



# **Key Determinants for the Slow Pace of Smart Home Adoption: A Study of Digital Consumer Insights**

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Dissertation written under the supervision of Pedro Oliveira

Dissertation submitted in partial fulfilment of requirements for the MSc in Management with Specialization in Strategic Marketing, at the Universidade Católica Portuguesa, January 2020.

## **Title**

Key Determinants for the Slow Pace of Smart Home Adoption:  
A Study of Digital Consumer Insights

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## **Abstract**

The smart home concept has been on the market for several years now. Its intelligent technology promises to improve living quality by enriching the consumer's daily life with more convenience and time. Yet, it has failed to establish in the homes of mass-market consumers. Existing academic research already spend time examining the concept and its barriers. Nevertheless, empirical evidence about insights from a consumer perspective is still scarce, even though it is considered to be crucial information for facilitating the implementation and acceptance of new technology concepts. The underlying dissertation aims to understand consumer attitudes and opinions towards the topic in order to discover the reasons hindering the smart home adoption. Therefore, an online netnography was conducted. Results identify numerous pain points that are deeply anchored in the product itself: technological problems, system complexity, investment efforts, and trust issues among others. It is now the responsibility of the businesses in the industry to cooperate and to solve first and foremost the problem of interoperability among devices by establishing industry standards. Simultaneously, the usage must be simplified so that all consumers, also those who are not technology affine, are able to intuitively use the products. Additionally, companies must focus on building trust, reinforcing transparency and assuring cybersecurity.

## **Keywords**

Smart Home, Smart Technology, Technology Adoption, Internet of Things, Netnography,  
Digital Insights, User Perspective

## **Título**

Determinantes-chave para o ritmo lento da adoção de casas inteligentes:  
Um estudo das percepções do consumidores digitais

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## **Resumo**

O conceito de casa inteligente já está no mercado há vários anos. A sua tecnologia inteligente promete melhorar a qualidade de vida, enriquecendo o dia-a-dia do consumidor com mais comodidade e tempo. No entanto, não conseguiu estabelecer-se nas casas dos consumidores do mercado de massas. As pesquisas acadêmicas existentes já passam o tempo examinando o conceito e suas barreiras. No entanto, as evidências empíricas sobre insights do ponto de vista do consumidor ainda são escassas, ainda que sejam consideradas informações cruciais para facilitar a implementação e aceitação de novos conceitos tecnológicos. A dissertação subjacente visa compreender as atitudes e opiniões dos consumidores em relação ao tema, a fim de descobrir as razões que dificultam a adoção de uma casa inteligente. Por isso, foi realizada uma netnografia online. Os resultados identificam inúmeros pontos de dor profundamente ancorados no próprio produto: problemas tecnológicos, complexidade do sistema, esforços de investimento e questões de confiança, entre outros. Agora é responsabilidade das empresas da indústria cooperar e resolver, antes de tudo, o problema da interoperabilidade entre dispositivos, estabelecendo padrões da indústria. Simultaneamente, o uso deve ser simplificado para que todos os consumidores, também aqueles que não são afins tecnológicos, sejam capazes de usar intuitivamente os produtos. Além disso, as empresas devem se concentrar na construção da confiança, reforçando a transparência e garantindo a segurança cibernética.

## **Palavras-Chave**

Casa inteligente, Tecnologia inteligente, Adoção de tecnologia, Internet das coisas,  
Netnografia, Insights digitais, Perspectiva do usuário

## **Acknowledgements**

I would like to thank Mr. Pedro Oliveira, for his expertise, patience, thought-provoking impulses and supervision during the entire dissertation process. Furthermore, I would like to express my gratitude to my family and closest friends who have been by my side on my personal and academic journey over the past years, no matter what. I cannot express in words how much your encouragement and support mean to me. Only one thing is for sure: If it was not for you, I would not be standing where I am today.

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# 1. Introduction

## 1.1. Problem Definition and Relevance

With the paradigm of the Internet of Things (IoT), society finds itself surrounded by an abundance of interconnected devices. By assigning artificial intelligence to physical objects and linking them to an internet-driven network, the concept allows to turn – colloquially called - dumb products into smart ones. This essentially disrupts the way people live and work, ultimately aiming at enhancing the quality of life.

The term finds its use in various fields of application such as e.g. in healthcare (Alam, Reaz & Mohd Ali, 2012) or manufacturing (“A Guide to the IoT”, 2019), but it also found its way into the personal home environment. The so-called smart home concept implies a residence that integrates smart technologies that independently take over (otherwise manual) tasks by observing their environment. In doing so, they can support the resident in their daily tasks.

Smart homes are only a small segment of the wide field of the IoT. However, the promised benefits of connecting home appliances and other technical products encouraged companies to invest in the industry. Nevertheless, contrary to the assumptions and the promising advantages of convenience and comfort, the concept has failed to reach the mass market yet. Compared to other novel technologies, the speed of the diffusion of the idea has been slow ever since.

Over the years, this attracted the interest of the academic community who has been trying to elaborate on this phenomenon, as well as the multitude of technological possibilities to transform consumers’ homes, its implications and the effects on their personal life. Numerous papers have been written about how smart homes can support the aging population (see e.g. Ehrenhard, Kijl, Nieuwenhuis, 2014), what the technical state of smart technologies is (see e.g. Rosslin & Kim, 2010 or Li et al., 2018), how they can be used in combination with energy management systems (see e.g. Zipperer et al., 2013) and why society fails to adapt the concept on a large scale (see e.g. Park, Kim, Kim & Kwon, 2017 or Hubert et al., 2019).

Regardless of the number of the academic works evolving around the topic, the focus is oftentimes narrow, concentrating solely on one target group, one technology or one service. An overarching view that is not just examined from a product perspective or holds empirical evidence from users is lacking at this stage. What needs to be investigated in greater detail, is the current state of the consumer perspective on smart homes, making the consumer the focus

of the analysis. Companies need to be able to empathize with the consumer and understand their opinions, behaviours and needs in order to make it a mass-market product. Addressing not only their needs but also their concerns is crucial in this process.

In the past, researcher used offline ethnographic studies to analyse consumer behaviour. Since this method is time- and cost-intensive, as well as geographically limited after all, the underlying dissertation moves the research process to the online environment. Adapting ethnographic methods, valuable insights about emerging themes that are relevant from a consumers' perspective with respect to smart homes can be collected in online communities (Kozinets, 2010). Since the topic is widely discussed by community members with different knowledge levels and opinions, the data can reveal a variety of aspects that can ultimately provide information about the challenges and opportunities.

## **1.2. Objective and Research Questions**

The underlying dissertation aims to examine the current state of the social conversation about smart home technology. The analysis of consumers' opinions and attitudes should provide insight into the mechanisms and behaviour behind the adoption process.

The investigation of selected online communities dealing with the topic contributes to the existing but scarce research of consumer-focused academic work about smart homes. Following a qualitative research approach, a netnographic study serves as the foundation for the exploration of valuable digital consumer insights.

The following research questions are raised in order to understand the key determinants of the slow pace of smart home adoption:

### **Research Question 1:**

**What is the common understanding of the smart home concept among the community members?**

The goal here is to find out how community members define the smart home concept and elaborate thematic associations. Additionally, the question intends to find out to what extent the community agrees or disagrees in terms of the understanding and the scope of the concept.

