

YOUNG CONSUMERS TOWARDS AN ECOLOGICAL APPROACH TO LIFE IN THE AGE OF SMART HOMES AND DEVICES

**MŁODZI KONSUMENTI WOBEC EKOLOGICZNEGO PODEJŚCIA DO ŻYCIA
W DOBIE INTELIGENTNYCH DOMÓW I URZĄDZEŃ**

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ABSTRACT

This article aims to present the attitude of young consumers to issues related to the ecological approach to life at the time of the popularisation of smart devices and homes. The article was written based on secondary and primary sources of information. Direct research was conducted using the online survey technique in 2021 on a sample of 588 consumers aged 18–34 years living in Poland. The declarations of the respondents show that they have a positive attitude towards the use of smart homes and devices that facilitate the implementation of an ecological lifestyle. Positive answers refer to the use of smart homes and devices that improve the comfort and conditions of life, leading to savings in electricity, water and gas, and also offer the possibility for a healthier lifestyle and control over one's health and well-being.

Key words: young consumers, Internet of Things, smart homes, smart devices, greening of life

ABSTRAKT

Celem artykułu jest zaprezentowanie stosunku młodych konsumentów, do zagadnień związanych z ekologicznym podejściem do życia w czasie upowszechniania się inteligentnych urządzeń i domów. Artykuł napisano na podstawie wtórnych i pierwotnych źródeł informacji. 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 mają pozytywny stosunek do wykorzystywania inteligentnych domów i urządzeń, które ułatwiają realizację ekologicznego stylu życia. Pozytywne odpowiedzi odnoszą się do użytkowania inteligentnych domów i urządzeń, co poprawia komfort i warunki życia, umożliwia oszczędzanie energii elektrycznej, wody, gazu, a także daje szansę na zdrowszy styl życia i kontrolą nad zdrowiem i dobrym samopoczuciem.

Słowa kluczowe: młodzi konsumenci, Internet rzeczy, inteligentne domy, inteligentne urządzenia, ekologizacja życia

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Introduction

For consumers and their households, smart home and smart devices are useful things in everyday life. They can be easily controlled at the right time and from anywhere. Smart thermostats and lamps allow users to control temperature and lighting remotely and configure timer programmes. The work of smart devices can often be managed using a single application that allows for supervising the house, checking whether the TV has been turned off, or changing the settings of the air conditioning, and washing machine — all to prevent wastage of energy, water and money (Stańczyk, 2020). Taking this into account, for resource-saving households, having energy-saving appliances is one of the ways to introduce pro-ecological solutions into their everyday lives. The Internet of Things (IoT) is inherently linked to smart homes and things. The main factors that are conducive to the development of consumer IoT applications are

convenience of use and facilitation of consumers' everyday life. The term 'Green Internet of Things' aims at reducing electricity consumption by remotely controlling heating, lighting and electronic devices using a computer, smartphone or voice commands (Alsamhi, Ma, Ansari, & Meng, 2018). IoT can be used in smart homes to connect home electronic devices (e.g., smart TVs and streaming servers), home appliances (e.g., smart refrigerators, dishwashers, washing machines) and home automation devices (e.g., thermostats, smoke detectors, alarm systems). Within the IoT, it is possible to combine all appliances that can be monitored and controlled. The ease of use and control of devices operating in IoT networks via mobile devices, mainly smartphones and installed applications, are also significant in this regard (Maçik, 2018a). In addition, integration of the smart home with IoT, as well as smart city technologies, can create new opportunities for innovation and improvement (Hui, Sherratt, & Sánchez, 2017).

A smart home is perceived not only through the context of convenience and comfort but also through ecological living, thanks to the possibility of reducing energy consumption through the use of innovative technological solutions (Kasprzyk, 2019). The chief motivation for designing smart houses is to make living in them not only pleasant but also as cost-effective as possible for the residents. Smart houses can be ecological, not only due to the use of solutions typical for smart houses but also to the use of ecological materials for their construction (Ekologiczny i inteligentny, 2022). A house with minimal environmental impact is considered to be ecological, while simultaneously ensuring convenience, comfort, modernity, contact with nature as well as a sense of security (Dom ekologiczny, 2022) for its users.

