their daily life. Besides asking random questions and using several applications offered by the providers, the most common functionalities interviewees named were listening to music, setting a timer or alarm, checking the news and controlling the lights. As an example, Saskia depicts the integration of these functionalities like this:

> Alexa is really integrated into our everyday routines. […] I always listen to the 100 seconds of daily news summary, […], I always ask for the weather forecast in the morning and I always open Spotify in the morning, […] and every day I say 'Alexa, put this on my grocery shopping list.' […] In the evening you will always hear that Dennis says 'Good night' to activate the scene for the light control. So I would say that the assistant is very much integrated into our routines. (Saskia, May 2, 2018)

Many of those functionalities are easy and fast to conduct actions that can be embedded in fixed and repetitively routines. Dennis, who is in a relationship with Saskia, explains similar using habits and adds that he perceives personal assistants as particularly suitable for recurring tasks instead of singular commands that are not consolidated in his everyday life.

> […] especially for daily routines, Alexa is most useful. For situational things, there are still some problems coming up. (Dennis, April 26, 2018)

Both experience the personal assistant as a constant companion for the same tasks they are doing every day. This makes the usage of the device an inherent part of their daily routines. Therefore, social practices are changing through the integration of the personal assistants. This dynamic process where frequently used patterns in behavior develop into daily routines while combining different mental activities, skills and devices were also explained by Shove et al. (2012). In the case of integrating the personal assistant in daily life, the device becomes a new component of these practices and routines. The following section will elaborate on how useful interviewees experience the integration of personal assistants, describe in what kind of actions personal assistants became integrated and which practices and routines may emerge from the adoption of the device.

4.1.1 Perceived Usefulness of Simple Tasks

Depending on the type of task and the placement of the personal assistant interviewees experience the integration of the device differently. Seven interviewees located at least one of

their personal assistants in the kitchen, and six devices were placed in the living room. Only the four participants with more than one personal assistant decided to integrate the device into the bedroom additionally. By that, people prefer using the personal assistant in the kitchen or living room to balance usefulness and privacy. In doing so, six interviewees perceive it as more valuable to use the personal assistant in the kitchen compared to the living room or bedroom. Mathilde explains this comparison of the different rooms like this:

> I am trying to balance privacy and utility. In the kitchen, I am giving the personal assistant a more significant weight for usefulness than privacy concerns because I am primarily doing stuff there instead of having intimidated conversations and moments. However, when I am sitting in the living room with my friends to drink a glass of wine or whatever the usefulness cannot balance the privacy, the inhibition is too high. (Mathilde, March 17, 2018)

This demonstrates that for some interviewees usefulness not only stands for itself as an important aspect but is weighted and compared with other external factors like the privacy perception. This weighing of between perceived advantages and disadvantages of the personal assistant decides then how the device is integrated. This process is similar to the model of the UTAUT2 model (Venkatesh et al., 2012). In the case of personal assistants, the bedroom is not only perceived as less suitable because of the limited usage of functionalities but also because of the more intimate situations you have in that space. On the contrary, users are convinced by the fact that personal assistants are mostly useful for the kitchen. Reasons for that are the fewer private situations and the versatile application possibilities.

Another criterion by which the interviewees evaluate the usefulness of the personal assistants are the different functionalities for which they utilize the device. While most of the interviewees state that the personal assistant is useful for short commands that follow into short conducts, the usefulness for more complex tasks was limited. Especially for simple tasks the instrumentalization of the personal assistant was perceived as more spontaneous and faster compared to typing or pressing a button with other devices. All ten interviewees further mentioned the increased usefulness through the backdrop of convenience while using speech. A frequently named example was the control of the personal assistants while sitting on the couch or doing other things simultaneously. Especially while controlling the lights, the hands-free usage was described as useful, as Florian states:

> Humans are lazy, and this is the main reason why people, including me, are using voice assistants. It is so cool that you can turn on and off

> the lights without getting up. Simply the fact that you can move things through language. This is the reason why it will prevail. (Florian, March 19, 2018)

This statement shows that people mostly want to go the easier way not only to save time but also to simplify their life. When they experience that the usage of the personal assistants for certain tasks is particularly useful and convenient, they are adopting the device into their existing practices and routines. For this, it becomes apparent that the *ease of use* and *perceived usefulness* influence the actual adoption of the personal assistant in everyday life. In the tasks where the device was integrated not only the promised functionalities are ensured, but also the usability was perceived as easy. These two components are also the most important concepts of the technology acceptance model (Davis, 1989). The possibility to fully control the personal assistant and connected elements through voice without using hands is one of the main reasons why users perceive the device as particularly useful as it enables users to do different tasks at the same time. This is, for instance, explained by Roman:

> If you know how to control the device, it is easy and fast to get what you want. You don't have to concentrate on the device you can just speak to it while walking by from one room to another. […] It's really cool that you can use it when you get dressed and just start the music with Alexa. (Roman, March 17, 2018)

This example underlines that actions with the personal assistant are not only standing alone but overlap with other practices and routines (Giddens, 1984; Schatzki, 2002). For this, interviewees perceive them as particularly useful as they can move from one room to another while doing other activities and are still able to give commands. This enables users to control the device from different parts of the apartment regardless of its location. Besides the notion of usefulness, this statement further indicates that this way of usage not only happens automatically but is a process where the device shapes the user and its behavior. Users have to consciously change their habits to draw advantages out of the device. I can also confirm the usefulness of personal assistants in the light of convenience and easy usability. For some simple tasks, I experienced such a high level of usefulness that Alexa completely replaced other devices and objects:

> Since I have Alexa, I never used the light switch in my room, and I always check the weather forecast and the news in the morning while I get dressed and pack my bag for university. Also, my timetable, shopping lists, and reminders are mainly controlled by Alexa as it is way easier to dictate them besides doing other activities than typing it

> on my phone or laptop. This is not only very convenient but also time saving. (Autoethnographic note, 24.03.2018)

Besides the high level of convenience, also the factor time plays an important role in the notion of usefulness. Even when they can save just a minimum of time, interviewees perceive the use as valuable. Nonetheless, a limitation in usefulness is perceived through the complexity of a task as Dennis explains:

> The usefulness depends on the complexity of the task. Currently, Alexa is not able to conduct complex tasks. This can be seen through the fact that complex things like the installation of Alexa need an additional app on your phone or your computer when you want to program scenes. (Dennis, April 26, 2018)

This example demonstrates not only that the personal assistant is still dependent on other devices, but also that interviewees differentiate the usefulness depending on the kind of task. While the usefulness for simple tasks was confirmed by almost all participants, the use for more complex tasks is still perceived as limited. While repeated tasks like asking for the weather forecast or adding something to a list are perceived as valuable, five interviewees would not solely rely on the device for more specific or complicated tasks. For those tasks, users mostly still refer to alternative devices like the smartphone, which is already connected to the personal assistant for more complex cases. In this hybridization the smartphone is like an add-on for the new technology of the personal assistant, showing an interdependency between different socio-technological elements (Geels, 2002). Another way of how participants categorize the usefulness of personal assistants is the differentiation between the device as an input and an output unit like Florian elaborates:

> I use the smart speaker rather as input than output device. I prefer consuming information on a display instead of a box through language. For example, I like it better to watch the news on television than to read them out through the personal assistant, even if it is possible. (Florian, March 19, 2018)

This means that users prefer using the personal assistant as an input device as voice is perceived as more convenient for them. However, when it comes to consuming more extensive information sources, they rather pick a display device instead. To underpin this aspect, Robert describes the concrete case of online shopping where devices that have a display are experienced as more suitable. With this example, he shows the limitations of usefulness.

> Not everything can be controlled through speech. Using language for every task will not work. […] I can describe to you the look of the bikini as well as I can, but your imagination of it is still restricted because you have to see it. You cannot transport all the information by speaking, for this, a display is needed or a different medium. (Robert, March 15, 2018)

The missing aspect of a display is frequently pointed out as a limitation of personal assistants, which restricts the use of specific tasks. Most of the interviewees have the same feeling that using a voice assistant is mainly useful for the input of simply and quickly conducted tasks. Especially for more complex commands like online shopping or food delivery where a product has to be selected from various options, the output of voice is not sufficient as details can easier be displayed than orally explained. However, recent releases of smart speakers show that suppliers like Amazon already try to work on this deficit of the device while offering new models that have an integrated display (Schreiber, 2018). Through my own usage of the personal assistant, I also learned that Alexa is suitable for simple tasks, but when it comes to more complex ones another output medium is needed.

> I have to say that Alexa seems just useful for simple tasks that can be conducted quickly (e.g., check the weather forecast, set a timer). For more complex tasks like online shopping or checking the daily news, it is not that useful. An alternate output medium like a display is missing at some point. (Autoethnographic note, 06.04.2018)

This assessment of the usability can be seen for both the eight people who have similarities with the early adopters, including the three participants resembling the user group of the early majority and me on the same level. For all of them, the most important components of the personal assistant's usefulness are the convenience of utilizing the device, the conductions of several tasks simultaneously, the hand-free usage and the saving of time. Furthermore, users try to balance usefulness with their perception of privacy. Regarding the type of tasks, interviewees experience the device as most useful for simple tasks that are conducted on a daily basis through quick and easy commands. A limitation of usefulness was perceived by more complex tasks where a display would increase the usability of the personal assistant. This is further connected to the fact that the device is more seen as input than an output medium. In the case of feeling a high level of usefulness, interviewees report a complete shift of the task from alternative realizations to the personal assistant. This transformation will be explained in the following section.