### **Research Question 2:**

**Which elements influence the buying decision of smart home products? Why are consumers buying smart home products?**

The next question is meant to explore the motivations for consumers to buy smart home devices. Alongside this, it investigates which factors shape the buying decision.

### **Research Question 3:**

#### **What are the adoption barriers of smart homes identified by the online community?**

The last question aims to examine the reasons that keep consumers from adopting the technology, capturing the community member's considerations and doubts concerning the concept before a possible purchase. Moreover, obstacles faced by smart home users after purchase should be captured.

### **1.3. Structure of the Dissertation**

The underlying dissertation is divided into six chapters. The first one introduces the problem statement, as well as the relevance of the research topic. Additionally, the research objective with its accompanying research questions is presented. The second chapter covers the literature review of existing academic works related to the Internet of Things technology, the smart home concept with its benefits and barriers of adoption, as well as the role of online communities in technology adoption. Subsequently, the methodology chapter introduces the qualitative research method of netnography, which is used in the empirical research of this dissertation. The different steps of the applied research process are highlighted in particular. The following investigation includes the presentation of the collected data combined with the thematic analysis which creates the foundation for the development of the grounded theory. Afterwards, the theoretical and managerial implications resulting from the analysis should provide an approach to a solution, contributing to driving the adoption among the mass market. The final chapter then discusses the research limitations and suggestions for future research directions.

## 2. Literature Review

The following chapter will present a review of the existing literature on the dissertation's main research field, the concept of *smart homes*. This implies a discussion on its origin, the internet of things, a definition of the concept, as well as the status quo about the adoption of smart technology.

### 2.1. The Internet of Things – The Basis for Smart Home Technologies

With the invention and development of the Internet of Things (IoT), a new technological revolution has been initiated. It instituted a new era of a connected world, a completely connected environment, which became widely present in daily life, shaping the way society works and lives.

Named in 1999, Kevin Ashton was the first person to draw a connection between Radio-frequency identification (RFID) and sensor technology, linking it to the internet. The idea behind it was to make computers omniscient and let them act independently from human beings. This vision was accompanied by the intention to make information and knowledge supply less dependent on the manual gathering done by human beings, a very time and labour intensive process. Instead, he suggested to transfer this task to computers and enabling them to observe, identify and understand the world themselves. The ultimate goal was to gather as much data as possible without human help that can then support the reduction of waste, loss, and costs (Ashton, 2009).

Over time, the definition of IoT has been developed due to multiple new technological concepts, the evolution of the web, and big data amongst others – and it is still evolving (Friess & Ibanez, 2014). Today, the paradigm of the Internet of Things refers to a dynamic global network infrastructure that connects physical objects to the digital world, using (mostly) wireless technology. This connection allows objects to communicate, sense, and interact with each other. Thus, they obtain intelligence that authorizes them to enable or execute context-aware decisions (Vermesan et al., 2014). Due to immense amounts of stored and processed data, this can happen in real-time and nearly without any human intervention (Yang, Lee & Lee, 2018). It is also often strongly connected to the term of ubiquitous computing (Risteska Stojkoska & Trivodaliev, 2017).

Any object integrated into an IoT network can be defined as a *smart object* or a *smart device*. The precondition for devices to be considered as smart is described as followed: they should

have “the capability to dynamically adapt to the changing contexts and take actions based on their operating conditions; they should be self-configuring and interoperable, having unique identities and being able to communicate and exchange data with other devices and systems.” (Silverio-Fernández, Renukappa & Suresh, 2018, p. 2). Smart objects can range from e.g. sensors to smartphones, to manufacturing machines, to home appliances (Risteska Stojkoska & Trivaodaliev, 2017).

Nevertheless, nowadays most smart devices are used by businesses and manufacturers. More precisely, robotic machinery and real-time analytics of supply chains account for 40.2% of the overall IoT devices. Further 30.3% are used in the healthcare sector e.g. for portable health monitoring or electronic recordkeeping. Another 8.3% is dedicated to the retail industry and 7.7% to the security industry (“A Guide to the IoT”, 2019).

The number of installed IoT compatible devices is growing enormously. With currently 26.66 billion smart devices worldwide, the amount already exceeds the world’s population count. In the future, the amount is expected to almost triple up to 75.44 billion devices in 2025 (Statista, 2019). Concomitantly, according to a European Commission Study from 2015, the market potential is expected to exceed 1.181 billion Euros in revenue only in Europe.

These figures underline the ongoing evolution of the trend. It has not come to an end yet while at the same time technology will advance even further. By producing a vast amount of data, IoT enables the world to become more efficient. As a result of high interconnectivity and continuous data exchange, the data can be tracked and collected more easily than ever before (Risteska Stojkoska & Trivodaliev, 2017). The ultimate goal will be to create one single ecosystem that involves smart objects from all areas of life: from electric vehicles, to smart buildings, to telecommunication and so on (Vermesan et al., 2014).

## **2.2. Smart Homes – A Definition**

Even though the Internet of Things impacts predominantly the business environment, emerging technologies also brought about change within the daily private life of consumers. With IoT-enabled objects getting smarter, home residences are also getting smarter. Already with the developing technological advancements in the 1970s, smart systems have been started to being developed in the area of security, energy management, entertainment and home automation (Sultan & Nabil, 2017).

Being based on the IoT concept and computer technology amongst others, a *smart home* can be defined as a communication network, that can be “remotely accessed, monitored and controlled and that provides services responding to the residents’ needs” (Yang et al., 2018, p.2). It aims at “improving home occupant experience using a set of sensors and actuators to observe the environment and automatically control home devices.” (Sultan & Nabil, 2017, n.p.). While some authors equate smart homes with pure home automation and remote control (see e.g. Robles & Kom, 2010), other authors take the scope of understanding further by conceding the system an own intelligence (see e.g. Alam et al., 2012). In this context, *Smart homes* can thereby be referred to as a new generation of *home automation*<sup>1</sup> as it goes beyond the simple control of an automation system which is executing instructions. It must be accentuated that it goes far beyond that. The decisive point is the likewise involvement of the system’s learning process, being fully context-aware. With time, the user’s behaviour can be understood, so that the system can apply individualized routines according to different situations and needs (Sultan & Nabil, 2017).

In doing so, the concept intends to enhance the quality of living, providing more convenience, security, and efficiency within the personal living environment. Most commonly, a smart home system can be divided into four entities: smart devices, hubs, cloud and third parties (Figure 1).

The different smart devices integrated into the house compose together to a wireless sensor network (Risteska Stojkoska & Trivodaliev, 2017). The integrated smart devices can be anything, ranging from for example smart appliances (e.g. air conditioners or refrigerators), security equipment (e.g. cameras or smoke detectors), as well as speakers, lights or other electronic controlled devices (Li et al., 2018). All of them equipped with its respective computation and communication proficiencies can then forward their data (either raw or already processed) to a so-called hub.

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<sup>1</sup> *Home automation* can be defined as “the capability to automate and control multiple distinct systems” (Sultan & Nabil, 2017, n.p.)

The hub processes the data mostly locally or forwards excessive data to the cloud to be processed there. Based on the processed data, the hub can play back commands to the devices that may for example include the scheduling of lighting or the regulation of electricity flows. Since smart devices oftentimes have different communication protocols, hubs work as a central control and are supposed to enable interoperability in the system.