In addition to the advantages, which are without doubt the declared possibility of energy savings and improved security, threats to the privacy and security of data downloaded by smart devices are also indicated (Kolny, 2021b; Wilson, Hargreaves, & Hauxwell-Baldwin, 2017). Concerns are also related to the use of smart devices and homes. A report presenting research conducted on a sample of 10,002 respondents commissioned by Dynatrace in eight countries around the world (the UK, the USA, France, Germany, Australia, Brazil, Singapore and China) shows that 73% of respondents expressed fear of being locked in a smart home or outside it. The inability to control the temperature (68%) and lights (64%) in a smart home was also

pointed out (Dynatrace, 2018). Again, the results of a qualitative study among smart homeowners conducted by Hargreaves, Wilson, and Hauxwell-Baldwin (2017) show that smart homes are burdensome for their users both in relation to other household members and in technical terms. These houses require adaptation to their functionality, which may limit their use. Learning to use smart home technology is also a demanding and time-consuming issue, and the lack of technical support by sellers is an inconvenience. In addition, it was found that there is a risk that they may generate some form of intensification of energy consumption.

It is noted that smart home systems are becoming more common every year, and predictions indicate that the number of smart homes will increase (Statista, 2022). In Poland, according to a survey conducted by Oferteo.pl, in 2018, 23% of respondents decided to implement smart home solutions in their newly built homes, while in 2019, a third of the respondents opted for them. People who did not decide to use these solutions indicated high prices, and a lack of need to possess any knowledge about them as reasons (Majchrzyk, 2020). The latter reasons are also confirmed by the research conducted by Kolny (2021a), which shows that although 75.8% of the respondents consider facilitating everyday activities to be an advantage, and 58.9% that everyday life becomes more convenient and comfortable, the following reasons for which consumers and their households do not buy smart devices were also indicated: high prices (79.5%), no need to own (59%) and no knowledge about them (55.6%). The next report prepared by Oferteo.pl in 2020 shows that the most frequently chosen intelligent solutions were heating (68%) and lighting (64%) control systems, which significantly facilitate saving electricity or gas. According to the respondents, the reasons they decided to introduce intelligent solutions into their home were increased comfort (78%), willingness to use modern technologies (50%), savings (43%), the need for safety (36%), as well as ecological considerations (19%) (Inteligentne systemy, 2021).

This article aims to present the attitude of young consumers (aged 18–34 years) to selected issues related to the ecological approach to life during the popularisation of smart devices and houses that can improve the management of electricity, water and gas consumption, and increase awareness of care for health and achieving well-being. The article focuses on issues from three separate research areas that are, however, related to

the topic. The first concerns the respondents' attitude to environmentally friendly products. The second is the attitude to smart devices and the convenience of their use, and the third focuses on the attitude of young consumers to greening life as a result of the use of smart home devices and the usefulness of these devices in practicing such an approach to life. It is assumed that young consumers have a positive attitude to the use of smart homes and devices that facilitate the implementation of an ecological lifestyle.

This article presents theoretical information on the greening of life, smart homes and devices, and IoT. It describes the research methodology and sample, presents the results of the author's research, and conclusions along with a recommendation for further research.

Theoretical Background

The ecological approach to life is related to various consumer behaviours on the market, in the household and in the natural environment. The greening of consumption manifests itself in the economical and rational use of consumer goods and the reduction of consumption of very rare, non-renewable, resource-intensive goods, which at the same time, may contain dangerous post-consumer waste. Significant opportunities for greening consumption lie in the modernisation of energy production and distribution by increasing the use of natural energy sources in the activities of consumers and their households (Bywalec, 2017), or reducing the level of energy consumption (Connolly & Prothero, 2008). Consumers usually understand the term 'ecological' or 'environmentally friendly' as taking care of the Earth, acting by the laws of nature, not disturbing the balance of the environment, segregating garbage, saving electricity and water, as well as using reusable paper bags, conscious organic food purchases, and the use of environmentally friendly cars (Dąbrowska, Jurowczyk, & Ozimek, 2022). An important role in this regard is played by environmental awareness, which determines the consumer's attitude to the natural environment and the amount of information and beliefs about it, as well as the system of values that guide the consumer behaviour towards this environment (Kielczewski, 2001) and environmental education to shape this awareness

