Smart Home – Status Quo, Trends and Innovations

Bachelorarbeit

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vorgelegt von

Name: Gerlach   Vorname: Jana

███   ███   █   ███

Prüfer: Prof. Dr. Breitner

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1 Introduction

"A house is being built, but a home is being shaped"

-Hazart Inayat Khan-

Home is the place, were people spend the most time of their lives, no other place in the world is much more important than home (aphorismen.de, 2018). It is getting built, personalized, shaped, and have its own individual meaning for the inhabitants. The new trend of transforming and shaping the home: is to automatize it. This leads to benefits for the owner, such as gaining comfort, management of lightning, efficient energy management, monitoring of family members, surveillance and also security.

Today, we live in a world, filled with increasing digitalization. Nearly every part in our lives became digital or even smart, such as smartphones, smart watches, smart television and also a Smart Home (SH). The trend of a SH became more and more prevalent and popular, especially, over the last few years. Due to the motivators of surveillance, energy management, lightning control, property protection and the monitoring of children, elderly family members and pets (Sivaraman et al., 2016, pp. 195-200), (Schiefer, 2015, p. 114).

In general, a SH aims to improve wellness and living comfort of its inhabitants, with the help of smart devices and smart services. These smart devices are connected to the internet and thus, connected to the so-called Internet-of-Things (IoT). In a household, they can work together and built up a SH environment. The most significant smart devices are smoke-detectors, door-locks, cameras, light-bulbs, multimedia, window-sensors, switches and thermostats (aphorismen.de, 2018), (Sivaraman et al., 2016, pp. 195-200).

Regarding to this trend, the number of IoT-devices in 2016 was 17.68 billion and two years later grew up to 23.14 billion. In the forecast, they will grow too. From presumably 30.70 billion in 2020 to 62.12 billion in 2022 and 75.44 billion in 2023 (statista.com A, 2016).

However, the global SH market revenue grew from 24.1 million U.S. dollars in 2016 to 31.4 million U.S. dollars in 2018 and presumably, these values will increase up to 40.9 million U.S. dollars in 2020 and 53.45 million U.S. dollars in 2022 (statista.com B, 2016).

This growth continued and spreads all around the world, so that the countries with the largest SH market revenue are the United States, China, Japan, Germany and United Kingdom (statista.com A, 2017).

The main problem in this field is, that these smart products, which are still available on the mass-market, are much future advanced, that the research itself is able to analyze and evaluate it. This leads to a large research gap, which is complex to close and to handle, because the development of such devices is very fast, nearly unstoppable.

The overall goal of this work, is to develop an overview about the Status Quo of SH technology. Focusing on trends and innovations and also to demonstrate the impact of SH as well as the advantages and disadvantages. Thus, the research question is as follows:

"What is the current state of the Smart Home technology relating to emerging trends and new innovations?"

Subsequent to the introduction into this topic, the second part represents the theoretical background. In this Chapter, the history of SH technology from the first electronically powered vacuum cleaner to today's surveillance systems and smart thermostats. Furthermore, the term SH gets defined by the development of an operational definition. After that, several different market segments from entertainment to surveillance and energy management are presented. The last section of the second chapter deals with the architecture and technological components of a SH.

In Chapter three, a literature review by Webster and Watson identifies research material, which is essential for the future procedure.

Chapter four provides an overview about the current market situation, including a market analysis and a service and product overview.

Chapter five deals with the taxonomy of a new living environment by discussing advantages and disadvantages, but also new trends and problem-solving solutions, deriving by SH and their usage. In this case, privacy concerns, security issues, the new trend: Smart Loudspeaker and also the influence with other markets will be discussed and gets structured in a Swot-Analysis. A discussion of the results follows.

Subsequent to the discussion, limitations and recommendations, including aspects of future research are present in chapter seven. The last chapter summarizes all findings and answers the research question in a conclusion and outlook.

8 Conclusion and Outlook

The aim of this thesis, is to develop an overview about the current status of SH technology, focusing on trends and innovations. In addition, the objective is to demonstrate the advantages and disadvantages to answer the research question: "What is the current state of the Smart Home technology relating to emerging trends and new innovations?"

However, a closer consideration of the SH market shows, that the purchase interest is very large and also the global market revenue of SH devices grows rapidly. A look into the future makes it presumable that this interest will continue to grow and spread around the world. The United States are the most significant market for SH devices followed by China, Japan, Germany and the United Kingdom. This leads to the result, that the distribution of smart devices and the concept of smart living is established very well in mostly every part of the world. The main reason for this distribution is the fact, that a SH environment offers many benefits towards their inhabitants. For instance, increasing comfort, more security, energy management, monitoring of family members and pets, surveillance, AAL and multimedia entertainment.

In contrast, there are also weaknesses and threats. The acceptance issues from the consumers side or the security issues and privacy concerns prevent a future expansion on SH devices. But also, the lack of interoperability, the difficult handling and the missing standards leads to that.

One of the most significant innovation and the latest trend on the SH market is the smart loudspeaker. It allows the user to operate a device without manual activities by using a smartphone or tablet, it only works with the voice. The relatively high adoption rate of smart loudspeaker can be a force to bring general SH devices forward and enhance to popularity of smart living.
In order to solve the interoperability issue with smart devices from different vendors, the platform IFTTT is a new trend. Furthermore, there are also other innovations on the SH market, such as AAL devices, (e.g. pill reminder) but also in the kitchen segment can be found novel devices and services.

Next to innovations and trends, other markets can also benefit from SH technology, for example insurance companies. They win twice, firstly, they can offer SH insurances against wrong operation or theft of such devices. Secondly, they can benefit from the data a SH gains. So, they offer a usage-based insurance, determined after the habits from the inhabitants.

The challenge for the SH market, in particular for manufacturers of smart device is, to reduce the acceptance problems, to work more transparent, eliminate security and privacy concerns. For success, another challenge in the future is very important and has to be solved, which is the enhancement and building of transmission standards for all smart devices. In order to achieve the goal of cross vendor transmission standards, vendors of smart devices have to work together and build a collaboration.

The question:" How future living will look like?" raised during the research. In answering this, it is necessary to look at the history of SH, the first electronical powered vacuum hover, the

washing machine and the dishwasher got one thing in common: They increase comfort. So, it is possible to consider that a home in the future will be smart and automated. Especially, new buildings will be equipped with SH technology and become a standard, for example apartments for senior citizens with the focus on ambient assisted living.

The research field in the future is highly diversified, many different fields have to be analyzed to close the currently existing research gap. Future research should include analysis, studies and surveys about the impact of SH technology and also the impact of the usage of SH technology. Another research field are innovations and the business usage of smart devices. An additional research project could be to analyze the concept of smart cities, smart tourism and smart communities, which have a great potential for the future. This raised the question, how does a city in the future will look like and which benefits can it offer to its inhabitants. The concept of smart cities is an expansion of a SH and demonstrates the high potential of smart devices and the SH.

It would be very interesting to explore how the SH market will change over the coming years. In particular the consumers perspective, but also the perspective from manufacturers and how the devices will look like or even work.

Overall, the results demonstrate, that the Status Quo of SH is as follows: The trend of a SH is currently still a trend, but it won't get out of trend. It will become more and more aware and also adopted.