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AN ASSESSMENT OF FAMILY BASED SMART HOME REFERENCE ARCHITECTURE MODEL

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Abstract

The smart home concept is a promising and efficient means of promoting good health, offering comfort and security, and so improving one's quality of life. Despite the advantages of smart home technology, why is adoption so low and not widely embraced by mainstream consumers? Most strategies are based on experimentation or are solely focused on the technological aspects. Technological or engineering perspectives on smart houses have failed to capture the true requirements of future smart home users. Through this research, we will determine the business gap preventing smart home adoption, as well as users' perspectives on smart homes and their concerns regarding smart home technologies. An online survey with 17 participants of household family has been undertaken as part of this research in order to better understand the attitudes and perceptions of potential smart home users, with the results of the survey being analyzed in depth afterwards. The results from this research may help broaden our understanding of the process of adopting smart homes and give valuable insight into user-centered tactics for promoting smart home service adoption.

Keywords: smart home; smart home technologies; smart home adoption; service preference; household family; users' perspective

Introduction

The definition of smart home and how smart home can be broadly and profoundly applied to various fields, will be discussed in this study. Smart home is sometimes referred as home automation (Alami, Benhlima, & Bah, 2015)

The Internet of Things has been the buzzword in business, but it is not a new notion. The word "Internet of Things", invented in 1999 by Kevin Ashton, the co-founder of Auto-ID Center.(Bassi et al., 2013) Ashton was a pioneer who invented this idea as he looked for ways in which by connecting RFID information to the internet and it could improve Proctor & Gamble's business. The concept was simple yet influential. If all objects in regular activities have identification and wireless access, these objects could interact with each other and be monitored by computers (Iot, 2013)

According to VID-19, 47%Gartner's recent surveys (October 2020) (Goasduff, 2020) that despite the impact of CO of organizations would raise their investments in IoT, as seen in Figure 1.

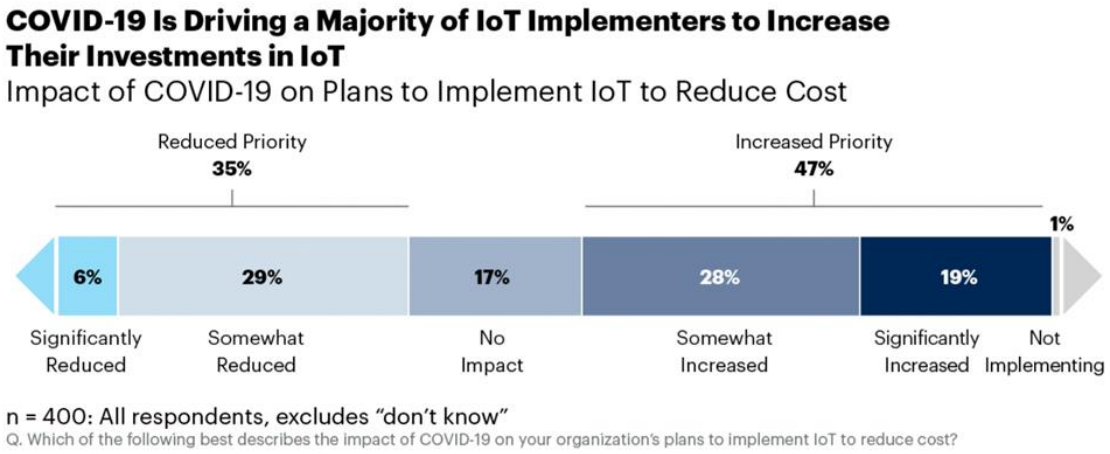

Figure 1
COVID-19's effect on implementing IoT to save costs. Source: 2020 Gartner IoT Implementation Trends Survey

Going to follow the COVID-19 lockdown, the survey there were 35% fewer businesses investing in IoT, while a greater number of enterprises intend to increase their spending in IoT deployments to reduce costs. One reason for the rise is because, despite businesses' lack of experience with IoT, IoT adopters deliver a predictable return of investment (ROI) within a defined period.

A large number of start-ups are attempting to break into this rapidly expanding industry. Despite the fact that the Internet of Things (IoT) has lately drawn attention to the smart home, this is not a new idea. In reality, the idea of a smart home has been debated since the 1980s, and it has developed beyond traditional home automation to include smart appliances. Although it has a long history and is gaining popularity, smart home services are still not generally embraced by the public. There are a variety of factors (such as high price of device, limited demand, and extended device replacement cycles) that are hindering the widespread adoption of smart homes. The most significant constraint is a lack of technological capability to create the infrastructure for a smart home. Smart home efforts seem to be in project phase, with slow consumer acceptance. In Parks Associates, high perceived costs continue to be a major barrier to the adoption of smart home. According to the company's Smart Home Tracker, 20.5 million people, or 44 percent of those who don't have or don't plan to buy a smart home device, mention high costs as a reason for not adopting the technology, followed by other factors, lack of advantages and privacy and data issues (Soto, Bosman, Wollega, & Leon-Salas, 2021)

Despite the many advantages that smart homes provide; they have not been generally accepted by mainstream consumers (Coskun, Kaner, & Bostan, 2018)

(Wilseon, Hargreaves, & Hauxwell-Baldwin, 2017). Many studies are being carried out to investigate the elements affecting the adoption of smart houses in order to determine the need and expctations of potential users, but not particularly in household families.

Smart homes are seen as possible alternatives for improvements in life quality, independent living and they offer intelligence services to increase life quality in homes, such as health monitoring, and regular activities predictions. Since smart homes is about the usage of intelligent environments, their aim is not only to reduce human or physical workload or power consumption but also to improve the quality of live for its inhabitants (Ho, Vogts, & Wesson, 2019).

Understanding the requirements and expectations of different user profiles is one successful way to enhance smart home adoption (Shin, Park, & Lee, 2018). Many researchers have examined the influence of user characteristics on adoption and prior research concluded that adoption is affected by a variety of variables, user expectations are varying, and efficacy changes based on user expectations. However, relatively few research has examined the effect of user perceptions of different kinds of services on adoption (Baudier, Ammi, & Deboeuf-Rouchon, 2020), particularly in terms of determining user preferences based on the categories of segmented services and evaluating their connection with adoption.

Primary goals of this study are:

• To identify the today's business architecture gap hindering smart home adoption

• To conduct a comprehensive assessment of the literature on smart home technology and evaluate its present situation.

