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POLISH YOUNG ONLINE SHOPPERS' EXPERIENCES WITH ECOLOGICAL E-COMMERCE

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Purpose: As in many economies, greening is entering e-commerce as an expression of the desire for sustainability. The aim of the study has been to diagnose the attitudes towards green e-commerce of young people, who often self-identify or are perceived to be green. The attributes of eco e-commerce were identified for the study. The research problem, which was formulated in the form of a question as to whether ecological e-commerce has become widespread on both the demand and supply sides.
Design/methodology/approach: In this paper, a qualitative study has been used, and a consumer survey was conducted that explored what the greening of e-commerce looks like. Results of selected statistical analyses were also presented.
Findings: The results of the study confirmed that, among both sellers and young online shoppers, ecological practices are not marginal but very much present. Young consumers identify with the slow life or less mess lifestyles and show a lot of pro-environmental behavior both in everyday life and in online shopping; but the pro-environmental aspect is not the main motive for online shopping.
Research limitations/implications A limitation of the statistical study was the large number of questions containing matrix-based responses. This resulted in blurred correlations. The questions concerned the pro-ecological attitudes of e-consumers themselves, not only in online shopping but also in everyday life, and assessed the greening of e-commerce by sellers.
Practical implications: The article can be used for application purposes, since it points out what e-sellers can improve as far as the greening of e-commerce is concerned. In summary, it can be concluded that the greening of e-commerce is not a temporary trend, but a well-advanced process.
Social implications It can be educational for society, as it provides a set of best practices in e-commerce. Familiarizing society with these practices will help increase social responsibility for the environment.
Originality/value: This article defines the attributes of e-commerce from both a demand and supply perspective, which can serve as a model for ecological e-commerce.
Keywords: e-commerce, green e-commerce, eco e-sellers, eco e-customers.
Category of the paper: Research paper.

1. Introduction

After almost four decades of development, e-commerce has become widespread. As global internet access and adoption rapidly increase, with over five billion internet users worldwide, the number of people making purchases online is ever-increasing. In 2024, retail e-commerce sales are estimated to exceed 6.3 trillion U.S. dollars worldwide, and this figure is expected to reach new heights in the coming years (Statista, 2024). Poland is among the countries where e-commerce has gained popularity. About 64% of 16-74 year olds shop online (Trade News, 2023). Buyers account for about 79% of internet users, i.e. people who use the internet regularly (every day or almost every day).

Not only does e-commerce contribute to growth, but also to socio-economic development. At the same time, this development should be sustainable. Thus, supporting sustainable e-commerce is becoming a challenge since this requires an increase in ecological awareness among all stakeholders. The issues of the greening of economic processes have been raised by decision-makers for many years, so it is inevitable that they will also be introduced in the area of contemporary forms of trade. The attitudes and actions of the younger generation are particularly important (Green Generation Report, 2020; WCO, 2022*)*. This issue is of interest to the authors, who have conducted empirical research among Polish youth.

The conceptualization of ecological e-commerce (EEC) requires an analysis of the evolution of commercial activities. This evolution from traditional commerce, through electronic commerce to increasingly ecological electronic commerce, has been the result of phenomena and processes occurring in the socio-economic space (Nanehkaran, 2013). It made the world interconnected (Ferrera, Kessedjian, 2019), and is improving the quality of life (Wolf, 2023; Pieczywok, 2023; Mohdhar, Shaalan, 2021). Dynamic advances in technology and increasing globalization, trade liberalization, deregulation, migration, and the expansion of capitalism have led to the growth of e-commerce (López González, Jouan, 2017; Aydına, Savrul, 2014; Totonchi, Kakamanshadi, 2011; Wodnicka, Skurpel, 2011). Therefore, transportation and logistical issues (Mangiaracina et al., 2015; Sallnäs, Björklund, 2023), including the impact of last mile (Vakulenko et al., 2019), have been identified as particularly important in the development of e-commerce.

Online trade is developing, but here too, the need for sustainable development is being noticed - that is, one in which economic growth and social progress are achieved, but with respect for the natural environment (Hossain et al., 2022; Meherishi et al., 2019; Kawa, 2023). Eco-conscious electronic commerce has been called ecological e-commerce, green e-commerce and sustainable e-commerce. In the context of sustainability, numerous research studies have been devoted to reducing the carbon footprint caused by manufacturing, trading and waste management activities (Groening et al., 2015; Abukhader, 2008; WCO, 2022). Prasertwit et al.,

(2023) when conceptualizing EEC, present a process that includes five stages from material receiving to disposal (Figure 1).

Figure 1. E-commerce green process.

Source: Prasertwit, Kanchanasuntorn, Vongmanee, 2023.

Fichter (2008) identifies three main categories of environmental effects of e-commerce such as : ITC infrastructure; transformation of markets, subsequent and rebound effects.

According to Sarkar (2023), the key aspects of environmentally friendly e-commerce are the following:

- Reducing the need for distribution centres to store products close to retail outlets, which saves energy in warehouses.
- The promotion process should have an open and long-term perspective, thereby highlighting environmental sustainability and social acceptability.
- A new, complete and mutually dependent viewpoint of the correlation between the market, culture, environment, and economy.
- Awareness of the impact of e-vehicles on last mile delivery for zero-emission fleets.
- Creating environmental sensitivity and drawing attention to recycling and paper for packaging for environmental sustainability.
- Building awareness among consumers about local delivery from local e-retail shops in order to minimize carbon emissions.

EEC can be conceptualized from a market perspective. In this case, it is buyers and sellers using the e-commerce platform who are the key actors in the real sphere of the market (Deeter-Schmelz, Kennedy, 2004). It is primarily their attitudes and actions that influence the greening of e-commerce. In addition, two important stakeholders, such as companies in the transportation and logistical sectors and companies in the financial sector, should be identified in the process of greening.