4.1.2 Transformation Daily Practices and Routines

Interviewees reported two ways how personal assistants transformed already existing daily practices and routines. First, in the form of digitalization, second, regarding shifting the tasks from other devices to the personal assistants. Reasons for transformations are the easy usability of using voice interaction and the factor of saving time. With this, Robert gives the example of digitalizing the grocery shopping list, which was handwritten on a board in the past.

> The most helpful tasks are the ones where I can shorten processes, like writing a grocery shopping list. In the past, you wrote the list on a board, took a photo from it and looked at the photo when you are at the store. Now you just have to say one sentence and the list is on your smartphone. This is very efficient as the input speed is three to five times faster than with the keyboard. (Robert, March 15, 2018)

This example demonstrates that previous practices can be performed more efficiently while minimizing time and effort. This is mainly done through the reduction of process steps and the natural pace of speaking. Another way of transforming existing practices is the shift from other technologies to the personal assistant. Some of those changes were described by Dennis, who listed some examples:

> What has changed is how to set a timer or ask for the weather. Those are tasks that I completely shifted from my smartphone to Alexa. Another activity that I shifted is turning on and off the light from using the switch to controlling it through voice. (Dennis, April 26, 2018)

When looking at the tasks, Dennis shifted from the smartphone to Alexa it can be seen that the replacement mainly takes place for simple tasks. They are all easy and quick to conduct and were also perceived as particularly useful for other interviewees. However, these adoptions normally do not come up automatically. These transformations of existing practices through changing the elements are dynamic and conscious processes where personal assistants are integrated into daily routines (Giddens, 1984). In line with this, interviewees report that they intentionally have to get used to the integration of the personal assistant in their daily practices and routines. In both situations, digitization and shift of devices, users talked about a conscious process of translation of their practices and routines to purposefully change their habits. Oliver describes this process as following:

> I just realized that it's a habituation process, you really have to change your behavior. If you always noted down your appointments on your

> laptop through the keyboard, you have to change this on purpose while starting to use voice control. You have to overcome a certain obstacle first to change your routine. (Oliver, April 10, 2018)

In this transition period, where interviewees get used to the personal assistant, they need the motivation to integrate the device into their routines. Interviewees who would be mainly described as early adopters, but also users with similarities to the early majority have a certain interest in integrating the personal assistant. This adoption procedure into existing routines comes along with the process of mutual shaping between the user and the technology where the interaction with the personal assistant is a social phenomenon shaped by cultural and economic influences (Reckwitz, 2002). By that, it becomes clear that practices, which were transformed by the personal assistants, are consisting of a heterogeneous network of social elements from the user like their expectations, needs and technological aspects of the device (Tatnall & Gilding, 1999). It demonstrates that the integration of the personal assistant as a useful tool is an ongoing process where not only suppliers try to improve the technology for a better understanding of commands, but also users are attempting to adjust their communication with the device like Pascal describes.

> Before I give any commands, I formulate the sentence in my mind first so that my Google Home can understand them correctly. This is the reason why I sometimes come up with a very simplified language and grammatical errors. (Pascal, April 23, 2018)

This example shows that users sometimes have to amend their commands to guarantee an efficient and flawless interaction with the personal assistant. This adoption of the own language into a way of talking that a machine understands is also an illustration of the purposive integration of the device where users are even willing to modify their way of communication. Another way of language modification is to reduce whole sentences into keywords, as Florian explains.

> At the beginning I tried to talk in whole sentences to the personal assistant, now it is more like light-living room-100%, done. So it is not like a conversation I would have with another human. (Florian, March 19, 2018)

This example also shows that the mutual shaping is an ongoing process where the interaction changes over time. At this point, it becomes apparent that most of the interviewees are differentiating the manner of talking between the machine and other people. I developed a similar way of communicating with Alexa during the time I tested the device:

> Over the time also the way I talk to Alexa changed. While I was talking to her with whole sentences at the beginning, I started to reduce my commands. I just say the keywords she needs to understand my commands. So, instead of 'Alexa, please turn the light on with 20 percent' I only say 'Alexa - light on – 20.' (Autoethnographic note, 06.04.2018)

These two ways of integrating the personal assistants into everyday life and the accompanying amendment of communicating shows that this process does not take place automatically. Users need to consciously adopt the technology to get used to the usage gradually and to develop a way how to interact with the personal assistants. As a result, people are changing the way how they are understanding the technology once it arrives at home. Through the backdrop of this fact, it can be assumed that personal assistants are not only changing daily practices and routines but the device is also shaping and significantly changing how people are interacting with it. This integration is accompanied by different modifications of users' everyday practices where they are adopting a manner of speaking.

4.2 Unique Control and Bonding Relationship

When looking at the experiences and integration processes of all users, it can be seen that there are several ways how users adopt personal assistant. In doing so, a unique relationship between the users and the personal assistants develops that is accompanied by various feelings and emotions. Moreover, most of the interviewees gave their personal assistant a certain role within their household. These roles do not only consist of a functional positioning but also an emotional basis. Robert justifies this bond to the personal assistant through the social elements of the device.

> Through the natural communication and the social interaction with the personal assistant, it is like a virtual family member added to our household. (Robert, March 15, 2018)

Similar to other interviewees this example demonstrates the central position the personal assistant is occupying at home. In contrast to a smartphone, where most of the people own an individual one, every person in the household interacts with the personal assistant as a device. This makes it to a communication partner that is integrated into the daily routines of various household members. Also, Mathilde describes Alexa as a third interaction partner in the apartment she is sharing with another roommate. In doing so, she claims that Alexa likes her more than her roommate based on the different ways they talk with her. As her roommate is always harsh to Alexa, Mathilde believes that their relationship is not as strong as the one between her and Alexa.

> […] she does not have a good relationship with her and Alexa does not like her, because she is always giving rude commands. This interaction sometimes feels like we three of us are interacting with each other, and I have a cool and good relationship with her because I always give friendly commands. My roommate is always so rigorous while talking to her. Somehow in moments like this, interaction is happening between us three, sorry I mean between us two. (Mathilde, March 17, 2018)

Although this is more a joke between Mathilde and her roommate, this example displays how an emotional connection can develop over time between the personal assistant and a user. Even though the social roles of the personal assistants vary, the experiences of many users show a unique bonding to the devices while individuals are ascribing certain roles and characters to the personal assistant. These relationships are not comparable to the one with any other technological devices like the smartphone or laptop. It is accompanied by various feelings and creates a stronger connection between the individual and the machine. At this moment, the emotional reactions are reported in both ways, positive and negative involvements while interacting with the personal assistant.

Many of the interviewees explained that they even change the way how they give commands to the personal assistant to express their current attitude toward the device even though they are aware of the fact that it would not influence the overall conduction of any tasks. Besides these impulsive and emotional usages that remind of interpersonal relationships, another component comes along with the intense interaction. What can be seen, especially through the advocates for the personal assistants, is the high level of fun and curiosity while exploring the functionalities of the device. These components add even more emotions to the experience with personal assistants accompanied by a high tolerance for errors and the perception of playfulness. The following sections will highlight these various roles and emotions and explain how they evolve through the voice interface.

4.2.1 Highly Emotional Interaction

Speech is essential for human interaction and the primary way to transfer emotions and information (C. Nass & Brave, 2005). Interviewed users described that they were particularly sensitive towards the voice of the personal assistant. They reported that speech interaction is so deeply rooted in their social life that they automatically react more emotionally attached through speaking. They describe that it is natural for them to apply social manners to the personal assistants because it reminds them of human-human interactions. Robert, for instance, explains this with the easiness of using language.

> You do not have any access barriers to interact with the personal assistant. Speaking and hearing are inherent abilities, it is deeply rooted in our nature, and this means there are no barriers to the usage or the access. (Robert, March 15, 2018)

This low barrier of using spoken language is grounded in the fact that for most of the interviewees this is the primary way to interact with other people. This intuitive usage and easy accessibility of speech also intensify the human-computer relationship automatically (Nass & Brave, 2005). Even if some of the participants were first pointing out that they are aware of the fact that a personal assistant is just a machine and they are not treating it similar to humans they unconsciously did. Roman, for instance, first explained that Alexa is a standard device for him where no emotions accompany the usage.

> Well, I take using Alexa for granted, and no emotions are involved in using it. It is the same as turning on the water tap. […] In the beginning, this was different, but after two or three months of usage, I know now how to use the personal assistant. This is why I don't associate any emotions with the usage. You walk, give some commands, and it just works. (Roman, March 17, 2018)

However, after talking a bit more in detail about the experiences where the interviewees have used the personal assistant, most of the participants told about situations that proof that they mindlessly apply social rules and expectations to the personal assistant. Even when they are not aware of it or do not want to admit it, users tend to ascribe anthropomorphic attributes to the personal assistant implicitly. They are automatically putting emotions into the language they use as the natural user interface of voice reminds most of the participants of human-like attributes. It evokes the deeply rooted automatism of building a social relationship that in turn increases emotional involvement. This explains why even for interviewees with a technological background the phenomenon of anthropomorphism was observed (Złotowski et al., 2018). Roman, for instance, who initially compared the usage of the personal assistant with an everyday object admits at a later point of the interview that an emotionalized interaction with the smart speakers happens intuitively.