• To discover how users perceive the smart home's adoption and service preferences, and to identify variables that influence the smart home adoption.

• To investigate which key drivers are most significant for consumers' intentions to adopt a smart home environment and how they influence this intention.

Research Methodology

The objective of this part is to describe the methodology used in this research as well as the motivations for conducting it in this approach.

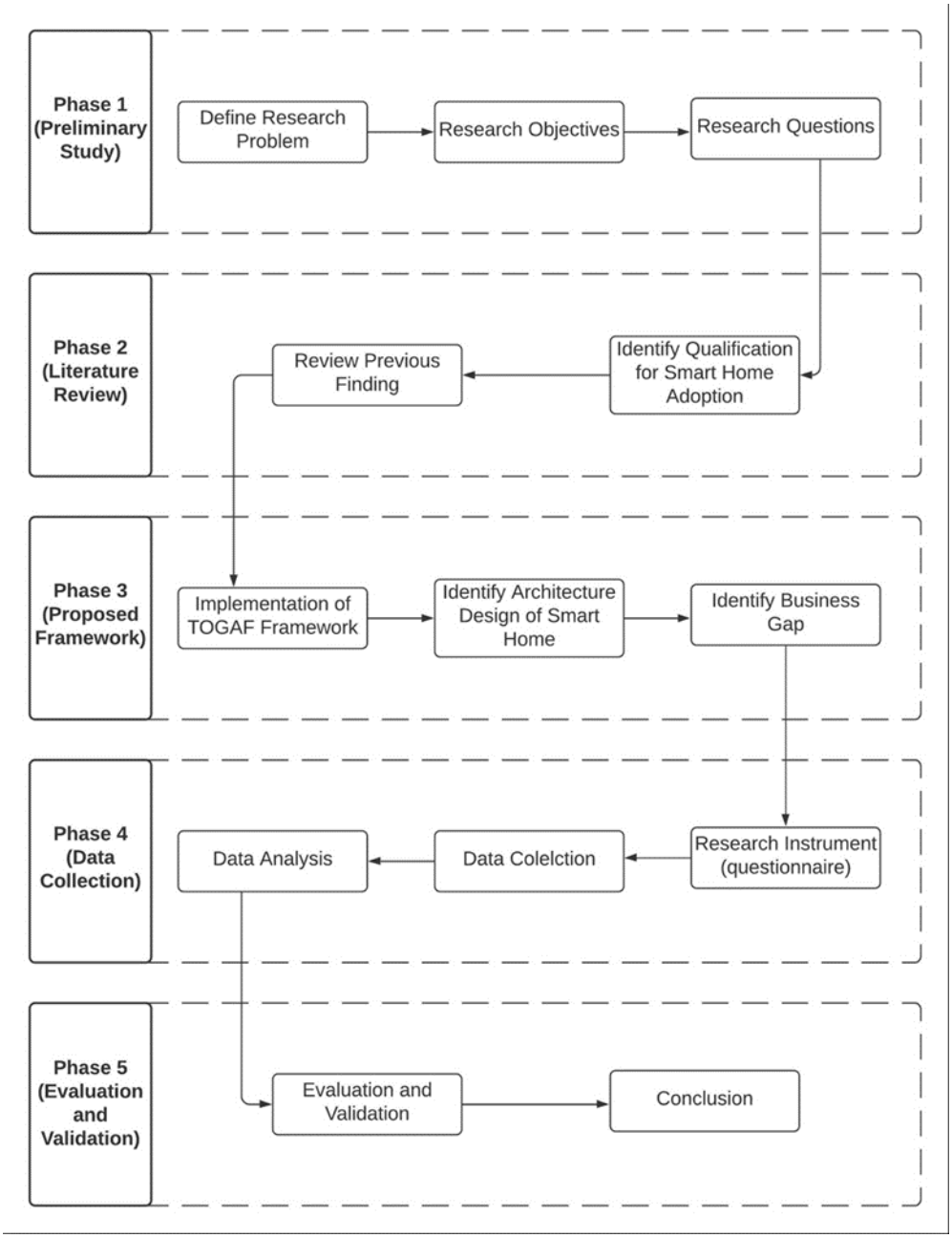

Figure 2
Research Methodology

In research design, we create a compilation of research activities that will lead to the realization of the research objectives along with problem statement, research questions. Figure 2 shows the research activities that consists of literature reviews in order to understand the existing research that relevant to Smart Home and to identify the research gap. After identifying the gap, the next step is to identify the business gap preventing smart home adoption by conducting a smart home architecture assessment using the TOGAF Framework. A survey will be conducted once the company and prior research gaps have been discovered to see whether the gap exists in a household family. The questionnaire format will be sent to selected respondents. Later, the data collected

from participants will be examined for reliability and validity using smart PLS software. After that, the architecture and survey findings will be reviewed by an IoT professional.

To acquire understanding of the motivations for adopting a smart home environment and thus to address the study question, we combined a literature review with a quantitative research strategy. The method has been to iteratively plan, develop, prepare, collect, and analyze data.

Factors influencing the decision to use one smart home technology may be profoundly different from those driving the desire to use a certain smart home technology. However, it should be noted that this study does not focus on or describe any particular form of smart appliances or technology.

We followed the standard and original parameters established by (Tranfield, Denyer, & Smart, 2003) to meet the purposes of the existing systematic literature review study and the assessment was based on a reference model of a smart home from the following perspectives, (Weisman, 2011):

- Business Architecture (External and Internal Stakeholder)
- Application Architecture (Interaction between Systems in the smart home)
- Data Architecture (Data Requirements, Flow and Integration)
- Technology Architecture (Technology Capabilities and Qualities)

Result and Discussion

1. TOGAF Framework Implementation Result
   a. Architecture Vision - Value Chain

In Figure 1, a recommended business process is shown using the value chain to provide a list of business processes that exist in the primary or core business activities and supporting activities. This business processes will be used to model the functions and services that exist inside each business function that will be depicted in a coherent way and believed can help to improve the smart home adoption. To model business processes, we utilize the framework offered by TOGAF ADM.