As already touched upon, the main role of the cloud is big data storage, analysis and processing. Hence, the cloud shares its work with the hub and additionally processes the data in a way so that third parties can make use of it.

The third parties need the data for the visualization in the application that they provide. They serve as the user interface in order to provide solutions for the consumer and for them to control the whole system (Risteska Stojkoska & Trivodaliev, 2017).



**Figure 1:** Smart Home System  
 Source: Own illustration (referred to Risteska Stojkoska & Trivodaliev, 2017, p. 6)

Amongst several smaller brands, global companies such as Google, Nest (Google owned), Amazon and Samsung Electronics are big players in the smart homes market. Looking at their websites, they are not only providing such interfaces, but are also establishing their smart home ecosystems with proprietary product lines (“Conntected Home”, 2019; “Alexa and Smart Home”, 2019; “Smart Home”, 2019).

**2.3. Benefits of Smart Homes**

Leaving technological details aside, smart homes are designed to transform not only consumer’s homes, but also their everyday lives, providing an unparalleled connected living experience. Smart home systems aim to make life simpler at home by creating a new home, primarily characterized by safety and convenience.

Alam, Reaz and Ali (2015) point out the main aspiration of installing a smart home, which is *comfort*. Since time is a tight and valuable commodity, sensor tracked activity identification

and following event automation help to ease daily tasks and makes conducting those tasks faster and more efficient (Georgiev & Schlögl, 2018). While smart home technologies take over specific jobs and support daily routines on the one hand, they also allow consumers to have full control over any adjustment of technical settings from e.g. heating, to lighting, to locking the door – at home or from a distant location via remote control (Wilson, Hargreaves & Hauxwell-Baldwin, 2014).

The second benefit of smart homes is *security*. Smart locks, cameras, as well as sensors that can detect movements with the ability to give an alert in the case of possible intruders makes consumer feel more safe. Especially when home owners are not at home, smart devices can notify about unusual happenings at the property or detect open door and windows (Balta-Ozkan et al., 2013).

Furthermore, literature addresses the topic of *energy consumption* and environmental reasons. With a climate crisis emerging and growing electricity demand, the interest in innovative and efficient smart technologies is growing (Bhati, Hansen & Chan, 2017). Smart devices can monitor and reduce the usage of energy by e.g. cutting phantom power and turning lights off every time someone leaves the room or adjusts the heating to the minimum needed (Robles & Kim, 2016).

Sultan and Nabil (2017) also suggest that people not only buy smart homes for improving their quality of life and energy efficiency, but also for “entertainment or impressing others, personalization, supporting special needs (i.e. disabled or elders), or for religious reasons (e.g. Sabbath home automation)” (p.3).

## **2.4. Barriers to the Smart Home Adoption**

Despite the promising advantages that the concept provides, the market for smart homes did not manage to reach its full potential yet. It is still in the adoption phase and only eventually predicted to reach mass-markets in the future (Heetae, Hwansoo & Hangjung, 2017).

Several researcher tried to examine why smart home solutions experienced such a slow adoption. Literature suggests the main reason being the discrepancy between the consumer need and the *perceived consumer value* of the technology. While technology developers seem to impose the idea on the market, the necessary consumer-centricity is missing (Chan, Campo, Estève & Fournails, 2009; Wilson, Hargreaves & Hauxwell-Baldwin, 2014; Balta-Ozkan et al., 2013). Associated with that, the point of *user-friendliness* is pointed out. This involves on

the one side the fact that users do need to have or develop a certain technological proficiency to understand the possibilities, setting up and maintaining a smart home network (Balta-Ozkan et al., 2013). On the other hand, missing interoperability creates more complexity as many devices are not compatible by producers default (Georgiev & Schlögl, 2018).

Moreover, the topic of *security* is another big issue. As the concept is based on the collection of personal data that contains all movements, routines, preferences, bills and even purchases, local and cloud storage of the smart home system offers a target to any hacker. Even those devices that should secure the living environment in the first place (e.g. a smart lock) can become affected. Not least of all through the possibility of remote control (Balta-Ozkan et al., 2013; Wilson, Hargreaves & Hauxwell-Baldwin, 2014). The topic of *trust* is also closely related. General distrust towards technologies and big companies collecting personal data triggers discussions amongst consumers (Balta-Ozkan et al., 2013).

Another important pain point are the *cost* of the system. This includes mainly the high set up cost that come up to the customer when buying an end-to-end product line. Investments are hence often outweighing the savings (Georgiev & Schlögl, 2018).

## **2.5. Technology Adoption**

Few studies of existing research have already tried examining factors that influence the adoption of smart homes and the perception of the idea (see e.g. Heetae, Hwansoo & Hangjung, 2017 or Kim et al., 2017). But despite the findings of the previous years, the barriers of adopting the smart home concept have not been overcome yet. This is rising the question if those barriers generally apply or if there are more variables from a consumer perspective than what has been touched on so far. Hence, it makes sense to completely focus on the consumer and those who possess a smart home and investigate where the main problems are located: Is there already an inconsistency in the understanding of the concept, which variables influence the buying decision in the first place and what are the pain points after the purchase?

Independently from the smart home concept, many different theories tackle the topic of new technology adoption, aiming to understand why and how society reacts to various types of novel products or services. Many scholars develop holistic models that try to explain all facets of adoption. However, the most original and commonly used theories in scientific work are

the Technology Adoption Model (TAM) and the Innovation Diffusion Theory (IDT) (Hubert et al., 2018).

The latter one is based on the passing on and exchanging of information among different groups in society, spreading the message of a new innovation idea through different channels. The spreading of information, called diffusion, can be defined as a process that changes social structure and function.

Against common belief, most of the ideas do not diffuse at a very rapid proportion. New technologies barely sell only by themselves, triggered by their indisputable benefit. Besides other factors such as communication, time or the social system itself, there are other characteristics that illustrate the success or failure of adaptation, such as e.g. the relative advantage (how much more advantageous does the individual perceive the idea compared to the technology it is replacing?), compatibility (does the innovation fit in the current value and belief system?), or complexity (is it perceived to be easy understood?) (Roger, 2003).

So far, technology adoption has mostly been explored in an offline context or in the means of traditional media. However, the development of the internet commenced to change the way how people communicate and brought up the phenomena of online communities.

Therefore, online channels need to be factored in the research as well, especially since there are already indications about the fact that those online communities are influential channels when it comes to the diffusion of a new technology. They are places to exchange views, gather information from fellow members, and learn about their perception (Peng & Mu, 2009). Lowe and Alpert (2015) also emphasize the high relevance of consumer perception of the innovation in their work. It is said that the feedback of technology adopters – either positive or negative – has a major influence on the public perception (Hu, Clark & Ma, 2003).

Being an increasing influence on adoption behaviour, it is necessary to focus on and increase the efforts to understand consumer behaviour in the online world (Kozinets, 2002). Hence, finding an online community about smart homes is suggested to be a valuable source to find out how people communicate about the technology. This course of action will provide ethnographic findings about the current state of diffusion and might open new points of views on the slow pace of consumer adoption due to its consumer proximity.

### 3. Methodology

The following chapter explores the methodological approach used in this dissertation in order to answer the underlying research questions. With the introduction of the research method *Netnography*, the concomitant process, advantages, and limitations will be discussed.