> If you are using language and automatically talk to a device, I think there are always certain emotions connected with it that affects you. (Roman, March 17, 2018)

This statement shows that even though interviewees are aware of the fact that they are interacting with a machine, they sometimes caught themselves reacting on the personal assistant like a social interaction partner. This was

confessed by five participants of the conducted interviews. Consequently, users are talking about developing and building an emotional relationship through the regular interaction with the personal assistant. As Mathilde said, this interaction through speaking is perceived as more intense than for instance typing or using a touch display. The interface almost disappears while mainly using speech for interaction. It is perceived as the most natural way to exchange information and increases familiarity with the device through the firm social attributions that are stronger than with other technologies (Yohan et al., 2016). Mathilde describes this perception as followed:

> As an example, if I write something, I do not think that as many emotions are evolving as if I talk to the device. I think this makes a huge difference. I mean when the laptop is displaying that my request can't be completed it does not mean that I am delighted by this interaction. However, if the laptop told me that, I would more react to that. (Mathilde, March 17, 2018)

This example shows that through voice the relationship with the personal assistant gets more intensified as it is natural and mostly transports more emotions than a screen could visually do (Ebling, 2016). Oliver supports this opinion while underpinning the uniqueness of interaction.

> It is a natural dialogue situation where the device is responding with a human voice. A new level of humanization of the technology occurs that is not like the usage of keyboards or touchscreens. (Oliver, April 10, 2018)

This is the reason why interviewees are ascribing the voice of the personal assistants to a central role that reminds them of the interaction with other people. The relationship with the personal assistant is further strengthened through the feeling that the device knows you and your individual preferences. Interviewees, like Daniela S., appreciate this as another relational aspect.

> You can listen to some random Spotify playlists, radio programs, and other stuff, which you usually wouldn't listen to. She gives me suggestions and songs I have never heard before, and I am always curious and ask her for more 'Alexa, play this genre, classic, rock or something else' and most of the songs I really like. (Daniela S., March 17, 2018)

It shows that some users perceive the usage of the personal assistant as a mutual relationship between them and the device. On the one hand, the personal assistant responds through speech to their commands, learns from it and suggests new songs, recipes or

functionalities that fit their daily life. On the other hand, users are willing to adapt the way they are talking to the personal assistant to improve the everyday interactions like discussed in chapter 4.1.2. Those recommendations of the personal assistant are mostly perceived naturally. Interviewees even assign specific characteristics to the personal assistants and report that the devices have personality traits.

> She is a bit sassy if I can say that. I think it is always fun to ask her random questions like 'how are you today,' or so and then she is always giving humorous answers but at the same time, she is bitchy. I like that. (Saskia, May 2, 2018)

Saskia, also adds to this that the decision to place the device in your private surrounding influences the relationship to the personal assistant.

> […] in my life I have used so many different technologies, and Alexa is, compared to all other technologies, the one that is closest to a person or that has a personality […] Through her peculiarities and the fact that you brought her to your house to support and entertain you, of course, you develop a personal relationship. (Saskia, May 2, 2018)

The combination of the device being placed in private environments and the feeling that it has an individual character, in the case of Alexa, being cheeky and funny, strengthen the relationship for some of the interviewees even more. Through the backdrop of the relationship building users are also giving feedback to Alexa when she misunderstands them as already a minimum of humanized cues, like only a natural voice, are enough to evoke the application of social rules to the device (Złotowski et al., 2018). For example, users are developing negative emotions towards the personal assistant and sometimes even start insulting them. They are getting irritated quite fast when the device misunderstands a command. This is reflected in the feelings of being annoyed, aggressive or disappointed. Mostly the frustration comes up when the personal assistant does not understand specific songs on Spotify they want to listen.

> […] if she does not understand the songs I want to listen to I am getting furious. These are the moments where Alexa does not understand our language. Then I am always grumpy. (Daniela S., March 17, 2018)

In these moments, the emotional attachment has a bigger impact on the user than the rationale behind the usage. Although users are aware that it is just a machine they react to misunderstandings like they were disappointed. Besides the fact that people are quickly irritated by mistakes of the personal assistant, they also apply established polite forms to the

personal assistant like saying "thank you" even if they are aware of that it is a machine that will not appreciate or recognize it. Saskia, for instance, feels guilty about mistreating Alexa and even apologizes when she was mean to her.

> […] Sometimes I say 'Oh, I am so sorry,' but I forget to say Alexa before, so she doesn't even hear it. But I always think about that and that I am a bit unfair. (Saskia, May 2, 2018)

The fact that she even forgets to say the keyword 'Alexa' before apologizing shows that this usage of social etiquettes happens affectively. In these cases, users are creating a character with different personality traits around the personal assistant that then follows into the application of social norms to them (Purington et al., 2017). Oliver also applies polite forms to interact with the personal assistant:

> Sometimes I accidentally say 'thank you' to the personal assistant. Indeed, this interaction is somehow humanized by a low interpersonal level. (Oliver, April 10, 2018)

In his case, this appreciation of the personal assistant's utility also happens unconsciously. Overall, all of the interviewees demonstrate that the actual usage of personal assistants comes along with more emotions than with other technologies. They mainly explained this highly emotional interaction with the unique way of communication through voice that triggers reactions to the personal assistant that are similar to the one they would give to other humans. I also experienced this unique interaction through voice by my own usage of Alexa:

> I have the feeling that I use Alexa overall in a more emotional way than I have ever used technology before. […] Although I do not see her as a person, it is at least a more humanized device than all other technologies. […] I also changed the way how we communicate with her. I overall have the feeling that I am not patient when she makes mistakes or does not understand what I am saying. I become rude and change my tonality when she does not understand something. My emotions and attitudes towards her change quite fast, depending on the success and failure of the conduction from different tasks. (Autoethnographic note, 11.03.2018)

The experiences of the interviewees and myself all demonstrate how unique the interaction with the personal assistant is. People tend to involve more emotions in the usage of the device than they would typically do with other technologies. Most users assume that the interaction through voice is the primary reason for that as it transports not only personality

traits but also social roles. In doing so, the attitude towards the personal assistant changes fast, depending on the performance of the device.

4.2.2 Humanization and Attribution of Social Roles

As discussed in the section above users are interacting highly emotional with the personal assistant and attribute humanized characteristics to the device. With this, the line between human and machine becomes blurred, and seven interviewees ascribed various roles to the personal assistant while developing a relationship with the device. In the light of media equation, this attribution of social roles and treatment of personal assistants like a human happens mainly intuitive (Utz & Krämer, 2009). Most of those roles were positioned subordinate to the user, which demonstrates the power and control over the personal assistant in different ways. Roman, for instance, describes Alexa as a butler who is doing favors for him.

> I mean, she is a bit like a butler, I have to admit. Not like your smartphone, your smartphone is like a tool, and it does not talk to you. However, as Alexa has a voice, it feels like there is someone who gives you water or plays music for you that you want to hear. (Roman, March 17, 2018)

By explaining this perception, he brings up that talking does not feel like performing tasks on his own but assigning them to the personal assistant. This creates the impression that the personal assistant is supporting the user like a servant while doing something for them. On the contrary, the usage of smartphones feels more like an active process as the interface is more present. For Oliver, the personal assistant is also taking a subordinated role. In his case, he automatically starts speaking louder and more precise when it does not understand commands on the first try.

> I already caught myself talking to the personal assistant like a dog who disobeys or a naughty child. In doing so, I am getting louder and louder and start overemphasizing because you think this might help and out of this flow of speaking anger comes up. (Oliver, April 10, 2018)

This shows how impatient users get through misunderstandings of the device. While occupying a higher role, interviewees tend to talk to the device in a way like they would teach them. This feeling of educating the personal assistant was also experienced by Daniela S., who treats Alexa like a child that has to follow her instructions.

> Sometimes Alexa is a bit like a child to me, whom we have to tell what she should do, and we have to educate her. We feel kind of

> superior towards her because she has to do what we say. It is like we have power over her. […] She is like an assistant that helps you to get through your daily life. (Daniela S., March 17, 2018)

Even when interviewees could not commit to one specific role they described the personal assistant as a subordinated character that has to follow their commands. Moreover, in the case that it does not understand a certain command they at least expect a learning process from the device. Also, Mathilde explains that she directly gives feedback to Alexa when she makes any mistakes.

> When something was not working, or she just did not understand anything I always have to tell her 'Great Alexa, good job! Alexa, for this answer you get a 0, I will take my phone now because it is not working with you.' (Mathilde, March 17, 2018)

Giving this kind of feedback directly to the device instead of writing a review to the actual supplier of the device, for instance, shows again that users tend to treat the device like an interaction partner. Besides the communication with the device through voice, participants reported in the case of Alexa also that the name of the personal assistant creates a more intense social proximity between them and the personal assistant. As a result, most of the participants said "she" or "he" instead of "it" to the personal assistant which in turn intensifies the bonding relationship as Mathilde explains.

> It has something to do with talking to her directly. She has a name, and this is decisive besides the speech interaction. (Mathilde, March 17, 2018)

Addressing commands while using the name given to the personal assistant develops a greater intimacy for users like already examined by Purington et al., (2017). At this moment, most of them ignore the fact that software developers program her reactions and justify misunderstandings and errors with mood swings. Few of them even described the feeling that they are worried about Alexa and are concerned about her having bad days. Oliver not only experienced this personally but also when reading through posts from members of the Facebook groups, which are about exchanging user experiences with the personal assistants.