2. Customers and ecological online shopping

A number of studies have been devoted to e-commerce customers. When shopping online, shoppers pay attention to elements such as: product value, product characteristics, information quality, site features, website design, quality of services offered through the website, quality of communication, delivery time, forms of payment, risk and privacy of online shopping,

post-purchase quality, merchandise attributes, and the goodwill of the country of origin (Hajli, 2014; Hoque et al., 2015; Fedorko et al., 2018; Vegiayan et al., 2013).

When analyzing the market from the buyer's perspective, it is important to note that the buyer has limited influence on the development of ECCs. However, the buyer can make important ECC-related decisions, including those regarding the choice of product, seller, platform, delivery method and payment method. He has less influence on the choice of packaging, transport company and financial institution. E-commerce uses cashless transfers carried out in virtual space. These are considered more ecological than cash transactions (Slozko, Pelo, 2014; Wu et al., 2023; Bhavsar, Samanta, 2022). A customer shopping online usually has several payment methods to choose from e.g. bank transfer, a specific method of contactless payment – known in Poland as Blik, debit or credit card payment. Research in China has shown that most customers choose credit cards (Liu et al., 2008) but the authors of the presented study were not aware of any studies that indicate which of these forms is the most ecological. It can be assumed that there is little difference between them in terms of negative environmental impact.

Many researchers believe that buyers are paying increasing attention to the ecological aspects of e-commerce (Łysoń, 2023). A survey of 2,000 consumers in Poland (Together for Earth Report, 2020), shows that only 24% (and 14% among the youngest respondents) do not perceive any ecologically unfriendly behavior of sellers when shopping online. The rest considered as harmful the following:

- the use of foil to package parcels (20%),
- wrapping food products in plastic bags and shopping bags (19%),
- packing small products in oversized parcels with fillers (18%),
- sending products from the same place in batches (16%),

lack of possibility to pick up a parcel at a dedicated point, e.g. a parcel machine (14%). Views are emerging (Jagoda et al., 2023) that the identification of factors for choosing a delivery method and factors that motivate e-customers to choose an eco-friendly delivery method is still unrecognized. There is some optimism in the research (Villa et al., 2022), which shows that the majority of customers (70.25%) are willing to pay more for eco-friendly delivery and accept delayed delivery if they support sustainable development. Other researchers seem to be more realistic and argue that for many customers, delivery time is the priority and in this case ecological issues become less important (Rahman et al. 2018). The development of eco e-commerce requires educational initiatives in both the real and regulatory spheres (Surmacz, 2014; Olejniczak et al., 2023). It is believed that all stakeholders, including the government, retailers and consumers should apply policies governing sustainable e-commerce (Kwiliński, 2023; Oláh et al., 2023).

Interestingly, the trend towards ecology in everyday life is becoming increasingly fashionable. Living in the spirit of zero waste, slow life, and less mess is an attribute of the new times. Young people are especially becoming adherents of such attitudes or ideologies

(Villa et al., 2022 and also Together for the Earth Report, 2020). Thus there is hope in them that public expectations and pressure will increase for e-commerce to be developed more and more in harmony with the natural environment.

3. Green e-commerce model

In ecological (green) e-commerce, responsibility lies with all parties to a transaction. In this paper, the focus will be on the main participants in online transactions: buyers and sellers. The following attributes of eco e-commerce, both on the buyers' and the sellers' side, were collected on the basis of good practices, e.g. courier delivery providers (DHL, InPost, UPS and others) and the proposed directions of development of e-commerce (i.e. Sallnäs, Björklund, 2023). It may constitute the eco e-commerce model postulated by the authors and is:

- conceptual (result of a literature review),
- normative (postulates, good practices),
- not yet fully empirically grounded.

Ecological sellers, in order to be recognized as eco sellers, should implement the following attributes when selling online:

1. Offering eco-friendly goods in the online store - obviously not all goods for sale are ecological, but the seller has a choice of what to sell.
2. Offering a reduced price for products that are close to their expiry date, have minor aesthetic defects or have been returned by customers - this measure aims at minimizing waste. Rather than throwing them away, the price should be reduced to sell the goods before they are worthless.
3. Providing product description and graphics as detailed as possible on the e-store website in order to limit returns to a minimum - if the customer can thoroughly familiarize himself with all the parameters and characteristics of the product, and watch it on well-visualized photos/videos, the purchase will surely prove successful.
4. Using incentives by the seller to make larger purchases at one time - one shipment instead of several.
5. Retailers offering ecological delivery e.g. personal collection, parcel or pick-up points, cumulative shipments (sending several parcels as one).
6. The use of ecological packaging by the seller, e.g. cardboard boxes, biodegradable packaging, reusable packaging, recycled packaging, as well as packaging made from natural materials - instead of plastic packaging.
7. Adjusting the size of the packaging by the seller to the size of the goods being purchased, thereby reducing the material required for packaging and saving space in transport.

8. The use of ecological fillers for empty spaces in the package, which protect the contents e.g.: recycled cardboard boxes, paper/cardboard fillers, shredder cuttings, biodegradable polymer/plant "crisps" e.g. “skropak” (a filling resembling cylinders or dumplings in shape) - instead of foil, e.g. bubble wrap, foam or polystyrene. However, in case recycled fillers are used, not too many of them should be used, so as not to litter the customer with your own waste and put the burden of disposal on the customer.
9. The use of digital sales documentation - e-mailed e-invoices instead of paper ones.
10. The use of electronic forms for returns, exchanges, cancellations instead of paper forms, all available from the seller’s website.
11. The possibility of reserving a product in a retailer's store in order to try it on - which can minimize returns.
12. Collection of used products by stores in exchange for discounts, coupons, which can prevent improper disposal of products.
13. Offering a reduced original price by the retailer in exchange for a non-returnable purchase in order to limit returns. This, however, carries with it a waiver of the customer's statutory right to terminate the contract.
14. Having bicycle couriers deliver orders from local stores in order to use an environmentally friendly form of transport.