#### 3.1. Introduction to Netnography

In a world that becomes more and more digital, the way people communicate has changed tremendously. Society becomes increasingly more connected through their constant use of mobile phones and computers (Heinonen & Medberg, 2018). With the establishment of computer-mediated communications, many conversations take place in social networks, online communities, and blogs. The internet offers a wide platform to tell and exchange opinions, wishes, beliefs, and experiences with other like-minded people. Moreover, opinions, problems, and solutions for particular products are being shared, which makes it a valuable source of information for the field of marketing research (Jawecki & Füller, 2008).

Researchers are given the opportunity to make use of this development by collecting and analysing those consumer dialogues and interactions. This described qualitative research approach is called *Netnography*, which was coined by the Canadian Marketing Professor Robert V. Kozinets (2010). *Netnography* aims to gather digital consumer insights that allow to better understand tastes, desires, and influences on decision-making processes of consumers (Kozinets, 2002). By adapting the observatory practices of ethnography, the researcher can study publicly available data within the online environment.

*Netnography* reveals immense potential concomitant with the increasing number of consumers that use the internet to share their stories. This did not stay undiscovered. On the contrary, Netnography gained rapid popularity and is widely adopted in different research fields, such as e.g. marketing or product development amongst others. The quick adoption can be attributed to easy information access, that makes this research method very fast and considerably cheaper than traditional research methods. Literature often describes it as an unobtrusive way of research, which hence does not intimidate the observed community members to voluntarily reveal their honest opinion or any sensitive information (Bartl et al., 2016). This implies richer and more naturalistic insights into customers' everyday lives due to given anonymity (Heinonen & Medberg, 2018). Additionally, it is possible to access a large number of participants at the same time, unlike with other qualitative research methods (Xun

& Reynolds, 2010). Kozinets (2002) also underlines the flexibility of the method, inherent with the possibilities to adapt the method to all possible research settings.

Nevertheless, Netnography is mainly limited to computer-mediated textual conversations, while ethnography can investigate also other kinds of human communication, such as body language or tone (Jawecki & Füller, 2008). This involves the assumption that community members may be more thoughtful when communicating online to present themselves as more cultivated, which consequently raises the question of the authenticity of the statements. Moreover, researchers are required to have good interpretation skills at their disposal in order to gain valuable knowledge. At this point, it is important to keep in mind that findings cannot necessarily be generalized to customers outside of the online community (Kozinets, 2002).

## **3.2. Research Procedure**

The next subsection of this chapter will explain the procedure of this netnographic study in detail, following the six steps suggested by Kozinets (2010): Definition of topic and research questions, identification and selection of community, observation of community, data collection, analysis and interpretation of findings, as well as finally the presentation of the findings with the corresponding theoretical implications. The latter one will be found in the next chapter.

### **3.2.1. Research Planning**

The first step to start the research is defining the topic of *Smart Homes* and the corresponding research questions that were already discussed in the introductory chapter. In the next step, appropriate online locations are investigated to explore the given research questions. To do so, search terms such as “smart home”, “home automation” and “connected home” were used to locate communities on online platforms including Google, Facebook, Reddit, Instagram, Pinterest, and YouTube.

After the familiarization with several locations, the selection was narrowed down. Correspondingly, the identification of suitable online communities was made upon Kozinets’ (2010) guidelines. According to his suggestions, selected online communities should be relevant concerning the topic focus and they should have recent activities with regular traffic. Additionally, they should consist of many different participants who produce detailed and rich content.

Since smart home is a very technical topic, many groups were eliminated directly at the beginning, as they did only consist of informational posts, not providing any further discussions among the community members. Locations with outdated activities were also disregarded. Communities about topics closely related to smart homes, for instance, Home Assistants or Smart Things amongst others were also investigated. However, for the purpose of this study, the focus was too narrow. Therefore, insights from those locations can only be used as supportive arguments.

Subsequently, taking Kozinets requirements into consideration, the research revealed two potential online communities on the website Reddit: [r/smarthome](#) and [r/homeautomation](#).

### **3.2.2. Entrée**

The primary source of information chosen for this research is the Reddit group [r/smarthome](#). It counts 41.7k community members (status October 2019) and is supposed to offer any help, tips, tricks, and advice around the topic of *smart homes*.

It was founded in October 2011 and is supervised by four moderators since then. They monitor the maintenance of all rules by the community members. Those rules incorporate guidelines related to the topic (all posts must be related to smart homes), sources (links for products & services talked about), behaviour within the community (no abusive behaviour) and referral links (should not solely be posted). In case those rules are disregarded, the post or comment will be deleted. This procedure secures a peaceful exchange with relevant and rich contributions for all issues around the matter of smart homes. Furthermore, it reduces the bias of a non-representative sample that is not interested in the topic and using the community for other purposes.

With around 10-20 posts per day, this group actively produces recent content. The majority of this community consists of members who already possess any kind of smart home devices or want to purchase some in the future. Hence, members are familiar with the topic and its facts. The conversation is correspondingly very subject-specific and requires a certain degree of knowledge on the topic. Since this conversation barely covers the opinions and viewpoints of persons who identify themselves as being completely new to the topic, other sources of user-generated information will be consulted to complete and contrast the picture with the conversation of the broader mass. Therefore, user comments on YouTube videos related to *smart homes* will be included in the analysis as well.

### **3.2.3. Data Collection**

Serving as a basis for this research, archival data of the respective online location was collected during the period of October 2019. All posts were skimmed for research question related topics such as the definition of smart homes, advantages, concerns, and current product problems. Posts that were considered as too technical (e.g. those containing programming codes) were kept disregarded as they were seen as insignificant for this research. After all, a total of 162 posts was considered. Additionally, occasional posts posted outside the above-mentioned timespan were regarded as relevant and hence contribute to the following analysis as well. The collected posts range from references such as “Making an old home smart”, “Is Smart Home worth it?”, “What do you consider the most useful smart home products?”, to pure product reviews, informative videos and member questions about specific product setups. These posts stood out for their concise messages, detailed user stories, and lively discussions.

Moreover, two YouTube videos were studied. The first one “5 Smart Home Tech (for Amazon Echo, Google Home & Siri!)” (2.597.049 views, 319 comments) presents as the name suggests five different smart home products. The second video “Best CES 2019 Smart Home Tech: 25 Awesome Gadgets” (1.529.464 views, 579 views) introduces new smart home products gadgets from the Consumer Electronics Show of the ongoing year. Both videos stood out due to their high reach and engagement of the broad mass, providing various relevant comments that complement the input of the previously mentioned primary location in Reddit.

### **3.2.4. Research Representation and Data Analysis**

For the analysis of the previously collected data, an inductive analysis method was applied. It is also known as grounded theory, a concept that was established by Glaser and Strauss (1967). It implies the discovery and creation of a theory based on qualitative data from social research. In other words, in the context of netnography, theory development starts with the ideas of the community.

Using the community insights as a starting point, the data was coded manually to highlight the single thoughts behind community interactions. This procedure was preferred to a computer-assisted qualitative data analysis software such as e.g. NVivo, as the scale of this research is of a comparably manageable size. Hence, following the suggestion of Kozinets (2010), the research stays more focused and keeps the researcher closer to the data, gaining an in-depth understanding of the community. Consequently, it reduces the risk of distancing oneself to the

data, which might unintentionally lead to a misinterpretation of the findings due to the missing context, ultimately preventing vague theorization.

