YOUNG CONSUMERS TOWARDS SMART HOMES

MŁODZI KONSUMENCI WOBEC INTELIGENTNYCH DOMÓW

Beata Kolny*

Faculty of Economics, Department of Market and Consumption, The University of Economics in Katowice, ul. 1 Maja 50, 40-287 Katowice, Poland
*Corresponding author:
E-mail: beata.kolny@ue.katowice.pl
Beata Kolny; ORCID: 0000-0002-9162-1704

ABSTRACT

Year after year, smart home systems continue to increase in popularity among consumer households. Consumption of smart home systems is also predicted to increase steeply in the coming years. Therefore, the article aims at assessing the attitude of young consumers towards a smart home and its devices. The article is based on primary and secondary sources of information. While primary information indicated the attitude of young consumers towards smart homes in their capacity as potential buyers, secondary information allowed for the definition of the issues discussed pertaining to smart homes and their devices. Using direct research, the online survey technique was employed on a sample of 588 consumers aged 18-34 years living in Poland in 2021. The respondents' declarations showed that they intend using smart home services in the future, and that they thought using smart home devices would be enjoyable. In addition, respondents agreed with the statements that smart home devices are easy to use and valuable in everyday life, and that using smart home devices helps complete household chores faster. In their opinion, using a smart device at home can increase security and safety by detecting gas and smoke emissions and by creating an alert in the event of unauthorised home intrusion.

ABSTRAKT

Systemy inteligentnego domu z roku na rok zyskują coraz większą popularność wśród konsumentów i ich gospodarstw domowych. Prognozuje się także, że liczba ich będzie wzrastać w najbliższych latach. W związku z tym celem artykułu jest zdiagnozowanie stosunku młodych konsumentów, do inteligentnego domu i jego wyposażenia. Artykuł napisano na podstawie wtórnych i pierwotnych źródeł informacji. Informacje wtórne pozwoliły na zdefiniowanie omawianych zagadnień związanych z inteligentnym domem i jego wyposażeniem, natomiast informacje pierwotne pokazały stosunek młodych konsumentów, jako potencjalnych nabywców, do inteligentnych domów. Badania bezpośrednie przeprowadzono techniką ankiety internetowej w 2021 roku na próbie 588 konsumentów w wieku 18-34 lata mieszkających w Polsce. Z deklaracji badanych wynika, że w przyszłości zamierzają i będą korzystać z usług inteligentnego domu. Uważają oni, że korzystanie z inteligentnych urządzeń domowych jest przyjemne. Ponadto respondenci zgodzili się ze stwierdzeniami, że urządzenia inteligentnego domu są łatwe w użyciu oraz że są przydatne w codziennym życiu, a korzystanie z urządzeń inteligentnego domu pomaga w szybszym wykonywaniu zadań. Ich zdaniem korzystanie z inteligentnego urządzenia w domu może zwiększyć bezpieczeństwo poprzez wykrywanie emisji gazów i dymu oraz poprzez informowanie w sytuacji nieuprawnionego wtargnięcia kogoś do domu.

Słowa kluczowe: inteligentny dom, inteligentne rzeczy, Internet rzeczy, młody konsument

JEL: D12; D19; O33; L86

Introduction

A smart home is also referred to as an interactive or networked home. Many 'define it as a home that includes digital sensing and communication devices' (Baudier, Ammi, & Deboeuf-Rouchon, 2020). It increases the quality of life of its inhabitants, allows them to better care for their security and safety, and reduces utility expenses. It offers greater convenience than its regular counterpart, in which the various devices are separately or individually operated and controlled by their users (Yang et al., 2017). In a smart home, less is done by its owners, and less needs to be remembered because the installed devices communicate with each other by performing the necessary activities. Smart homes create an economically optimised and effective space for people living in them owing to the appropriate structure, power supply and control systems for electric energy, systems ensuring

comfort and safety, and the mutual relations between them. The appliances of a smart home include, among others, smart devices, smart lighting, smoke and gas detectors and intrusion detection systems. These devices can be connected wirelessly to the internet and controlled remotely. Smart devices include television sets, audio-video equipment, vacuum cleaners, refrigerators, ovens, washing machines, dishwashers, light bulbs, air conditioners, doorbells, locks, devices classifiable under heating systems, and systems using security cameras and sensors for intrusion detection and alert. What distinguishes a smart home from an ordinary home is that in the case of the former, its smart devices communicate with each other and synchronise their activities.