Figure 1
Smart Home Business Value Chain

The main activity consists of several activities including:

- Technology:

  Technology advancement enables businesses to innovate. Additionally, technology may be leveraged at numerous points throughout the value chain to achieve a competitive edge by enhancing efficiency or cutting manufacturing costs.
- Operations:

  Operations are the steps taken in the production of materials and resources that result in the production of a finished product or service.
- Data Analytics:

  Using data analytics to understand how clients are interacting with your products and work to improve their experience.
- Logistics:

  Distribution is necessary after a product or service is completed. This delivery procedure is referred to as outbound logistics.
- R&D:

  To be a pioneer in the Internet of Things, it is not enough to create what people want now. Research and development must be at the core of your business if you are to supply what your customers need, when they need it. Thus, IoT research and development initiatives become critical for worldwide advancement of the technology.
- Marketing & Sales:

  To increase the product's marketability and to promote the product, marketing and sales are required and play a critical role.
- Services:

  Warranties and guarantees, as well as product assistance and instruction, are examples of this kind of customer service.
- After Sales Services:

  Product maintenance is a critical aspect of after-sales services.

Support activities assist main activities in establishing a competitive edge. They include the following:

- Human Resource:

  A competitive edge may be gained by employing an expert and specialists inside an organization.
- Infrastructure:

  brand and idea should remain the emphasis while bringing store-level concepts back to the top tier of priorities.
- Finance:

  increasing finance at certain places throughout the value chain in order to boost the overall competitiveness of the value chain.

b. Architecture Vision - Stakeholders Relationship

As previously said, all stakeholders in the smart home ecosystem must collaborate harmoniously in order to achieve high levels of usefulness and compatibility via the adoption of standards or protocols for communication and collaboration. Ensuring that each stakeholder is aware of the effects that have been experienced and anticipated by the other stakeholders may help to extend their perspectives and lead to more effective deployments of smart home technology, as well as technology in general. The relationship between smart home stakeholders is shown in Figure 2.

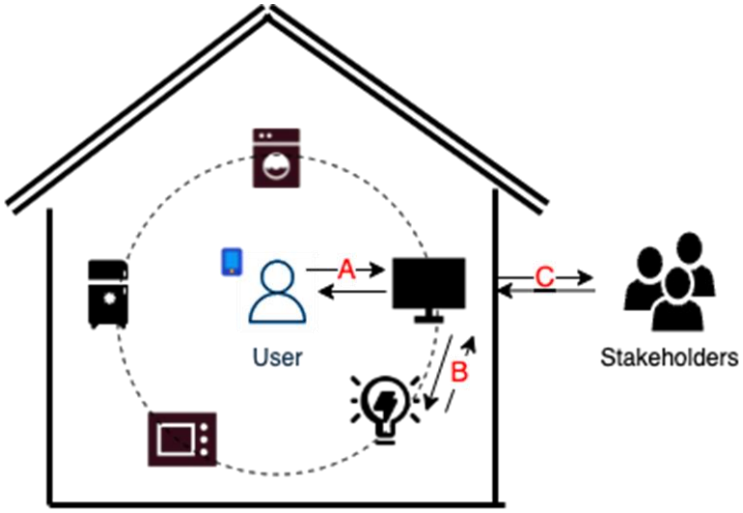

Figure 2
Smart Home Relationships Between Products, Users, And Stakeholders

1) Product to End Users

A smart home product or system is an ICT device that can process, store, or send data. It may easily become technology-driven rather than customer-driven (Montano, Lundmark, & Mähr, 2006). In terms of user demands, the product-service system is considered a success since it may lead suppliers to a unique solution by integrating efficient goods and services. Also, product-service suppliers may keep a longer connection with their customers, enabling them to bridge values and increase client loyalty.

2) Product to Product

Smart home appliances can process, store, and transfer data, allowing them to better meet customer needs. Smart devices communicate with each other to acquire information about their users, which they use to enhance services and value.

3) Product to Stakeholders

Service features help satisfy user needs and provide value. Synergies between many stakeholders are required to develop high-tech smart home

equipment and deliver a broad variety of services. Participants may benefit from one other's professional skills, new technology, and high-quality products and services while minimizing system costs.

c. Architecture Vision - Smart Home Business Model Canvas
Value Proposition Scope Through Business Model Canvas. The canvas is more than a collection of checklists; it is a method for identifying the strengths, weaknesses, and opportunities hidden under the surface of concepts. It may, for example, inquire as to the basis for your existing beliefs.
• It will inquire as to if there are any further potential consumers.
• Is there another reason customers purchase from you?
• Inquire as to if there are alternative methods to structure your team.
• It will inquire as to whether you are billing the correct amount.

Three innovation lenses are shown in Figure 3. Each lens has its own strengths and weaknesses, and evaluating all three may provide beneficial ideas.

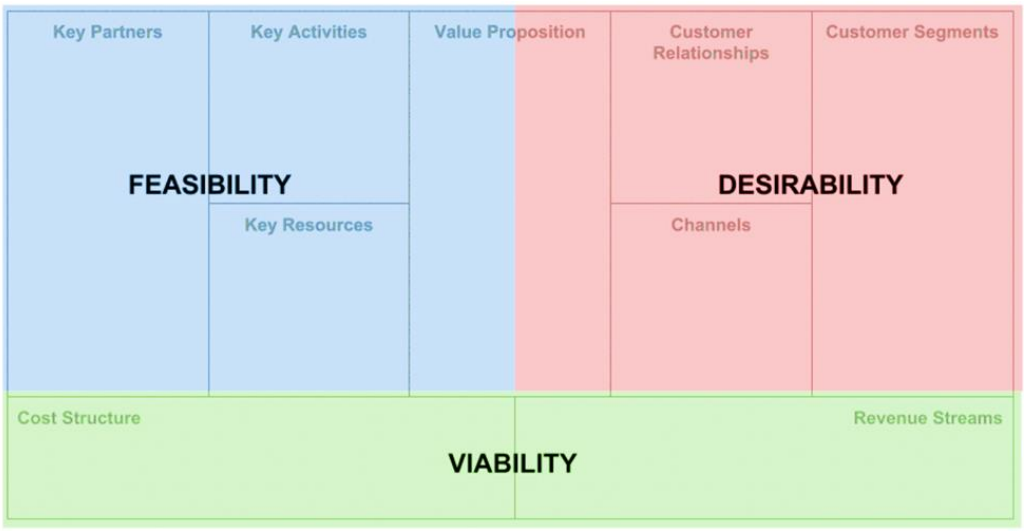

Figure 3
Three Lenses

Desirability: Desirability is understanding your customer, their motives, interactions, and the things that influence or deter a purchasing decision. We must appeal to our clients or we will lose revenue.