For the completion of the coding process, study colleagues were consulted for coding suggestions of other mindsets. The respective codes were then grouped in larger categories regarding subject matter. Those categories were then again assembled to broad themes that describe the overarching idea of the various code collections. This approach resulted in a thematic network (appendix 1), which serves as the basis for the development of grounded theory around the topic of smart homes.

### **3.2.5. Ethical Standards**

A netnographic study makes use of information that is publicly available and originally not intended to serve for scientific research. Since the authors of that information might be offended or harmed in case they are not explicitly asked for permission of use, Kozinets (2010) advises ensuring several ethical research procedures. These procedures include first and foremost the full disclosure of the researcher to the members of the online community regarding his or her presence and intentions during any interaction. Additionally, confidentiality and anonymity must be kept. Lastly, feedback from those community members whose input was used should be requested in order to verify appropriate interpretation. The latter is also referred to as member checks. They do not only contribute to research ethics but might also trigger new useful information that can benefit the study.

To maintain the above named ethical standards, the admins of the online location under analysis were contacted in order to ask for permission for data collection and feedback of respective members for any queries. Concomitantly, the researcher introduced herself in every incurred interaction with the community, uncovering the interest in the community, as well as the methodology and objective of the research. Confidentiality and privacy is given by the anonymization of all user names.

## 4. Analysis

The following chapter explores the collected archival data<sup>2</sup> and netnographic fieldnotes, using it as a basis for the development of the grounded theory. It is presented in three emerging ethnographic themes. A visualization of the thematic network can be found in appendix 1.

### 4.1. Smart Home Definition

The first ethnographic theme that developed from the inductive data analysis is the definition of the smart home. This involves associations to the topic, the definition of the concept itself, the interpretation of the word *smart*, and the dissociation to home automation.

In the analysis, it is noticeable that terms such as “*remote control*”, “*home assistant*”, “*voice control*”, “*routines*”, “*needs*”, “*control*” and “*home automation*” amongst others repeatedly occur within the community’s conversation. This shows that members associate not only the various elements of the technology itself with smart homes, but also the aspect of personalization according to their individual needs.

While associations to the topic seemingly match, the exact definition of the concept remains vague. The understanding of the community overall includes home automation technologies, (remote) control, and digital assistants being part of system that is adjusting to one’s personal needs to improve the quality of life. While describing their understanding of smart homes, users usually focus on the tasks the smart home system is taking over for them such as e.g. opening the curtains in the morning, turning electronic devices on or off when needed, adjusting the lights in occupied rooms, regulating heating and air conditioning or turning on the alarm when people are leaving the house. Nevertheless, the extent to which human interference is required seems not to be agreed on completely.

The discovery of this fact is highlighted by the post “*What is a Smart Home? Let’s clear up some terminology that is commonly misused on here...*” which reveals that there is no uniformity for this concern. The author claims that some of the terms are often applied wrongly and requests to resolve this issue. On the one hand, several community members – including the author of the post – claim that the term “smart” is ultimately the distinguishing factor to pure home automation. In the context of technology it is associated with intelligence

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<sup>2</sup> For better legibility, spelling and grammar errors have been improved without distorting the meaning of the statement.

and the automatic adoption of the home environment to customer's needs. The latter one, automatic adoption, is based on information gathering, followed by the creation of logics without human intervention.

Only few scholars explicitly point this out in their smart home definition (see e.g. Sultan & Nabil, 2017). Others use terms such as *seamless*, *context-aware decisions* or *automated need response* which might support this point of view, but which do not explicitly express this issue (see e.g. Alam et al., 2012 or Eunil et al., 2017). Balta-Ozkan et al. (2013) and Georgiev and Schlögl (2018) for example also point out the distinguishing element of information management and concomitant communication between devices. Nonetheless, they also demand that the development of this technology should continue to become even more self-learning to reduce human interaction with the system, to become less present in peoples' mind (Balta-Ozkan et al., 2013).

Community members with this understanding of the smart home concept also point out that remote control via the smart phone or voice assistant – basically the replacement of one control for the other – is not smart in any case. It is rather a more advanced manual control in the end which solely serves to be more convenient.

On the other hand, other people do still equate the term “smart” with the automation feature and remote control. Considering the different definitions that are circulating, it becomes clear that some of the users think that home automation can be compared to smart homes, whereas it is rather understood as a predecessor system. It shares the idea of an automated home, but not of an intelligent, learning home without the user functioning as an intermediary (Sultan & Nabil, 2017). However, they are not alone with this thinking. There are different academics who also use home automation and convenient control as a synonym of smart homes (see e.g. Li et al., 2018; Robles & Kim, 2019).

Community member's divergent views are ultimately resulting in different understandings of the value proposition of the product, which could propose a barrier for adoption as well.

## **4.2. Influences on Buying Decisions**

The next emerging theme is the influences on the buying decision. These imply first of all the background of the user and hence the current target group of smart home products. Concomitant to this, people influencing the main target user also play a role. Moreover,

attributes of the product such as for example price or design can be found, as well as their initial motivations to buy the product.

Looking at the conversation in the Reddit community, many members identify themselves as persons with an IT background (e.g. developers) and high technology affinity (“*geek*”). They have technology knowledge at their disposal and acquire this knowledge on their own, doing a lot of research online and by exchanging stories among each other with like-minded people. For a lot of them, smart home technology is a hobby that they use to experiment with in their free time. They are building their systems by themselves, mainly because it is described to be fun, but also because they want to have the full control above the whole system and customize it to their wishes. “*With so many possible configurations and integrations I want to do it my own way with my own app*” one user is stating, alluding to the technological barrier of interoperability.

One user describes the technology as “*enthusiast toys*”, which is also underlined by the discovery that several users go beyond just DIY’ing the system. After setting up the system, they monitor and track every information, visualizing them into charts and analysing the potential for further improvement. A member check confirms that experimenting with different settings can even be seen as leisure time activity. One user also claims this hobby as being addictive, constantly wanting to buy new devices. Others are reporting similar experiences, another user states: “*And prepare to expand. I started with three smart plugs. I ended up replacing all my in-wall switches, most of the plugs, blinds, garage door, lamps, bulbs. I went from a \$60 investment to \$5000 in a few months.*”.

The early adopters and their background are however not the only influential factors for the buying decision. Several users express their concern about the opinion of their family and the user-friendliness for guests and friends. Especially the family must agree on it and be able to understand the system when it comes to controlling and operating it. All of them must “*jump on board the tech*” as one of the users states. This is most likely to also include persons who might not be very tech savvy, making the situation problematic in some cases. That is why some members are claiming to keep all the manual control options. Seemingly complex products that might be difficult to understand are hence hindering consumers from buying the product (Roger, 2003). Scholars come to the same conclusion, associating the increase of effort to use the product with a significant negative impact on the intention to use it (see e.g. Marikyan & Papagiannidis & Alamanos, n.d.).

Further influences on the buying decision of smart home products could be identified within the analysis, namely, convenience, time, efficiency, price and design.