The above-mentioned postulated attributes of ecological sellers are those that can be identified and assessed by customers. In addition to these, one could also mention the use of ecological means of transport (e.g. electric or hybrid cars) by retailers or intermediaries (e.g. delivery companies), or the use of ecological own collection points - e.g. solar-powered parcel machines or pro-ecological waste management. However, these aspects are often unnoticeable to the final recipient, i.e. the customer, and will therefore be omitted from the survey.

Customers, meanwhile, should meet the following requirements in order to call themselves ecological:

1. Buying ecological and natural products online, maybe not exclusively, but they should be included in their purchases.
2. Thinking carefully about the need to buy a particular item, whether or not it is really necessary.
3. Limiting impulse purchases (e.g. under the influence of online advertising) in order not to buy things you may not need.
4. Buying used products on special platforms - e.g. on Vinted, OLX or Allegro, since there you can buy cheaper what is still in good condition.
5. Selling second-hand products on special platforms - e.g. on Vinted, OLX or Allegro to give them a second life.
6. Making larger online purchases at a time, supplied in one delivery.

7. Choosing eco-friendly delivery, e.g.: personally collected parcel or pick-up points, cumulative shipments (several shipments sent as one).
8. Paying a surcharge for eco-friendly packaging if requested by the seller.
9. Reusing the shipment packaging (e.g. for return delivery, another shipment or, for example, for storing things).
10. Disposing of product packaging and delivery packaging according to waste segregation rules.
11. Minimizing the delivery of returns.
12. Making returns, if they actually occur, in the packaging received from the seller.
13. In the case of self-packaging of returns, opting for ecological packaging.

In order to test the customer's credibility as an ecological customer, it would be worth checking whether or not he follows the principles of any pro-environmental ideas, for example - zero waste, less mess, slow life or if perhaps he is eco-friendly in every way. Ecological shopping should also be supported by pro-environmental actions in everyday life, such as:

- not throwing food away,
- saving water,
- saving energy,
- reducing the use of plastic,
- separating rubbish thoroughly,
- using cosmetics/chemicals which have not been tested on animals,
- using public transport/bicycle/scooter instead of a car,
- repairing things instead of throwing them away.

The above outlined attributes of ecological e-commerce will form the core of a survey study of young customers, who are more likely than others to declare eco-friendly attitudes.

4. Research methodology

The main theoretical objective was to conceptualize and identify the attributes of ecological e-commerce. The aim of the empirical research, in turn, was to diagnose young people's attitudes towards ecological e-commerce. To achieve the empirical objective, the following research questions were posed:

1. What is the respondents' attitude towards e-commerce - how often do they make purchases?
2. Are ecological aspects taken into account by buyers during online shopping?
3. Is what they buy ecological?
4. What ecological attitudes do respondents display in their lives?

5. How important are the various aspects of eco e-commerce to them?
6. Do they perceive eco aspects in e-commerce?

The main research problem was formulated in the form of a question: Has ecological e-commerce become widespread on both the demand and supply sides? In the context of the research objectives and questions, the following research hypotheses were formulated:

H1: Young customers display pro-ecological attitudes in e-commerce.

H2: The supply side (sellers) generally implement the concept of ecological e-commerce.

In order to meet the objectives and verify the hypotheses, a survey study was chosen, which is one of the most popular research methods suitable for obtaining customer opinions. An e-survey technique was used with a survey questionnaire.

It was decided to survey young people, who, according to other studies, are displaying highly pro-ecological attitudes. For the sake of convenience, the survey was conducted among Polish e-customers, which is a deliberate measure, as pro-ecological attitudes may differ from one nationality to another (Villa et al., 2022). Young people were arbitrarily considered to be between the ages of 18 and 29 years inclusive. The age limit was set so that those surveyed were of working age, i.e. able to make purchases based on their own financial means. It was planned to survey a minimum of 100 people, and the sampling was done using a non-randomized method. The population in the surveyed age range is not distinguished in detail in Polish demographic statistics (working age is defined, amongst others, in the range of 18-44 years, with no breakdown into detailed segments). Therefore, there is no sampling frame from which a quota sample could be drawn. The present sample is therefore a quasi-sample, but this does not undermine the validity of the study.

Individuals under 30 years of age on e-commerce-related social media sites were invited to participate in the survey, this may be considered a targeted selection, although people willing to participate were recruited.

In the survey questionnaire, use was made of questions to meet the stated objectives - the questions referred to the frequency of online shopping, the motives for online shopping and environmental attitudes in daily life. Likert, nominal, interval and ordinal (balanced) scales were used. One of the questions involved an assessment of the frequency with which the shoppers encountered displays of pro-ecological behavior on the part of sellers.

5. Results

5.1. Consumer survey results

Basic profile of respondents are presented in table 1. One hundred people took part in the survey, including 57% women. People with a financial status similar to their peers predominated (69%). Among the survey respondents, the largest group were those who shopped several times a week. They represented 65%. The respondents most often paid by Blik (contactless payments) (68%) and collected the ordered goods from a parcel machine (80%).

Table 1.
Basic profile of the respondents

Purchase frequency	**Sex**	**Age in years**
Several times a week - 9%. Several times a month - 65%. Several times a year -23%. Once a year or less frequently - 3%.	Woman - 57%. Man - 42%. Other - 1%.	18-20 - 37%. 21-23 - 35%. 24-26 - 10%. 27-29 - 19%.
Financial status	**Method of payment**	**Preferred place of delivery**
Lower than peer status - 11%. Close to peer status - 69%. Higher than peer status - 20%.	By bank transfer - 13%. By credit /debit card - 11%. Contactless payment - 68%. Cash on delivery - 6%. Other - 3%.	Home/Work - 15%. A parcel machine - 80%. A post office - 1%. Another collection point (for example a store) - 4%.

