ORIGINAL ARTICLE

Agnieszka Jagoda
Wroclaw University of Economics and Business, Poland
  orcid.org/0000-0001-8560-031X

Tomasz Kołakowski
Wroclaw University of Economics and Business, Poland
  orcid.org/0000-0003-2507-4850

Jakub Marcinkowski
Wroclaw University of Economics and Business, Poland
  orcid.org/0000-0002-6076-1552

Katarzyna Cheba
West Pomeranian University of Technology in Szczecin, Poland
  orcid.org/0000-0001-8753-7764

Monika Hajdas
Wroclaw University of Economics and Business, Poland
  orcid.org/0000-0003-1006-2486

E-customer preferences on sustainable last mile deliveries in the e-commerce market: A cross-generational perspective

Abstract

Research background: In the last few years, e-commerce market has increased in population shares, but the situation has changed dramatically since the Covid-19 pandemic. Electronic marketplaces have changed due to rapid digitalization and shopping. Online services offer the possibility to choose a different delivery method such as home delivery or out-of-home delivery. This aspect of the e-commerce market faces an increased interest among practitioners and academia in the field of sustainable last mile deliveries. Interestingly, the subject literature consists of papers analyzing the e-commerce impact on the last-mile delivery. However, the identification of factors for choosing a delivery method and factors that motivate e-customers to choose an eco-friendly delivery method is still an unrecognized field of research.

Purpose of the article: The authors of the paper focused on the e-customer perspective on sustainable deliveries in cities. Thus, the main purpose of the paper is to compare factors among the generations that motivate e-customers for choosing a delivery method.

Methods: The research was conducted among 1.110 e-customers in Poland in 2021. The paper aims to answer the following research question: what factors motivate each generation for choosing a delivery method? To answer the above-mentioned question, the correspondence analysis (MCA) is prepared that help to identify and compare factors in each generation.

Findings & value added: The original research procedure focused on the use of multivariate statistical methods in the study of e-customers' preferences. The analysis revealed three clusters of e-customers in terms of pro-sustainable factors: (a) aged 65+ without pro-sustainable tendency, (b) aged 18–64 with pro-sustainable attitudes, and (c) mixed with no identified delivery preferences. As a result of the research, it can be concluded that the parcel price and the possibility of free return are still the most important factors in choosing the delivery method. From a business/practical perspective, the research results can be used by companies that are the main stakeholders in last mile deliveries, including mainly forwarders and transport companies.

Introduction

The e-commerce market achieved an increase in sales by 300% in the period 2014–2019. The Covid-19 pandemic, which broke out at the end of 2019 in the People's Republic of China, additionally contributed to a sharp increase in sales via the Internet. The end-users (e-customers) have modified their behavior and switched from traditional distribution channels to more diversified home deliveries and out-of-home deliveries. Thus, the global share of online sales in retail increased from 13.6% in 2019 to 19.5% in 2021 (E-Commerce Share of Total Retail Sales, 2021).

The delivery of products ordered by e-customers generates many problems, especially regarding last mile delivery. It is the most expensive, least efficient, and cost-generating part of the supply chain (Ranieri *et al.*, 2018). Moreover, last mile delivery is also regarded as one of the most inefficient and polluting parts of the supply chain (Gevaers *et al.*, 2011).

This makes last mile deliveries non-sustainable in each of the three sustainability pillars: economical, environmental, and social (Liu, 2014). Therefore, last mile delivery is exacerbating issues related to sustainability and livability in cities (Comi, 2020). In particular, since the majority (66%) of e-customers choose home delivery (Van Duin *et al.*, 2020; Statista, 2020), which has the largest impact on freight transport, as they lead to a deeper penetration of freight activities into residential areas. What is more, home deliveries produce large amounts of return flows as a result of failed delivery attempts and returns from e-customer (Visser & Lanzendorf, 2004), and overpackaging creates a large amount of waste (Lu *et al.*, 2020). Thus, the last mile delivery impact on sustainability in cities may be classified as follows:

– economic – related to delivery cost, delivery speed, and delivery options (Nguyen *et al.*, 2019);
– social – mainly related to comfort, safety, and security in the city. The growing number of last mile deliveries results in increased traffic jams, more accidents, vehicle noise in urban areas, illegal parking practices, and longer waiting times for public transport (Ducarme, 2019; Laghaei *et al.*, 2016);
– environmental – where most attention is paid to external costs and losses, such as air pollution, greenhouse gas emissions (GHG), climate change, and noise pollution (Iwan *et al.*, 2019; Muñoz-Villamizar *et al.*, 2020). Environmental impact depends on the travel mode choices and behaviour of the consumer (Hischier, 2018).

Based on the above-mentioned last mile delivery impact on sustainability in cities, it can be assumed that "sustainable last mile delivery on e-commerce market in cities concerns the planning, implementing, coordinating and controlling of processes on urbanized areas related to the last mile delivery of goods purchased online with the accompanying information, to reduce costs, reduce environmental degradation and increase road safety, obtained as a result of a compromise developed among the diverse preferences of stakeholders" (Kiba-Janiak *et al.*, 2021). Thus, to achieve sustainability in last-mile deliveries, the obligation for the cooperation of all stakeholders is important (Ranieri *et al.,* 2018; Kiba-Janiak *et al.*, 2021).

The authors of the paper focused on the e-customer perspective on sustainable deliveries in cities. Literature analysis suggests that the main aspect of sustainable behavior is the eco-friendliness of the undertaken

activities. The rapid digitalization of transactions and shopping has forced electronic marketplaces (e-shops) to expand their online services. Some of them can find a possibility to choose a different delivery method such as home delivery or out-of-home delivery. The scientific publications provide the analysis of the e-commerce impact on last mile delivery (Allen *et al.*, 2018; Cárdenas *et al.*, 2017), nevertheless there is very little research that refers to the identification of factors for choosing the delivery method and the factors that motivate e-customers to select an eco-friendly delivery method.

Hence the main purpose of the paper was to compare factors among the generations that motivate e-customers for choosing the delivery method. The research was conducted among 1,110 e-customers in Poland in 2021. The added value of the paper refers to the use of multivariate statistical methods in the study of e-customers' preferences that enable to reveal of clusters of e-customers in terms of pro-sustainable factors. The research also intends to enrich the existing research in the subject literature in the field of generations theory and last mile deliveries.

