

THE ATTITUDES OF YOUNG POLISH CONSUMERS TOWARDS ENERGY COSTS OF SMART PRODUCTS

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Introduction/background: The attitudes of young Poles towards smart products and their relationship with the costs of energy supplying smart products are the main research objects in this paper. The smart products market is developing very dynamically, including both simple everyday utility products and durable goods with a significant unit value. The authors point out the existence of a cognitive gap regarding the connection between attitudes towards smart products and attitudes towards using electricity. The authors emphasize that the use of smart products requires universal access to the possibility of topping up these products.

Aim of the paper: The study aims to diagnose the attitudes of young Poles towards the location of power sources for smart products and the formalization of access to this power (determining the payer), which will allow in the future to conduct educational activities in the field of optimizing the use of natural resources (energy) as well as marketing activities of smart product suppliers.

Materials and methods: The research was conducted on a group of young Poles in 2021 as online questionnaire. The presented results refer to pilot study in Poland. According to the authors, they have a high level of originality, as there are no previous studies in this area known. In turn, the social and economic problems related to the amount of energy consumed and its costs is a civilization challenge across the world.

Results and conclusions: The results indicate disproportions in the knowledge and attitudes of young Poles towards costs of energy supplying smart products. Research hypotheses were positively verified. Young consumers do not see energy for smart products as “something” that has a price and must be paid for (access to it). The conducted research shows that young buyers are not conscious energy buyers and are not aware of the costs of purchasing energy. Moreover, according to the respondents, both now and in the future, access to electricity (sources of energy) that allow powering smart products should be free and universal. Electricity is a product that has a price, and most likely the cost of energy will increase. Hence, it is important to conduct campaigns to make young consumers aware of the cost of energy and the relationship between the use of smart products and energy costs.

Keywords: energy costs, smart products, young consumers, Poland.

1. Introduction

Smartphones, i.e. multifunctional devices that have replaced traditional telephones, are an example of a new product category called smart products. This category, as will be discussed later in this paper, covers a wide range of products, but the common feature that is the focus of this paper is that they require the use of electricity. Electricity is a market product that has a price, but access to this product is specific – it is "invisible". Plug the cable into the socket and it's done!

Since in the process of socialization a person gets used to the market behavior, according to which receiving a product or service requires paying for it, a person (including young customers who are in the center of interest in this paper) is aware of the costs of obtaining products that meet his needs. The authors of the presented study put a question:

"Are young people aware of the costs of obtaining energy?"

At the same time, electricity is a product related to environmental protection issues, hence the next research question is:

"Do young customers perceive a relationship between the use of smart products (requiring electricity) and environmental protection issues"?

The issue of pro-ecological customer attitudes in various age groups has been of interest for many years. There are also several studies on the pro-ecological attitudes of young buyers. The research focuses mainly on waste segregation, the use of disposable packaging (mainly plastic bottles), and supporting the development of renewable energy.

Analyzing the literature, no studies dedicated solely to the attitude of young buyers to electricity were identified, including the costs of using energy in a household, the costs of using energy as an element of product use. In this context, the authors intend to try to fill the research gap in this area.

The research aims to diagnose the attitude of young Polish consumers to the costs of electricity, in particular, to identify the perception of the costs of energy supplying smart products. In this research project, the authors present these attitudes as an element of purchasing attitudes and analyze them in connection with the pro-ecological attitudes of young consumers in Poland.

The conducted research shows that young buyers are not conscious energy buyers and are not aware of the costs of purchasing energy. Moreover, according to the respondents, both now and in the future, access to electricity (sources of energy) that allow powering smart products should be free and universal.

In addition, the research results allowed the formulation of methodological recommendations for future research on the relationship between smart products and electricity. According to the authors, this will allow for the development of future research in this area and the formulation of practical recommendations supporting the development of smart products.