Smart home technologies are gaining popularity. In Poland, according to a study conducted by Oferteo.pl, 23% of respondents decided to implement smart home solutions in their newly built home in 2018, while every third respondent chose them in 2019. People who did not choose to use these solutions in their new homes indicated high prices to be the reason, as well as the absence of a need to know about or have them (Majchrzyk, 2020). The latter reasons are confirmed in research findings available from the same author and forming part of the published literature (Kolny, 2021a), in which it is demonstrated that 75.8% of respondents consider facilitating the performance of everyday activities as an advantage, and 58.9% that everyday life becomes more satisfying and comfortable. However, the consumers constituting the respondents in the earlier study (and their households) who did not buy smart devices indicated the following factors to be the reason: high prices (79.5%), no need to have them (59%), or lack of knowledge about them (55.6%).

According to the Digital Market Outlook, the number of smart homes in the world in 2025 is expected to reach 478.2 million (Statista, 2021a), and the market penetration rate will reach 21.1% (Statista, 2021b). In 2020, the total number of smart home devices worldwide was 349 million. This number is predicted to increase significantly in the next few years, reaching 1.77 billion in 2025 (Statista, 2022).

As smart home systems are gaining more and more popularity from year to year, and since it is expected that their number will increase, despite the mentioned factors discouraging their implementation, an attempt was made to answer the question of what the attitude of consumers towards

them is. Therefore, the article aims at assessing the attitude of young consumers towards a smart home and its devices. The study exclusively focuses on young consumers aged 18-34 years, who are more likely than others to adapt to all technological innovations and potentially become smart home users in the future. The research results can indicate what the level of acceptance of the smart home technology will be, and what is and will be the willingness of consumers to use these solutions. The focus was on issues from three research areas. The first area concerned the general attitude towards the concept of smart homes; the second, the possibility of using smart devices and smart homes in the future; and the third area covered issues related to the sense of security and safety as well as the possibilities offered to consumers using smart home solutions. It is assumed that young consumers intend to use a smart home in the future and have a positive attitude towards it, especially towards those solutions that are related to ensuring a sense of security and safety for its inhabitants.

The article provides information on smart homes and their devices. It describes the research methodology and the research sample, as well as presents the results of the author's research and conclusions with recommendations for further research.

Resources and Method

The article is based on primary and secondary sources of information. Issues discussed pertaining to smart homes come from secondary information, which was supplemented with primary information collected by the author during direct research using the internet questionnaire technique from Mar. 1, 2021 to May 18, 2021. The questionnaire was made available on the SurveyMonkey platform, and the link to the research was sent by e-mail to potential respondents. The research sample, which consisted of 588 individuals, exclusively focussed on young consumers aged 18-34 years, out of whom 50% were women and 50% men. Among the respondents, 20.7% lived in rural areas, 27.6% lived in cities with up to 99,000 residents, 24.0% lived in cities from 100,000 to 199,000 residents and 27.7% of the respondents lived in cities with more than 200,000 residents. Most respondents assessed the financial situation of their

household as good (63.8%) and answered that they could afford some luxury goods. Among the respondents, 26.0% declared the financial situation of their households as sufficient, meaning that they have to plan all major expenses. A very good financial situation was declared by 9.7% of the surveyed households and only 0.5% assessed their financial situation as bad. When analysing the respondents' competencies to use objects and tools necessary to operate devices adopted in a smart home, it was found that very high skills related to the use of a smartphone were declared by 70.1% of respondents, a tablet by 49.8% and various internet applications by 61.9%. When declarations of high and very high skills were compared, the percentage of respondents in almost all cases increased to well over 90% (except for the tablet, where 75.8% of respondents declared skills at these levels). Moreover, 67.2% of the respondents declared that they were interested in technological innovations, which undoubtedly include all devices used in a smart home, whereas 32.8% declared that they were not interested in them.

Smart Home Features

The concept of a smart home is not something new, as the automation of household duties has been known for nearly 100 years. It emerged with the spread of electricity and electrical household appliances. The first devices using technology in home automation, based on the existing electrical installation to transmit signals controlling lights and home appliances, were introduced to the market by the Scottish company Pico Electronics in 1978, and the concept of the 'smart home' was created in 1984 (Miller, 2016). When reflecting on the meaning of the word *smart* concerning things, it seems that the point is that many people will find that calling an object smart is determined by the ability to manage it remotely, and turn it on and off. 'Smart home can be de?ned as a residence equipped with a communication network, high-tech household devices, appliances, and sensors that can be remotely accessed, monitored, and controlled and that provide services responding to the residents' needs' (Yang et al., 2017). Thus, the modern smart home is a place equipped with various devices, lighting, heating, air conditioning, RTV equipment, household appliances and security systems that can communicate with each other and are

controlled by using an application on a smartphone or tablet to by remotely turning on or off a given hardware contraption (Domb, 2019). The operation of a smart home is based on the use of a wireless home network (WiFi, Bluetooth, RFID) that allows many devices to be connected with an appropriate application developed and made available by manufacturers of smart devices.