Source: Authors' own survey.

Respondents were asked how important various aspects of e-commerce were to them. The results are illustrated in Figure 2.

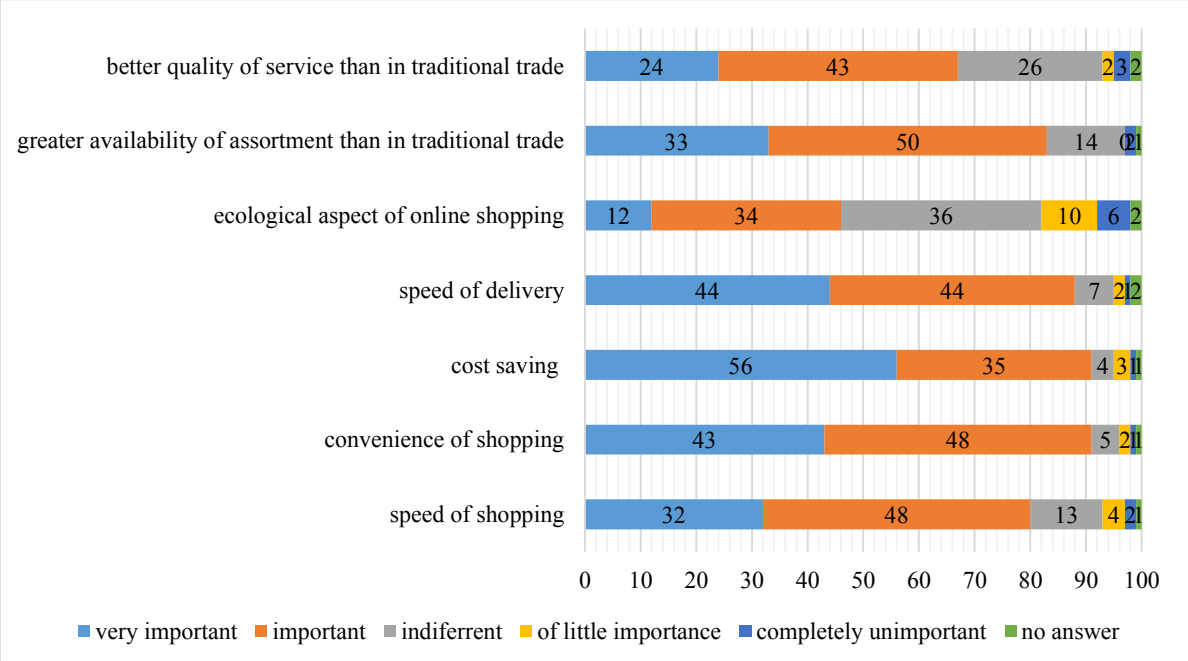

Figure 2. Importance of selected aspects of e-commerce (in %).

Source: Authors' own survey.

The following aspects of e-commerce are very important or important: cost savings and convenience of shopping (a total of 91% of indications for each), speed of delivery (for 88% of respondents) and greater availability of assortment than in traditional stores (for 83% of respondents). The ecological aspects of e-commerce are important or very important for only 46%, which is less than half of the respondents. Ecology in e-commerce was of least importance to respondents, and thus it may well be that ecological attitudes are only declarative.

Subsequent questions examined in more detail the customers' pro-ecological attitudes and values in this regard. Respondents were asked to declare which attitude was closest to them - from a totally eco-friendly person to one not guided by ecology at all in their life. The results are shown in Figure 3.

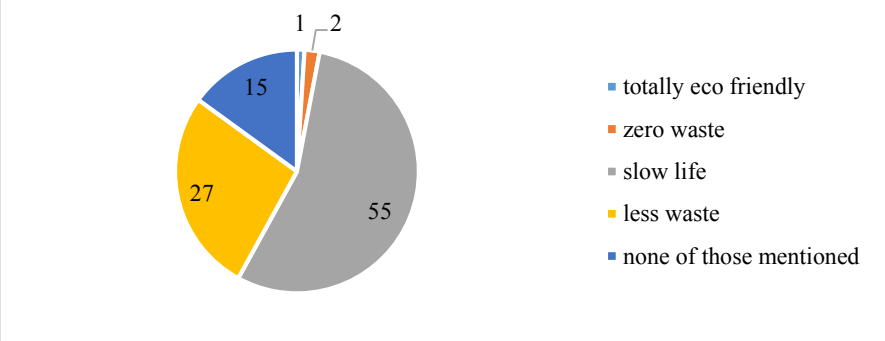

Figure 3. Professed pro-ecological attitudes (in %).

Source: Authors' own survey.

It turned out that the highest number of people (55%) identified themselves as adherents of the “slow life” ideology, that is to say, buying sensibly, fewer but better fitting things. Second in the group (27%) were followers of the “less waste” lifestyle. Only 1% of the respondents described themselves as eco in every way and 2% declared that they live in the spirit of zero waste. A sizable group of respondents (15%) did not identify themselves with either attitude. The results indicate that the respondents do not necessarily give priority to ecology, and they do not live as people determined to be pro-ecological. People identifying with a “slow life” and “less waste” lifestyle predominate in the group; however their ecological behavior can be considered as moderate. What is positive is that it occurs at least to this extent.

The frequency of pro-ecological behavior in the daily lives of the young people surveyed was also checked. As it turns out, pro-ecological behavior occurs in their lives always, very often or often (Figure 4). The results are encouraging.

As many as 85% of respondents indicated that they do not throw away food (at least they often do not do so). 83% of respondents save water. 82% strive to carefully sort their rubbish. It is encouraging that as many as 79% of the respondents declare that they repair things instead of throwing them away. More than three-quarters of the respondents save electricity. Furthermore, 72% often/very often or always use cosmetics or chemicals not tested on animals. 68 % declare a high frequency of using public transport, bicycle, scooter etc. instead of a car.