(Ambalagan & Shanthi, 2015; Omoogun, Egbonyi, & Onnoghen, 2016). Among the components of the consumer's ecological awareness, the descriptive-technical and axiological-normative spheres can be distinguished. The first of them includes their environmental knowledge, the elements it consists of, the laws that govern it, as well as environmentally friendly and harmful behaviour. In addition to this, ecological imagination, that is, the ability to predict the ecological effects of the actions taken, design them in line with the requirements of ecological knowledge, and the ability to perceive and capture the connections between human activity and ecological processes. The second of them, that is, the axiological-normative sphere includes a system of values and norms that relate to the interconnections between the whole of society and nature as well as between the individual and the environment. This sphere also includes relations between people in the context of the natural environment (Kielczewski, 2001). The concept of greening is also related to sustainable development conditioned by ecological space. It is beneficial for humans, the environment and the economy through the assumed synergy of economic, environmental and social aspects (Santhanlaxmi & Chandramohan, 2020). Sustainable development is also a way of life that enables one to choose the forms of consumption. The consumer usually associates an organic product with something safe and healthy, with something modern (Janoś-Kresło, 2006). Sustainable and balanced development is aimed at increasing both social and individual well-being. Not only does this prosperity depend on the consumption of goods and services, but also on the ecological living conditions. The goal is therefore not so much to increase the level as to increase the quality of life while trying not to harm the ecosystem that sustains life (Kunarto & Prasetyo, 2022). Hence, the essence of sustainable development is to ensure a lasting improvement in the quality of life of the present and future generations by shaping the right proportions between three types of capital: economic, human and natural (Klarin, 2018). Therefore, it is a development based on properly shaped structures, which include the natural environment, and the integrating criterion is the category of quality of life (Piontek, 2002). Greening of life causes greater care for the natural environment but also for one's health and fitness. For a consumer who promotes an ecological

lifestyle, it is important to both what is outside in their environment, the natural environment, but also what is inside them, that is, the condition of their body. Taking care of health has become one of the main determinants of consumption in recent years. The increased interest in health problems is also prompted by the growing fear of disease and death (Rachocka, 2003). The ecological approach to life is also related to the zero-waste philosophy, which promotes zero waste footprint. The zero waste definition indicates 'the protection of all resources through responsible production, consumption, reuse, and recovery of products, packaging, and materials without incineration and without discharges into the ground, water or air that threaten the environment or human health' (The Zero Waste International Alliance, 2018). According to this concept, every resource should be reused instead of being thrown away. The zero-waste philosophy is based on six pillars (the 6R principle): Refuse, Reduce, Repair, Reuse, Recycle, Rot (Ecological, 2021). For eco-conscious households, it is important to use resources sparingly. These savings are possible thanks to the use of smart homes and devices that help reduce the consumption of electricity, water and gas while increasing the comfort of living. Smart homes can help improve energy efficiency and promote sustainable development (Reinisch, Kofler, & Kastner, 2010). It is also assumed that energy efficiency is one of the main advantages of a smart home (Asare-Bediako, Ribeiro, & Kling, 2012). Although smart home technologies are increasingly contributing to more efficient energy use, their use rate is estimated to remain lower than expected, with environmental awareness influencing the use of these technologies playing an important role (Ferreira, Oliveira, & Neves, 2023).

Smart homes can help improve energy efficiency and promote sustainable development (Reinisch et al., 2010). It is also assumed that energy efficiency is one of the main advantages of a smart home (Asare-Bediako et al., 2012). Although smart home technologies are increasingly contributing to more efficient energy use, their use rate is estimated to remain lower than expected, with environmental awareness influencing the use of these technologies playing an important role (Ferreira et al., 2023). The concept of a smart home equipped with smart devices is not something new. The first of them using technology in the field of home automation,

based on the existing electrical installation to transmit signals controlling lights, home appliances and so on, were already known in the second half of the 20th century, as they were introduced to the market in 1978 by the Scottish company Pico Electronics, and the term 'smart home' itself was coined in 1984 (Miller, 2016). 'A smart home can be defined as a place of residence incorporated with a communication network, modern household appliances, devices and sensors that can be remotely accessed, monitored and controlled, and provide services that respond to the needs of residents' (Yang, Lee, & Zo, 2017). When analysing the meaning of the word 'smart' concerning homes and devices, it should be assumed that the ability to remotely manage, turn on and off an object determines whether an object is called 'smart' (Miller, 2016). A modern smart home is a place equipped with various devices, lighting, heating, air conditioning, radio and television equipment, household appliances and security systems that can communicate with each other and are controlled using an application on a smartphone or tablet to remotely start or turn off the equipment (Domb, 2019). The operation of a smart home is based on the use of a wireless home network (WiFi, Bluetooth, RFID), which allows users to connect many devices and an appropriate application developed and made available by manufacturers of smart devices. Items that can be connected to a smartphone or tablet are perceived as having extended functionalities. Mobile devices act as a control centre for consumer electronics and household appliances connected to the home network. For an average user with the skills to use a smartphone, and in particular, to install a control application, using them should be easy, and adding another device to the home IoT ecosystem is not a problem (Maćik, 2018b).