The paper aimed to answer the research question as to what factors motivate each generation for choosing the delivery method. To answer this, the factor analysis and the correspondence analysis (MCA) were prepared to help identify and compare factors in each generation.

The paper consists of six consecutive sections. After the introduction, the literature review is presented in the context of customers' perception of sustainability in generational approach, and sustainable last mile delivery solutions. The following section describes the research methodology, then statistical data and study results. Finally, the paper presents a discussion in two contexts: the individual and social practice perspectives on behavior change. The paper is summarized with conclusions.

Literature review

Customers' perception of sustainability — a generational approach

The term 'generation' is used to describe a group of individuals born during a particular period. According to Mannheim's (1952) theory of generations, unique, social, and economic conditions produce different values for each generation. In reaction to historical events (e.g. social,

economic, and technological) collective attitudes and behavior are creat-ed, which result in new generational values and lifestyles during the same period (Mannheim, 1952; Wey *et al.*, 2002; Severo *et al.*, 2018; Ivano-va, 2019). This period (time interval) is not clearly defined in the subject literature, e.g. Strauss and Howe (1991) identified 25 generations in the history of the United States, but modern literature analyses of the year ranges define four generations present in the market place, which can be summarized as follows (Kotler *et al.*, 2013):

− Baby Boomers – born between 1946 and 1964,
− Generation X – born between 1965 and 1979,
− Generation Y (Millennials, Echo Boomers) – born between 1980 and 1997,
− Generation Z (Digital Natives, iGeneration) – born between 1998 and 2010.

The literature analysis shows that there is a difference between gener-ations in the perception of the sustainability or pro-environmental con-sumption/purchase behavior. Baby Boomers have a tendency to alter their shopping behavior but based only on the economic situation (Williams & Page, 2011). According to a study by Benson and Connell (2014), they exhibit positive attitudes towards fair trade, but are not willing to com-promise on certain product characteristics such as quality just to support fair trade, while Kalmus *et al.* (2009) suggest that retirement age is strong-ly associated with an 'indifferent' consumer type characterized by their low engagement with environmental issues.

In turn, Generations X and Y feel strongly about sustainability values and make purchasing decisions based on those values (Kong *et al.*, 2021). Both groups of consumers also try to recycle and reuse products, reduce waste, as well as attempt to encourage other groups to do the same (Pa-padopoulou *et al.*, 2021). Members of Generation Y are especially socially concerned and aware of many global issues (Williams & Page, 2011), however their knowledge of the elements of sustainability is low, with a high level of interest in the concept (Wilhelm, 2009).

Generation Z, as consumers, are far more concerned about environ-mental protection actions and aware of the negative effects of pollution than older generations. They prefer to have a healthier environment and often choose companies implementing sustainability principles; members of that generation are also aware of sustainable consumption (Jain *et al.*, 2014; Parry & Battista, 2019). According to Dabija *et al.* (2019), 'digital

natives' express a very keen interest in sustainable development and social responsibility, and tend to get involved in environmental protection actions. Generation Z is more concerned with sustainable issues compared to previous generations, while Generation Y cares more about them than Generation X and Baby Boomers. Morrison and Beer (2017) investigated which generation group is the most pro-environmental in its purchase behavior. Their study showed that, as awareness increases with age, it reaches a peak in early to late middle age, and then declines among older groups of consumers. Diamantopoulos *et al.* (2003) also suggested that younger consumers have greater environmental knowledge than older generations.

Sustainable last mile delivery — stakeholders, solutions, behavior

Sustainable last mile delivery has received increased attention in academia in recent years. Generally, the field of sustainable last mile delivery on the e-commerce market can be considered from the perspective of various stakeholders, such as: receivers (e-customers), shippers (producers, online retailers, and e-trade services), residents, government (local and national authorities), transport companies (including courier, express, and parcel — CEP), and others. From the e-consumers' perspective, issues related to sustainable/eco-friendly last mile delivery contains aspects such as customer habits in terms of delivery method and the change for more ecological, improving delivery times, and pick-up point planning from the perspective of the e-customer and the city (Kiba-Janiak *et al.*, 2021).

Products purchased on the e-commerce market can be delivered based on two solutions: home delivery and out-of-home delivery (Kawa, 2020). Home delivery is not always convenient and is usually called door-to-door delivery. It is a delivery method where goods are physically moved to the customer (Agatz *et al.*, 2008). This solution creates challenges for courier companies and e-customers who have to be present at home (or another place of delivery) when the courier tries to make a delivery (Kawa, 2020). Home deliveries were structured by Tadić and Veljović (2021), who divided endpoints in door-to-door delivery into: customer's home address, customer's workplace, neighbor's household, collection and delivery points (attended and unattended), and drop-off company. However, the last two endpoints of delivery should be classified separately as

out-of-home deliveries (Kawa, 2020). This delivery method is more convenient for courier companies (or more broadly CEP operators) and receives increased popularity among e-customers. In general, out-of-home delivery (OOH) should be defined as a "*shipment to a point or machine that is in a convenient place for the customer*" (Kawa, 2020). OOH can be found in several forms: parcel locker (Prandtstetter *et al.*, 2021), home parcel drop box (Iwan *et al.*, 2016), drop-off point (Kawa, 2020), click and collect (Jara *et al.*, 2018). Home delivery is seen as less sustainable (less eco-friendly), while OOH may be treated as a sustainable last mile delivery (see: Rai *et al.*, 2019; Kawa, 2020; Ignat & Chankov, 2020).

The subject literature suffers from a lack of studies relating to the behavior change of e-customers in different generations concerning choosing the last mile delivery method in terms of sustainability (or even eco-friendliness). Although studies are describing e-customer behavior in the field of last mile delivery preferences, they lack the perspective on sustainable methods of delivery (e.g. Nguyen *et al.*, 2019, Gawor & Hoberg, 2019). One study (Ignat & Chankov, 2020) examine e-customers behavior concerning economic, environmental, and social sustainability factors in the field of last mile delivery. According to the authors, when e-customers place online orders, they get the chance of choosing different last-mile delivery methods only based on economic factors. E-retailers give customers only limited information about the available delivery methods, solely related to the associated time and cost in different delivery locations. Information on the environmental and social impact of the different delivery options is currently not provided at all or only rarely. The finding shows that e-customers are willing to make economic sacrifices if they have transparent information on the environmental and social impact of last mile delivery methods. However, the presented study (Ignat & Chankov, 2020) has some limitations, such as a lack of consideration regarding delivery specifics (product type, order urgency, ease of access to the pick-up location, etc.), and customer characteristics (age, gender, education, etc.).