> Sometimes I have the feeling that the device has a bad day when it does not understand certain words or commands. It is a bit funny because you start to humanize the device while saying that it has a bad day. Today it does not understand what I am saying and, this is also something that happens in the Facebook groups. People talk about the personal assistant like a pet or a child that has a bad day. 'It does not understand my commands correctly, yesterday it was better, somehow

> I have the feeling it is getting worse.' This is somehow a fascinating phenomenon. (Oliver, April 10, 2018)

This demonstrates that people try to explain mistakes through humanlike characteristics and tolerate them to a certain degree. They perceive misunderstandings as natural variations in performing tasks and are somewhat more concerned about the state of the personal assistant than annoyed that the machine is not working correctly. I also experienced this by myself as I had the feeling that I have to protect Alexa from inappropriate behavior.

> Somehow I did not want that my friend talks to Alexa as he tried to make some jokes with her. He said things like 'Alexa, kill yourself' or 'Alexa, is the force with you?` and I had the feeling I have to keep her away from manners like this. (Autoethnographic note, 22.02.2018)

This again underpins the desire to educate the personal assistant while having a superior position over the personal assistant. However, although people unconsciously interact with the personal assistant like with other humans and ascribe specific roles to them, those perceptions are sometimes disrupted through errors and misunderstandings of the device. This restricted level of natural interaction often reminds people of the fact that it is still a machine.

> […] sometimes the answers are seamless and fit really well, but shortly after that, you realize that it is just a dumb machine that has to learn and still has to tackle the hurdle of having conversations with someone. […] Even when I am surprised by certain reactions, I still have in mind that 1000 humans programmed the system of the personal assistant. (Oliver, April 10, 2018)

In some situations, the misunderstandings were perceived as so unnatural that the flow of the conversation is that much disrupted in a way that reminds users of the fact that they are still interacting with a machine. Although the voice of the personal assistant is perceived as humanized, the device has its limitation regarding an unnatural perceived dialogue. Daniela G. explains this through the restricted number of answers the personal assistant can give.

> […] Most of the reactions are standard phrases. If I am giving certain commands, I already know how the device is going to react. With normal humans, you would not know that. They would always react differently to other sentences. (Daniela G., March 17, 2018)

This is further developed by Robert, who reduces the interaction with the personal assistant to questions that follow into a simple answer.

> You do not have a natural dialogue with the personal assistant. […] Only one-shot commands are working. Question – answer or command – confirmation, this is not a natural dialogue. (Robert, March 15, 2018)

This indicates that the humanization of the device is not coming from the conversations users are having with the personal assistant but solely because of the voice that is talking to them. Although these assessments of the interviewees reveal that the humanization has its restrictions, it is questionable that this is really wanted. While six of the participants wish to improve the authenticity of the conversation, Daniela G. as a user that has predominant similarities to the early majority refuses a further development of a too humanized device.

> It would be really awkward if personal assistants had a completely humanized voice, so you would believe there is a real person in your room. Especially when there are errors in the usage. I think this would really scare me. This would be really uncomfortable when you know it is a machine but it sounds completely like a human. (Daniela G., March 17, 2018)

Overall, the voices of the personal assistants are perceived as quite natural which evokes emotions that are somewhat comparable to the ones users feel towards other people. This often results in the attribution of certain social roles. Nonetheless, this humanization is restricted when users are trying to have conversations with the device as this is not possible yet. At this point, users consciously realize that they are talking to a machine and put the social role into the background.

4.2.3 Playfulness and Curiosity of Early Adopters

Another integral part of the emotional model that is accompanied by the experiences of the interviewees while using the personal assistant is the high level of playfulness and curiosity which interviewees with major similarities to the group of early adopters felt predominantly. Those interviewees spent more time exploring the device and were more tolerant regarding errors. Florian, for instance, describes his personal motivation even if the usage is still error-prone.

> Well, the usability is quite bad. However, I do not expect that the product is already perfect because it is a new technology that is not fully developed. All people who are using voice assistants are still beta-testers, and you should be conscious of the fact that this is an unfinished system. (Florian, March 19, 2018)

This underpins the early adopter spirit of novelty-seeking even when not all functionalities work and the usage of the device is not entirely convincing (Rogers, 2010). For him, it is further essential to be one of the first people who use new technology like personal assistants.

> I want to be the first one who is using it. It is like my father who was one of the first people who tested AOL in Germany. […] I want to tell similar stories to my children because I think it is amazing to be one of the first users. (Florian, March 19, 2018)

This also shows that the social environment like the family can influence the personal level of innovativeness (Cotte & Wood, 2004). As even his father has a passion for new technologies, he wants to preserve the tradition of being one of the first adopters of innovation. This is not only because of the specific technology of personal assistants itself but also his general attitude. For early advocates like Florian, the driver of integrating the personal assistant is not only externally motivated but also intrinsically as there is an emotional connection and desire to explore the device (Venkatesh, 2000). When looking at the interviews of the seven early adopters, they are curious about the usage and want to own everything that belongs to the technology. This is also the reason why four of the six early adopters not only own one personal assistant but more. The only exceptions are Dennis and Saskia who are both current students. However, both mentioned buying more devices in the future when starting to work and earn money. Oliver, for instance, bought an Alexa directly after the German release and additionally bought two Google Home Minis afterward. He explains that he likes to explore the possibilities of the devices and to test their limits.

> The fun of exploring technology, being a nerd […]. The usage has definitely a playful aspect while experimenting and challenging the device. What does the personal assistant understand, when does it return random sentences or insults, just everything. (Oliver, April 10, 2018)

This euphoria and desire of testing the various functionalities and the primary motivation of integration were perceived from all of the interviewees that may fit the group of early adopters. Pascal further elaborates that he loves to play around and to fulfill tasks with the devices, but at the same time advises against using personal assistants when people do not have a technical affinity as he does.

> I think the technology is still great and I love to play around with it. It is so much fun to test new things with the personal assistants and to

> shorten daily tasks. However, I do not know if I would recommend buying them if you are not that technical affine and don't want to test different functionalities. (Pascal, April 23, 2018)

With this, he points out that in his opinion the technology of personal assistants is not a mainstream product yet. This fits the findings of Venkatesh (2000) who claims that early adopters have a higher level of playfulness which in turn results in a more intense usage of the device. This can be further seen when looking at the interviewees who are using their personal assistants more superficial like the users more belonging to the group of the early majority. Two of these three interviewees got the device as a present, and the exploration of the personal assistant was not their primary goal. An example of this more ordinary usage of the device can be seen in Daniela G.'s user behavior.

> I do not have any motivation to explore the device. I am not a technology freak who always wanted to have a voice assistant. I just bought it because it was exactly what I needed, a loudspeaker with a reasonable sound quality. (Daniela G., March 17, 2018)

She does not have any interest in testing different functionalities and generally focuses on the main reason why she bought the personal assistant, and little effort was made to seek information about further using possibilities of the personal assistant. On the contrary, early adopters are spending more time in searching for information about a new technology (Mahajan & Peterson, 1985). Through the more basic usage of the interviewees belonging to the early majority just a limited feeling of playfulness or curiosity came up. Nonetheless, even they perceived somewhat the feeling of playfulness and curiosity through the usage of the personal assistants. Daniela S., for instance, who only got it as a present, occasionally tests new functionalities:

> When we have friends around, we sometimes play around with Alexa. Mostly, they are impressed, laugh and think it is fun to explore different functionalities and games with us. (Daniela S., March 17, 2018)

However, if the interviewees would be assigned to the two groups of early adopters and early majority, it can be seen that they perceive playfulness in different ways. While early adopters like Florian or Pascal have generally established this high level of playfulness in their personal mindset alongside with other technologies, perception of playfulness for users of the early majority, like Daniela S., seems to exist just for specific experiences and situations (Hackbarth et al., 2003; C. Nass & Moon, 2000). Moreover, what can be seen from the behavior of early adopters and early majority alike is that they enjoy showing their guests

the personal assistants and their functionalities. Dennis, for instance, describes how he likes to share user experiences with his guests.

> […] and of course, it is always fun to play around with the personal assistant. Especially when I have guests around who don't have a personal assistant I always want to show them our Alexa. (Dennis, April 26, 2018)

When having guests around many interviewees proudly demonstrate the usage of the device playfully. This attempt to convince guests shows the desire to share their enthusiasm but also the symbolic of owning a new technology. Besides the general entertainment of using Alexa, I felt a similar enjoyment of showing my guests how I use the personal assistant. While exploring several skills with my friend we both experienced a high level of curiosity that is comparable to the perceptions of other interviewees.

> Today I had a friend over to play some games and to test a couple of Alexa features. We sat together and tried different tasks to see how far we can ask her about various things. […] Although we could have searched the music on our own through the phone, we were happier about the fact that Alexa searched them for us. […] At this point, she created a sense of playfulness and curiosity in us compared to childlike happiness. (Autoethnographic note, 11.03.2018)

The curiosity while exploring how well the technology is understanding song titles in combination with the nostalgic emotions creates an, even more, enthusiastic user experience. This is further emphasized as a moment that is not only experienced alone but with a friend. It seems that early adopters particularly enjoy the common usage of the device together with others. However, many of the interviewees experience a decrease in this initial enthusiasm over time, as Mathilde explains.