The main element of a smart home is the integrated building management system (BMS) which controls household appliances, RTV equipment, alarm system and all controllable activities such as heating or lighting, including central unit, power supply, and electricity control subsystems, subsystems ensuring comfort, safety and control devices (Malinowska, 2021).

All the smart devices in one's home are designed to automate household chores. When various intelligent devices that communicate with each other are gathered under one roof, the result is a smart home. Even a house

equipped with basic automation has some intelligent functions (Miller, 2016). In a smart home, apart from simply controlling and automating individual devices, smart devices communicate with other devices and synchronise their operation. A smart home can be seen as fully autonomous and acts on behalf of its occupants. Smart home systems can be easily adapted to the changing needs of its inhabitants. A smart home learns the behaviour and preferences of the people living in it. It adapts to these behaviours, anticipates needs and responds accordingly. It uses data collected from devices and sensors in the home, but also from wearables and even connected cars (Ekholm, 2018). For example, smart thermostats can remember a homeowner's daily schedule and adjust their temperature to save energy, as they can be programmed to turn off at the right time (Nacer, Marhic, & Delahoche, 2017; Pang et al., 2021). A well-configured smart home system means that when its user closes the door with a key, the alarm system is automatically activated, the blinds in the windows are lowered, the temperature in individual rooms is lowered, lamps left on turn off by themselves, electronics and household appliances are automatically turned off, and when a homeowner comes back, it automatically adjusts to their preferences (including, for example, appropriate lighting, music, heating). Thanks to the system, one can check what is going on at home, and when the system itself senses something dangerous, it activates the alarm and sends information to the security office or the fire brigade. The house and the smart devices in it perform most of the activities for humans, both when they are inside and outside of it. From an eco-friendly lifestyle point of view, smart home technology can help homeowners save energy and thus lower their energy bills by automating energy-saving actions, such as turning off lights when not needed, adjusting the thermostat to more energy-efficient temperatures, and turning off appliances when not in use (Jo & Yoon, 2018).

The concept of smart homes and smart devices is inextricably linked to IoT (Gunge & Yalagi, 2016). It is defined as an open and comprehensive network of intelligent objects that can self-organise, share information, data and resources, and react and act in the event of changes in the environment (Madakam, Ramaswamy, & Tripathi, 2015). IoT is perceived as a set of intelligent objects that can react to the environment and process

and remember digital information, as well as send it to other objects (and users) via Internet protocols. Not only does IoT enable communication between people and smart objects, but also between such smart devices. This leads to ensuring communication anytime and anywhere, that is, anywhere, using any information carrier (Kwiatkowska, 2014). According to another source, the term IoT was created to reflect the growing number of intelligent, connected devices and to emphasise the new possibilities that they can present (Porter & Heppelmann, 2014). One of the simplest definitions of IoT indicates that it is a system of physical objects that can be discovered, monitored, controlled and interacted with through the use of electronic devices that provide communication via various network interfaces and the ability to connect to the wider Internet (Guinard & Trifa, 2016). IoT consists of four basic elements: devices that allow for the active collection and transmission of measurement data indicating their functioning; a communication network connecting devices (i.e., the internet); IT systems capable of collecting incoming data; and analytical solutions that process data and allow for inference and obtaining additional business value (Rozmus, 2019). IoT can connect many different devices, both very small and large. The important thing is that the object does not need to have a physical form. It may be data, that is, information about the location and temperature in the room collected using a device designed for this purpose (e.g., thermostat, smartphone) (Miller, 2016). In addition, both living beings (humans and animals) as well as plants and inanimate objects are perceived as things (Madakam, Ramaswamy, & Tripathi, 2015). IoT is about collecting data, using it, and mutual communication between devices and the environment. This requires huge storage capacity, cloud computing, a high channel bandwidth for transmission and high power. In order to carry out the development of a smart world and sustainable development, the Green IoT has been introduced to reduce carbon emissions and energy consumption. Green IoT is related to technology that makes it environmentally friendly, using devices and warehouses that allow consumers to collect, store, access and manage various information (Alsamhi et al., 2018). Adopting smart home technology and IoT not only saves money but also helps to reduce our carbon footprint and protect the environment (Zhou et al., 2016).