Interesting research by Caspersen and Navrud (2021) also diagnosed e-customers' preferences for environmentally sustainable last mile deliveries from the perspective of gender. The findings revealed that female e-customers are more likely to accept an increased delivery time of a shipment if it results in a reduction of emissions. Yet, there is still very little research assessing the perspective of generations on sustainable last

mile deliveries. For example, Moroz and Polkowski (2016) attempted to diagnose Generation Y's behavior and eco-friendly attitudes in the field of last mile delivery.

It should also be noted, that generally, the authors focus on the simple presentation of the obtained research results. Publications in which additional information is provided by the results of more advanced statistical analyses are published much less frequently. Meanwhile, studies that use more complex methods of analyzing the collected research material e.g. methods of multivariate comparative analysis, make it possible to search for additional information, directly unrecognizable, which is difficult to perceive when analyzing answers to single questions.

Concluding, the existing research in a generational approach is mainly focused on the perception of pro-environmental consumption. A differently understood generations have various and not always common concerns with sustainable issues. Accordingly, the research in sustainable last mile delivery approach is considered, mainly separately, from the perspective of various stakeholders, however, faces a lack of studies in the field of the behavior change of e-customers in different generations. Pro-environmental attitudes in consumer behavior are analyzed usually in the context of the method of delivery (home vs. OOH), e-customer characteristics or gender. Nonetheless, there is no research assessing and comparing e-customers' preferences for sustainable last mile delivery from the perspective of all generations.

Research methods

In this study, a two-stage research procedure was used to examine the preferences of some groups of residents of voivodeship capital cities in Poland in terms of last mile deliveries on the e-commerce market. In the first stage of the study, factor analysis was used to analyze the preferences of the respondents regarding the delivery method of products purchased via the Internet.

Factor analysis is used to transform a given, inter-correlated system of observable variables into a new system of similarly assessed variables, referred to as common factors (the so-called hidden variables) (Fabrigar & Wegener, 2011; Belas *et al.*, 2020, Virglerova *et al.*, 2021). The main advantage of this method is the ability to determine the optimal number of

hidden variables sufficient to explain the interrelation between multiple observable variables. This approach to factor analysis is known as explanatory factor analysis. A detailed description of the factor analysis and the examples of its applications in scientific research have been presented in the publications of such authors as Cudeck (2000), Kline (2013), Yong and Pearce (2013), and McDonald (2014).

The aim of the second stage was to analyze the relation between decisions on the method of selecting deliveries carried out on the e-commerce market with variables that may affect the choice of a more or less ecological delivery method, taking into account the various age groups of the respondents. For this purpose, a correspondence analysis was applied. The main advantage of this method is the ability to compare features measured on various scales (including the nominal scale) and characterized by coexistence, which means that in the set of examined variables it was not possible to indicate the dependent variable. This method also allows for analysis of the results obtained from a non-random sample as was the case in the research, the results of which are presented in this paper. A detailed description of the correspondence analysis and examples of its many applications can be found in Greenacre (1984, 2017), Beh and Lombardo (2014), and Frankowska and Cheba (2022). The results of the correspondence analysis included the simultaneous occurrence of categories of variables, which are usually presented in graphic form. However, it should be noted that if the space with a dimension larger than 3 is the best form of the presentation of the variables' coexistence, another method of presenting the results should be applied. In this case, the Ward method, one of the classification techniques, can be selected (Bąk *et al.*, 2018).

Data

The basis of the analyses presented in this paper is the research carried out at the turn of July and August 2021 on a sample of over 1,100 adult inhabitants of voivodeship cities in Poland (602 women and 508 men), making purchases using the Internet during the year preceding the survey. The study used quasi-representative sampling, with the sample structured according to the place of residence, gender, and age (Kiba-Janiak *et al.*, 2022). The research was carried out in all provincial cities in Poland. The structure

of the sample in this respect corresponded to that of the population. As such, quota selection was applied to the stratum, while a filter question was introduced — only respondents who shopped on the Internet were allowed to participate in the survey. Table 1 shows the structure of the study sample accounting for the gender and age of respondents.

The survey questionnaire was very extensive and addressed several issues related to last-mile deliveries and returns in the e-commerce market. The study analysed the results in terms of last mile deliveries on the e-commerce market and e-customers' preferences in this respect.

Results

In the first stage, factor analysis was used to identify the features determining the choice of the delivery method of products purchased via the Internet, which may be perceived by the respondents as similar, even though assessed separately by them. Before applying factor analysis, the degree of adequacy of the sample to the assumptions of this analysis was checked, and for this purpose the KMO (Kaiser-Meyer-Olkin) statistic was calculated. The obtained result above 0.84 can be assessed as very good (worthy of praise). It allows to recognize the significant adequacy of the data to the assumptions of the factor analysis. Next, to select the optimal number of factors the Kaiser criterion was applied, and on its basis it was confirmed that the first three factors with eigenvalues above 1 should be used for further analyses. These factors explain a total of 60.25% of the variance of all 13 variables. It is worth noting that the significance of the remaining factors is not so significant, as the corresponding eigenvalues are less than one, and none of them explains more than 6.8% of the general outcome. To improve and obtain the simple structure of factors, the matrix of factor loadings was subjected to Varimax rotation (Varimax normalized). This allows to simplify the interpretation of factors by minimizing the number of variables needed to explain a given factor. Table 2 presents the system of variables forming the determined dimensions.

Based on the results presented in Table 2, the existence of moderate and high values of the factor loadings of all items constituting the individual subscales was confirmed. The values of the factor loadings of the items that make up the dimensions are as follows: a) for the first factor

from 0.59 to 0.75; b) for the second factor from 0.56 to 0.82; c) for the third factor 0.85. The first factor, explaining 26.33% of the variance, consists of seven variables: Z1, Z2, Z3, Z4, Z5, Z6, and Z13. This factor was defined in the study as the fundamental requirement. It contains factors indicated in many different studies (see: Rosal, 2016), as the basic criteria considered by buyers when choosing a delivery method. These are economic factors (e.g. delivery price, free return), as well as those related to security and trust in the supplier. The second factor, explaining 19.32% of the variance, brings together four variables: Z9, Z10, Z11, and Z12, and can be described as a pro-sustainable factor; it mostly focuses on factors directly related to reducing pressure on the natural environment. It is also important to include such a method of organizing deliveries that can be adapted to the limited mobility of buyers, e.g. related to disability. The third factor explains 14.60% of the variance and brings together two variables: Z7 and Z8. This factor can be described as the dimensions of the parcel delivered to the e-customer.