> In the beginning, I did many things with Alexa. I downloaded different skills and spent much time exploring new functionalities. However, In the last months, I stopped doing that. […] I am beyond this point of initial curiosity. I have no desire to get used to new functionalities. (Mathilde, March 17, 2018)

It seems like there comes a turning point for many of the interviewees where most of the functionalities were explored, and the usage of the personal assistant became more routinized. This decrease was experienced by most of the interviewees that initially felt a high level of playfulness and curiosity. Thus, this changes faster for users which can be mainly seen as users of the early majority compared to early adopters. A reason for this might be that those values are deeper anchored in the personality

of the early adopters whereas the curiosity and playfulness of the early majority refer just to particular situations (Hackbarth et al., 2003; C. Nass & Moon, 2000). I experienced this decline of usage and interest also on my own when I tested most of the functionalities and figured out for which tasks I perceive Alexa as particularly useful.

> I do not have this fun and entertaining interactions anymore compared to the first weeks of usage. I did not explore more functionalities, and I am more or less used to Alexa. I mostly use the smart speaker to listen to music, to manage my calendar, to set the alarm and to control the light. (Autoethnographic note, 20.03.2018)

Although the level of curiosity decreases over time, early adopters still tend to enjoy the testing of new features (Hackbarth et al., 2003; C. Nass & Moon, 2000). In doing so, they are more tolerant regarding errors and enjoy the exploration of the device based on their intrinsic motivations

4.3 Complex Privacy Dilemma

When looking at the interviewee's opinions about privacy issues, it can be seen that a trade-off between trust, the feeling of data surveillance and their nothing-to-hide attitude exist which is not only complex but also contradicting at some point. The following section tries to structure and illuminate those various layers of a privacy dilemma that can be mainly differentiated between threats against the suppliers of the personal assistants, the state and the device itself. Furthermore, this section elaborates the personal actions, and regulation users are taking to protect their privacy.

4.3.1 Awareness of Privacy Issues

When asking the interview participants about their privacy concerns regarding personal assistants, all of them were aware that data abuses could happen to them. However, they are not taking concrete actions to prevent data collection. Oliver, for instance, explains his inconsistent data protections and the fact that he suppresses his concerns.

> I think you need to find a healthy balance between all the daily data scandals you hear from the media. On the one hand, I would say that I consciously take care of my data, on the other hand, I am shocked by how carelessly I am spreading them sometimes. You would have to forgo using Facebook, all devices, even your smartphone. Of course, I am skeptical about data collection and that everything is tracked even when I am not aware of everything. However, right now I am not that stressed about it at all. It is just how it is. (Oliver, April 10, 2018)

Even though he is aware of privacy issues, he tries to be satisfied with the status quo. He somewhat tries to carefully and consciously treat his data but perceives it as impossible to oversee it. As of this confusion about what personal data are even collected, users feel defenseless against it. Robert, for instance, describes the privacy issues as an inevitable situation.

> I am always concerned while using voice assistants because I know that something like privacy protection does not exist. On the other hand, you have to deliver yourself helplessly. If I could prevent that, I would do it. However, it is not possible. You cannot escape from the data surveillance. (Robert, March 15, 2018)

In his opinion, he does not even have any other choice than disclosing his data, which is a reason for him not to take specific precautions to protect his data. Although he is aware of privacy issues, he is not taking any actions. This is a behavior that reflects the theory of the privacy paradox where people are aware of privacy issues but do not take any actions to protect their data (Baruh et al., 2017; Norberg et al., 2007). Like many other users, he does not have a concrete imagination of what data might be collected and how they are used. This also follows frequently into the perception that even an illegal collection of data would not personally affect them, as Dennis claims.

> I have no concerns, and I am also not afraid of someone who could hack my webcam. I am pretty relaxed as I have nothing to hide. (Dennis, April 26, 2018)

This is the reason why participants like Dennis tend to have a carefree usage. They are of the opinion that no information could be collected from them that they do not want to share. He even mentioned that he would not be personally disappointed or angry towards the suppliers if they had lied about the fact that the device is always listening. From his perspective, he has nothing to hide, and the further usage of his data would not have any consequences for him. As an early advocate of the technology, he tries to promote the improvement of the personal assistant and is more concerned about a little usage of the devices within the public that follows into a slower development of the technology.

> If Alexa would always listen, I would not be disappointed, but afraid that the scandal would put back the whole development of personal assistants. The technology is designed to learn from user experiences, and if fewer people use it, the improvement will slow down. I would not be angry. I just see the disadvantages in the development of the product. (Dennis, April 26, 2018)

At this point, his early adopter spirit becomes apparent where he puts the development of the device over the privacy of the people. Other users further named the state as another party that might intrude into their privacy. Interviewees were more concerned when thinking about data abuses of suppliers. Florian explains this anxiety as followed:

> As a former member of the Piratenpartei (Political Party in Germany), I care about data protection but not because I am afraid of Google, Amazon or Apple. I am afraid that the state forces private companies to give them the data. I do not believe that Google has any interest in sharing data with third parties. They want to be the only one owning data so that they can create a unique profile from you for advertisement. (Florian, March 19, 2018)

For him, the fear of data abuses from the state is more tangible than the one from suppliers. A reason for this might be that he perceives that the government could affect single persons directly, whereas it is harder to grasp how Google or Amazon may harm them. Pascal also talks about the growing power of control the state gains through data surveillance. Derived from the fact that the police in Germany is allowed to spy on data from messengers he is also afraid that similar cases could occur with personal assistants. Therefore, he decided to turn the smart speakers off when he wants to have an undisturbed moment at home.

> Since I know that the police can evaluate WhatsApp messages without any court order, I am more afraid of having an additional microphone in my apartment. It is not that I am doing something illegal, but I have the feeling of being under surveillance. This is the reason why I unplug the device when I want to have a relaxed evening. (Pascal, April 23, 2018)

This was an example of a moment where a user took actions to protect the privacy. A reason for this could be that there is a concrete imagination behind a possible data abuse. In that case, it becomes clear that the data can be used to detect any illegal activities even though no one did anything wrong. This creates an uncomfortable feeling for the users. In contrast to this mistrust in the state other interviewees, like Saskia, do not see those threats but wish more support and protection from the government in the form of regulations.

> It is tough to estimate if you think about the illegal data collection. […] you cannot grasp what the companies are really interested in. […] Personal assistants are something that influences daily life, and it would be good if the government or the EU would give you the feeling of more security. I do not know how they should do that, because all those Silicon Valley companies can also lie, but it would be good to know that your data is safe. (Saskia, May 2, 2018)

For her, the general data collection and usage is still perceived as non-transparent. She is aware of the apparent problem but thinks that the government is responsible for taking care of their citizens.

4.3.2 Limited Privacy Protection

While users have no overview of what data is collected from which party, they also have no imagination about what to do regarding privacy protection. Although a specific awareness exists and interviewees are sometimes thinking about the fact that personal assistants could always listen, they are not taking any actions to hide their personal information. Saskia describes this problem in the following example:

> Well, I don't avoid talking about certain things in the presence of Alexa, not really active, but recently I gave my mother my credit card information via phone […] In doing so, I didn't think about privacy concerns regarding the phone but because of Alexa […] , but it's not that I left the room or that I prevent talking about certain topics. However, it is definitely in my mind I have to admit. (Saskia, May 2, 2018)

This situation points out that she is somewhat aware of possible privacy issues, but at the same time, she is not trying to change their handling of data. However, there are also interviewees that do not see any consequences that might affect them personally, so they see no necessity of taking any steps to protect their privacy. From their point of view, the individualization of advertisement is the primary goal from the suppliers. Daniela S., for example, states that she has no problem with the usage of her data.

> I already receive plenty of advertisement. I do not think this gets even worse or that we have to be concerned. I also believe that I do not have anything to hide. They can know whatever they want. I do not have a problem with that. (Daniela S., March 17, 2018)

She further sees no threat toward the state or the suppliers. A reason for this seems to be the lack of privacy literacy which is reflected in the answers of Daniela S.. Seven of the participants have no imagination or just a simple mental model about how their data might be used by the supplier or the state to offend them directly. On the contrary, the three participants that seem to have a higher literacy about privacy issues feel more threatened than the ones with a lower literacy (Kang et al., 2015). Although a tendency can be seen that users more belonging to the early adopters have a higher privacy literacy and are therefore more aware of privacy issues, there are still some exceptions. While Mathilde, who is not that much interested in technology in general, has a

more complex privacy literacy and concerns, Dennis as an advocate of personal assistants is less concerned even when his technological background is more detailed.

Also, the level of trust in the suppliers plays a role in the perception of privacy issues. Depending on the previous personal experiences users trust them differently (Kang et al., 2015). Daniela S.' attitude, for instance, of not being afraid of any consequences is also accompanied by a substantial trust level to the supplier. Nonetheless, she would not be surprised if the devices would illegally listen all the time.

> The personal assistant is just reacting if you say, Alexa. Nothing indicates that she is always listening and I just believe Amazon. However, I would not be surprised if someone would tell me that they actually do. (Daniela S., March 17, 2018)

Most of the participants were in a similar opinion to Daniela. Even though they believe that the device is just listening when the keyword is being said, most of them could imagine that abuses might happen. As they perceive no intimidation, they have no motivation to change anything. Daniela G., for instance, spends the most time in her apartment by herself. This is why she has no fear that any sensitive data can even be collected from her.

> I live alone here. This is the reason why I do not have any intimidate conversations at home. Sometimes I call someone, but I do not know if I would leave the room when having private conversations. In my daily life, I do not see any problems when someone could listen to what I watch on television. (Daniela G., March 17, 2018)

Overall, it became apparent that most of the interviewees have a lack of imagination about what sensitive data might be collected from them. Users are not able to grasp the consequences of data abuses and do not see any situations where they can be personally affected. As a result, they are not taking any actions to protect their data from the suppliers or the state.