Feasibility: Feasibility is the capacity to make things happen behind the scenes. This means selecting the right people, tools, partners, and tasks.

Viability: Money generated and spent is a measure of viability. A surplus is required to exist in any legal form.

In order to qualify as a business feasibility qualification, Smart Home Technology must meet three Design Thinking criteria, as indicated in Figure 4, namely desirability, viability, and feasibility. An essential factor to address is how

to design value propositions and how to implement business models for Smart Home Technology.

d. Information System Architecture - Activity Diagram of User Interaction with Smart Home Appliances

The activity diagram depicting the flow of user interaction with the smart home is illustrated in Figure 5, and Table 1 details the interaction from beginning to end.

Table 1
Detail Step Of Interaction

No.	Steps of interacting with smart home appliances
1.	User select the application if they want to turn off or on the lights (example)
2.	Login with their smart phone
3.	Smart home system will verify the user's username and password
4.	Do the validation
5.	If the username and password is not valid than back to login page
6.	If it is valid than user may choose the appliances (which lights?)
7.	User check the status is it on or off
8.	User may see the options
9.	User may enter the values
10.	The smart home system will set the value
11.	And update the status
12.	User may see the changed status
13.	User may choose other appliances
14.	If yes than go back to number 6 and follow the steps forward
15.	If no, than application close

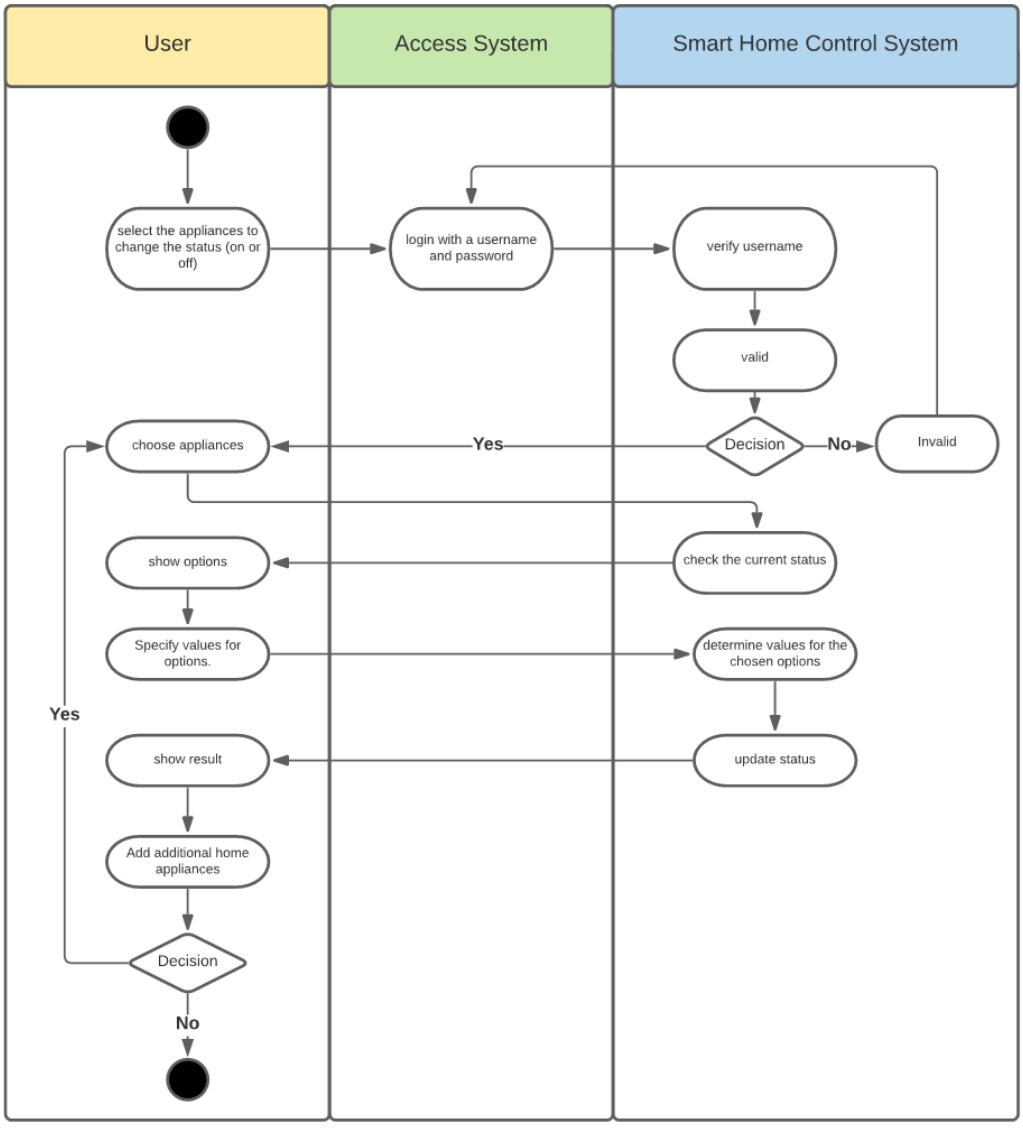

Figure 4
Activity Diagram for Smart Home Appliances

e. Information System Architecture - Data Flow Model

In Figure 6, you can see how data moves through a system. Data is transported from the mobile system to the command sender (command to be delivered) and then to the cloud system's command receiver through a http post request to the web server, which accepts the command and transmits it to the database for storage. After converting the command to an action, it is sent to its action sender, which in turn delivers it to the simulated system's (microcontroller's) action receiver. In turn, the mobile system communicates its updated status to the cloud system, which then changes the database and provides it to the user.