The obtained set of factors confirms the previous results of the authors' research (see: Cheba *et al.*, 2021), which also indicated that apart from the factors of fundamental importance (factor 1, the average rating for all variables describing this factor was 4.0), more and more important for buyers are also the factors that in the study are related to ensuring sustainable deliveries (factor 2), but their importance is slightly lower (the average score for all the variables that make up this factor was around 3.0). The variables that make up factor 3 (weight and size of a package), similarly to factor 2, are of slightly less importance to buyers than factor 1 (average rating around 3.0). However, it should be clearly emphasized that, despite the increased interest in balanced delivery, the price of the service is still the main factor of choice. E-commerce customers are interested in sustainable delivery, but, according to research, are unwilling to pay more for it.

In the second stage, the variables used to test the preferences for the choice of the delivery method for products purchased by consumers via the Internet were used in analyses that additionally take into account the preferred delivery method (dependent variable): D1 — the choice of deliveries made only in a non-ecological way, i.e. places of work, D2 — only ecological delivery, i.e. delivery to the parcel locker, drop off point, click and collect, and to a home parcel box; D3 — selection of various delivery methods (both ecological and non-ecological delivery). The study also

took into account the division into age groups of the respondents (an independent variable that may differentiate the choice of the delivery method): W1: 19–34, W2: 35–44, W3: 45–64, and W4: 65 and over. It was assumed that age may be a factor that significantly differentiates the choices of customers purchasing online.

Not all the factors included in the factor analysis were analyzed because some of them, such as delivery price, free return, safety, or speed, are important for all respondents and, as shown at the beginning of this section, the participants similarly evaluate them. Three variables constituting factor 1 were analyzed:

– Z9 – the possibility of delivering in an environmentally friendly manner (e.g. by electric car, cargo bike), where Z9.1 means high importance of this factor when choosing the delivery method, Z9.2 — average weight, Z9.3 — low weight, which means that this factor is irrelevant;
– Z10 – the possibility of returning the purchased products ecologically (delivery to the collection point, collection by electric car, cargo bike) (similarly: Z10.1, Z10.2, Z10.3);
– Z11 – limitations related to the possibility of movement (e.g. related to disability (Z11.1, Z11.2, Z11.3);
– and additionally ZD – the possibility of collecting the parcel by bike or by foot (ZD.1, ZD.2, ZD.3).

In the next stage, to identify the respondents purchasing in the e-commerce market in a similar way, in particular taking into account their preferred delivery method, a correspondence analysis which is one of the multi-dimensional analyses, was used

According to the results presented in Table 3, the main inertias larger than $\frac{1}{Q} = \frac{1}{6} = 0.167$ should be considered in the next step of the analysis, as necessary for the study. This means that the inertias for K taking values up to and including 5, have to be taking into account. The results for $K > 5$ need to be ignored, as for these dimensions the main inertias did not exceed 0.167. The percentage of inertia is a measure that determines the inertia share of a selected dimension (λ_k) in the total inertia (λ). The level of explanation of inertias (τ_k) in two-dimensional space is 31.07% and in the five-dimensional amounts to 56.87%. It is also possible to improve the quality of representation in the five-dimensional space by the modification of ($\tilde{\lambda}_k$) eigenvalues. The effect of the conducted modification is an increase in the level of total inertia explanation. After this modification,

we can observe that the level of inertia explanation in the five-dimensional space ($\tilde{\tau}_k$) increased from 56.87% to 68.54%.

Due to the large number of the analyzed features and their levels, the interpretation of results obtained in the five-dimensional space is very difficult. To clearly interpretation of the results, Ward's method, which is one of the agglomeration methods of grouping, was applied. This method enables the identification of connections between variants of features in a graphic form. Figure 1 presents the combinations of categories into typological groups (classes). The stage in which the combination of classes was interrupted is marked by the horizontal line.

The effect of the correspondence analysis applied in the paper is the division of the respondents into three typological groups (classes) presented below.

The oldest respondents aged 65 and over qualified were assigned to the first cluster (W4, D1, Z9.2, Z10.2, Z11.2, ZD.2). Members of this age group participating in the study usually choose postal or courier delivery to their home or workplace as the delivery method for products purchased via the Internet. This method was marked as non-ecological in the study. At the same time, all the factors analyzed in the study that may affect the choice of a greener delivery method were assessed by them as moderately important. The assessment at this level also addressed limitations related to mobility (e.g. disability, which theoretically could have a greater impact on the choice of a less environmentally friendly delivery method).

The second cluster (W1, W2, W3, D2, D3, Z9.1, Z10.1, Z11.1, ZD.1) comprises the respondents representing other age groups, from 18 to 64 years old. Inhabitants of provincial cities who qualified for this cluster chose different methods of delivery: only carried out in a manner recognized in the study as ecological (D2), i.e. to the parcel locker; drop-off point, click and collect, to a home mailbox, and in a mixed manner (ecological and non-ecological, D3). All the factors analyzed in the study which may affect the choice of an ecological delivery method were assessed by them as significant. The factor describing limitations related to the possibility of movement (e.g. disability) was also assessed as significant.

In turn, the third cluster (Z9.3, Z10.3, Z.11.3, ZD.3) comprised the respondents belonging to different age groups, with no specific preferences

regarding the choice of the delivery method, assessing the analyzed factors that may affect the choice of the delivery method as irrelevant.

Discussion

In the following section, the authors discuss two main perspectives to be considered when designing interventions aimed at fostering sustainable behavior in last mile delivery.