Also, two-thirds of those surveyed reduce their plastic consumption. Well above two-thirds of the people surveyed declare pro-ecological behavior in their daily life.

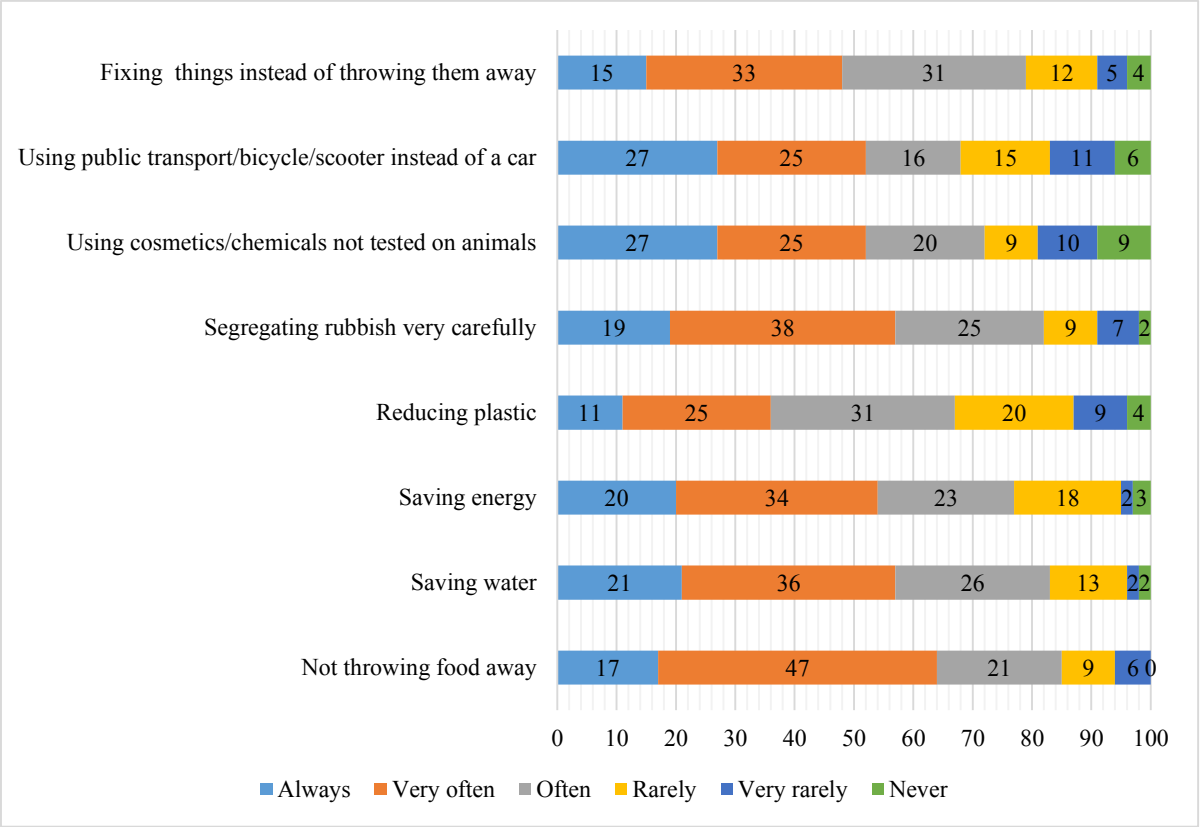

Figure 4. Pro-ecological behavior of respondents in everyday life (in %).

Source: Authors' own survey.

Therefore, respondents were also asked to what extent they were ecological when making online purchases (Figure 5).

The most common pro-ecological behavior displayed by online buyers was choosing ecological delivery - as many as 87% of the respondents choose it often, very often or always. As many as 83% of the respondents send returns in the packaging received from the retailer at least often. 82% of respondents dispose of product and delivery packaging according to the principles of waste segregation. The need for buying online is taken into account - at least often - by 79% of respondents, which partly confirms the idea of slow life declared by respondents. Eco or natural products are purchased at least often by 46% of the respondents, which can be considered a satisfactory result, since the respondents did not declare themselves to be radically ecological. About 50-60% of respondents sell or buy on platforms with second-hand goods at least often. And this is also an optimistic percentage. Yet, a sizable group of respondents is at least often tempted to buy online under the influence of advertising - which 46% of the respondents admitted doing.