2. Smart products

The term “smart product” has become popular in everyday life among technology experts, scientists, also politicians. As the idea of smart products is interdisciplinary, the concept itself develops in close relation to the terms like the Internet, the Internet of things, new technologies. In general terms, a smart product is linked to the Internet and it allows the exchange of information about its users, environment, and about the product itself. The group of products that are called smart is very broad: from industrial equipment, home appliances, medical equipment, motor vehicles, to even smart packaging that can report on the location and condition of the product it protects (e.g. RFID systems used in retailing). The popularization of the use of products that we have defined as smart prompted researchers to scientific interest in this product category. The term "smart" is also used differently, e.g. "smart city". At the same time, the smart city fits in the broadly understood context of our research, because it is a concept about the use of information and communication technologies to increase the efficiency of urban infrastructure.

As Porter and Heppelmann (2014) defined, smart, connected products have three core elements: physical components, “smart” components, and connectivity components. Physical components comprise the product’s mechanical and electrical parts. Smart components comprise the sensors, microprocessors, data storage, controls, software, and, typically, an embedded operating system and enhanced user interface. In many products, software replaces some hardware components or enables a single physical device to perform at a variety of levels. Connectivity components comprise the ports, antennae, and protocols enabling wired or wireless connections with the product.

Raff, Wentzel, Obwegeser (2020) have made a comprehensive conceptualization of smart products and, in addition to a broad review of the subject literature, they presented four distinct archetypes: 1. digital, 2. connected, 3. responsive, 4. intelligent. The mentioned authors emphasized that smart products are cyber-physical products that not only possess software-based capabilities but have a distinct material nature.

It is not the purpose of this paper to analyze smart products as such. Although the topic is very interesting, it will not be discussed further. Interest in these products results from the dynamic development of this category and its entry into areas of life that were diametrically different in the past (not related to the use of modern technologies). Smart, connected products are emerging across all manufacturing sectors. What is of particular interest to the authors of this paper, these products have one thing in common – the need for the use of electricity. These products do not exist without access to energy. And this is the main focus of this study. The authors additionally pay attention not so much to the connection with the use of energy, but to the fact that the possibility of using these products depends on access to energy. Therefore

we underline that the common feature of all these products is the addiction to access to electricity.

Additionally, according to the authors of this study, an important feature of smart products is the combined physical and non-material form of the product, connection with software as an inseparable element enabling the use of the product, connection to the Internet (more and more smart products require constant access to the Internet; many smart products can also function in offline mode).

And regardless of whether the smart product is a "regular" phone – a smartphone, an electric scooter that can be rented freely in the city, an electric bicycle, a pressure monitoring wristband, a Thermomix cooking device, credit card, or a different cashless payment system, a complicated smart home system or navigation, allowing you to quickly find the right way to your destination, all these products have one thing in common – using them requires power – energy. They need to be charged, plugged in. Some of these products have their power source, allowing them to function autonomously (battery), but even in this case, the time of its operation is limited and the battery after discharging requires replacement or (more often) recharging. To sum up: smart products depend on access to energy. There are no products on the market that would "charge themselves" and work as a kind of perpetual motion machine. Energy, in the sense of electricity, has become an inherent element of using smart products.

Therefore, as mentioned earlier in the paper, the general question posed by the authors is: are the users of smart products aware of the connection between the use of smart products and energy costs?

An important argument for researching smart products is their importance for the young generation. Behavior and consumption habits change with each generation. The currently observed trend is not only the dynamic increase in the importance of technology products related to IT and the Internet (i.e. "smart products"). The age at which children initiate the use of IT technologies is decreasing. According to research conducted in Poland in 2021, 41% of children started using a mobile phone at the age of 7-8, and 11% at the age of 5-6 (Report: *Badanie konsumenckie dzieci i rodziców*, 2021). In turn, in 2019 research was carried out in Polish schools of various types, from primary schools (including children from 6 years of age) to secondary schools (young people up to 19 years old), indicating that almost 94% of young people use a smartphone. Young people spend an average of 4.2 hours a day using the Internet (Raport: *Nastolatki 3.0*, 2019). The youth from secondary schools (15-19 years old) attended on average 4.5 hours and younger children, from primary schools (6-14 years old) – 4 hours on average. So it is visible that the young generation is brought up in the company of constant access to the Internet, of which 65% declared that they listen to music in this way, 62% - watch movies, 61% - contact friends and family, 59% use the media social networks and over 50% do their homework.

Since children are brought up today with constant access to the Internet, they are surrounded by products that are directly related to this access, and as young adults, they will also represent such behaviors.