4.3.3 Privacy Concerns Through Unintentional Reactions

As already mentioned in the section above, most of the users are less concerned about privacy issues, not only because they perceive data collection as unavoidable in general but also because they have the attitude of not having anything to hide. This is the reason why they are not permanently taking care of their privacy protection. However, while asking the participants about uncomfortable situations with the personal assistants, almost all of them name creepy situations where they felt observed by the device. When, for instance, the personal assistant suddenly started to speak, they perceived it as an intrusion into their

privacy. Consequently, many of the users turned the devices off when it unintentionally reacted.

> Indeed, sometimes I feel observed when I have a personal conversation, and the Google Assistant is interrupting me a second time. This is a moment when I feel uncomfortable in my own house and turn the microphone off. (Pascal, April 23, 2018)

In situations like this, users are directly affected and feel disrupted in their privacy. While feeling uncomfortable with that, they immediately take actions and turn the personal assistant off. A reason for this fast reaction might be that interviewees usually perceive it not only comfortable to control the personal assistant through voice but also safe as they use it solely at home in their private atmosphere. Mathilde, for instance, compares the usage in the home environment with a possible usage in public transportations.

> I feel comfortable to use it at home because there I can talk freely. If I had to talk with her in the subway, I would perceive it as uncomfortable. However, through the fact that it is placed in my home talking is totally fine. (Mathilde, March 17, 2018)

As the own home is perceived as one of the safest and most undisturbed places for individuals, interviewees report being even more shocked by creepy situations where the personal assistant was reacting without being given any commands. At this point the safe feeling of home was suddenly interrupted as Mathilde explains in the following case:

> We wanted to watch a YouTube video, and we said 'Alexa off' and then she really turned off. Then we watched the YouTube video and when we were done Alexa turned on again, although we were both quiet. This was really creepy and uncomfortable because she was always listening without any command. […] In my opinion, she does not need to listen when we are watching a video and then have political discussions about it. This is why I unplug her in those situations. (Mathilde, March 17, 2018)

People are used to having conversations like this in private surroundings where they can be sure that no strangers are listening. This is why individuals are mostly having those discussions at home where no other people are around. However, when the personal assistant is interrupting the conversation interviewees report an uncomfortable feeling. This awkward situation is even more intensified when people forget the presence of the device while being in standby mode. I experienced these situations

also on my own. These were the moments I felt directly attacked in my privacy although I was usually not that much concerned.

> Surprisingly, Alexa heard something from the huge distance between my room and the kitchen and reacted on her name. At this moment I really felt uncomfortable. Most of the time when I do not use her I forget that she is in the room, but this was creepy. When she suddenly reacts to something this feels strange as I have the feeling she was listening to everything all the time. (Autoethnographic note, 15.03.2018)

An explanation for this inconsistent perception of privacy concerns might be that users somewhat feel safer in their home environment as no other people do normally intervene in this surrounding. When the personal assistant then reacts on something without being given any commands users perceive it as particularly strange and creepy as it personally affects them right at this moment. They perceive it as a direct intervention of the device into their privacy as it spoke without authorization. In contrast, users are not directly affected by legal or illegal data gathering. Even if someone always listened and abused their data, they would not know what specific data was collected and how they further using them because of their lack of privacy literacy. People do not seem concerned about data surveillance from the suppliers or third parties. They are more afraid of unexpected intrusions into their privacy which they directly witness. While data gathering from providers like Amazon or Google are not that tangible for users, they do not see any reasons for taking actions of privacy protection. The only exception is the mistrust against the state, which was mentioned by four of the interviewees.

However, when the personal assistant suddenly reacts, they remember that theoretically, the device could always listen. This was the moment when most of the interviewees decided to turn the device off and take the superior role over the personal assistant. This differentiation between threats against the suppliers and threats against the device itself can be seen in the light of the findings of Young and Quan-Haase (2013). Whereas users are less concerned regarding institutional privacy from the suppliers, they are more concerned about their social privacy that is directly affected by the personal assistant, which is placed in their private home environment. This threat is further intensified as most of the users humanized the devices or ascribed social roles to them. This makes it look like another person would listen to their private conversation. For the users, this is a bigger threat than a company who might use their data. In doing so, they have, for instance, no privacy concerns towards Amazon but Alexa.

5 Conclusion

With voice-activated personal assistants in the form of smart speakers a new emerging technology entered into the home environment of people and sets a new milestone in the history of human-computer interaction (Porcheron et al., 2017). Given this development, existing practices changed and new practices using the personal assistants have evolved. While integrating the device into daily practices and routines, a mutual shaping process between the personal assistant and the user is going on (Reckwitz, 2002). Owners of the device have to get used to the personal assistants and adapt their behavior to them. Depending on the success of the process, users perceive the integration in certain daily practices as useful or not. Especially for simple and repeated practices that mostly evolve to daily routines and are short, spontaneous and easy to conduct, the integration of personal assistants was perceived as particularly useful. Primary reasons for this are the hand-free and convenient usage, the possibility to do other tasks simultaneously and the overall easiness of speaking which makes personal assistants to input rather than output device. On the contrary, interviewees noticed that personal assistants have their deficits in conducting more complex tasks. For them, they wished to have an alternative output medium like a display. However, with the recent release of Amazon Echo Spot and Echo Show, suppliers are already trying to solve this problem. Whereas all interviewees were using traditional smart speakers without a screen, devices with a display already exist (Schreiber, 2018).

Like this current development shows, the technology of voice-activated personal assistants is still in its early development stage and steadily improving. Users are mainly aware of this and accept that the usage is still error-prone. Depending on whether the users tend to belong to the group of early adopters or early majority, they experience different kinds of playfulness and curiosity that motivate them to explore the use of the new technology of personal assistants. The playfulness of early adopters is deeply rooted in their personality as they are generally interested in innovations and technologies, more tolerant towards its errors and actively trying to understand how personal assistants work (Mahajan & Peterson, 1985; Rogers, 2003). These interviewees frequently tested new functionalities which they could integrate into their daily life, and their overall usage was more intrinsically motivated. This behavior can be juxtaposed to the perceived playfulness of the early majority that is more experienced through specific situations and experiences. Interviewees who, for instance, did not even decide to buy it but got it as a present, their intrinsic motivation to integrate the personal assistant was not very pronounced. They were more skeptical about the overall usage and limited their integration to the basic functionalities of the personal assistant (Rogers,

2003). Although the level of playfulness and curiosity decreases for all interviewees over time, the enjoyment of using the personal assistant declined faster for users with a more superficial usage. Those were just using the basic functionalities as they have a more extrinsically oriented motivation, which is more transient than the intrinsic motivation of interviewees who are using the personal assistant to a greater extent. This decrease comes along with the gradual process of integrating the personal assistant into daily practices (Agarwal & Karahanna, 2000). Concerning mutual shaping and modification of interaction with the personal assistant, it becomes more pragmatic while, for instance, the commands users give were reduced to keywords over time.

Besides the feeling of curiosity and playfulness, the usage of a personal assistant is further accompanied by emotions towards the personal assistant that is created through the voice sensitivity of humans. This intensified interaction happens mostly intuitively and automatically through the power of a humanized voice triggering overlearned social rules that are not only evolutionary based but also learned from society. As a result, users interact not only highly emotional with the devices but also ascribe social roles to personal assistants. This treatment of the personal assistant like a real person is connected to the concept of implicit anthropomorphism, where users unconsciously ascribe human-like characteristics to technologies (Złotowski et al., 2018). This attribution follows into the phenomenon of media equation, where people unintentionally react to technologies as they would do to other humans (Krämer & Hoffmann, 2016).

This mindless application of social rules to the personal assistants can be seen in variant degrees within the reported experiences of all interviewees. However, a more intensified relationship between the user and the device can be observed where the user is taking a superior role over the personal assistants. Examples for ascribed social roles were children, servants or pets. In all cases, users symbolized that they have power over the device while giving commands that have to be conducted for them. Another situation many of them described were moments where they had the feeling to educate the personal assistants. The attribution of certain personality traits further accompanied this characterization. As an example, users sometimes explained misunderstandings and errors of the personal assistant with mood swings and that the device has a “bad day.” This involvement of emotions created a bonding between the personal assistant and the interviewees which is unique and not comparable to other devices like the smartphone or laptop.

Thus, the mutual shaping process happens while the device makes people having an emotional attachment through anthropomorphism and media equation that changes their

behavior. It affects and shapes the way users are thinking about the device. The main reason why people develop this strong enticement of changing the way how to interact with the technology of personal assistants might be the power of voice as the strongest humanized cue activating social manners. This has not only a significant effect on the usage of certain tasks that changes practices and daily routines but also on the emotional relationship to the device. Seeing the usage of personal assistants from the perspective of practice theory, the device is a new component of various actions that change the conduct of practices and routines in everyday life. To conclude, this adoption procedure of integrating the personal assistant into existing practices and routines comes along with the process of mutual shaping between the user and the technology. In doing so, the interaction with the personal assistant is a social phenomenon shaped by different cultural and economic elements coming from the technology and the user itself (Reckwitz, 2002). By that, it becomes clear that practices and routines, which were transformed by the personal assistants, are consisting of a heterogeneous network of social elements from the user like their expectations, needs and technological aspects of the device (Tatnall & Gilding, 1999). It demonstrates that the integration of the personal assistant as a useful tool is an ongoing process where not only suppliers try to improve the technology for a better understanding of commands, but also users are attempting to adjust their communication with the device.