The Internet of Things is the most broadly utilised in the areas related to smart home furnishing (Gunge & Yalagi, 2016). The Internet of Things is viewed as a body of smart things that can react to the environment, process and remember digital information, and transfer it to other objects (and users) via internet protocols. The Internet of Things not only enables people to communicate with smart objects but also allows the interface between such smart devices. This ensures the capability for communication anytime and anywhere, using any information carrier (Kwiatkowska, 2014). The Internet of Things consists of four basic elements: devices that allow for the active collection and transmission of measurement data that indicate their functioning; the communication network that connects the devices (i.e. the internet); information systems capable of collecting incoming data; and analytical solutions that process data and allow for inference and obtaining additional business value (Rozmus, 2019).

The main elements of a smart home, in which the integrated *Building Management System* (BMS) manages household appliances, include RTV equipment, alarm system and all controllable activities, such as lighting or heating, including central unit, power supply subsystems and control of electric energy, subsystems ensuring comfort and security and control devices (Malinowska, 2021). The central unit is defined as the 'heart' of the BMS, to which all devices in the smart home are connected. There is also the need for electricity supply and control subsystems, i.e. various types of power supply installations, wiring, smart plug sockets, security, lighting and emergency power supply. Among the subsystems that ensure comfort, the following stand out, among others: heating, ventilation, air conditioning, lighting control, audio-video devices, sound system, entrance gate, garage door and sprinklers. On the other hand, the subsystems ensuring security and safety include alarms, smoke monitoring system and gas, motion and temperature detectors. For all of this to work smoothly, a control device is needed, i.e. a tablet, smartphone or other device dedicated

to a given system, using which the functionalities of the home can be managed.

Objects that can be connected to a smartphone or tablet are perceived as having enhanced functionalities. Mobile devices act as a control centre for consumer electronics and household appliances connected to the home network. It should be easy for an average user, in particular one having the ability to use a smartphone, to install a control application and add another device to the home IoT ecosystem (Mącik, 2018).

All the smart devices in the home are designed to automate the performance of household chores. When various smart devices, communicating with each other, are gathered under one roof, this results in a smart home. Even a house equipped with basic automation has some smart functions (Miller, 2016). Apart from simply controlling and automating individual devices, home automation ensures that smart devices in a smart home communicate with other devices such that their operation is synchronised. A smart home can be seen as a fully autonomous system that works on behalf of its residents. It is the next step in the operation of the *Connected Home*, where devices can be controlled from anywhere using an application. Smart home systems can be easily adapted to the changing needs of smart home inhabitants. A smart home learns the behaviour and preferences of people living in it. It adapts to these behaviours, anticipates needs and reacts appropriately. It uses data collected not only from devices and sensors in the home but also wearable devices and even connected cars (Ekholm, 2018). A well-set-up smart home system means, e.g. that when a person locks the door with a key, the alarm system is automatically turned on, the blinds in the windows are automatically lowered, the temperature in particular rooms is automatically reduced and the lamps, home electronics and household appliances are automatically turned off. When the person comes back, the system automatically adjusts to their preferences (turning on, e.g. appropriate lighting, music or heating). The system incorporates the advantage that the user can continually check what is happening at home, and when it senses something dangerous, the automated system activates the alarm and sends information to the security company office or the fire brigade. The house, and the smart devices inside it, do most things for people, both inside and outside.

Apart from the advantages, such as the undoubted likelihood of energy savings and improved security and safety, there are also threats to privacy and security data that are downloaded by smart devices (Wilson, Hargreaves, & Hauxwell-Baldwin, 2017; Kolny, 2021b). These concerns are also related to the operation of smart devices and homes. A report on a survey of 10,002 respondents commissioned by Dynatrace in eight countries around the world (Great Britain, USA, France, Germany, Australia, Brazil, Singapore and China) showed that 73% of respondents fear that they may be locked inside or outside a smart home. The inability to control the temperature in a smart home was indicated by 68% of respondents, and light by 64% (Dynatrace, 2018). Furthermore, the results of a qualitative study among smart homeowners conducted by Hargreaves, Wilson and Hauxwell-Baldwin (2017) pointed out that smart home technologies are both technically and socially disruptive, it is not easy for all household members to adapt to the functionality of a smart home and learning to use this technology is a demanding and time-consuming task.