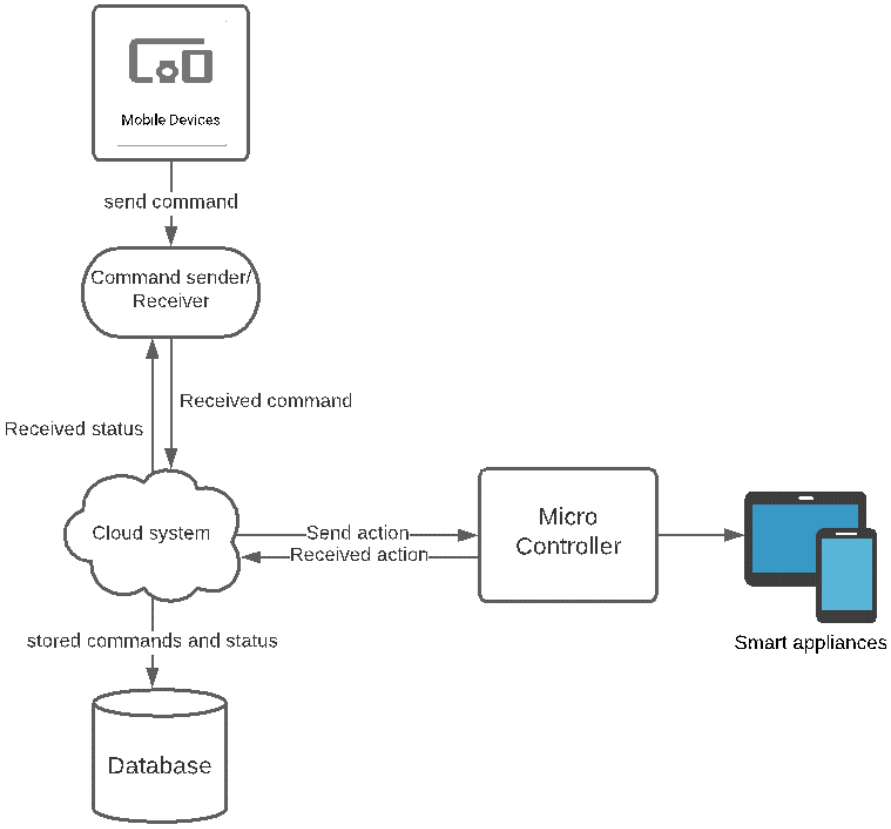

Figure 6
Data Flow Diagram

f. Technology Architecture - Home Network Segmentation

A network segmentation is a method of isolating devices from one other to better share throughput or capacity to the Internet.

With two extra routers in the normal household, this is possible. They are connected to the primary router through normal ethernet wires, as seen in the Figure 7. Wireless and cable connection are both provided by the two new routers. The network on the left is for standard computer devices, such as cell phones, laptops, printers, backup disks, and any other devices that store sensitive data. A guest network may also be created here for home guests. Built-in guest networks are convenient since they enable us to provide Internet access to visitors without providing them with network access to your other PCs or printers.

The Internet of Things network is seen on the right. This is the location for devices that do not contain sensitive information and may not receive frequent updates due to a lack of functionality or because manual patching occurs only when the device's owner notices.

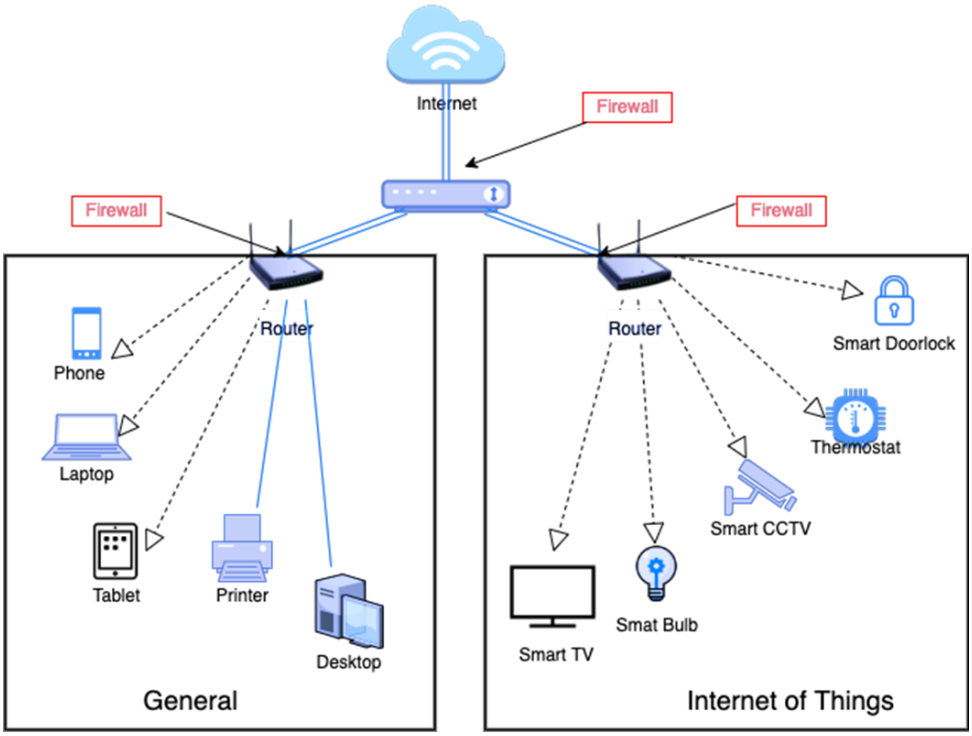

Figure 7
Smart Home Network Segmentation

Network segmentation is beneficial from a cybersecurity standpoint since it helps isolate issues. That IoT network is protected by a firewall, so an infected laptop cannot access it. Furthermore, if an IoT device is infected, the firewall on the main network will prevent it from malware-infected IoT devices in the same home.

g. Business Architecture - Business Gap Analysis

After identifying the company's stakeholders, it's time to integrate and maximize the use of information technology in business operations. Determined the roles and duties of stakeholders, as well as their interrelationship in order to meet and exceed users' expectations and requirements via a mix of efficient solutions and efficient services.

Following the identification of stakeholders' roles and functions, as well as their relationships with corporate stakeholders, analytical gaps will be generated. Analysis of Gap Business Architecture provides a comparison between the present activities of smart home enterprises and the anticipated target architecture that will be outlined in Table 2.

Table 2
Gap Analysis Business Architecture

Current Business Architecture	Targeted Business Architecture
The efforts of technology developers to promote the notion show a lack of consumer-centricity.(Kim, Cho, & Jun, 2020)	The reality that smart home services must integrate seamlessly into an existing house's design and technical architecture and grow over time in response to their use. A smart home user should not have to learn technology to operate the smart device. Rather than that, the gadget should be able to adapt to the user's everyday activities. (Georgiev & Schlögl, 2018) (Chikhaoui & Pigot, 2010)
Due to the lack of collaboration among smart home businesses, the challenge arises, since many gadgets are incompatible by default.(Georgiev & Schlögl, 2018)	Collaboration among objects within such organizational structures can thus facilitate the production and supply of constructed value-added services by service developers. These environments and accompanying services create new opportunities for business, which often need collaboration among various stakeholders. (Camarinha-Matos & Afsarmanesh, 2014)
Smart home businesses place a premium on a significant initial investment(Wilson et al., 2017) (Chang & Nam, 2021)	By allowing the systems to be adjusted for rapid deployment, it will address the misconception that Smart Home Technologies are expensive and needs specialized programming, allowing end-users to customize their own systems.(Michelle Guss, 2020) Smart home businesses may offer "as-a-service" product or pay as you go service, instead of "one-off-selling" product.