Once again, however, we return to the question already posed: are the young users of smart products aware of the connection between the use of smart products and energy costs? Are young people using smart products aware of their dependence on access to energy and do they understand that energy is the same product as food that must be paid for? Without electricity, the Internet (and related products) will not work.

3. Customer behavior

When talking about products or services, we also talk about the processes of their acquisition. They can be delivered to users in the processes of commodity-for-commodity exchange or the classical processes of market exchange: commodity for money. Users can also receive access to products and services as part of public services, free of charge. Examples include medical services that can be accessed on the market (private health care) or through public health care (publicly funded). Regardless of how products and services are accessed, their users represent specific purchasing behavior.

Consumer behavior significantly shapes their attitudes, which can be positive, negative, or neutral. Expressing one of these attitudes is very individual and conditioned by the respondent's situation and relationship with the object (Rudnicki, 2012).

Attitude, according to the definition taken from social psychology, is understood as the permanent attitude of an individual towards someone or something. This attitude includes three components: cognitive, affective, and behavioral (Lindzey, Aronson, 1985), with the above-mentioned elements interacting with each other.

Attitudes are built by cognitive and emotional processes as well as behavioral tendencies (DeLamater, 2014). Getting to know them is important because attitudes are difficult to change, and they make people who like or dislike something, strive for something or avoid it (Armstrong, Kotler, 2016).

The customers' behavior results from innate and acquired (still modified) needs and aspirations, the satisfaction of which is a combination of conscious and unconscious processes and emotional factors (Gracz, Ostrowska, 2014).

To understand the impact of attitudes on customers' behavior, Ajzen, Fishbein, Lohmann, and Albarracín (2019) additionally made a distinction between attitudes toward physical objects, or groups of people, institutions, policies, events, or other general targets and the second type – attitudes toward performing specific behaviors concerning an object or target (using the physical object). These attitudes will be referred to as "attitudes toward a behavior".

This distinction is interesting for the research reported in this paper. What is the attitude of young Polish customers to access electricity (i.e. to a physical product)? What is the ratio of young Polish customers to paying for the use of electricity (attitudes toward a behavior)?

The analysis of the literature on the subject indicates the existence of a research gap in the field of understanding the customer attitudes towards smart products, including the attitude of young consumers to smart products which issue is completely unrecognized.

Zied and Chouk (2016) concentrated on the resistance to smart products. Priporas (2020) investigated the influence of smart technologies on the decision-making process. The relatively wide interest of researchers is attracted by the behavior of smartphone buyers. Of course, smartphones are one (and main) example of smart products, but there are many products in this category. Guan et al. (2021) presented research results with insights into the diffusion of innovation theory and provides retailers launching smart products (research based on a smartwatch) with a better understanding of their target young customers' purchasing behavior. Won-jun et al. (2018) underlined that there is a lack of understanding about consumers who buy and use smart products. They concentrate their research on smartphones and underlined that adaptability and multi-functionality have a significant influence on perceived product smartness and consumer satisfaction.

Among the multithreaded research problem undertaken in this paper, it was decided during the brainstorming session that, for this research, three dimensions of attitudes of young consumers towards smart products were adopted:

- cognitive – the tested element of which was the respondent's knowledge of energy costs, its consumption, and saving,
- affective, the manifestation of which in this study was the assessment of the possibility of using and supplying smart products,
- behavioral, which was examined through the declared behavior regarding the daily use of smart products recharging and the validity of the energy consumption criteria in the case of the purchase of smart products.

Additionally, when designing research tools, an important element of the analysis was the distinction introduced by Ajzen et al. (2019) into the attitude to the physical product (electricity) and the attitude towards using this product (in our case: bearing the costs of using electricity).

4. Pro-ecological attitudes of young Polish customers

As has been emphasized many times in this paper, the issue of using smart products is related to the use of another product - energy. Energy is the same market product, traded on the market, buy and sell transactions, it has its value (price) and specific access conditions.