Research Results

At the beginning of the study, respondents were asked what smart devices their households are equipped with and which ones they are planning to buy in the future. It was found that most households were furnished with RTV equipment such as a smart TV (68.7%) and a multimedia player (49.5%). Among household equipment, the most popular type of appliance used by respondents' households was a vacuum cleaner (41.7%), followed by a washing machine (39.5%) and a refrigerator (39.4%). The lowest share of surveyed households had an oven (37.3%) and a dishwasher (27.8%). The last two mentioned appliances are also not planned purchases in the future, because as much as 62.5% of respondents replied that they did not plan to buy a dishwasher, and 56.8% that they did not plan to buy an oven (Table 1).

RTV equipment and household appliances are only part of the furnishings of the connected house. Smartphones and tablets, via the internet, can control, for example, lighting, temperature, roller shutters and alarm systems. Therefore, the respondents were asked what home

furnishings, classified as home automation devices, their households had. It was found that most of them had smart lighting (44.5%), followed by heating (38.3%), sockets (37.7%) and door locks (34.1%). About 15% of the surveyed households had other analysed appliances. These were air quality monitoring devices, weather stations and alarm systems. Among the respondents, 13.4% had smart homes that were equipped with monitoring cameras, 12.0% with video intercoms and the least number of them with window and door sensors (6.4%). The respondents' declarations showed that most of them did not plan to purchase these devices (Table 2).

Table 1. Declared possession and intention to purchase smart electronics and household appliances by respondents (in %)

Specification	Respondents		
	Owners	**Planning purchase**	**Not planning purchase**
Smart TV	68.7	13.1	18.2
Multimedia player	49.5	7.0	42.0
Vacuum cleaner	41.7	11.7	46.6
Washing machine	39.5	7.4	53.1
Refrigerator	39.4	6.4	54.2
Oven	37.3	5.9	56.8
Dishwasher	27.8	9.7	62.5

Source: Own study.

The attitude of young consumers to the concept of having a smart home installed and equipping it with smart devices was studied in three areas, each with corresponding statements. The first research area concerned the general attitude towards smart homes, the second area referred to the use of smart devices and a smart home in the future, and the third area concerned the sense of security and safety and the additional possibilities offered by the use of smart home solutions. Attitudes were tested on a scale from 1 to 7, where 1 meant that the respondents strongly disagreed with a

given statement and 7 that they strongly agreed with it. It is worth noting that among all the scores, the respondents most often awarded 7, i.e. the highest score confirming that they definitely agreed with the particular statement.

Table 2. Declared possession and intention to purchase smart home automation devices (in %)

Specification	Respondents		
	Owners	Planning purchase	Not planning purchase
Lightening/bulbs	44.5	16.0	39.5
Heating/thermostats	38.3	13.6	48.1
Sockets	37.7	8.3	54.0
Door lock	34.1	6.4	59.5
Device drivers	22.9	9.3	67.8
Air quality monitoring devices	15.5	13.5	71.0
Weather stations	15.3	8.5	76.2
Alarm systems	14.9	13.7	71.4
Surveillance cameras	13.4	16.4	70.2
Voice assistant	13.9	7.8	78.2
Video intercoms	12.0	11.8	76.2
Door/window sensors	6.4	12.3	81.3

Source: Own study.

The calculated average scores indicate that in terms of the issues from the first research area, the respondents agreed with the statements regarding smart homes, giving each of them an average score of more than 5. Moreover, their answers were dominated by scores of 7, and the median was mostly 6. The respondents gave high scores mostly towards indicating their agreement with the statements that smart home appliances are fun and that smart home appliances are

enjoyable, giving each of these an average score of 5.45. The respondents also agreed with the statements that smart home devices are easy to use (average score 5.41) and that they are useful in everyday life (average score 5.38). A similar average score was also obtained for statements indicating that the use of smart home devices helps complete chores faster (average score 5.35) and that the interaction with smart home devices is clear and meaningful (average score 5.31). The lowest mean (3.45), as well as the median (3) and the mode (4), were obtained for the statement that smart devices have a reasonable price. Analysing the largest differences in respondents' answers by gender, it was noted that women more often than men agreed with the statement that using smart home devices helps complete chores faster (average score of 5.56 compared to 5.13), while men agreed more often than women with the statement that they know how to use smart home devices (average score of 5.28 compared to 4.85). Considering the respondents' declarations of interest in technological innovations, it was found that in all cases, higher average scores were awarded by people declaring themselves interested in technological advances (Table 3). When analysing the respondents' answers in terms of their place of residence, it was noted that in most cases, residents of smaller cities (up to 99,000) agreed with these statements more than others, as evident from the results presented in Table 4. If we consider the percentage of respondents giving the highest scores, it can be concluded that most respondents (34.6%) agreed with the opinion that using smart home devices is fun, giving a score of 7. Then, 33.5% confirmed that smart home devices are useful in life. Slightly less, 32% confirmed that smart home devices are enjoyable, and 28.4% thought that smart devices are easy to use. The obtained results show that the general attitude of young consumers towards smart homes and devices is positive due to the pleasure derived from their use and their usefulness in everyday life.