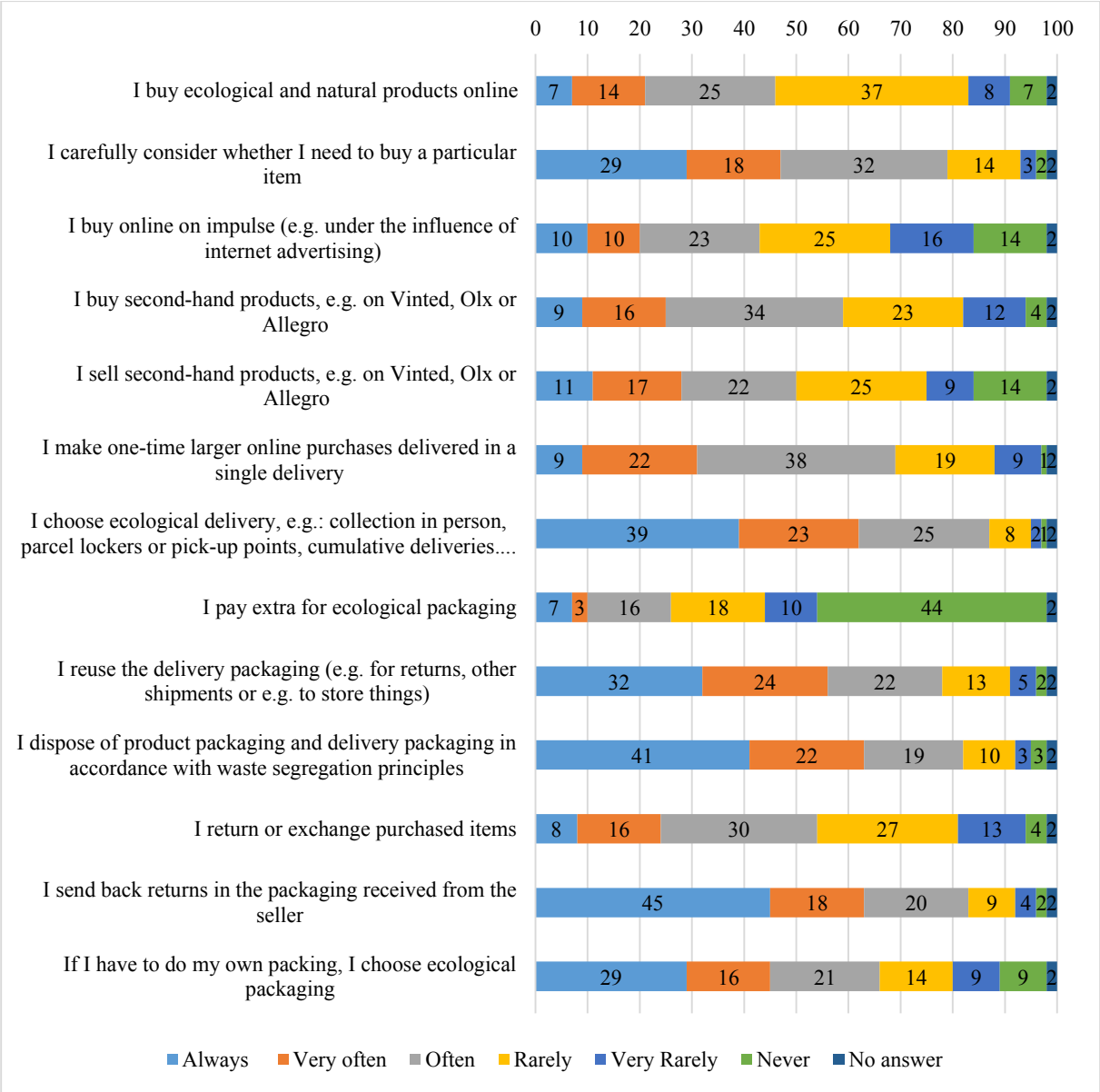

Figure 5. Pro-ecological activities of the respondents in online shopping (in %).

Source: Authors' own survey.

Unfortunately, also a sizable group returns products at least often, which does not support the idea of "slow life". It might be that the purchases are not fully thought through, although the need to return might be due to a mismatch between the offer and the buyers' expectations. Finally, only one in four people declared that they at least often pay extra for ecological packaging, whereas the rest do not. What is puzzling here is whether the respondents actually paid for ecological delivery because it was an option to choose from, or whether they were aware that, in fact, the buyers pay for the packaging because the sellers somehow try to pass this cost on to the buyers. Also in this context, respondents were asked how much they would be willing to pay extra so that the packaging would be eco.

As it turns out, the majority of respondents (56%) would not want to pay a surcharge for ecological packaging at all. As many as 28% of them declared that they could pay a minimum charge of up to 2 PLN. For 15% the maximum charge could be 5 PLN, and only 1% of respondents (one person) declared that they might pay even 10 PLN. This means that respondents feel that the cost of ecological packaging should be borne by the seller, since the latter probably passes this cost on to the buyer anyway. It may also mean that they expect such packaging as standard.

Respondents also provided feedback on how often they encounter practices of e-commerce greening by sellers (Figure 6).