Convenience, time, and efficiency are the predominant motivations of consumer to buy smart home technologies. Therefore they expect the product to fulfil the very ones in an easy understandable way. *“It’s little things like seeing when packages arrive, knowing if I left the garage door open, checking on my dogs while at work, the porch light turning on automatically at sunset etc. Nothing here is ground-breaking change – but it’s incredibly convenient.”* says one user. Other community members are also telling about the many small automated jobs that are taken over by their smart home system for convenience and more productivity. Time savings are also mentioned, such as in the following comment: *“I know it probably just saves me like two or three minutes per day, but that adds up!”*, which hence makes daily life more efficient for the consumer. Due to the slightly varying understanding of the concept of smart home, the perceived benefits also vary amongst community members. Some users enjoy controlling e.g. lights and home appliances with their smart phone while sitting on the couch or being on the road. Others point out how much they appreciate the fact that their home is learning with time in order to adopt appropriate settings independently. This way they do not have to take care of doing it and focus on other things in their daily life. However, after all, they are attributed to the motivation of comfort.

The reduction of energy consumption is likewise frequently mentioned by scholars (see e.g. Balta-Ozkan et al., 2013 or Risteska Stojkoska & Trivodaliev, 2017). Though, it does not have such an importance for the community members. Only one user actively argues that his energy bill has reduced by 20-25% since using his smart home system. Other users are indirectly mentioning the reduced energy consumption as well, yet, they are looking at it rather from a financial, than from an environmental perspective.

Another factor is the visual design of the smart home devices. Community members demand being able to integrate the products seamlessly into their personal interior, ideally even hidden from sight. Some of the products that the users currently have in use are perceived to not be visually appealing. Stringer, Fitzpatrick and Harris (2006) highlight that smart home devices should be incorporated not only into the design, but also in the lifestyle and the surrounding of home in general. If there is no fit, the appeal of the technology is likely to go down.

In general, a smart home system is seen as a kind of status symbol by the community. Its functions are a popular aspect to show off in front of others. They do not only meet the

approval of guests and friends but are also called to have a “*cool factor*”, stirring enthusiasm among the users.

Lastly, the price plays a big role when it comes to the purchase decision. As it is perceived as quite high within the community, it becomes likewise a decisive criteria, under the consideration of the perceived benefit of the product usage. In this context the payment option of subscription is additionally highly critiqued. Those aspects will be discussed further in the next section about barriers of adoption.

### **4.3. Barriers of Adoption**

As research and many discussions online show, the smart home concept still inherits many pitfalls that is keeping it from being adapted by the mass market. The third and last theme hence evolves around the adoption barriers experienced by the online community – before and after the purchase. Those barriers can be categorized in failures of smart technologies, the trade-off between benefits and costs, the issue of trust and effects on the human health and behaviour.

The analysis revealed many posts and comments that deal with the failure of smart technologies. Many of them are product specific, but the sheer quantity highlights the relevancy of the issue. This finding gives the impression that circulating smart home technology is still in the development stages and rather “*gimmicky*”, as one user states. Software is perceived as not sophisticated enough for the set price point, while systems are perceived as not reliable. Especially the reliability of wireless connection is being questioned, which hence queries an essential part of the whole smart home system. One user states: “*Lights and sensors always wired if you have the option, you rely on your light and wireless is not and likely will never be reliable enough. [...] WLAN is for computers and mobile devices, not for things in your house you rely on!*”. The handing over of control seems already difficult for many people. Not being able to rely on the technology that is now in charge of this control, creates a major problem. Additionally, literature suggests that reliability is not only an issue on the technical side, but also on the intelligence side. Meaning, how reliably smart home services are to predict individual users need. At the current state, these abilities are still limited (Balta-Ozkan et al., 2013).

The collected posts and comments do not show any repeated specific failures but rather a broad range of problems, ranging from communication failures, to problematic updates, to

speed problems and short battery life amongst many others. Yet, the conversations about interoperability between different brands are very frequent and hence disclose another major matter. Noticeably many community members complain about their problems of connecting products from different brands in one system. Seamless integration in one platform does not seem easily possible which limits the customer with the personalization of the system. Leaving the customer off with multiple platforms to control their smart home, the usage of the system becomes more complicated. Conversations showing that early adopters who are usually technology affine have trouble understanding the complexity of the systems does certainly not encourage the broad mass to integrate smart home technology into their daily life.

It is turning out to be a challenge to make all the smart devices work together. As there is no industry standard at the moment, many of the technologies are conflicting with each other, resulting in a communication failure between products. This ultimately leads to the failure of the whole system. Consumers are irritated about this situation and demand for one holistic ecosystem, possibly created by one company. As one user for example states: *"This reminds me of the pre-smartphone days where everybody was thrashing around trying to bring it all together. There has to be an "Apple" in that group of companies."* Recent literature suggests to either establish a central connector system that functions as an intermediary between the different protocols or to institute a universal standard among all smart home devices.

One member attributes the reason for the missing interoperability to the profit focus of the companies, reproaching them to pay too little attention to the customer needs: *"The industry has been trying to come up with standards so that products can reliably work together for years but, seeing there is no economic incentive for company A to work with company B, nothing ever gets better. And, depending on the company, there is no incentive to fix or update the product once they have your cash."* The latter sentence refers to the fact that many brands try to build their own ecosystem. Once trapped in one system, the interoperability forces the customer to stick with the respective company and its setup. Switching costs are simply too high.

Speaking about cost, the discussion comes to the next pain point of the community members. The price of the products compared to their perceived value. Smart home systems are generally associated with very high set-up costs, talking about amounts in the four-digit range. This leads back to the infrastructure of the system, requiring numerous devices to

work. A high initial investment keeps many consumers from buying it. It is too expensive to simply try out the product to see if they like it. Also, since the system is usually bought to fit into the current home, users talk about the expenditure not being worth enough in the case of moving in the close future. Finally, people identify the smart home product to be targeted at the middle or upper class and otherwise not being affordable.

Some persons note that building an own system tends to be cheaper. Still, the investment is inevitable and from experiences, are not being offset: *"You will almost never see a monetary gain from having a smart home. The upfront costs will likely never be made up in savings."* Additionally, community members worry about the resale value once they installed a system in their house, considering the individualization of the system and the rapid depreciation and innovation of technology. With this view, they would not have a return on investment while using it, but neither when they resell it.

Furthermore, subscription based products arouse opposition. Subscription based pay models for e.g. smart cameras comes upon resistance: *"I think subscription fees are getting crazy as time goes on. I mean, I just want to pay for a product and be done with it but now it's like, you pay for a product and you get charged like you are paying taxes on it for as long as you have the product. How did us consumers let this happen to us? It's not about the customer anymore. It's all about how much money can they make off us."* Taking up the last sentence of this quote, the data analysis showed that many consumers do not think that the price is justified for its value. On the contrary, for several users within the broader conversation on YouTube especially do not see any values in the extolled benefits. For them, the enormous amount of money does not legitimize the minimal increase in convenience. Other users even respond sarcastically *"I have never once asked why I'm still opening and closing my own blind and never will"*, implying that there is no need for such technology, simply not adding any value to their life. Even though the opinion on this matter might be differentiating in the online world, this finding proposes that the relative advantage of the smart home technology is not perceived by everyone.

Moreover, the effects of smart home technology on humans, more precisely on their health and behaviour is another topic commonly referred to, predominantly in the discussion on YouTube. The consumer is exposed to an increased rate of radiation on a daily basis, emitted from technological devices. Radiation is mainly associated with a bad impact on health and specifically cancer. But even more attention is paid to the fear of change of current behaviour

to a negligent behaviour. Smart home technologies are portrayed as an enabler for laziness that robs people's innate abilities to independently act and find their way around. The consequences will become worse and worse with time, making humans "dumb" and "fatter". As most of the literature is rather product oriented, this topic is barely mentioned by academics and could hence be a valuable insight to the current discussion.