Table 3. Attitude towards smart homes and devices by respondents' gender and their interest in technological innovations

Specification	Me	Mo	Average sores*				
			T	W	M	INT	NINT
Using smart home devices is fun	6	7	5.45	5.55	5.34	5.61	5.12
Smart home devices are enjoyable	6	7	5.45	5.58	5.32	5.60	5.16
I find smart home devices easy to use	6	7	5.41	5.39	5.44	5.63	5.01
I find Smart Home objects useful in everyday life	6	7	5.38	5.51	5.25	5.48	5.18
Using smart home devices helps get chores done faster	6	7	5.35	5.56	5.13	5.44	5.16
Interaction with smart home devices is clear and meaningful	6	6	5.31	5.35	5.27	5.53	4.89
I have the necessary knowledge to use smart home devices	5	7	5.06	4.85	5.28	5.38	4.43
Smart home devices are reasonably priced	3	4	3.45	3.45	3.45	3.51	3.31

INT, respondents interested in new technologies; M, men; Me, median; Mo, mode; NINT, respondents not interested in new technologies; T, total sample; W, women.
*The scoring was based on a scale from 1 to 7, where 1 meant strongly disagree and 7 strongly agree.
Source: Own study.

The respondents' attitude towards smart home solutions may be related to the possibility of using them in the future and the acceptance of this technology. Therefore, when analysing the respondents' declarations on their predicted use of smart devices and smart homes in the future, as part of the scope of the second research area, it was noted that they agreed with the statement indicating that they could use smart home devices (average score 5.58), and further, that the use of smart devices could become a habit for them (average score 5.45). It can therefore be assumed that the use of a smart home would not be a major problem for the respondents. They also agreed with the statement that they might use smart home services in the future (average 5.35), and even explicitly indicated that they intend to use smart home services in the future (average 5.23). Despite the declaration of willingness to use smart home solutions, it should be noted that they are not indispensable for the respondents because they did not agree

Table 4. Attitude towards smart homes and devices by respondents' place of residence (average scores*)

Specification	Rural area	City population (in thousands)		
		Up to 99	From 100 to 199	Over 200
Using smart home devices is fun	5.49	5.54	5.50	5.23
Smart home devices are enjoyable	5.55	5.54	5.50	5.25
I find smart home devices easy to use	5.39	5.44	5.45	5.37
I find smart home objects useful in everyday life	5.39	5.51	5.45	5.20
Using smart home devices helps get things done faster	5.21	5.49	5.37	5.29
Interaction with smart home devices is clear and meaningful	5.26	5.34	5.40	5.25
I have the necessary knowledge to use smart home devices	5.10	5.22	4.98	4.94
Smart home devices are reasonably priced	3.34	3.36	3.35	3.45

*The scoring was made on a scale of 1 to 7, where 1 meant strongly disagree and 7 strongly agree.
Source: Own study.

unequivocally with the statement that they could get addicted to using a smart home device (mean 3.96, median and mode 5). Among those interested in technological innovations, female more often than male respondents agreed with all the statements on the possibility of using smart devices and a smart home solution. The biggest difference in declarations was noted concerning the statement, 'I intend to use smart home services in the future' (the average score given by women was 5.37 compared to 5.10 by men, and the average score given by respondents interested in technological innovations was 5.44 compared to 4.81 by those not interested), as can be seen from the results presented in Table 5. Considering the place of respondents' residence, it was also found that for the statements on the use of smart home solutions in the future and statements reflecting attitudes towards smart homes, the residents of smaller cities (up to 99,000) agreed with them more often than other urban

Table 5. Declarations on the possibility of using smart home solutions in households by respondents' gender and their interest in technological innovations

Specification	Me	Mo	Average scores*				
			T	W	M	INT	NINT
I could use smart home devices	6	7	5.58	5.66	5.50	5.70	5.35
It may become natural for me to use smart home devices	6	7	5.45	5.51	5.39	5.60	5.13
I predict the use of smart home services in the future	6	7	5.35	5.38	5.31	5.50	5.02
I intend to use smart home services in the future	6	7	5.23	5.37	5.10	5.44	4.81
Using smart home devices could become a habit for me	5	5	4.80	4.90	4.71	4.95	4.48
I could get addicted to using smart home devices	4	5	3.96	4.06	3.86	4.06	3.71