2. Expert evaluation's recommendations

An expert review is essential while doing research since it ensures that the framework, activities conducted, and outcomes are correct. are all solid.

According to Mr. Aji, he acknowledged that despite the cost gap discovered in the business gap, the incompatibility of communication between smart devices would be one of the reasons for the poor adoption rate. He is also agree that the smart home network segmentation should be divided into two different router as seen in Figure 4.7. The reason to have a separated router for general devices and IoT devices are:

a. To provide the fundamental security, scalability, and agility needs for IoT network environment.
b. From a cybersecurity standpoint, network segmentation is effective in isolating issues. That IoT network is protected by a firewall, so an infected laptop cannot access it. This also applies to compromised IoT devices; the regular network firewall will protect them from malware infected IoT devices inside the same household.
c. To prevent the transmission of mixed data between IoT and non-IoT devices. Through the network, each IoT device communicates with the other. IoT, on the other hand, operates at the network and transport layer levels. So the Internet of

Things has an issue in that each device encounters an interaction issue as a result of the differences in protocol, which causes the device to be delayed in getting responses. As a result, to alleviate the issue of IoT devices communicating with one another, it is possible to equalize the IoT subnet into a single segment. The other reason for incompatibility between devices, according to Mr. Aji, is that each IoT device has a unique programming language, which creates another communication challenge between devices. Alternatively, Mr. Aji may have advised potential users to purchase IoT gadgets featuring the same branding.

Mr. Aji further said that the business components should include a cost burden minimization strategy. To minimize the initial cost to the potential buyer, which may discourage them from purchasing, it is advised that smart home producers offer the product as a service package, which eliminates the need for the potential buyer to worry about the high cost of servicing, repair, or upgrade.

3. Verification Based on Users' Survey

All four households were offered to take part in the study. Following their informed permission, respondents filled out and submitted the online survey. Prior to the survey, all participants were given a description of a smart home.

a. Respondents' Demographics

The demographic characteristics of the respondents. There was a larger proportion of male participants, with 52.9% of the participants being male (N = 9) and 47.1% of the participants being female (N = 8). Three-quarters of the participants were between the ages of 22 and 34, with more than half reporting to be in full-time employment and earning a salary.

b. Indoor Daily Activities To Evaluate Convenience and Activity Level

For this section, we used a checkbox questionnaire to learn about the users' or participants' indoor activities as well as their degree of comfort. 76.5% (N=13) of respondents selected relax as their favourite indoor activity, followed by cleaning at 58.8% (N=10) and entertainment at 52.9% (N=9).

c. Service Preferences

The results of the test to see which services people would prefer. Almost half of the participants (N = 8, 47.1%), chose the convenience service, whereas 29.4 % (N = 5) selected the safety service. However, just 17.6% (N = 3) and 5,9% (N = 1) of respondents preferred energy and healthcare services, respectively. In response to the following question on the behaviour and skills of the personal AI assistant, the majority of participants preferred that "they would only communicate to the interface if it spoke their native language."

d. Users' Perceptions and Concerns Towards Smart Home

The outcomes for data protection were unaffected by gender and age, as well as whether or not the respondents were acquainted with smart home technologies. Most participants agreed that all information including personal

information, health information and access information should be protected at all costs.

e. Users' Expectation Towards Smart Home

Interestingly, the vast majority of participants, are open to the idea of having an alert that may be activated automatically and sent to selected families or institutions in the event of unexpected behaviour, such as falls.

f. Households' Purchase Potential and Desire for Smart Home

Despite the optimistic outcomes about smart homes expressed by the participants, as well as their desire to have more control over their homes, the probability of participants purchasing smart home products was not particularly high. Half of the participants (52.9 percent, N=9) responded that their average budget for technological systems was less than IDR 5 million.

g. Users' Requirement for Smart Home

The group of people aged 55 to 64 said that they lacked knowledge and education on how to utilize the most up-to-date technology or system, and that they had difficulties understanding the operational language. The primary barrier to smart home adoption in the age group of 22-54, was primarily a cost issue. Smart devices are excessively pricey in comparison to conventional ones. Another concern expressed by participants is the difficulty of installing a smart house with no clear instructions, and the lack of security for the Internet of Things (IoT). These are the key points of input from the participants regarding what is preventing the widespread adoption of smart homes.

4. Reliability and Validity of Data using Smart PLS

Smart PLS software was used to verify the measure of measurement model. The intention of use of a smart home was derived by four main aspects which are convenience, safety, energy, and healthcare. The principal component analysis (PCA) is the foundation of PLS and is meant to explain changes in constructs included in the model. (Chin, Marcolin, & Newsted, 2003) proposed that PLS be used as an operational analytical tool for reducing error. A practical implementation of the Smart PLS method may be shown in Initial path model Figure 4.23, which shows the following associations, coefficients, and loading values.

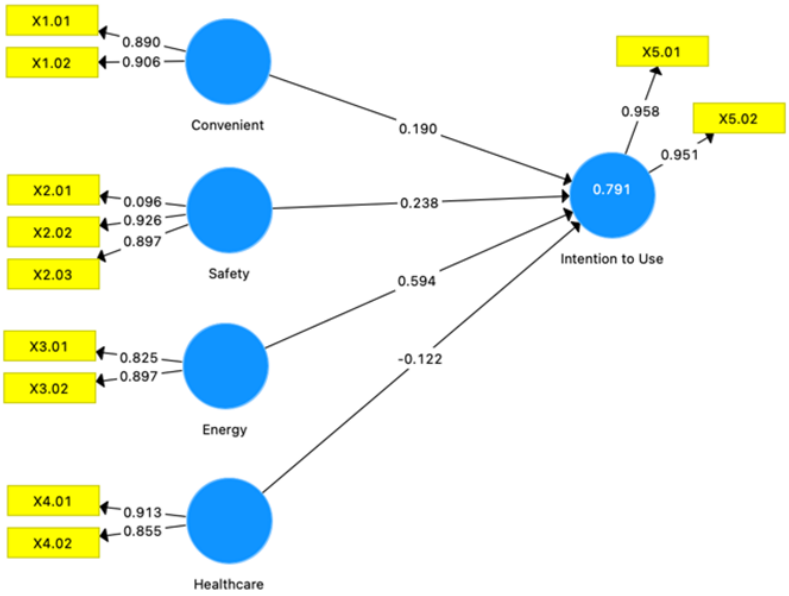

Figure 8
Initial Path Model

5. Summary of Analysis Results

Literature review, online survey and third-party suggestion results will be mapped to the TOGAF Framework, Figure 4.24, to confirm any gaps that have been identified.