Why are we interested in energy (electricity)? The issues of interdependence between various products are of research interest from various disciplines. In the case of the research presented here, the interest in energy stems from the dependence of modern society on access to energy. As a "product" it has become a very important element of international trade. It is obtained from various sources and used in various forms. The issue of natural resources that are a source of energy is also a critical issue of modern civilization. In this article, we are interested, on the one hand, in energy, understood as electricity, and, on the other, in linking energy use with the natural environment. There is a widespread discussion in society on the need to protect the natural environment, and the issue of the depletion of natural resources, especially energy resources, is also widely discussed. Do we represent pro-ecological attitudes by developing purchasing behavior that makes society dependent on electricity (and these are smart products)? This provocative question is not the subject of research directly in this paper, but the authors attempt to analyze the pro-ecological attitudes of young customers. And they ask whether young customers, as promoters of smart products, are aware of their dependence on electricity? Do they understand that without access to energy, they are not able to meet the needs that they satisfy today with smart products? If there is a shortage of natural energy sources, or – in a less catastrophic dimension, the society will have to significantly limit the use of energy due to its shortages (depletion of natural resources), the use of smart products may (hypothetically) be subject to limitations. The authors' question is whether young consumers see a relationship between environmental protection and the use of products that require electricity?

The pro-ecological attitude is the result of acquiring knowledge and ecological sensitivity of a conscious man (Jarosz, Brol, Jarzębska, Nowińska, Przewoźnik, 2014). The main components of environmental awareness are precisely defined contents, attitudes, and emotions about the natural environment (Kwiatek, Skiba, 2017). These attitudes are shaped throughout life and can change over time. However, their beginning is derived from the process of socialization that the individual goes through from an early age in the family. And then with the knowledge that he develops in the process of training education. Summing up, we can observe pro-ecological attitudes in various age groups, including young people.

In Poland, research has been conducted on the environmental awareness of its inhabitants for many years. They mainly come down to the areas of knowledge and attitude to the natural environment, its protection, waste management, i.e. behaviors and attitudes related to how Poles get rid of waste (waste segregation), how they save energy in households, what is their attitude towards renewable energy sources, how they manage water (methods of saving water in households). Many studies refer to purchasing attitudes and behaviors towards food (preferences for organic products) as well as concerning packaging (plastic bottles, additional product packaging) (Report: *Badanie świadomości i zachowań ekologicznych mieszkańców Polski*, 2020; Radzymińska, Jakubowska, Mozelewski, 2015).

The studies, conducted periodically by the Ministry since 2011 (Report: *Badanie świadomości i zachowań ekologicznych mieszkańców Polski*, 2020), indicate a growing social awareness in the field of environmental protection. Actions in the field of waste segregation policy and optimization of water consumption in households should also be assessed positively. The importance of pro-ecological activities in Polish society is evidenced by the fact that among the three areas in which, in their opinion, the country has the most problems to be solved, the respondents by the Ministry mention environmental protection (as indicated by as many as 52% of respondents).

Despite the observed growing pro-ecological attitudes, they are not satisfactory and we cannot say that we are dealing with the great concern of Poles for the natural environment. Many research results indicate the lack of optimal attitudes and pro-environmental behavior of Poles (Stefaniuk, 2021; Report: *Green Generation 2.0*, 2021; Report: *Postawy ekologiczne. Badanie postaw i opinii Polek i Polaków*, 2020; Report: *Barometr ekologiczny Polaków*, 2020).

In the context of the research conducted in this paper, we are primarily interested in the pro-ecological attitudes of young Poles, especially in the context of energy. When it comes to the attitudes of young Poles, interesting results can be found in the study by Kwiatek and Skiba (2017). In their research, Kwiatek and Skiba verified the specific attitudes and behaviors of young Poles. They most often repeated statements about saving water (turning off the tap when brushing your teeth, shower instead of bathing, even watering the plants previously collected rainwater, etc.) and electricity (switching off the lights in unoccupied rooms, chargers, or other devices electric). The surveyed youth also declare that they are active in the field of waste management and waste segregation (very often and often (65%).

The pro-ecological attitudes of Polish youth were investigated by Gajewski (2007). The results of these studies indicate pro-ecological behavior (e.g. saving water) declared by young Poles. However, an in-depth analysis of the results shows that young Poles do not see and do not understand the relationship between your action and the environment. This is due to the low-level practical knowledge, unaware of the consequences of one's behavior, the materialistic paradigm of existence, and the thoughtless satisfaction of one's own consumption needs.