INT, respondents interested in new technologies; M, men; Me, median; Mo, mode; NINT, respondents not interested in new technologies; T, total sample; W, women.
*The scoring was based on a scale from 1 to 7, where 1 meant strongly disagree and 7 strongly agree.
Source: Own study.

and rural dwellers. Only the residents of rural areas agreed more often than city dwellers with the statement 'I could get addicted to using smart home devices' (Table 6). The highest score (7) was given by 37.4% of respondents who stated that they could use smart home devices, while 35.4% definitely admitted that the use of smart devices may become a habit for them. Over every third respondent (34.8%) definitely confirmed that they would use smart home services in the future, and not much less, almost every third (32.3%) gave a score of 7 stating that they intend to use smart home services in the future. Only 21.3% strongly confirmed that using smart home devices could become a habit for them and only 14.6% strongly admitted that they could become addicted to using smart home devices. The obtained results show a positive attitude in young consumers towards the possibility of using a smart home, although it should be emphasised that the declarations related to the use of a smart home in the future are contradictory to the described declarations regarding the intention to purchase (Tables 1 and 2). This can only be explained by the

Table 6. Declarations on the possibility of using smart home solutions in households according to the respondents' place of residence (average scores*)

Specification	Rural area	City population (in thousands)		
		Up to 99	From 100 to 199	Over 200
I could use smart home devices	5.53	5.77	5.72	5.33
It may become a habit for me to use smart home devices	5.30	5.65	5.48	5.32
I predict to use Smart Home services in the future	5.38	5.46	5.39	5.17
I intend to use Smart Home services in the future	5.19	5.38	5.32	5.04
Using smart home devices could become a habit for me	4.66	4.91	4.89	4.74
I could get addicted to using Smart Home devices	3.99	3.89	4.04	3.94

*The scoring was based on a scale from 1 to 7, where 1 meant strongly disagree and 7 strongly agree.
Source: Own study.

fact that an intelligent house is perceived as a comprehensive facility with devices and services, and individual smart things about the intention to buy that were asked may be the equipment of every regular house and flat.

Living in a smart home is undoubtedly associated with benefits for its user in terms of ensuring security and safety, reducing utility costs and facilitating everyday activities. Therefore, during the study, the attitude of young consumers towards the sense of security and safety associated with the use of a smart home solution, as well as the additional possibilities offered by the use of a smart home, was assessed. These issues were surveyed in the third research area. The mode score in all cases is 7, and the highest average score-indicating that the respondents agreed with the given statement-was that using a smart device at home can increase security and safety by detecting gas and smoke emissions (average 6.13), and by notifying in the event of unauthorised home intrusion (average

5.95). Also important are the abilities to provide automatic temperature control in the house (average score of 5.71), to control any electrical apparatus through simple operation (average 5.52), and to control whether the doors and windows in the house are closed (average 5.45), as well as active help without the need for human intervention (average 5.23) and the possibility of reducing costs (5.18). As far as the issues of the third research area are concerned, which are related to the sense of security and safety obtained from implementation of a smart home system as well as the additional possibilities created by the use of a smart home, among respondents interested in technological innovations, women agreed with them more often than men. The biggest difference in the declarations of women and men was noted concerning the statements that a smart home allows for the 'possibility of reducing utility costs' (the average assessment given by women was 5.33 compared to 5.02 by men) and that it provides active help to residents without human intervention (5.37 average score awarded by respondents interested in technological innovations compared to 4.94 by those not interested), as can be seen from the data presented in Table 7. The study also showed that those city dwellers living in towns having a population of up to 99,000 agreed more often than other respondents with the statements presented to them from the third research area concerning the sense of security and safety obtained from implementation of a smart home system as well as the additional possibilities created by the use of a smart home (Table 8). These respondents also more often agreed with the statements from the first and second research areas (Tables 4 and 6). When analysing the scores in detail, it was noted that the largest proportion of respondents agreed with and assigned the highest score to the statements that using a smart device at home may increase their security and safety by detecting gas and smoke emissions (60.7%), and by informing in the event of an unauthorised home intrusion (52.9%). In these two cases, both the mode and the median were also 7 (Table 7).