The individual perspective on behavior change

Some researchers interpret the unsustainability problems as being caused by individual choices, which, if influenced and changed, will lead to sustainable outcomes (Southerton *et al.*, 2004). Those who follow this approach often relate to the 'nudge' theory, which refers to policy actions (nudges) that change an individual's choices or behavior without economic incentives not 'forbidding any options' (Thaler & Sustein, 2009). An essential aspect of this theory is choice architecture, which refers to how choices are presented, framed, and structured (Schubert, 2017). To nudge someone means to intentionally intervene in their choice of architecture. Studies distinguish between nudges that serve individuals by increasing their health and wellbeing, and those that incentivize people to contribute to a broader public good (Boruchowicz, 2022; Nagatsu, 2015). The latter are called social nudges or green nudges (Boruchowicz, 2022; Schubert, 2017) if they refer to pro-environmental behavior. Table 4 presents some possibilities for implementing 'green nudges' in the last mile delivery area.

Several studies described some benefits of using green nudges for promoting more sustainable consumption choices in various product categories such as light bulbs (Dinner *et al.*, 2011), energy source options (Pichert & Katsikopoulos, 2008), or the reuse of hotel towels (Goldstein *et al.*, 2008), while at the same time, other researchers notice that although some interventions may be successful at changing behavior in one area, it does not necessarily entail transferring these approaches to other areas and expecting similar results in terms of behavior change (Hedin *et al.*, 2019). Therefore, both scholars and practitioners should be cautious when

comparing and transferring interventions aimed at e.g. changing food behavior to interventions in the transport-related area.

According to this study, the age cohort which is the least prone to include environmental aspects in their last mile delivery choices are persons over 65. The authors suggest that green nudges could be designed and tested among this age group to foster their transition to more sustainable options. Yet, as this study also showed that people who do not care for environmental aspects of their delivery choices can be found in any age group, one needs to search for some other theories that could explain how to transform the last mile delivery into a more sustainable area. Despite the wide acceptance and popularity of the nudge theory and its applications in studies and interventions aimed at fostering sustainable behavior, there are several limitations to this approach. The first one lies in the questionable results of such interventions regarding the behavioral change (Hedin *et al.*, 2019; Schubert, 2017). Previous findings of Hedin *et al.* (2019) showed that for various digital interventions aimed at fostering sustainable food consumption behavior, the results of the interventions in terms of behavior change in many cases were either not considered in a measurement, unclear, or none. Schubert (2017) highlighted that the impact of green nudges may be highly context-dependent (i.e. on ideological or other predispositions of nudges). Another limitation is the assumption that responsibility for environmental problems can be assigned to individuals rather than corporations, industries, or governments and the system they co-create, which is the critique of the neoliberal view of these problems (Hursh *et al.*, 2015; Pellizzoni, 2011). Studies refer to this as the 'responsibilization of the consumer' which relates to the reduction of systemic issues linked to the individualized, behavioral choices of the 'sovereign consumer' (Welch *et al.*, 2021; Thompson & Kumar, 2018).

Social practice perspective on behavior change

An alternative approach, based on social practice theory (Evans, 2012; Evans *et al*., 2012; Reckwitz, 2002; Shove & Pantzar, 2005; Shove & Walker, 2010; Spotswood *et al.*, 2015) defines unsustainable patterns of consumption as embedded in the social ordering of practices (Southerton *et al.*, 2004). The authors believe this perspective to be more useful in studies on last mile delivery, as no single entity can create a sustainable last mile

solution on its own (Accenture, 2021). Such transformation requires all stakeholders and the ecosystem they co-create to work together (Accenture, 2021, Ranieri *et al.*, 2018; Kiba-Janiak *et al.*, 2021).

Social practice theory shifts the attention from individual behavior to social practices as the core unit of analysis and interventions (Welch, 2017). Social practices are conceptualized as combinations of three interrelated elements: resources (materials, objects, infrastructure, technology), competencies (skillful actions, knowledge), and meanings (principles, values) (Shove & Pantzar, 2005). How practices are performed depends on each of these elements and how they affect each other. For example, low-cost airlines (resources) will invite travelers to engage in a frequent flying practice, but changes in social norms — i.e. flight shaming (meaning 'excessive use of air travel') may prevent them from engaging in frequent flying practice and turn into more sustainable travelling practices instead. Following this logic, one may suspect that drones (resources) (McKinsey & Company, 2016) might encourage customers to choose instant (and not sustainable) delivery methods, but evolving regulations supporting green initiatives (principles) might engage companies in a sustainable last mile supply chain development. These, however, are only suggestions as the identification of practices should be the outcome of a study and not a predefined assumption (Kłeczek *et al.*, 2020; Smagacz-Poziemska *et al.*, 2020).

Another important aspect of social practices is that they are bundled (Castelo *et al.*, 2021) and interlocking one with another, therefore they should be studied together as a nexus of practices (Paddock, 2017). Moreover, some practices mediate other practices (Kłeczek *et al.*, 2020; Hargreaves, 2011), and this is also true for the last mile delivery as it depends on other practices, such as remote work (which may foster more home deliveries), driving children to school (which may foster more out-of-home deliveries), or being on a 'box diet' (which — because of the short expiry date of a product — requires frequent deliveries). These examples demonstrate that mediating practices of last mile delivery and the related destination practices should be studied together, as reducing or redesigning the destination practices may inspire a reduction in mediating practice (Kłeczek *et al.*, 2020; Bezerra *et al.*, 2020). It also implies that the practice interventions aimed at a more sustainable last mile delivery require breaking down the industry or functional silos and fostering the active cooperation of all the actors and stakeholders involved in the nexus of the

studied practices (Bezerra *et al.*, 2020), as sustainable transition pathways cannot be fully explored using 'niche-regime' categories (Turku *et al.*, 2022; Strambach & Pflitsch, 2018).

Conclusions

The conducted empirical research indicates that one of the three groups of factors motivating e-customers to choose the delivery method contains pro-sustainable factors, which essentially focus on limiting the pressure imposed on the environment. As a result of the analysis, a clear division of e-customers' preferences in this area was observed. *Baby Boomers*, i.e. respondents aged 65+, were the first cluster that did not show pro-sustainable tendencies in last mile deliveries. Home delivery dominates here, and pro-sustainable factors were not assessed as important for that generation when choosing the delivery method. The second cluster was composed of other generations, namely Generations X, Y, and Z, i.e. respondents aged 18–64. Pro-sustainable attitudes were widespread and actively supported here by preferring out-of-home deliveries. Moreover, pro-sustainable factors were treated by this group as important in choosing the delivery method. It means that consumer preference for sustainable delivery differs between generations, being bought more by younger people than by the more mature or elderly. The third cluster was a mix of different generations, with no identified delivery preferences.