As the literature review showed, relatively few empirical studies have been conducted to identify the attitude of young people to the use of electricity, as well as the relationship between the use of smart products and the use of energy and bearing the costs of its use. In this context, the authors emphasize that the conducted research, although currently of a pilot nature, fills the cognitive gap. They will contribute to a better understanding of buyers' attitudes and behaviors and cross-relationships between products (smart products vs. energy).

5. Research method

As a result of the literature analysis, review of available research results, brainstorming and expert discussions (a group consisting of educators and management practitioners from waste management companies), two research hypotheses were formulated:

H1: For young consumers, energy (as access to power from smart products) is something natural. At the same time, when we mean "natural", we do not refer to the origin of the natural environment, but the perception of the right to accessibility and universality of this accessibility. Just as oxygen for humans is essential for life and it is obvious for people that it is widely available to everyone, for young people access to energy/power is something obvious, common.

H2: Young consumers do not see energy as a product/service that has a price and must be paid for (access to it).

The study was conducted in two phases. Phase 1 was designed to pre-test the questionnaire. Phase 2 consisted of a study designed to collect and analyze information gathered from students' responses.

The idea of the questionnaire used in the research was modeled on the questionnaire and the scale of Vitell and Muncy (Vitell, Muncy, 2005). These studies on ethics in the behavior of young people (students) were also used in the studies by Grzesiuk and Wanat (2010). Ultimately, the questionnaire used in the research project on the perception of energy costs reported in this article consists of 25 questions, including 3 metric questions (gender, year of birth, field of study). The respondents were asked to indicate their answers on a 5-point scale, where "1" meant strongly disagree and "5" – strongly agree. The questions relate to three spheres that define the attitude of young consumers to energy: knowledge, attitudes, and behavior.

The questionnaire was prepared online on the docs.google.com platform. The research was conducted in the first half of 2021.

In phase 2, the questionnaires were made available to the students during their classes (classes were online; questionnaires also online). The research was deliberate and participation was voluntary and anonymous. In total: 201 completed questionnaires were collected, including 151 filled in by students of economic faculties and 50 filled in by students of other faculties. The results were analyzed in two categories: 1. data collected among students of economics and 2. among students of other fields of study (mainly pedagogy and law).

Assuming that the order of magnitude of the success probability p is not known, the minimum number of units was 201 with the following assumptions: significance level = 0.01, the maximum error of the estimate $d = 5\%$ ($u = 2.7434$).

Students represent the generation of young people born in the 1990s and at the beginning of the 21st century. In both groups of students, the majority were women: 75% among students of economics and 74% among students of other faculties. Among Polish students in general,

women also predominate – ca. 58% (GUS: płeć studentów, 2020; Szkolnictwo wyższe i jego finanse w 2019, 2020).

The authors of the research project are aware that the students do not fully represent the generation of young consumers. This generation, like other age groups, is diverse. It is possible that the results of the research are influenced by the place of residence of the respondents (students are mainly residents of large cities) and the level of education, and thus, probably, the pro-ecological awareness of the respondents. The educational profile of the surveyed group may also be important. However, the discussed research results are not analyzed as a representative sample. The authors are developing a wide research project in the area of the use of smart products by young consumers. In further research, the experience from the reported surveys will be used.

After the research was conducted, its results were compiled and analyzed, and conclusions were formulated. Basic statistical tools were used, i.e. mean, standard deviation, median, mode, they use an Excel spreadsheet.

6. Research results

The questions asked to the respondents referred to specific situations, using examples of smart products (e-bike, laptop, smartphone), potentially used by young people. Additionally, questions with an example of an electric kettle were included. Although this product does not belong to the group of smart products, its use requires an electrical connection. It was used in the research questionnaire as a kind of reference product, allowing for the verification of energy consumption attitudes and behavior.

To verify the H1 hypothesis, two questions related to the respondents' knowledge, five questions allowing to characterize their attitudes, and four describing the respondents' behavior related to powering smart products with energy were used.