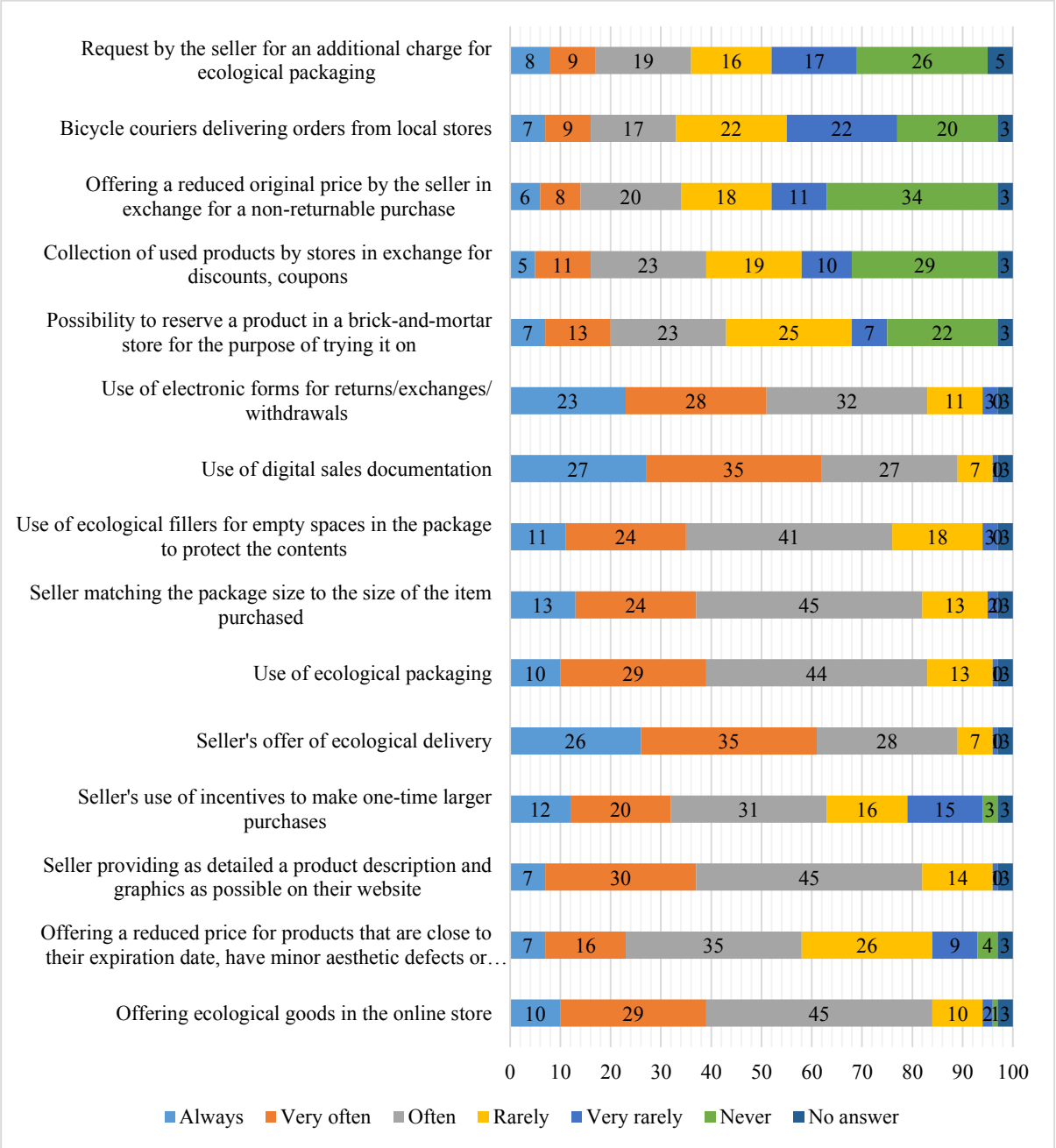

Figure 6. Frequency of pro-ecological activities of e-sellers in the opinion of respondents (in %).

Source: Authors' own survey.

Most frequently, customers have encountered e-sellers offering ecological delivery (e.g. parcel machines, in-person collection) - with as many as 89% encountering this often, very often or always. The same percentage of respondents have noticed the use of e-invoices and e-billing by e-sellers at least frequently. Also, as many as 84% of respondents have noticed, at least frequently, products that can be described as ecological or natural on offer. A similar proportion of respondents (82-83% each) have at least frequently encountered eco-packaging, the matching of package size to content size, electronic forms for return or withdrawal and the use of increasingly accurate product descriptions and visualizations via sellers' websites, which can lead to a reduction in the number of unsuccessful purchases. In the responses discussed, indications of very often and often predominated, which means that these solutions are quite common, but not yet radical and occurring every time.

More than three-quarters of the respondents noticed the use of ecological package fillers at least often. Some 63% of respondents noticed encouragement from sellers to make larger purchases - at least often - most likely by way of promotional activities. And 58% of the respondents noticed, at least often, price reductions on defective goods, goods after return, items perhaps damaged or with an approaching use-by date. About 30-40% of respondents also indicated that they encountered products being reserved for in-store fitting, collection of used products in exchange for discounts, additional fees being demanded for ecological packaging, reduced prices being offered for non-returnable purchases or bicycle couriers - all of which tend to be the least frequently encountered practices. It is therefore worth noting the frequency of the *never* responses, which ranged as high as 20-34%.

The final matter about which the respondents were asked was whether they had ever been asked by sellers about ecological aspects when expressing their opinion on online shopping. It was definitely noticeable that even sellers did not particularly raise ecological aspects when asking customers for their opinion on online shopping. Only 27 % were asked about this issue at least frequently, thus as many as 73 % were asked occasionally - while 18 % answered: *never*, and 34 % stated that the issue had rarely been the subject on which their opinion was surveyed. The result is puzzling. Why, then, are sellers not particularly emphasizing their pro-ecological attitudes? Is this of no interest to them since they do not consider it important? Or, on the contrary, do they see it as a necessary practice to introduce pro-ecological measures, but do not count on any applause in this matter? Maybe they do not see pro-ecological practices as a potential source of competitive advantage? These questions remain unanswered for the time being, but the doubts raised by the results presented here prompt the need for further research in this area in the future.

5.2. Results of selected statistical analyses

The responses were analyzed also for co-occurrence. For this purpose, correlation was examined using Spearman's coefficient. Correlation coefficients were assumed to be significant with a probability of $p < 0.05$. Key findings from the selected analyses:

1. The more pro-ecological the respondents' attitudes, the more (table 2):
   a) they considered the necessity of online purchases more carefully,
   b) they made fewer impulse purchases,
   c) they were more meticulous in sorting product packaging and deliveries.
2. The more frequently respondents shopped, the more carefully they considered the necessity of purchasing (R = 0.32).
3. Although the survey sampled young e-consumers, they made less impulsive purchases with age (R = -0.27).
4. It also turned out that the younger the respondents, the more often they bought used items on websites like Vinted or OLX (R=-0.22).

Table 2.
Correlation matrix - selected results

Pro-Environmental Attitudes in E-Commerce and Respondents' Pro-Environmental Attitudes	**Spearman Correlation Coefficient (R)**
I carefully consider the necessity of purchasing a given item	0.29
I buy online on impulse (e.g., influenced by online advertising)	-0.31
I throw away product packaging and shipping containers in accordance with waste separation guidelines	0.22

Source: Authors' own elaborations.