Research Methodology

This article was written based on secondary and primary sources of information. The former made it possible to characterise the discussed issues related to the greening of life through the use of smart homes and devices and IoT. Secondary information was supplemented with primary information collected by the author in the mode of direct research using the online survey technique on 1 March 2021–18 May 2021. The survey questionnaire was made available on the SurveyMonkey platform, and the link to the survey was sent by e-mail to potential respondents. Over 1,000 completed questionnaires were returned. However, taking into account the limitations of the research technique used, resulting from, for example, too hasty completion of the questionnaire by a respondent (this is evidenced by the time devoted to reading it and completing it before sending it back), skipping questions, and deficiencies in the details that would not allow us to describe the socio-economic characteristics of the respondents. Another constraint was the overrepresentation of women (588 in number) in the research sample described in this article. Therefore, we selected only young consumers aged 18–34 years, including 50% of females and 50% of males. The detailed characteristics of the respondents indicate that 20.7% of the respondents lived in the countryside, 27.6% lived in towns with up to 99,000 inhabitants, 24.0% lived in towns with a population of 100,000 to 199,000, while 27.7% of the respondents lived in cities with more than 200,000 inhabitants. Most of the respondents assessed the financial situation of their household as good (63.8%) and stated that they could afford some luxury goods; 26.0% of the respondents assessed the financial situation of their household as satisfactory, meaning that they had to plan all major expenses. A very good financial situation was declared by 9.7% of the surveyed households and only 0.5% answered that their financial situation was bad. When analysing the respondents' competences in terms of the ability to use objects and tools necessary to operate the smart home and devices, it was found that 70.1% of the respondents declared very high skills related to the use of a smartphone, 49.8% of the tablet, and 61.9% of various Internet applications. 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 skills at these levels were declared by 75.8% of respondents). In terms of the subject of the article, the declarations of 66.3% of the respondents who answered that they consciously purchase environmentally friendly products, and the responses of 33.7% of the respondents who stated that they do not pay attention to whether the product is environmentally friendly, are also important.

Research Results

At the outset of the study, it was attempted to identify the general attitude of respondents to issues related to the greening of life, and in particular, to buying and using environmentally friendly products, by asking them to respond to selected statements related to this topic on a scale from 1 to 7, where 1 meant that the respondent completely disagrees with a given statement and 7 that they completely agree with it. The highest average score was given to the statement: 'I feel that using environmentally friendly products is right (average 5.84). A slightly lower average of 5.79 achieved the statement: 'Buying environmentally friendly products is setting a good example.' An equally high average of 5.53 achieved the statement: 'Buying environmentally friendly products can make a difference to the environment.' Average scores above 5 were also given to the following statements: 'If I use environmentally friendly products, my friends or family will think it's a good thing' (5.30) and 'Environmentally friendly products are as effective as regular products' (5.15). It is worth noting that all the listed statements with an average score above 5 had the highest number of scores of 7 confirming that the respondents strongly agreed with them. In addition, women more often than men agreed with these statements, as in all cases the average of the ratings given by them is higher than the ratings given by men. A similar relationship was noted in the case of people declaring that they consciously purchase environmentally friendly products compared with those who do not pay attention to whether the product is environmentally friendly (Table 1).