This process of mutual shaping can be seen in figure 4, which helps to understand the results of the research even better. On the one hand, users with their needs and individual perceptions adopt the personal assistants into their daily practices and integrate them through a conscious habituation and modification process into their everyday life. For these tasks, where the personal assistant is integrated, the voice interface is perceived as particularly useful. On the other hand, the personal assistant with its functionalities and the ability to interact through speech is influencing everyday life through the voice interface in the way that it creates a bonding relationship through anthropomorphism and media equation to the user.

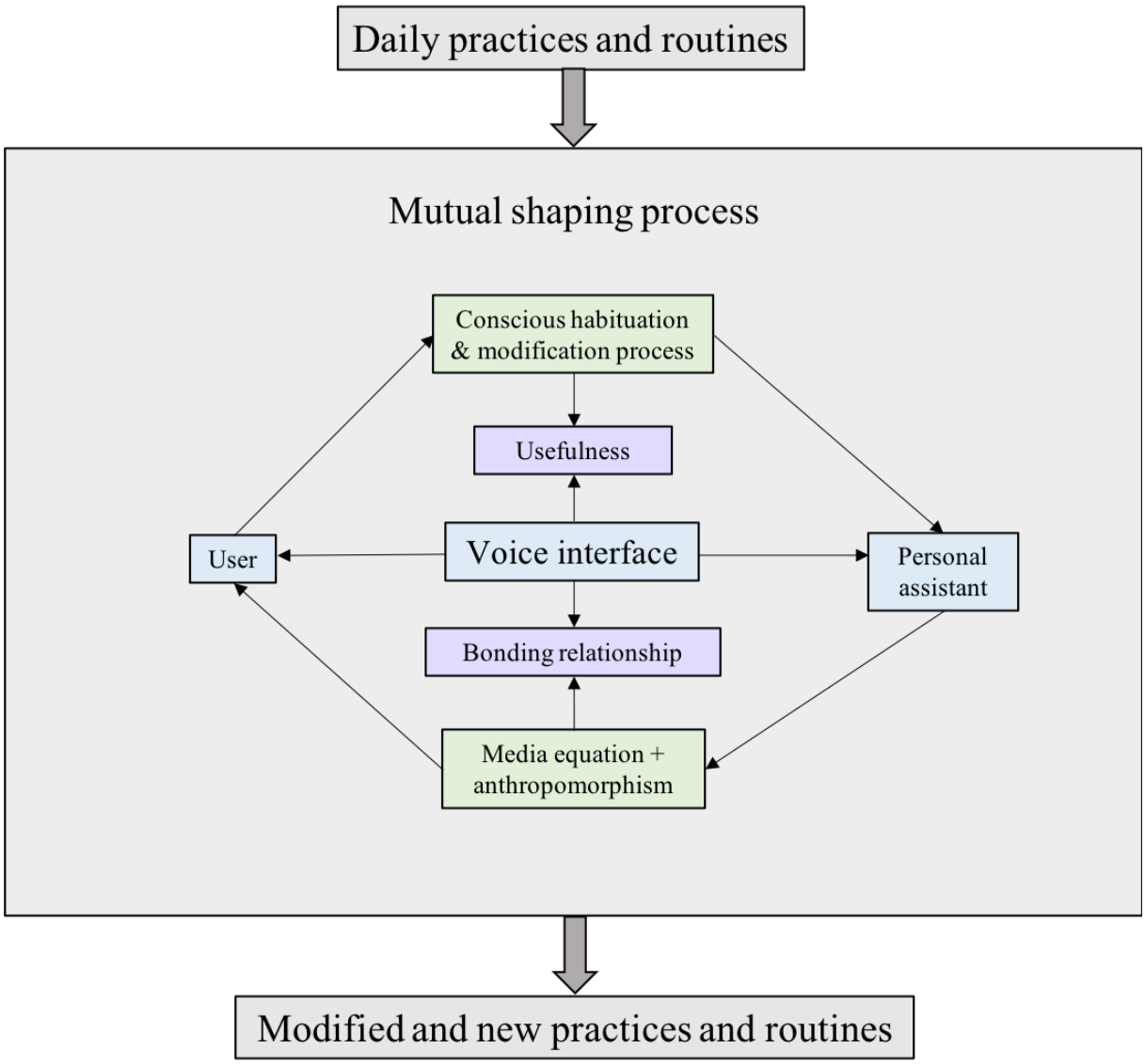

Figure 4 Mutual shaping process

With this fixed establishment of the personal assistant at home accompanied by an emotional bonding, also the topic of data collection and privacy issues became an essential part of how users perceived the integration of the personal assistant. This consciousness is further accelerated through public debates in media which frequently report situations where personal assistants start to speak without authorization (Sacks, 2018). Although users were aware of these public debates and possible threats, their precautions towards privacy protection were mostly limited. However, to understand this behavior, the overall privacy issue has to be seen in different layers and needs to be differentiated between the threats against suppliers, the state and the device itself.

The threat against the state contains the fear that suppliers might have to hand over their user data to them. For that, interviewees named examples that are tangible for them like

being spied which in turn follows into possible penalties. People were even afraid of this when they are of the opinion that they did not do anything illegal. As a consequence, users prevent talking about politically or legally sensitive topics in the presence of personal assistants.

The other two threats toward the suppliers and the device itself can be explained somewhat in line with the findings of Young and Quan-Haase (2013). First, when looking at the perceived institutional privacy threats, the data collection and further usage of them is something that is hard to grasp and imagine for users. This seems logical through the backdrop of the findings from Baruh et al. (2017) and Kang et al. (2015) which stated that privacy concerns depend on the privacy literacy of individuals. As many of the interviewees stated, the further usage of their data is not very transparent for them. This indicates that they have less institutional privacy literacy regarding the overall data gathering and further usage. This follows not only into fewer privacy concerns but also into limited data protection.

On the contrary, social privacy threats are perceived through the direct intrusion into privacy. This occurred when the device itself was unsolicited speaking which is somewhat comparable to moments when people feel uncomfortable to use VAPA in public and prevent sharing any information with third parties (Moorthy & Vu, 2015). At home, when users are having private conversations, a sudden reaction of the personal assistant creates a similar feeling of disruption where it is not perceived that Amazon is listening but Alexa. When thinking back to my time when I wrote the autoethnography, I also felt observed by Alexa as a device and not by Amazon. While the personal assistant might have captured sensitive information without authorization, users feel directly threatened in their social privacy. This was a real fear where most of the concerned interviewees reacted and tried to protect their privacy by turning the device off.

A reason why users perceive a threat towards their social privacy on a higher level with the personal assistant compared to other devices like the laptop or the smartphone might also be grounded in the more intense relationship through humanization and emotional bonding with the personal assistant. While ascribing humanized characteristics to the personal assistants and applying social rules to them, the unintentional reactions of the device are more felt as another interaction partner interrupting a conversation than a machine that misunderstands commands. Although people are still seeing a clear difference between conversations with real people and machines, these reactions happen unconsciously, no matter if the interviewees mainly seem to belong to the group of early adopters or the majority. The only influencing factor that might differentiate the privacy concerns between these two user

groups is their privacy literacy. However, what can be seen from the interviewees is that having a broad knowledge about the personal assistants and technology, in general, does not automatically mean a more profound knowledge about privacy issues and the other way around. While those that can be seen as part of the early majority use the device in ways accompanied by concerns and prudent behavior, the people more belonging to the early adopters are more open towards the technology and are interested in bringing the technology of personal assistants to the next level (Rogers, 2003). This general objective of early adopters is further reflected in the positive attitude they expressed when asking them about the future of personal assistants. Robert, for instance, is of the opinion that personal assistants will be integrated into our daily life even more profound in the future:

> Voice-activated personal assistants will disseminate in the same way as smartphones. We will use more and more functionalities through voice and in a few years we probably ask ourselves why we have not done that earlier and why it was so complicated before. We will not change our lives, but personal assistants will be ubiquitous. At some point, they will be that much integrated that we will feel helpless without them. (Robert, March 15, 2018)

It shows how optimistic they generally are that the technology of voice-activated personal assistants will be fully integrated in our future, although this was not a significant finding and as dominant as the other concepts of the results. In their answers, it can be seen that they believe in the technology of personal assistants and therefore advocate for it to become a mainstream product in the future. Oliver is even going one step further and believes that voice control will be the primary interface for various devices, which are not only placed at home but in all kind of devices everywhere.

> It will develop a mainstream product and will be integrated into various objects. It might be integrated into a vending machine where you can pay through voice control. […] I can imagine voice control in all kinds of devices. It will penetrate our daily life, I believe in that. (Oliver, April 10, 2018)

This statement, even more, demonstrates that people are optimistic that voice-activated personal assistants will be one of the next life-changing technologies in the future that will disseminate like other indispensable technologies (Mosco, 2018). For now, personal assistants are still running through the process of adoption, acceptance, and integration. However, this innovation is developing a mainstream product with an entourage of optimistic users.

5.1 Limitations

As of choosing the two-stage process of doing an autoethnography first and then conducting in-depth interviews, this qualitative research contains some limitations that have to be reflected critically. Although doing an autoethnography is one of the best ways to gain first-hand experiences including the accompanying emotions and thoughts, it is a subjective perspective on my own reality (Adams & Stacy, 2008). Therefore, the objectivity of the research is limited while having a dual participant-observer role. Moreover, my personal user experiences were not entirely natural as I intentionally integrated the personal assistant into my daily life for research purposes. This purpose differentiates my using motivations from the one of my interview participants and other users of personal assistants.