The obtained research results indicate that households most often had smart electronic devices such as TV sets and multimedia players. Less than half of the surveyed households declared having smart home automation devices such as lighting (light bulbs) and heating (thermostats). When

Table 7. Attitude towards the sense of security and safety obtained from implementation of a smart home system as well as the additional possibilities created by the use of a smart home, by respondent gender and their interest in technological innovations

Specification	Me	Mo	Average scores*			
			W	M	INT	NINT
Detecting gas and smoke emissions	7	7	6.13	6.15	6.11	6.05
Notifying in the event of unauthorised home intrusion	7	7	5.95	5.96	5.95	6.03	5.79
Providing automatic temperature control in the house	6	7	5.71	5.77	5.65	5.79	5.54
Controlling any electrical apparatus through simple operation	6	7	5.52	5.52	5.52	5.64	5.27
Ability to monitor whether doors and windows are closed	6	7	5.45	5.52	5.38	5.49	5.36
Active help for the home inhabitants without human intervention	5	7	5.23	5.31	5.16	5.37	4.94
Possibility of limiting utility costs	5	7	5.18	5.33	5.02	5.22	5.09

INT, respondents interested in new technologies; M, men; Me, median; Mo, mode; NINT, respondents not interested in new technologies; T, total sample; W, women.
*The scoring was based on a scale from 1 to 7, where 1 meant strongly disagree and 7 strongly agree.
Source: Own study.

examining the attitudes of young consumers towards the smart home and its equipment, it was found that the respondents most often agreed with the statements indicating the sense of security and safety obtained from implementation of a smart home system as well as the additional possibilities created by the use of a smart home, especially those specifying the capability of the smart home system to increase safety by detecting gas and smoke emissions. Young consumers also agreed with the statement that they could use smart home devices and that the use of smart home devices is fun, and even declared their intention to use smart home

Table 8. Attitude towards the sense of security and safety obtained from implementation of a smart home system as well as the additional possibilities created by the use of a smart home, by the respondents' place of residence (average scores*)

Specification	Rural area	City population (in thousands)		
		Up to 99	From 100 to 199	Over 200
Detecting gas and smoke emissions	6.09	6.21	6.25	5.99
Notifying in the event of unauthorised home intrusion	6.04	6.15	5.93	5.71
Providing automatic temperature control in the house	5.67	5.85	5.79	5.53
Controlling any electrical apparatus through simple operation	5.45	5.71	5.49	5.40
Ability to monitor whether doors and windows are closed	5.29	5.76	5.45	5.28
Active help for the home inhabitants without human intervention	5.20	5.32	5.19	5.20
Possibility of limiting utility costs	4.92	5.36	5.37	5.02

*The scoring was made on a scale of 1 to 7, where 1 meant strongly disagree and 7 strongly agree.
Source: Own study.

solutions in the future. It should be noted that a full conviction concerning the sense of security and safety deriving from implementation of a smart home system has not yet been reflected in the current equipment of the respondents' households, because their houses and flats were least often equipped with window and door sensors (6.4%), surveillance cameras (13.4%) and alarm systems (13.4%).

Conclusions

The constant development of technology has come to mean that the modern consumer has to live in an extremely interesting world, offering

a countless range of possibilities for consumers to communicate with each other, for communication between consumers and objects and for that between the objects themselves without a consumer's interference to facilitate and improve everyday life activities. Smart home systems are becoming more common day by day and forecasts indicate that the number of smart homes will increase. Therefore, the undertaken research was aimed at answering the question of what the attitude of young consumers is towards smart homes and furnishings in a smart home. Can the opinions expressed by young consumers give hope that these solutions will be used in the future? The survey shows that young consumers most often agreed with the statements indicating the sense of sense of security and safety obtained from implementation of a smart home system as well as the additional possibilities created by the use of a smart home, especially those specifying the capability of the smart home system to increase safety by detecting gas and smoke emissions. Importantly, the respondents agreed with the statement that they could use smart home devices, even agreeing with the statements that they intend to use smart home services in the future and that using smart home devices is fun. The obtained responses confirm the assumption that young consumers intend to use smart home solutions in the future and have a positive attitude towards them, especially those related to ensuring a sense of safety. In the responses of the respondents, one can see great optimism towards the use of smart homes, and this is related to both the sense of security derived from their use and the pleasure and ease of using them. However, it is difficult to predict whether these opinions would be confirmed during use, and when they will actually use it. Therefore, finally, attention should also be paid to the limitations of the results of the present research. No question was asked about who among the respondents already lives in a fully autonomous smart home and will continue to live in it. The questions referred only to individual smart devices, which do not always have to be synchronised with other smart devices used by households but are controlled separately by mobile devices. Therefore, it would be important to ascertain the opinions of people who have already decided to live in a smart home and repeat the research in the future.