More than half of the surveyed students of economic faculties (64%) know the number of electricity bills in their homes, but at the same time every fourth of them admitted that they did not have such knowledge. Therefore, it cannot be unequivocally stated that they are conscious energy buyers, which is confirmed by the average rating of 3,5 with the standard deviation of the sample 1,41. The respondents' housing status was not taken into account in the analyzed research project. According to Eurostat data (Eurostat 2019), 75 percent of young Poles aged 16-29 live with their parents. And according to the research of the Educational Research Institute (Herbst, Sobotka, 2014) from 2014, more than half of the students in Poland lived with their parents in the last year of their studies. The fact of living with parents who are likely to bear the main burden of the cost of maintaining the apartment may lower respondents'

awareness of the cost of utilities in the apartment. This issue will be considered in future research.

The survey shows that young Poles do not know about new solutions that will save them money/reduce expenses. It is possible that due to the low popularity of innovative solutions, an example of which was e-bike, almost 75% of respondents could not assess the relationship between the cost of using an electric bike and the price of a public transport ticket. At the same time, however, they rather agree with the statement that in the future the use of these devices will be widespread. The e-bike results are surprising because respondents were students, usually living in cities where such solutions are available.

According to the respondents, both now and in the future, access to energy sources that allow powering smart products should be free and universal. Only about 14% of the respondents do not agree with this opinion.

Such opinions of young Poles are unambiguous, additionally verified by a reverse question (charging a smartphone in a public place should be paid).

The respondents do not use the option of charging their smartphones in public transport for fear of being discharged or because of a lower price. On the other hand, half of them recharge their devices at universities/at work, and almost 70% are aware that they do not bear any financial costs.

To verify the H2 hypothesis, six questions related to the respondents' knowledge were used, one question characterizing their attitudes, and four describing the respondents' behaviors related to powering smart products with energy.

Smartphones are the most popular type of smart product with Internet access among young people in Poland (Eurostat 2021). And having a smartphone is common in the group of young people (over 94% in 2018). Therefore, the obtained results concerning this type of solution are not surprising. Most of the respondents indicated that they know exactly what fees they pay per month (75%) and what their Internet limit is (78%). These reviews received the highest average score (4.0).

The respondents do not have such knowledge concerning other smart products. In the case of a laptop, 69% do not know the monthly cost of electricity with the dominant rating of 1 for the entire group. An additional question checking the respondents' knowledge of the level of electricity consumption by home furnishings that they use daily was the question about the electric kettle. A definite answer was given by every fourth respondent, but less than a third of them marked it correctly.

The questionnaire also included questions about energy saving daily, which were formulated in the form of affirmative and negative. The distribution of answers and the dominant ratings allow us to state that about half of the surveyed students of economic faculties are aware of the need to save energy and pay attention to it daily. However, over 68% disagree with the statement that there should be charges for using the power supply of mobile devices offered in public places. The standard deviation is one of the lowest, which would mean high

consistency of the answers provided. At the same time, with an average grade of 2, it can be stated that the surveyed students are against it or, possibly, have no opinion, which means that people ready to pay for energy supplied in this way are in a clear minority.

The declared attitudes of the respondents do not indicate that they are highly aware of energy consumption, and thus its cost. More than half of them do not turn off the devices when they are not using them (mainly at night), and during their last purchases of smart products less often than every fifth student of economics took into account its energy efficiency. Based on the obtained results, it cannot be clearly stated whether the respondents are aware of the cost of energy consumption by performing daily, simple activities such as boiling water. The answers are fairly even on the "agree and disagree" side ($M = 3$).

The results presented above concern students of economic faculties. The results of the conducted research do not indicate the existence of differences in attitudes towards smart products and the use of electricity between students of economic faculties and non-economic faculties (mainly law and pedagogy).

The responses of non-economists represent very similar attitudes to students of the economic faculties, except for the answer to the question about the cost of using public top-up/top-up sites. In this case, respondents are more cautious/hesitant than respondents of economic faculties. They also showed somewhat less certainty in assessing the future use of urban e-bikes.

Regarding H2, responses of non-economists differed on one point in the area of knowledge (they are more confident in their knowledge of the limit they have in smartphones (average = 4.24, $D = 5$) and in almost all in the area of attitudes, although these differences, apart from using an electric kettle, they are small. However, there were no differences in the area of attitudes.