Table 1. The attitude of respondents to environmentally friendly products

| Statement | Average ratings* | | | | | Me | D |
|---|------------------|------|------|------|------|----|---|
| | T | F | M | KPN | NKPN | | |
| I feel that using environmentally friendly products is the right thing to do | 5.84 | 6.09 | 5.59 | 6.13 | 5.24 | 6 | 7 |
| Buying environmentally friendly products is setting a good example | 5.79 | 6.12 | 5.46 | 6.11 | 5.13 | 6 | 7 |
| Buying environmentally friendly products can make a real difference to the environment | 5.53 | 6.01 | 5.04 | 5.84 | 4.91 | 6 | 7 |
| If I use environmentally friendly products, my friends or family will think it's a good thing | 5.30 | 5.63 | 4.97 | 5.64 | 4.61 | 6 | 7 |
| Environmentally friendly products are as effective as regular products | 5.15 | 5.42 | 4.90 | 5.45 | 4.57 | 6 | 7 |
| It is easy to distinguish environmentally friendly products from other products | 4.64 | 4.72 | 4.57 | 4.84 | 4.27 | 5 | 5 |
| Environmentally friendly products are readily available in stores | 4.58 | 4.76 | 4.40 | 4.73 | 4.25 | 5 | 5 |
| Environmentally friendly products have a good price-quality ratio | 4.27 | 4.68 | 3.85 | 4.62 | 3.57 | 4 | 4 |

*The assessment was made on a scale from 1 to 7, where 1 meant that the respondent completely disagreed with the given statement and 7 that they completely agreed with it.

D, dominant; F, females; KPN, respondents consciously purchasing environmentally friendly products; M, males; Me, median; NKPN, respondents not paying attention to whether the product is environmentally friendly; T, total.

Next, the study diagnosed the respondents' attitudes to smart devices and the benefits for the consumer resulting from their use, including the possibility of saving time as a result of their use. The assessment was made on a scale from 1 to 7, where 1 meant that the respondent completely disagreed with the presented statements covering the analysed issues, and 7 meant that he completely agreed with them. The respondents agreed with the statement 'Smart devices enhance the comfort and conditions of life' (average score of 5.64). Two statements achieved almost the same average, namely 'The use of smart devices in households, i.e., washing machines, vacuum cleaners, etc. contributes to

the rational consumer's time management and saving this time' (average 5.35) and 'Use of smart devices in households (cameras, sensors, etc.) increases the consumer's sense of security' (average 5.34). The dominant score assigned to each of these statements was 7, meaning that the largest number of respondents completely agreed with them. Women and people consciously purchasing environmentally friendly products more often agreed with these statements. Despite the advantages of smart devices, which the respondents agreed with, it is worth emphasising that they did not fully agree with the statement indicating that consumers willingly install smart devices in their homes, which can be controlled using a smartphone or tablet. This statement did not receive full support and the average rating was only 4.69, while the most frequently awarded rating was 4 (Table 2).

Table 2. Respondents' attitudes to selected issues related to smart home devices

| Statement | Average ratings* | | | | | Me | D |
|---|------------------|------|------|------|------|----|---|
| | T | F | M | KPN | NKPN | | |
| Smart devices enhance people's comfort and conditions of life | 5.64 | 5.80 | 5.48 | 5.75 | 5.46 | 6 | 7 |
| The use of smart devices in households, i.e., washing machines, vacuum cleaners, etc. contributes to the rational consumer's time management and saving this time | 5.35 | 5.66 | 5.04 | 5.47 | 5.10 | 6 | 7 |
| The use of smart devices in households (cameras, sensors, etc.) increases the consumer's sense of security | 5.34 | 5.51 | 5.17 | 5.47 | 5.06 | 6 | 7 |
| The use of intelligent refrigerators enables, among others, a preview of the interior on the screen, on the door, or the phone(in a place far from home) can contribute to the rational management of food supplies | 4.82 | 5.12 | 4.52 | 4.96 | 4.52 | 5 | 7 |
| Consumers willingly install smart devices in their homes that they can control using a smartphone or tablet | 4.69 | 4.75 | 4.63 | 4.79 | 4.46 | 5 | 4 |

*The assessment was made on a scale from 1 to 7, where 1 meant that the respondent completely disagreed with the given statement and 7 that they completely agreed with it.

D, dominant; F, females; KPN, respondents consciously purchasing environmentally friendly products; M, males; Me, median; NKPN, respondents not paying attention to whether the product is environmentally friendly; T, total.

Given that smart home devices enhance the comfort and conditions of life — this was also confirmed by the conducted research — the respondents were asked to comment on the convenience of using these devices in the context of greening life. Each of the presented ideas received an average score of above 5 (on a scale from 1 to 7). Most respondents agreed with the statement indicating that it is convenient that smart devices can provide automatic temperature control at home (average 5.71), then that they can provide access to a lot of information (average 5.65). It is also convenient that they can control any electrical apparatus through simple operation (average 5.52) and that these devices give the opportunity to actively help residents without human intervention (average 5.23). People consciously purchasing environmentally friendly products agreed with these statements more often than people who did not pay attention to whether the product is environmentally friendly. Concerning all the statements, the dominant rating was 7, so most people strongly agreed with them (Table 3).