   A review of the literature has shown that the youngest generation prefers to purchase products from companies that apply sustainability principles. The youngest generations adopt a proactive attitude because they realize they contribute to a healthy environment through their own personal involvement. They want to be actively involved in their communities and participate in sustainable ideas. Therefore, the younger generation should be included by e-commerce stores and courier companies in social and educational campaigns in order to deepen their pro-sustainable attitudes. Their involvement in sustainable practices in society might provide a bridge to communication with older generations, by transmitting the importance of sustainable practices in last mile delivery. The challenge for online stores remains how they encourage cooperating courier companies to adopt environmentally friendly practices, along with the development of a green mentality and a commitment to adequately informing consum-

ers about the environmental impact of the delivery they offer (Jones *et al.*, 2005).

From a business/practical perspective, the research results can also be used by companies that are the main stakeholders in last mile deliveries, including forwarders and transport companies. Those results could help to revise the existing or adopt a new strategy of operation in the context of servicing particular generation cohorts, considering the aspect of sustainable last mile delivery. This may come down to choosing one of the basic directions in strategic logistics management of such enterprises, i.e.:

– cost minimization – a strategy consisting of minimizing total expenses related to transport, storage and distribution system at the assumed level of logistic customer service, e.g. better delivery scheduling considering specific eco-friendly means of transport for individual generation cohorts,

– maximization of additional (added) value – a strategy aimed at maximizing the benefits obtained through high-quality logistics services that exceed the standards offered by competitors, e.g. a greater number and availability of out-of-home delivery (OOH) infrastructure or more optimal distribution in space. In this case, the level of service is determined by the limited financial outlays of the company,

– achieving flexibility and control of the logistics system – a strategy based on the ability to quickly adapt to changes resulting from the evolution of preferences of particular generation cohorts in the field of pro-sustainable attitudes. A strategy implemented despite the need to incur significant costs or give up the benefits of a high level of customer service.

The final choice of one of the above-mentioned strategies will result from an in-depth customer survey (examination of additional factors discussed later in the conclusions) and their segmentation, considering the pro-ecological preferences of individual generation cohorts.

The main contribution of this study is twofold. First, we offer several empirical insights into which factors among the generations motivate e-customers to choose the delivery method. By using multivariate statistical methods, we were able to reveal the clusters of e-customers in terms of their preferences for pro-sustainable factors. Our findings add to the existing research in the field of generations theory and last mile deliveries. We presented also some managerial implications of the research. Second, we offer several theoretical insights into researching and designing

interventions aimed at fostering sustainable behaviors in the last mile delivery using two theoretical perspectives, the individual and the social practice perspective.

The authors also wished to point out the limitations of the research. Firstly, the respondents were exclusively residents of voivodeship capital cities in Poland, therefore the study did not consider the preferences of residents of smaller cities, towns, and villages. Undoubtedly, the lifestyle and environmental performance of e-customers from smaller and less urbanized areas may differ significantly from those of the inhabitants of large cities. From the perspective of last mile deliveries, this may be influenced by the availability of out-of-home delivery (OOH) infrastructure (e.g. parcel locker, a drop-off point, click and collect, etc.) in rural or peripheral areas. The second limitation to which attention should be paid was the analysis conducted from the perspective of only one of the demographic features, i.e. the age of the respondents (belonging to a specific age cohort). Of course, as the analysis of the research results showed, this affiliation has an impact on the decisions taken in the field of last mile delivery and sustainable behavior. However, it would be reasonable, from the perspective of a comprehensive view of the addressed problem, to extend the research results to include analyses that also discuss other characteristics of the surveyed group, such as gender, education, and income level. The inclusion of additional characteristics describing the respondents in the survey could allow for the selection of subgroups within the already identified three main ones, which could show even better the social motivations in the field of sustainable last mile delivery. The last element to which attention should be paid at this point, is that the conducted research focused only on one of the areas of sustainable last mile delivery in the e-commerce market, namely on the choice of delivery methods and factors determining such a decision. However, the analysis did not attempt to indicate the factors directly motivating to change the decision in the scope of the delivery method to a more sustainable (or at least ecological) one, while some possibilities of implementing the green nudges in the last mile delivery area were proposed. The aspects related to the process of returning goods purchased via the Internet were also not analyzed in this paper.

Given the above, future research comparing sustainable last mile delivery options should include diverse subjects to represent more varied features of e-customer (such as gender, educational background, career

level, monthly salary, different place of residence (city/suburbs/country etc.). The authors, supporting the pursuit of sustainability and a green lifestyle, also suggest conducting further research on the generations and the template of sustainable last mile delivery. On the one hand, it seems that it is necessary to deepen the research on behavioral changes in the few eco-friendly groups of *Baby Boomers* and others, whose members do not show any preferences in the last mile delivery method. On the other hand, there is also a need for more extensive research concerning representatives of Generations X, Y, and Z, not only because they have higher spending power in the e-commerce market but, as was proved, they seem to be more inclined to sustainable consumption and eco-friendly last mile delivery solutions. Furthermore, future studies could also identify factors that affect the sustainability orientation of Generations X, Y, and Z, and could also highlight if or how this is orientation evolving. Despite the indicated limitations, it seems that the research conducted by the authors can help organizations that are the main actors in last mile delivery (shippers and transport companies) in their efforts to become greener organizations, which will ultimately contribute to the dissemination of sustainable last mile delivery and will fit into the current universal call for sustainable development.

References

Accenture (2021). The sustainable last mile. Sustainable Last Mile Delivery. Retrieved form https://www.accenture.com/gb-en/insights/consulting/sustainable-last-mile-delivery (07.07.2022).

Agatz, N., Campbell, A. M.., Fleischmann, M., & Savelsbergh, M. (2008). Challenges and opportunities in attended home delivery. In B. Golden, R. Raghavan & E. Wasil (Eds.). *The vehicle routing problem: Latest advances and new challenges* (pp. 370–396). Springer-Verlag.

Allen, C., Metternicht, G., & Wiedmann, T. (2018). Initial progress in implementing the Sustainable Development Goals (SDGs): A review of evidence from countries, *Sustainability Science, 13*, 1453–1467. doi: 10.1007/s11625018-0572-3.