References

1. Baudier, P., Ammi, Ch., & Deboeuf-Rouchon, M., (2020). Smart home: Highly-educated students' acceptance. *Technological Forecasting & Social Change*, *153*, 119355. doi:10.1016/j.techfore.2018.06.043

2. Domb, M. (2019). Smart home systems based on internet of things. In Y. Ismail (Ed.), *Internet of Things (IoT) for automated and smart applications* (pp. 25–37). London, UK: IntechOpen.

3. Dynatrace. (2018). *IoT consumer confidence report: Challenges for enterprise cloud monitoring on the horizon.* Retrieved from https://assets.dynatrace.com/en/docs/report/ 2824-iot-consumer-confidence-report-dynatrace.pdf.

4. Ekholm, J. (2018, May 31). *Good bye connected home — Hello intelligent home, Gartner*. Retrieved from https://blogs.gartner.com/jessica-ekholm/2018/05/31/good-bye-connected-home-hello-intelligent-home/?

5. Gunge, V. S., & Yalagi, P. S. (2016). Smart home automation: A literature review. *International Journal of Computer Applications* (0975–8887). National Seminar on Recent Trends in Data Mining (RTDM), Retrieved from https://research.ijcaonline. org/rtdm2016/number1/rtdm2568.pdf.

6. Hargreaves, T., Wilson, Ch., & Hauxwell-Baldwin, R. (2018). Learning to live in a smart home. *Building Research & Information*, *46*(1), 127–139.

7. Kwiatkowska, E. M. (2014). Rozwój Internetu rzeczy — szanse i zagrożenia, Internetowy *Kwartalnik Antymonopolowy i Regulacyjny*, *8*(3), 60–70, Retrieved from www.ikar.wz.uw.edu.pl.

8. Kolny, B. (2021a). Equipping households with durable goods in the age of the internet of things. *Acta Scientiarum Polonorum. Oeconomia*, *20*(3), 23-32.

9. Kolny, B. (2021b). Attitudes of young consumers on the security of their data collected by smart devices in the age of the Internet of Things. *Marketing Instytucji Naukowych i Badawczych*, *41*(3), 21–38.

10. Malinowska, K. (2021). *Co to jest inteligentny dom? Co się w nim znajduje?* Retrieved from www.compero.pl.

11. Majchrzyk, Ł. (2020). *Już co 3. nowy dom w Polsce jest inteligentny*. Retrieed from https://mobirank.pl/2020/02/16/juz-co-3-nowy-dom-w-polsce-jest-inteligentny/

12. Mącik, R. (2018). Konsument w świecie internetu rzeczy (IoT) — uwarunkowania akceptacji technologii IoT, *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, nr 526*, Wrocław: UE Wrocław, 48–59.

13. Miller, M. (2016). *Internet rzeczy. Jak inteligentne telewizory, samochody, domy i miasta zmieniają świat*. Warszawa, Poland: PWN.

14. Rozmus, S. (2019). Gospodarstwo domowe w dobie Internetu Rzeczy. *Rocznik Kolegium Analiz Ekonomicznych*, SGH, nr 54. Warszawa, Poland, 61–73.

15. Statista. (2021a). *Number of smart homes forecast in the world until 2025*. Retrieved from https://www.statista.com/forecasts/887613/number-of-smart-homes-in-the-smart-home-market-in-the-world

16. Statista. (2021b). *Smart Homes penetration rate forecast in the World until 2025*. https://www.statista.com/forecasts/887636/penetration-rate-of-smart-homes-in-the-world

17. Statista. (2022). *Smart home device shipments worldwide 2020–2025*. Retrieved from https://www.statista.com/statistics/1223274/smart-home-device-shipments-worldwide/

18. Wilson, C., Hargreaves, T., & Hauxwell-Baldwin, R. (2017). Benefits and risks of smart home technologies. *Energy Police*, *103,* 72–83.

19. Yang, H., Lee, H., & Zo, H. (2017). User acceptance of smart home services: An extension of the theory of planned behavior. *Industrial Management & Data Systems*, *117*(1), 68–89.

Beata Kolny — Associate Professor of the University of Economics in Katowice. Holds the degree of *doctor habilitowany* (DSc) in economic sciences. She is an Associate Professor of the University of Economics in Katowice and head of the 'Culture Manager' post-graduate studies programme. She has implemented numerous research projects, both alone as well as in teams of market and consumption researchers and in interdisciplinary teams. She has been involved in the implementation of projects funded by six grants (from the State Committee for Scientific Research, the Polish Ministry of Science and Higher Education and the National Science Centre). She specialises in market and consumption research, especially the behaviour of market participants. Her scientific interests centre around leisure time, especially the market of leisure services.