Lastly, trust issues towards smart home technologies can be identified as an important barrier of adoption. The conversations make clear that people are highly sceptical when it comes to the subject matter of cyber security and the threat of surveillance. With the data documentation of all moves or decisions within and outside of the house, consumer make themselves contestable. Thus, hacker attacks and cyber terrorists stealing those data counts to the biggest fears amongst the community. But not only the misuse of personal data from private outsiders arouses apprehension, but also the misuse of data by the manufacturer, the government and secret services such as the CIA. The technology is compared to Big Brother<sup>3</sup> functioning as a surveillance tool to spy on society. This position assigns them with power and control, making the user giving up its freedom unnoticed. One user states: *"This is how the herd slowly gives up freedom & security without realizing and being perfectly fine with it. Not all technology is great or safe. They push this modern age crap like its necessary & revolutionary. Electronic dependency is 21st century slavery. Only time will tell the atrocities it causes."* Indeed, one of the member checks ensures that the fear of loss of control by third parties such as hackers or companies is actually greater than the fear of the artificial intelligence of the technology itself. Literature proposes that the highest priority is to overcome the barrier of trust issues, taking all necessary steps to assure all consumers that data will be treated confidential and systems are immune to cyber attacks.

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<sup>3</sup> Big Brother is an internationally successful but disputed TV show. The concept of the show is described as follows: A group of people lives in a residential environment. Their daily routines get structured by the production firm, receiving daily instructions from the computer voice "Big Brother", while cameras and microphones record the happening 24/7 (Mitchell, 2019).

<sup>4</sup> As described on the official Netflix website, the Netflix production Black Mirror is a science-fiction series that deals with the possible (partly drastic) impacts of the usage of novel technologies and innovations in society. ("Black Mirror", 2019)

In this context the Netflix Series Black Mirror<sup>4</sup> is mentioned several times, using it as a comparison of how people imagine the world to develop with smart technology as the enabler. While for some users, these possibilities portray an atrocious turning point in societies life, others rather view it with equanimity. One smart home user argues: *"And to the people who ask me if I'm okay with google listening to my conversations via the google homes, all I have to say is if you have a smartphone, chances are that is already happening. And all they're going to hear is me yelling at my friends while playing PUBG<sup>5</sup> anyways."*

Lastly, an overarching topic that goes along with and is rooted in all identified barriers is the topic of missing user-centricity. It is addressed in different contexts, revealing that consumers do not feel heard, while companies are purely profit-oriented. The sole amount of pain points consumer are facing supports this feeling of the community members. All of these findings can be verified by the findings of academic work that is exploring the adoption barriers of smart home technologies. The gap between the consumer need and the perceived consumer value is pointed out by several authors in the research field (see e.g. Chan, Campo, Estève & Fournils, 2009; Wilson, Hargreaves & Hauxwell-Baldwin, 2014).

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<sup>5</sup> PlayerUnknown's Battlegrounds (PUBG) is a multi player shooter video game ("PUBG", 2019).

## 5. Conclusion and Managerial Implications

This chapter aims to conclude the netnographic analysis by answering the research questions stated at the beginning of the dissertation. Subsequently, theoretical and managerial implications arising from the main findings of the analysis are then discussed.

Altogether, the research purpose of this dissertation is to investigate the current state of social conversation online about the product concept of smart homes. As a replenishment to the mostly technology focused academic work, the qualitative research approach should introduce insights from the consumer perspective. This form of social listening, aims at trying to understand their behaviour and attitude towards the topic. The ultimate objective is consequently to identify the cause of the slow pace of smart home adoption. Online locations have been proven to be a valuable source of less obtrusive and more naturalistic information for marketeers, so that the research method of netnography was chosen. To cover the broad discussions, the online communities on Reddit and YouTube are providing the input for the analysis. As a result, applicable grounded theory and strategy for the innovation adoption to the mass market are developed.

Based on the findings, the research questions can be answered as followed:

### **Research Question 1:**

**What is the common understanding of the smart home concept among the community members?**

The communities' understanding of the smart home concept is based on two elements: the technology part and the personalization part of the concept. Above all, the focus rather lies on the latter one. Accordingly, in their understanding, the concept provides a technology that should ease everyday life by supporting the persons routines and take over little tasks within their living environment. When explaining the concept, people usually use a range of examples to visualize the functions and benefits.

While the general understanding and associations to the topic are widely consistent, there seems to be still a disagreement or at least no precise definition on the scope of the concept. Some members equate the definition of smart homes with man-controlled home automation, while others argue that the definition goes far beyond that, implying an independent learning system acting without human interference.

### **Research Question 2:**

#### **Which elements influence the buying decision of smart home products? Why are consumers buying smart home products?**

The decision to buy a smart home system is influenced by various factors. First and foremost it becomes clear that the user background plays a big role. At the moment, the majority of people possessing a smart home is characterized by tech affinity or the interest in technology. However, their decision also gets influenced by the people they are surrounded with and who might not be alike in this respect. The ease of usability even without technological knowledge is from major importance here.

Functionalities of the product according to personal needs and technical requirements shape the decision making process as well. Concomitant, the benefits of the product are decisive influences on the motivation for purchase. Those include convenience, efficiency, time-savings amongst others.

The discussion also shows that design is an important attribute of consideration, since consumers want the system to be perfectly integrated in to the interior style and the residence itself.

Finally, prices for the whole systems are considered. While early adopters tend to attach less importance to the topic, the members of broad conversation in YouTube repeatedly express their concerns on the cumulated cost.

### **Research Question 3:**

#### **What are the adoption barriers of smart homes identified by the online community?**

The adoption barriers identified in the analysis are broad. Firstly, the smart technology itself is an issue. User experience a lot of problems on the technology part of the concept, ranging from communication failures, over a lack of system reliability up to the most discussed problem, the interoperability between systems. Making smart devices from different companies working together within one system is sometimes difficult, as there is no universal communication protocol standard in the smart home industry. This results in a rather bad perception of user-friendliness among consumers.

Furthermore, many consumers think that the rather small amount of benefits they gain by using the product concept do not justify the high monetary investment. Often, people regard

smart homes as a gadget more as a product that is actually satisfying any needs. That said, contributing to the reproach against the companies to not focus enough on the consumer.

On the opposite, many people think that the products are actually harming human kind. Both, the influence on health, through radiation, and the influence on behaviour, making people more lazy and negligent in daily life.

Ultimately, trust was identified as a main concern in the analysis. Community members are particularly anxious about cyber security and privacy being violated by smart home devices. They are afraid about the utilization of their personal data by hackers on the one hand, but also by the responsible companies, the state or international intelligence services on the other hand. After all, they are left with a feeling of vulnerability as it becomes easier to infiltrate their life.

## **5.1. Theoretical Implications**

Online discussions in communities influence the adoption of technology. Therefore, they provide a valuable source of digital consumer insight that allow researcher to understand their behaviour and perceptions about innovative ideas. These insights throw light on the personal consumer perspective, revealing attitudes, opinions and feelings within the context of smart homes. The findings allow to empathize with the consumer and consequently develop more customer-centered managerial implications for a successful adoption to the mass-market.