Table 3. Respondents' attitudes to statements related to the convenience of using smart home devices

| Statement | Average ratings* | | | | | Me | D |
|---|------------------|------|------|------|------|----|---|
| | T | F | M | KPN | NKPN | | |
| <i>Conveniently, smart home devices can:</i> | | | | | | | |
| Provide automatic temperature control in one's home | 5.71 | 5.77 | 5.65 | 5.80 | 5.52 | 6 | 7 |
| Provide access to a lot of information | 5.65 | 5.66 | 5.65 | 5.73 | 5.50 | 6 | 7 |
| Control any electric apparatus through simple operation | 5.52 | 5.52 | 5.52 | 5.64 | 5.28 | 6 | 7 |
| Actively help residents without human intervention | 5.23 | 5.31 | 5.16 | 5.32 | 5.08 | 5 | 7 |

*The assessment was made on a scale from 1 to 7, where 1 meant that the respondent completely disagreed with the given statement and 7 that they completely agreed with it.

D, dominant; F, females; KPN, respondents consciously purchasing environmentally friendly products; M, males; Me, median; NKPN, respondents not paying attention to whether the product is environmentally friendly; T, total.

Referring to the issues considering the ecological approach to life in the era of smart homes and devices, the respondents were also asked to react to statements containing these aspects on a scale of 1–7. When analysing the answers received, it was noted that the respondents agreed with the

statement that 'Smart devices used in homes contribute to environmental protection by reducing electricity and water consumption by households', awarding an average of 4.79. The median of the answers was 5, which means that half of the respondents gave a score lower than 5, and the other half was higher than 5. The dominant score was 4, so it can be considered that the respondents agreed with this statement, although it is not an assessment indicating complete compliance. Higher average scores and the highest number of highest scores confirming that the respondents strongly agreed with them were obtained by statements pointing out that for those living in a smart home, these devices 'will allow for accurate knowledge of energy and water consumption (expenditure, consumption of water, heat, etc.)' — average 5.67, then that 'They will save resources (energy, water, etc.)' — average 5.49. The statement that most closely corresponds to the subject of the article: 'Smart devices will allow an ecological approach to life' received an average rating of 5.18. The statement emphasising that these devices will reduce costs was also rated above 5 (average 5.17). All these statements were more often agreed upon by women than men, and by people paying attention to the purchase of environmentally friendly products (Table 4).

Table 4. Respondents' attitudes to statements related to the greening of life through the use of smart home devices

| Statement | Average ratings* | | | | | Me | D |
|---|------------------|------|------|------|------|----|---|
| | T | F | M | KPN | NKPN | | |
| Smart devices used in homes contribute to environmental protection through reducing electricity and water consumption by households | 4.79 | 4.99 | 4.60 | 5.00 | 4.37 | 5 | 4 |
| <i>For people living in a smart home, these devices:</i> | | | | | | | |
| Allow them to know exactly the consumption of energy and water (expenses, the consumed amount of water, heat, etc.) | 5.67 | 5.73 | 5.61 | 5.78 | 5.48 | 6 | 7 |
| Allow for saving resources (energy, water, etc.) | 5.49 | 5.61 | 5.38 | 5.63 | 5.23 | 6 | 7 |
| Allow for an ecological approach to life | 5.18 | 5.39 | 4.98 | 5.41 | 4.69 | 5 | 7 |
| Allow for cost-savings | 5.17 | 5.33 | 5.02 | 5.36 | 4.82 | 5 | 7 |

*The assessment was made on a scale from 1 to 7, where 1 meant that the respondent completely disagreed with the given statement and 7 that they completely agreed with it.

D, dominant; F, females; KPN, respondents consciously purchasing environmentally friendly products; M, males; Me, median; NKPN, respondents not paying attention to whether the product is environmentally friendly; T, total.