To exam the statistical significance of the obtained results, a nonparametric chi-square test was conducted, assuming a significance level of α=0.05. In particular, pro-environmental behavior in e-commerce was analyzed based on the respondents' gender. Key results:

a) The chi-square test statistic for independence was 11.67 (significance α = 0.04), demonstrating a relationship between gender and the frequency of choosing eco-friendly delivery. Women were more likely to choose eco-friendly delivery than men.
b) The chi-square test statistic for independence was 11.19 (significance α = 0.048), demonstrating a relationship between gender and the separation of product packaging waste or delivery. Women were more likely to separate waste than men.
c) It was also found that gender was unrelated to such pro-environmental behaviors in e-shopping as: buying eco-friendly products, buying or selling used products on platforms such as Vinted or OLX, making larger one-time e-purchases, paying extra for eco-friendly delivery, eco-friendly packaging of returns, or reusing packaging. However, there was also no association between gender and impulsive shopping or returns, which are stereotypically considered feminine traits. There was also no association between gender and careful consideration of the need to make a purchase, which is typically the domain of men. In this regard, the lack of association is a somewhat surprising result.

The analysis showed that more pro-ecological attitudes of e-consumers are associated with more conscious purchasing decisions. At the same time, no relationship between gender and many other pro-ecological or impulsive purchasing behaviors was found, which is in contrast to established consumer stereotypes and may constitute a certain finding in this research.

6. Conclusions and Discussion

The analysis carried out made it possible to solve the research problem and answer the question of whether ecological e-commerce has become widespread on both the demand side and the supply side. It is worth noting that a specific group of customers was chosen as the demand side, namely young people, from 18 to 29 years old. As a result of the survey, one may conclude that, among both sellers and young online buyers, pro-ecological practices are very common and, most importantly, are not marginal.

The survey provided answers to the supporting questions that were formulated to specify the research problem:

1) Here it was found that ecological aspects in e-commerce were also considered, but they were much less important to customers than other e-commerce attributes. The pro-ecological aspect was not the main motive for shopping online.
2) It appears that buyers frequently purchased ecological or natural products. Almost half of the surveyed respondents bought them at least often. This means that customers are able to differentiate products based on the ecological aspect and, most importantly, they buy them quite consciously.
3) It turned out that respondents identify with the ideology of "slow life", that is, buying sensibly, fewer but better-fitting things, as well as the "less waste" lifestyle - meaning less waste. There were few radical ecological customers; the dominant attitude, though, was that environmental problems, the phenomenon of waste and excessive consumption are noticeable by the respondents in today's world, and they try not to exacerbate these problems with their consumption activities. Respondents proved to be mindful of pro-ecological aspects in their buying activities, which is very satisfying.
4) It is satisfying that respondents commonly perceive many ecological aspects of online commerce in their shopping experience. This means that sellers include ecological products in their offers, provide ecological delivery, and that there are a lot of ecological solutions in the area of parcel packaging. Electronic sales documents and after-sales service forms have become much more widespread and customers can see increasingly better product descriptions and visuals on sellers' websites.
5) The survey revealed areas for improvement on the part of e-sellers, as these solutions are not yet common. Sellers could more widely implement solutions such as reserving in-store products for fitting, collecting used products in exchange for discounts, offering a reduced price for non-returnable purchases or bicycle couriers. Respondents, however, are not interested in introducing fees for ecological packaging.

The conclusions drawn from the collected results of the survey, authorize the adoption of the hypotheses assumed in the paper. The consumers are not extremely ecological and sellers also still have a lot of space for further greening in e-commerce.

The presented studies do not fully confirm the results of studies, e.g. *Green Generation Report* (2020) or WCO (2022), indicating great hopes for the greening of trade by young people. The studied population turned out to live in moderate agreement with the idea of ecological life.

The results of the studies (like Slozko, Pelo, 2014; Wu et al., 2023; Bhavsar, Samanta, 2022) proving that buyers choose payment methods considered ecological (mainly cashless and electronic). However, card payments did not dominate as in the results of Liu et al. (2008). Young consumers see the role of pro-ecological activities in e-commerce, which is confirmed by research by e.g. Łysoń (2023), and more and more of them are being noticed - partly contrary to the results of the *Together for the Earth Report* (2020). The results of e.g. Jagoda et al. (2023) regarding the choice of mainly ecological forms of delivery were also confirmed. But young consumers do not necessarily want to pay extra for ecological packaging - as in research by e.g. Villa et al. (2022).

Conclusions from the statistical analysis - although the sample was non-random - do not rule out generalizations to the youth population. Due to the lack of a sampling frame for the population of the analyzed age, the sample could be representative despite the method of selection. An interesting finding is that young consumers do not act stereotypically based on their gender and appear to become pro-environmental, increasingly mature consumers with age.

The empirical study results indicate that young consumers declare moderately pro-environmental attitudes and relatively often undertake selected actions consistent with the idea of reducing consumption and waste. At the same time, the data do not allow for the unequivocal conclusion that environmental aspects are currently the dominant factor in online purchasing decisions, meaning that the further "greening" of e-commerce remains a development direction and expectation rather than an empirically confirmed market standard. Distinguishing between observed behaviors and the postulated development of green e-commerce is crucial for the proper interpretation of the results and for designing future research, for example, to verify whether consumers' declarations of their actual contribution to the greening of e-commerce translate into actual behavior. To this end, behavioral studies based on actual transaction data should be conducted. The gap between pro-environmental attitudes and actual online purchasing decisions could also be measured". It would also be interesting to examine the impact of various factors, such as time pressure, promotion, and personalization, on the "erosion" of pro-environmental behavior.

Then again, the supply side arouses curiosity - how sellers approach the greening of e-commerce. The supply-side perspective (vendors and platforms) is also interesting – what are the actual costs of implementing environmentally friendly practices, what are the organizational and technological barriers, and what is the scale of the discrepancy between company declarations and operational practice.

The topic is therefore still a lively and open field for further research. Nevertheless it is apparent that the process of greening in e-commerce is ongoing, which gives cause for optimism in view of the confirmation of the fact that there is a move towards sustainable development in this area as well.

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