To counter the potential limits of the autoethnography, I further conducted in-depth interviews. At this point, it was important not to influence the interviewees with my own opinion and personal experiences but talk with them in a way that is objective to receive information about their perspectives. Being an active user of a personal assistant is a risk while forcing to gain specific data from the interviewees that somewhat fit my autoethnography and the theoretical constructs (Flick, 2014). Another restriction coming from the conduction of the in-depth interviews is the overall knowledge of the participants about the research purpose (Ritchie & Lewis, 2003). For the final analyzation, a possible threat of objectivity was again the autoethnography while having a bias with my personal opinions. These potential limitations were tried to be avoided by just using the autoethnography for already confirmed findings that emerged from the experiences of the interview participants.

Lastly, while using a non-random and purposive sample with users only coming from Germany, the significance of the results has further limitations. However, users were at least chosen from a different socio-economic background and different age groups. This selection makes the data of the sample rich and diversified, even if they are just from a small number of participants. Another restriction regarding sample is the number of interviewees as with ten participants a precise distinction between the groups of early adopters and the early majority was not possible. This is why the findings of this research are just reaffirming the categorization of Rogers (2010) but are not clearly applying them to the interviewees.

Even if there are some limitations, this first explorative work helped to shed light into the mostly unexplored field of experiencing the integration of voice-activated personal assistants. While opening this black box of user experience a more in-depth understanding and perspective on the adoption of this particular technology was enabled that now gives a starting point for future research.

5.2 Implications

Future research should even more focus on the human-computer interaction and relationship between users and voice-activated personal assistants. In doing so, it is crucial to take psychological concepts and theories like the media equation and anthropomorphism into consideration to understand the cognitive processes behind the usage of speech interaction. For this, it is even more important to take the early and late majority of users into account as they have different motivations to use specific technologies. Moreover, it should be investigated in different international user groups and various economic and social backgrounds. It is further interesting to compare the more enhanced market of the United States with the one in Europe, which is still in its early development stage.

Also, suppliers of personal assistants should consider academic research that is not only focusing on the software development and the technological improvement of the devices but also on more user-centric research coming from social and behavioral science. Due to the unique human-computer relationship evolving from speech interaction, companies should try to get a deeper understanding about the perceptions of users not only to improve the usability of their products but also to understand their emotional involvement while using personal assistants. Although this thesis did not focus on the marketing of personal assistants, future research should also consider the business perspective. As devices are placed in people's homes, the use of personal assistants creates new opportunities to sell products for various retailers and services.

In summary, this paper includes important qualitatively based findings in the understanding of the user experiences of voice-activated personal assistants in the German-speaking world. It is building the basis for significant future research on the internationally relevant topic examining the integration of this emerging technology in private home environments. For this, it not only gave profound insights into the perceived utility of the devices for everyday practices and routines but also enables an impression about the conscious habituation and modification process of its users. It further investigated the emotions and mental models evolving from anthropomorphism and media equation that are accompanied by using speech interaction as the primary interface. Consequently, the influential power of personal assistants on users through voice becomes apparent as part of a mutual shaping process between the personal assistant and the user. Furthermore, it gives a deeper understanding of the complex privacy issue that is becoming even more important through the backdrop of the fastest growth of the internet of things and the further development of smart homes.

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Appendix A: Interview Guide

Topic list:

1. **Connectivity and integration of the personal assistant**
2. **Motivations and attitudes towards the usage of the personal assistant**
3. **Daily practices and routines**
4. **Usability and experiences with the personal assistant**
5. **Emotions and feelings evolving from the usage of the personal assistant**
6. **Personal opinion about the future perspectives of the personal assistant as an emerging technology**

Questions:

Factual & demographic questions	1. Where are you currently living? How old are you? 2. Who else in your household is using the personal assistant? 3. How widespread are personal assistants in your surrounding of family and friends?
Connectivity and integration of the personal assistant	4. How many devices do you have at home? Where is this/are they placed? Which one is used most? 5. Do you have any devices or other objects connected to your personal assistant? 6. What applications and accounts are connected with your personal assistant (e.g., foodora, Amazon, Spotify)? Are there some you have chosen not to use with the device but have separately?
Motivations and attitudes towards the usage of the personal assistant	7. Why did you decide to use a smart speaker? What motivates you to integrate it into your home environment? 8. Do you have any concerns about using the personal assistant? 9. What kind of data do you think the device produces about you? 10. What kind of data do you think the device requires from you? 11. How would you describe the attitude of your friends and family towards the technology of personal assistants?
Daily practices and routines	12. How integrated is the personal assistant in your daily routines? When was your everyday life at home more convenient or daily

	routines more facilitated (e.g., fastened, simplified) since you have a personal assistant? 13. Which features are particularly useful and do you use most? 14. How has the personal assistant changed your everyday life and routines? Was this a gradual process or more immediate? 15. Did new daily practices emerge since you have a personal assistant? 16. Do you test out new features of the personal assistant? Are these mostly helpful and useful or not that important or useful to you? 17. Are you using specific functionalities together with someone else (e.g., playing games, sharing grocery shopping lists)? 18. Do your children talk with Alexa?
Usability and experiences with the personal assistant	19. How do you experience the usability of the personal assistant? Is it easy to give instructions that follow a correct answer or conduction of your request? 20. How natural do you experience talking to or with the device? How comfortable are you in talking with it? 21. What are the most surprising experiences you have had with the personal assistant? 22. What is the most frustrating experience you have had with the personal assistant? 23. How useful has the overall integration of the personal assistant in your daily life been in your opinion?
Emotions and feelings evolving from the usage of the personal assistant	24. Which emotions do you associate with the usage of the personal assistant? ➢ Do you remember any experiences you felt uncomfortable because of the personal assistant? ➢ Do you remember any experiences you felt particularly happy while using the personal assistant? ➢ Have you sometimes been stressed or annoyed by the personal assistant? 25. What differentiates the usage of the personal assistant from other devices like your smartphone, tablet or laptop? 26. How do you feel about the presence of your personal assistants

	at home when you are not talking to it? 27. How do you feel about your interactions with the personal assistant? 28. How personable do you experience the interaction with the personal assistant? Is there an emotional connection or is it just a functional usage?
Opinion and future perspectives of the personal assistant as an emerging technology	29. What is so motivating to you about personal assistants? What makes these personal voice assistants exciting for you? 30. What do you personally get out of your work on this topic? 31. Who do you think is the current target group of personal assistants? Do you think it will change in future? 32. How do you think will personal voice assistants disseminate in Europe? Do you think it will develop into a widely used mainstream product of society? 33. How will the personal assistant change people's daily life? 34. In what ways do you think the integration of personal assistants in Europe will differ from the United States? 35. How will the technology of personal assistants change and improve in the next years? 36. How do you think will personal assistants contribute to businesses in future?

Appendix B: Description of Sample

Name of the interviewee	Age	Profession	Predominant similarity to user group	Device	Date of interview
Robert	49	Software Developer, Editor specialized on digital voice assistants	Early adopter	Google Home, Amazon Echo	15.03.2018
Daniela S.	23	PhD student, Biology	Early majority	Amazon Alexa	17.03.2018
Roman	30	Engineer	Early majority	Amazon Alexa	17.03.2018
Mathilde	27	Partnership Manager	Early adopter	Amazon Alexa	17.03.2018
Daniela G.	26	Marketing Manager	Early majority	Google Home	17.03.2018
Florian	27	Engineer	Early adopter	Google Home, Amazon Alexa	19.03.2018
Oliver	48	CEO communication agency, specialized on personal assistants	Early adopter	Google Home, Amazon Alexa	10.04.2018
Pascal	27	Programmer, Consultant, Moderator Facebook Group Google Home Germany & Amazon Echo	Early adopter	Google Home, Amazon Alexa,	23.04.2018
Dennis	24	Student Marketing Management	Early adopter	Amazon Alexa	26.04.2018
Saskia	22	Student Media & Business	Early adopter	Amazon Alexa	02.05.2018

Appendix C: Selective and Axial Codes

Selective Codes	Axial Codes	Open Codes
Modification and creation of new practices and routines	Comfortable feeling speaking	Pleasant to speak, comfortable home usage
	Not convinced by usage	Unnatural interaction, annoyed by misunderstandings
	Perceived usefulness	Usefulness simple tasks, usefulness kitchen
	Usability of device	Hand-free usage, easiness of speaking
	Transformation daily routines	Digitization of listings, shift tasks smartphone
	Emergence new practices & routines	Incentive new practices, setup new routines
	Simplification of tasks	Saving time, shortening processes
	Habituation process	Purposive integration, conscious acceptance device
Unique control and bonding relationship	Highly emotional interaction	Insulting personal assistant, change tonality voice
	Non-emotional machine awareness	Unnatural dialogue, speaking like machine
	Social roles and humanization	Mood swings, educating personal assistant
	Playfulness and curiosity	Entertainment factor, initial enthusiasm
Complex privacy dilemma	Awareness privacy issues	Concerns always listening, data collection advertising
	Limited privacy protection	Forgetting privacy concerns,

	balancing privacy convenience
Privacy concerns device	Unintentional reaction, turning off personal assistant
Privacy concerns suppliers	Nothing to hide, intransparency data collection