	Literature Review	Survey	Peer review with Mr. Aji
Arcitecture Vision	While smart homes have the potential to improve lives and make them more convenient, there is a barrier in ensuring that gadgets are compatible with one another. 1	The vast majority of respondents agreed that smart homes may improve their quality of life and increase their sense of security, yet there is still an issue, such as no response after a command.	The incompatibility of communication between smart gadgets is one of the reasons for the low adoption rate, according to Mr. Aji. He also agrees that the smart home network should be segmented into two routers. So, to solve the issue of IoT devices communicating, the subnet may be equalized into a single segment. Also, each IoT device has its own programming language, which adds another communication issue, according to Mr. Aji
Business Architetcure	Smart homes require a significant initial investment. 2 The slow adoption of technology is due to the fact that it is technology-centric. 3	Cost remains the primary factor of smart home technology adoption across all age groups, and the majority of respondents expressed difficulty operating the devices.	Mr. Aji said that the business components should include a cost-cutting approach. As a result, the customer is not concerned about the high cost of the devices, maintaining, repair, or upgrading, which may deter them from buying.
Information System Architetcure	The smart home's aims are eco-friendly living and improved quality of life. Using smart devices, such as smartphones, smart homes enable internet access anytime, anywhere. It also monitors housing conditions and appliances. Cloud computing enables scalable computing and storage for home services. Using cloud computing, the user can monitor and operate home gadgets from anywhere. 4		Mr. Aji added that cloud computing is significantly more convenient than local Web servers or control panels. Additionally, the cloud can act as a middleware or gateway with application that translating between proprietary protocols and formats and delivering information to the user in a systematic way.
Technology Architetcure	Security is yet another important problem. A smart home system's local and cloud storage can be a target for hackers since it relies on the gathering of personal data such as every movement, activity, preference, payment, and transaction. Even gadgets that are intended to safeguard the living environment (e.g., a smart lock) can be compromised. 5 A common home network has a single firewall router, which allows hackers easy access. 6	Most of the respondents are aware of data privacy and are unwilling to provide personal, access, and health information with other parties.	According to Mr. Aji, IoT devices capture a large amount of data, making a flat network design a risky solution. Segmenting networks not only helps the Internet distribute bandwidth more efficiently, but also protects sensitive data by isolating it from people or other devices that do not need to interact with it.

Figure 9
Analysis Summary Mapped Into TOGAF Framework

1.(Georgiev & Schlögl, 2018), 2.(Georgiev & Schlögl, 2018); (Wißmann, 2020)., 3. (Wißmann, n.d.), 4.(Lee, Hsiao, Huang, & Seng-cho, 2016), 5(Chikhaoui & Pigot, 2010), 6. (Lee et al., 2016)

6. Discussion

The participants in the survey were generally between the ages of 22 and 34 and were working full-time, which indicates that they are more likely to be interested in smart home technology and regardless of age, the majority of participants are aware of or feel themselves to be comfortable with technology. Additionally, the findings indicated that those between the ages of 55 and 64 choose relaxing and cleaning as their primary indoor activity, whereas those between the ages of 45 and 54 chose work, exercise, cleaning, and relaxing as their primary indoor activity. Their primary activities between the ages of 22 and 34 are work, followed by leisure activities such as fitness, entertainment, and relaxation. Participants over the age of 55 were generally unfamiliar with the concept of smart home, and they either did not have any smart gadgets or just had one smart phone. They may only pick their native language if they have the option of selecting it as the smart system's primary language, which is consistent with previous research findings. Furthermore, the

flexibility to change the voice/speech settings is important for those between the ages of 22 and 34. All age groups are hesitant to give their information, which contradicts earlier research results those older persons are truly receptive to sharing their information for medical purposes. According to earlier results, older people prefer passive monitoring since it is simpler for them not to operate the gadget themselves. However, in the survey findings, elderly people are more reluctant to be observed and a smart gadget that can send an alert is more desirable. As with previous research, young adults preferred not to be monitored, and the survey findings do not confirm the statement that they all agree to be monitored.

Analyzing preferences for a variety of different types of services is an efficient way for predicting service acceptance. The group that chose convenience services came out on top in the overall preference evaluation, while the intention to use was higher among those who selected safety services, which came in second place in the overall preference assessment. However, the group that picked energy conservation service, on the other hand, revealed that they were less ready to utilize the service in general. According to the assumptions made, it was considered that this group was price sensitive due to their budget being less than IDR 5 million based on the result, or that they did not think they need the service despite its necessity.

Demographic variables were also discovered as a factor affecting preferences and intentions to utilize smart home services. To start, service preferences were influenced by gender. Female respondents were shown to have a stronger desire for convenience than male respondents, according to the study. On the other side, the intention to utilize smart homes was somewhat greater among men, but this wasn't statistically significant.

Second, although age had no impact on service selection, it did influence intention to use. There was no significant difference in the number of participants intending to utilize safety services based on their age group. All age groups ranked safety services highest, with no significant difference in intention to use across ages, however the age group 55-64 had no desire to acquire a smart product in the near future, in contrast to the age group 22-54, which is confident about purchasing a smart device. Numerous studies have been conducted on the senior population, which has been identified as a significant benefit of automated technology in smart homes, due to their financial stability relative to younger adults, and smart home research has mostly focused on healthcare services for the elderly. However, the findings of this research indicate that there is a significant demand for other parts of services that might support residents' independent activities, such as safety and convenience, across all age groups, as well as among many younger persons who are already financially stable and in full-time jobs.