In the end, respondents were asked to comment on statements related to the usefulness of smart devices in practicing an ecological approach to life, and in particular, taking care of their well-being and health. As in the previous questions, a seven-point scale was used concerning these issues, and the respondents agreed with them. The highest average score was given to the statement indicating that smart home devices can provide information when needed to help make better decisions about health and well-being (average 5.29). A slightly lower average was achieved by the statement that these devices can increase health and well-being awareness when needed (average score of 5.16). The average ratings of the last two statements stating that smart home devices can, if necessary, increase the chances of a healthier lifestyle (average 5.12) and give greater control over health and well-being (average 5.11) are also very similar. As in all the presented statements, women and people paying attention to whether the product is environmentally friendly agreed with them more often (Table 5).

Table 5. Respondents' attitudes to statements related to the usefulness of smart devices in the implementation of an ecological lifestyle

| Statement | Average ratings* | | | | | Me | D |
|---|------------------|------|------|------|------|----|---|
| | T | F | M | KPN | NKPN | | |
| <i>Smart home devices can, when needed:</i> | | | | | | | |
| provide information to help make better health and well-being decisions | 5.29 | 5.46 | 5.12 | 5.47 | 4.95 | 5 | 7 |
| increase health and well-being awareness | 5.16 | 5.29 | 5.04 | 5.35 | 4.82 | 5 | 7 |
| increase chances of a healthier lifestyle | 5.12 | 5.19 | 5.05 | 5.30 | 4.80 | 5 | 7 |
| give more control over one's health and well-being | 5.11 | 5.20 | 5.02 | 5.29 | 4.78 | 5 | 7 |

*The assessment was made on a scale from 1 to 7, where 1 meant that the respondent completely disagreed with the given statement and 7 that they completely agreed with it.

D, dominant; F, females; KPN, respondents consciously purchasing environmentally friendly products; M, males; Me, median; NKPN, respondents not paying attention to whether the product is environmentally friendly; T, total.

Conclusions, Recommendations and Research Limitations

The ongoing development of technology means that modern consumers live in an extremely interesting world offering a countless range of communication possibilities between themselves, between them and objects, and objects themselves without human interference to facilitate and improve everyday life activities and implement an ecological approach to life. This article therefore aimed at diagnosing the attitudes of consumers to selected issues related to the greening of life at a time when smart devices are becoming popular and smart homes are being built to improve the management of electricity, water, and gas consumption and give a chance to increase health and well-being awareness outreach. Only young consumers aged 18–34 years were selected for the study as they seem to be more willing than others to adapt all technological innovations and conveniences created and potentially be their future users to improve their daily lives while protecting the environment (Baudier, Ammi, & Deboeuf-Rouchon, 2020). The conducted research shows that young consumers have a positive attitude to the use of smart devices in the context of an ecological approach to life. They agreed with the statement that smart devices will allow for an ecological approach to life, giving an average rating of 5.18 on a scale from 1 to 7. They also agreed with the statement that 'Smart devices used in homes contribute to protecting the environment through reducing electricity and water consumption by households.' In their opinion, these devices 'will allow people living in a smart home to know exactly the consumption of energy and water, and will also save resources (energy, water, etc.)'. Young consumers agreed with the statement that smart devices enhance the comfort and conditions of life. In their opinion, it is convenient that smart devices can provide automatic temperature control in the home, can provide access to a lot of information, and can control any electrical apparatus through a simple operation. Smart home devices can provide information when needed to help one make better health and wellness decisions, increase health and well-being awareness, increase one's chances for a healthier lifestyle, and give more control over one's health and well-being.

The collected responses confirm the assumption that young consumers have a positive attitude to the use of smart homes and devices, facilitating the implementation of an ecological lifestyle. In the respondents' answers, one can see positive reactions to statements on the use of smart homes and devices related to the possibility of enhancing the comfort and conditions of life as well as saving resources, a chance for a healthier lifestyle, and control over health and well-being. However, it is difficult to predict whether these opinions would be confirmed during the actual use of smart homes and devices. Therefore, in conclusion, attention should be paid to the limitation of the presented research results given that the respondents were not asked who already lives in a smart home or whether their opinions are a result of the acquired experience of using smart homes and devices. The focus was only on obtaining their subjective opinions on the issues discussed in this article. Therefore, it would be essential to repeat the research in the future, including, in particular, the use of in-depth research techniques and diagnosing the attitudes towards the ecological approach to life of people who have decided to live in a smart home and have knowledge resulting from the experience gained through its use.

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