The lack of differentiation in the knowledge of respondents from individual groups regarding energy costs is in contradiction with the adopted hypothesis. The authors assumed that students of economic faculties would represent more mature attitudes (and knowledge) regarding the prices/costs of products purchased on the market. However, this preliminary assumption has not been positively verified.

7. Discussion and Conclusions

The results show, on the one hand, that young Poles declare that they know the energy costs incurred by their households, and on the other hand, they believe that in public places it should be possible to power laptops and smartphones free of charge.

The results, apart from the cognitive values, also allow for the formulation of methodological recommendations and will allow for the conceptualization of future research in the area of connections between the use of smart products and energy.

In terms of methodology, we propose to group factors in the "knowledge" category:

- Group 1: direct costs, identifiable costs related to the use of smart products (including the cost of purchasing a physical product, the cost of purchasing software, the cost of Internet access);
- Group 2: household electricity costs (cost of powering smart products).

Additionally, we propose two cross-sections of Group 1 and Group 2 analysis:

- Dimension 1: Costs incurred directly by young Poles;
- Dimension 2: Household costs (electricity).

The attitude of young Poles to smart products and their relationship to energy access and charging/power costs should also be analyzed in the future concerning the development of electromobility (electric cars, electric buses). According to the data of the Electromobility Meter (Report: Electromobility Meter, 2021), at the end of the first quarter of 2021, a total of 22,291 electric cars were registered in Poland. Although the number is not impressive, in Q1 2021 the number increased by 3,555 vehicles, which is an increase of 107% compared to the same period in 2020. The group of respondents included in the discussed research will probably make decisions about buying a car soon. The attitude of these future buyers to electric cars will largely determine the development of this market and, more broadly, the transformation of social mobility.

As customers constantly gain new knowledge about the market, their definition of value keeps changing. Today young Poles grow up and become mature consumers (also with age). Their needs and attitudes towards products are changing. It can therefore be assumed that along with gaining new knowledge about smart products, the value they will represent for (currently) young Poles will change over time. In a sense, these products will grow with the young consumers surveyed today.

This is important cognitively and in the context of business recommendations. Today we are researching young consumers who use a smart product. In the future, these young Poles will become adult market participants and – probably – potential users of advanced smart products such as electric cars. According to the authors, producers of electric cars should be particularly interested in the attitude of young Poles to electricity. The availability of smart products charging/power stations, charging ports, sockets, connectors, plugs, and their spatial arrangement in the field is one of the critical elements of the development of electric cars. According to the authors, parallel to this accessibility, one should also observe the attitude of young Poles to the costs (fees) for using this energy made available. The presented research results indicate that concerning the smart products currently used by young Poles (i.e. smartphones, laptops), they believe that it should be possible to power these devices free of charge in public places.

During the implementation of the pilot research, we also formulated a proposal of directions for further research related to the attitudes of buyers vs energy cost. The direction of research in the area of smart cities and the attitudes of young people towards the cost of living in a smart city seems particularly interesting. The experience of many products available on the market bearing the "eco-products" logo shows that the costs of such products are usually higher. Are young consumers willing to pay higher living costs in the name of being eco-friendly? E-bike, which was used in research as one of the examples of smart products, is a product that is relatively unknown and unknown outside large cities. But the electric bicycle is a product that has been on the market for several years. What are the attitudes of young buyers towards such products? An electric bicycle requires interaction with energy. The cost of energy to use the product and pro-ecological attitudes reappear - you can reduce energy consumption by using a classic bicycle. Are young buyers aware of the consequences of the home bidet and environmental consequences of the development of products such as an electric bicycle?

Summing up, young consumers do not represent homogeneous attitudes towards smart products and their awareness of energy costs and the connection between smart products and the costs of acquiring access to energy is very low. According to the authors, this is an important and interesting direction of research, both in the context of eco-friendly attitudes and the development of new product categories.

Acknowledgements

The project is co-financed within the framework of the program of the Minister of Science and Higher Education under the name „Regional Excellence Initiative” in the years 2019-2022; project number 001/RID/2018/19; the amount of financing PLN 10,684,000.00.

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