The collected information are particularly valuable, as they can be compared to the information that lead users are generally providing to researchers. Hence, they practically become general for the wide mass in the future (Hippel, 1986). The message those lead users or early adopters are spreading determines the judgement of new technologies and consequently how fast the diffusion process is progressing (Roger, 2003).

Although there has been numerous research done on the adoption of smart homes (see e.g. Eunil et al., 2017; Heetae, Hwansoo & Hangjung, 2017), the work only rarely grasp the reason behind their findings and the context of the consumers' attitude beyond the statistical findings.

The following subchapter will introduce first possible approaches for corporations in the smart home industry in order to speed up the pace of adoption, allowing to extract the full potential.

## 5.2. Managerial Implications

The underlying conducted research revealed that many of the causes for the slow pace of smart home adoption are deeply rooted in the product itself. Its complexity, mainly evoked by the conflicting, immature technology, leads to the perception that it is complicated to use. Not only possible primary users might think so, but also those people influencing the buying decision, resulting in a lower willingness to buy. At the latest when moving to the mass market, companies need to address this serious issue. While the early adopters tend to buy the product because of its “coolness factor” and the “novelty value”, the mass market might not be as forgiving. Consumers should not be expected to have technological expertise to use a product that is designed to simplify life. Therefore, priority lies on counteracting this reality.

A possible approach to do so on the product level, is to create first and foremost a universal standard of communication protocol. It must be integratable to all smart home devices, allowing the consumer to easily combine devices from different players in one ecosystem.

*"This reminds me of the pre-smartphone days where everybody was thrashing around trying to bring it all together. There has to be an "Apple" in that group of companies."* As one user suggests, there must be one authority in the market taking care of it – let it be an individual company with the necessary available assets or a strategic alliance of players. In this case, the partnership of competitors might be more profitable than stand-alone firms trying to strictly defend their own market share from their rivals. Other markets have proven to come to the same conclusion. Players are strategically partnering up with their competition to not only improve the overall customer experience, but also to build strong bounds against new entrants to the industry. The market of gaming consoles is a best practice example, where Sony and Microsoft partnered to develop new solutions for future cloud solutions, letting both benefit from the agreement.

The comparison to Apple also implies on the simplicity and user-friendliness the company is focussing on, with the goal of improving people’s life. With the implementation of both respective characteristics on a product level, this should also be part of the B2C communication. The communication should also focus more on the benefits than on the product attributes: A product that is seamlessly integrated into the home, almost invisibly supporting daily tasks, allowing him or her to focus on the important things in life. In this respect, the understanding of the concept can be cleared by emphasizing the minimum amount of human intervention needed, in order to make it work. Alongside, the advantages of

possessing a smart home system must be highlighted particularly in order to convince those who do not see the value in it at the current state of mind. In this course of action, it is important that an incisive value proposition is communicated in order to clear prejudices and wrong interpretations of the product concept.

Resuming to the value proposition, companies should think about emphasizing the association of climate impact with smart home usage. Even though the analysis reveals that this connection is barely made, the current happenings and media devoted attention for the topic is showing the growing interest in this issue. Maybe even taking the concept a little further in the context of smart buildings, energy savings, as well as a more efficient use of resources in favour of the environment could be a convincing selling point for the broad mass.

It is also from major importance to educate the consumers not only on the benefits, but in general on its use, as well as on the role and obligations of the company in terms of security. The analysis shows that the mistrust towards corporations and the state is strong. Transparency should be given in order to gain the trust of the consumer and stay credible. This can for example be achieved by clear information about how the system works and how it is protected. Long-term, this is only effective, if the companies seek the dialogue with the consumers in order to build a connection, being able to pay close attention to their needs.

Ultimately, the most obvious implication for the trust issue on a product level is to allow the customer to decide individually which tasks are needed to be taken over, which security settings are preferred and to which extend data should be accessible - without adversely affecting the basic performance. By providing the option, the personalization of the product can be taken even further. Given that this is commonly valued, the feeling of having control will be brought back partly, a feeling that many consumer fear. Supplementary to this, it is on the governments, to work out appropriate regulations about data handling, aiming to protect the end consumer and decrease conflict potential between service provider and customer.

## 6. Limitations and Future Research

Looking at the conducted netnography research, the findings provide a valuable and solid foundation for businesses to understand the current state of consumers' perception of the smart home concept. However, the limited scope of the research method must be considered.

With netnography being a qualitative research method, the analysis should provide an enhanced contextual understanding but is at the same time prone for subjective interpretation to a certain degree. The quality of analysis hence depends on the interpretation skills of the author.

Moreover, due to the limited time and resources available to run the study, the amount of data collected and analyzed is rather narrow. The manual conduction is known to be very time-consuming due to the amount of irrelevant data within the sample that must be skimmed. Additionally, the research is mostly limited to the Reddix group and the conversation underneath two YouTube videos. Not only that this is solely a small sample, the online world also implies an anonymity that complicates the information about e.g. demographics. Therefore, it is advisable to validate the main findings of the study with further qualitative or quantitative research. This way, conclusions can be generalized and made valid for other groups than those under study.

Concomitant, the dissertation touched upon several topics that are interesting to examine in more in-depth. Continuing to study the consumer perspective, it would be valuable to find more empirical evidence on needs and opinions of the mainstream mass market consumer. Ajar to these findings, the investigation or even co-creation of practically implementable and effective solutions for the known barriers are needed.

Additionally, regarding the topic of trust and security, it would be interesting to investigate why smartphone or laptop usage is perceived as less threatening than the usage of smart home devices. After all, all technical devices that society is using on a day to day basis are collecting data and prone to allow insights into each and everyone's privacy. Alongside this study, a major item of research should be the development of appropriate laws and regulations that governments should be passing to protect consumers.

Finally, it would be interesting to investigate the topic in the context of smart buildings, and even bigger holistic ecosystems that combine already independently used (connected) services. As one user under analysis suggested, combinations might be perceived as much

more valuable to the consumer. An example would be the linkage to an intelligent and efficient resource usage with solar panel generated energy or water systems. This way, the positioning of the concept and accompanying opportunities in the context of environmental sustainability could be examined in more detail.

There are still many unanswered questions regarding the truly successful implementation of the smart home concept in the mass market. The example of the smart home market shows once again how important it is to deeply understand the consumer and his or her motives. The online world provides a valuable source of information and barometer of public opinion shaping the diffusion of technologies. It allows to discover the roots of the problems and needs beyond the thematic aspects. It allows to close gaps between consumer perception and the actual value proposition. Accordingly, not only aspects are discovered which the product does not yet fulfil as expected, but also those whose benefits and understanding have not yet reached the consumer yet (as in this case, for example, the contribution to the environmental benefit of using a smart home). This is especially important in fast moving times full of changes like today. “In the long term, though, the fact that society and technology co-evolve in a complex and non-linear manner leading to reshaping of homes and routines by technologies in radical ways, there remains a question mark over whether smart homes can fulfill the promise” (Balta-Ozkan et al. 2013, p.372). Therefore it remains open whether smart homes will actually be used in this (intended) way in the future. What is certain is that the answer can only be found with certainty if the problem is further researched from a consumer perspective.

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## 8. Glossary

<b>B2C</b>	Business to Customer
<b>IoT</b>	Internet of Things
<b>PUBG</b>	PlayerUnknown's Battlegrounds

# 9. Appendix

## Appendix 1: Thematic Network