Bąk, I, Cheba, K., & Szczecińska B. (2019). The impact of transport on the quality of the environment in cities of Poland – A statistical analysis. *Transportation Research Procedia*, *39*, 24–33. doi: 10.1016/j.trpro.2019.06.004.

Beh, E. J., & Lombardo, R. (2014). *Correspondence analysis: theory, practice and new strategies*. John Wiley & Sons.

Belas, J., Gavurova, B., Čepel, M., & Kubák, M. (2020). Evaluation of economic potential of business environment development by comparing sector differences: Perspective of SMEs in the Czech Republic and Slovakia. *Oeconomia Copernicana*. *11*(1), 135–159. doi: 10.24136/oc.2020.006.

Benson, E. L., & Connell, K. Y. (2014). Fair trade consumption from the perspective of US Baby Boomers. *Social Responsibility Journal, 10*, 364–382. doi: 10.1108/ SRJ-08-2012-0094.

Bezerra, B. S., dos Santos, A. L., & Delmônico, D. V. (2020). Unfolding barriers for urban mobility plan in small and medium municipalities – A case study in Brazil. *Transportation Research Part A-policy and Practice, 132*, 808–822. doi: 10.1016/j.tra.2019.12.006.

Boruchowicz, C. (2022). Public policy, the environment, and the use of green nudges. In R. Fike, S. Haeffele & J. Arielle. (Eds.). *Nudging public policy. examining the benefits and limitations of paternalistic public policies* (pp. 175–202). Lanham, Maryland: Rowman & Littlefield.

Cárdenas, I., Beckers, J., & Vanelslander, T. (2017). E-commerce last-mile in Belgium: Developing an external cost delivery index. *Research in Transportation Business & Management*, *24*, 123–129. doi: 10.1016/j.rtbm.2017.07.006.

Caspersen, E., & Navrud, S. (2021). The sharing economy and consumer preferences for environmentally sustainable last mile deliveries. *Transportation Research Part D: Transport and Environment, 95*, 102863. doi: 10.1016/J.TRD. 2021.102863.

Castelo A. F. M., Schäfer M., & Silva M. E. (2021). Food practices as part of daily routines: A conceptual framework for analysing networks of practices. *Appetite*, *157*, 104978, 1–12. doi: 10.1016/j.appet.2020.104978.

Cheba, K., Kiba-Janiak, M., Baraniecka, A., & Kołakowski, T. (2021). Impact of external factors on the e-commerce market in cities and its implications on the environment. *Sustainable Cities and Society*, *72*, 103032, 1–15. doi: 10.1016/j.scs.2021. 103032.

Comi, A. (2020). A modelling framework to forecast urban goods flows. *Research in Transportation Economics, 80*, 100827. doi: 10.1016/j.retrec.2020.100827.

Cudeck, R. (2000). Exploratory factor analysis. In H. E. A. Tinsley & S. D. Brown (Eds.). *Handbook of applied multivariate statistics and mathematical modeling* (pp. 265–296). Academic Press. doi: 10.1016/B978-012691360-6/50011-2.

Dabija, D. C., Bejan, B. M., & Dinu, V. (2019). How sustainability-oriented is generation Z in retail? A literature review. *Transformations in Business & Economics, 18*, 140–55.

Diamantopoulos, A., Schlegelmilch, B. B., Sinkovics, R., & Bohlen, G. M. (2003). Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *Journal of Business Research*, *56*(6), 465–480. doi: 10.1108/07363760410542165.

Dinner, I., Johnson, E. J., Goldstein, D. G., & Liu, K. (2011). Partitioning default effects: Why people choose not to choose. *Journal of Experimental Psychology: Applied, 17*(4), 432. doi: 10.1037/a0026470.

Ducarme, D. (2019). *Sustainable solutions for "last mile" deliveries in the parcel industry: A qualitative analysis using insights from third-party logistics service providers and public mobility experts.* Louvain: Louvain School of Management, Universithe catholique de Louvain.

E-commerce share of total retail sales. (2021). EMarketer

Evans, D. (2012). Beyond the throwaway society: Ordinary domestic practice and a sociological approach to household food waste. *Sociology, 46*(1), 41–56. doi: 10.1177/0038038511416150.

Evans, D., McMeekin, A., & Southerton, D. (2012). Sustainable consumption, behaviour change policies and theories of practice. *COLLeGIUM: Studies across Disciplines in the Humanities and Social Sciences, 12*, 113–129.

Evans, N., Eickers, S., Geene, L., Todorović, M., & Villmow, A. (2017). Green nudging: A discussion and preliminary evaluation of nudging as an environmental policy instrument. Environmental Policy Research Centre, Freie Universität Berlin, Retrieved from https://refubium.fu-berlin.de/bitstream/handle/fub188/22047/EansxEickerxGeenexTodorovicxVillmov_FFUxReport_GreenxNudging.pdf?squen-ce=1.

Fabrigar, L. R., & Wegener, D. T. (2011). *Exploratory factor analysis*. Oxford University Press.

Frankowska, M., & Cheba, K. (2022). The relational embeddedness as the differentiator of the cluster supply chain collaboration – A multidimensional comparative analysis. *Competitiveness Review, 32*(1), 59–84. doi: 10.1108/CR-11-2019-0114.

Gawor, T., & Hoberg, K. (2019). Customers' valuation of time and convenience in e-fulfillment. *International Journal of Physical Distribution & Logistics Management, 49*(1), 75–98. doi: 10.1108/IJPDLM-09-2017-0275.

Gevaers, R., Vanelslander, T., & Van de Voorde, E. (2011). Characteristics and typology of last-mile logistics from an innovation perspective in an urban context, city distribution and urban freight transport: multiple perspectives. In *City distribution and urban freight transport: Multiple perspectives* (pp. 56–71). Edward Elgar Publishing.

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research, 35*, 472–482. doi: 10.1086/586910.

Greenacre, M. (1984). *Theory and applications of correspondence analysis*. London: Academic Press.

Greenacre, M. (2017). *Correspondence analysis in practice*. Chapman and Hall/CRC. doi: 10.1201/9781315369983.

Hargreaves, T. (2011). Practicing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture, 11*(1), 79–99. doi: 10.1177/1469540510390500.