In conclusion, although the substantial impacts of some variables on smart home adoption (e.g., experience and preference) are consistent with the current research, the effects of other factors (e.g., gender and age) are inconsistent. Furthermore, the results of this research may not only increase our knowledge of

how people choose to use smart home technology, but they can also provide a user-centered approach for encouraging adoption. For example, although convenience services are valued by almost all age groups, those willing to spend are mostly between the ages of 22 and 34. In other words, initiatives for actively promoting smart home adoption must include tactics for aggressively targeting these users. On the other hand, since women spend the majority of their time cleaning and working inside, while men enjoy working, relaxing, and entertainment, it is critical that they have a plan in place that may assist them in improving their lives via indoor smart technology.

The findings of this research emphasize the importance of policies and strategies for sustaining smart home adoption and fostering technological innovation. Smart home services should thus be made available to a broad variety of consumers, particularly those with low budget and limited technological skills, as a first step toward increasing their adoption. One example is to decrease costs via collaborative purchasing or to give pre-experience chances for services favored by target consumers, in general safety services.

Conclusion

The vision of smart homes will be achieved only when people become interested in embracing these technologies in their ordinary activities; and awareness will be heightened when developers include their specific requirements and concerns. This research provides insight into the issues and demands of the potential smart home users.

Smart home technology is considered to provide advantages such as comfort, safety, and an improved quality of life; nevertheless, Prospective users were not receptive to data sharing, despite the fact that the data may be required by doctors. On the other side, they are willing to have a CCTV monitor the home 24 hours a day and provide notifications if anybody enters.

The primary driver behind the adoption of smart home technology is, unsurprisingly, the cost. Therefore, smart home appliance producers must develop a strategy for addressing the demands and expectations of their potential customers. Another issue slowing adoption is incompatibility between smart devices. The constant discussion of interoperability between brands reveals another important issue. The customer's ability to personalize the system is limited since seamless integration into a single platform does not appear to be easily achievable. Smart home technology has a hard time integrating into everyday life even for early adopters who are often technology affine. This is discouraging the general population from adopting smart home technology.

BIBLIOGRAFI

Alami, Ahlam, Benhlima, Laila, & Bah, Slimane. (2015). An overview of privacy preserving techniques in smart home wireless sensor networks. *2015 10th International Conference on Intelligent Systems: Theories and Applications (SITA)*, 1–4. IEEE.google scholar

Bassi, Alessandro, Bauer, Martin, Fiedler, Martin, Kramp, Thorsten, Van Kranenburg, Rob, Lange, Sebastian, & Meissner, Stefan. (2013). *Enabling things to talk*. Springer Nature.google scholar

Baudier, Patricia, Ammi, Chantal, & Deboeuf-Rouchon, Matthieu. (2020). Smart home: Highly-educated students' acceptance. *Technological Forecasting and Social Change*, *153*, 119355.google scholar

Camarinha-Matos, Luis M., & Afsarmanesh, Hamideh. (2014). Collaborative systems for smart environments: trends and challenges. *Working Conference on Virtual Enterprises*, 3–15. Springer.google scholar

Chang, Soojung, & Nam, Kyeongsook. (2021). Smart Home Adoption: The Impact of User Characteristics and Differences in Perception of Benefits. *Buildings*, *11*(9), 393.google scholar

Chikhaoui, Belkacem, & Pigot, Hélène. (2010). Towards analytical evaluation of human machine interfaces developed in the context of smart homes. *Interacting with Computers*, *22*(6), 449–464.google scholar

Chin, Wynne W., Marcolin, Barbara L., & Newsted, Peter R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research*, *14*(2), 189–217.google scholar

Coskun, Aykut, Kaner, Gül, & Bostan, İdil. (2018). Is smart home a necessity or a fantasy for the mainstream user? A study on users' expectations of smart household appliances. *International Journal of Design*, *12*(1), 7–20. google scholar

Georgiev, Aleksandar, & Schlögl, Stephan. (2018). Smart home technology: An exploration of end user perceptions. *Innovative Lösungen Für Eine Alternde Gesellschaft: Konferenzbeiträge Der SMARTER LIVES*, *18*(20.02), 2018. google scholar

Goasduff, L. (2020). *Gartner survey reveals 47% of organizations will increase investments in iot despite the impact of covid-19*. google scholar

Ho, Brandon, Vogts, Dieter, & Wesson, Janet. (2019). A smart home simulation tool to support the recognition of activities of daily living. In *Proceedings of the South African Institute of Computer Scientists and Information Technologists 2019* (pp.

1–10). google scholar

Iot, T. (2013). An Introduction to the Internet of Things (IoT). *Lopez Res. Llc*, (November), 1–6. google scholar

Kim, Mi Jeong, Cho, Myung Eun, & Jun, Han Jong. (2020). Developing design solutions for smart homes through user-centered scenarios. *Frontiers in Psychology*, *11*, 335. google scholar

Lee, Ying Tsung, Hsiao, Wei Hsuan, Huang, Chin Meng, & Seng-cho, T. Chou. (2016). An integrated cloud-based smart home management system with community hierarchy. *IEEE Transactions on Consumer Electronics*, *62*(1), 1–9.google scholar

Montano, C., Lundmark, Mattias, & Mähr, Wolfgang. (2006). Control vs convenience: Critical factors of smart homes. *2nd Scandinavian Student Interaction Design Research Conference*. Citeseer.google scholar

Shin, Jungwoo, Park, Yuri, & Lee, Daeho. (2018). Who will be smart home users? An analysis of adoption and diffusion of smart homes. *Technological Forecasting and Social Change*, *134*, 246–253.google scholar

Soto, Esteban A., Bosman, Lisa B., Wollega, Ebisa, & Leon-Salas, Walter D. (2021). Peer-to-peer energy trading: A review of the literature. *Applied Energy*, *283*, 116268.google scholar

Tranfield, David, Denyer, David, & Smart, Palminder. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222.google scholar

Weisman, Robert. (2011). An overview of TOGAF version 9.1. *Publ. by Open Gr*, *43*, 108.google scholar

Wilson, Charlie, Hargreaves, Tom, & Hauxwell-Baldwin, Richard. (2017). Benefits and risks of smart home technologies. *Energy Policy*, *103*, 72–83.google scholar

Wißmann, Corinna Sarah. (2020). *Key determinants for the slow pace of smart home adoption: a study of digital consumer insights*. .google scholar