Hedin, B., Katzeff, C., Eriksson, E., & Pargman, D.S. (2019). A systematic review of digital behaviour change interventions for more sustainable food consumption. *Sustainability 11*(9), 2638. doi: 10.3390/su11092638.

Hischier, R. (2018). Car vs. packaging - A first, simple (environmental) sustainability assessment of our changing shopping behaviour. *Sustainability, 10*, 3061. doi: 10.3390/su10093061.

Hursh, D. W., Henderson, J. A., & Greenwood, D. A. (2015). Environmental education in a neoliberal climate. *Environmental Education Research, 21*, 299–318. doi: 10.1080/13504622.2015.1018141.

Ignat, B., & Chankov, S. (2020). Do e-commerce customers change their preferred last-mile delivery based on its sustainability impact? *International Journal of Logistics Management, 31*(3), 521–548. doi: 10.1108/IJLM-11-2019-0305.

Ivanova, O., Flores-Zamora, J., Khelladi, I., & Ivanaj, S. (2019). The generational cohort effect in the context of responsible consumption. *Management Decision, 57*, 1162–1183. doi: 10.1108/MD-12-2016-0915.

Iwan, S., Allesch, J., Celebi, D., Kijewska, K., Hoé, M., Klauenberg, J., Zajicek, J., (2019). Electric mobility in European urban freight and logistics – Status and attempts of improvement. *Transportation Research Procedia, 39*, 112–123. doi: 10.1016/j.trpro.2019.06.013.

Iwan, S., Kijewska, K., & Lemke, J. (2016). Analysis of parcel lockers' efficiency as the last mile delivery solution – The results of research in Poland. *Transportation Research Procedia 12*, 644–655. doi: 10.1016/j.trpro.2016.02.018.

Jain, V., Vatsa R., & Jagani K. (2014). Exploring generation Z's purchase behavior towards luxury apparel: a conceptual framework. *Romanian Journal of Marketing* 2, 18–29.

Jara, M., Vyt, D., Mevel, O., Morvan, T., & Morvan, N. (2018). Measuring customers' benefits of click and collect. *Journal of Services Marketing, 32*(4), 430–442. doi: 10.1108/JSM-05-2017-0158.

Jones, P., Comfort D., & Hillier D.(2005). Corporate social responsibility as a means of marketing to and communicating with customers within stores: A case study of UK food retailers. *Management Research News*, 28, 47–56. doi: 10.1108/01409170 510785011.

Kalmus V, Keller M, & Kiisel M. (2009). Emerging consumer types in a transition culture: Consumption patterns of generational and ethnic groups in Estonia. *Journal of Baltic Studies, 40*(1), 53–74. doi: 10.1080/01629770902722252.

Kawa, A. (2020). Out-of-home delivery as a solution of the last mile problem in e-commerce. In P. Golinska-Dawson, K. M. Tsai & M. Kosacka-Olejnik (Eds.). *Smart and sustainable supply chain and logistics – trends, challenges, methods and best practices* (pp. 25–40). Cham: Springer.

Kiba-Janiak, M., Cheba, K., Mucowska, M., & de Oliveira, L. K. (2022). Segmentation of e-customers in terms of sustainable last-mile delivery. *Oeconomia Copernicana, 13*(4), 1117–1142. doi: 10.24136/oc.2022.032.

Kiba-Janiak, M., Marcinkowski, J., Jagoda, A., & Skorwońska, A. (2021). Sustainable last mile delivery on the e-commerce market in cities from the perspective of various stakeholders. Literature review. *Sustainable Cities and Society, 71*, 102984. doi: 10.1016/j.scs.2021.102984.

Kłeczek, R., Pluta-Olearnik, M., & Pukas, A. (2020). *Transformation of urban mobility practices. Services and values, routines and innovation*. Wrocław: Publishing house of the Wrocław University of Economics and Business.

Kline, R. (2013). Exploratory and confirmatory factor analysis. In Y. Petscher, C. Schatschneider & D. L. Compton (Eds.). *Applied quantitative analysis in education and the social sciences* (pp. 171–207). Routledge.

Kong, H. M., Witmaier, A., & Ko, E. (2021). Sustainability and social media communication: How consumers respond to marketing efforts of luxury and non-luxury fashion brands. *Journal of Business Research*, *131*, 640–651. doi: 10.1016/j.jbusres.2020.08.021.

Kotler, P., Armstrong, G., Harris, L. C., & Piercy, N. (2013). *Principles of marketing*. Pearson Education Limited.

Laghaei, J., Faghri, A., & Li, M. (2016). Impacts of home shopping on vehicle operations and greenhouse gas emissions: Multi-year regional study. *International Journal of Sustainable Development and World Ecology, 23*, 381–391. doi: 10.1080/13504509.2015.1124471

Liu, G. (2014), Development of a general sustainability indicator for renewable energy systems: A review. *Renewable and Sustainable Energy Reviews, 31*, 611–621. doi: 10.1016/j.rser.2013.12.03880857932754.00009.

Lu, S., Yang, L., Liu, W., & Jia, L. (2020). User preference for electronic commerce overpackaging solutions: Implications for cleaner production. *Journal of Cleaner Production, 258*, 120936. doi: 10.1016/j.jclepro.2020.120936.

Mannheim, K. (1952). *Historicism. Essays on the sociology of knowledge*. New York: Harcourt, Brace & World.

McDonald, R. P. (2014). *Factor analysis and related methods*. Psychology Press.

McKinsey & Company (2016). Parcel delivery. The future of last mile. Travel, Transport and Logistics, September 2016. Retrieved form https://www.bringg.com/wp-content/uploads/2016/10/Parcel_deliveryThe_future_of_last_mile-1.pdf (01.07.2022).

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science: IS, 6*, 42–42. doi: 10.1186/1748-5908-6-42.

Moroz, M., & Polkowski, Z. (2016). The last mile issue and urban logistics: Choosing parcel machines in the context of the ecological attitudes of the Y generation consumers purchasing online. *Transportation Research Procedia, 16*, 378–393. doi: 10.1016/j.trpro.2016.11.036.

Morrison, P. S., & Beer, B. (2017). Consumption and environmental awareness: Demographics of the European experience. *Socioeconomic Environment Policies and Evaluations in Regional Science*, *24*, 81–102. doi: 10.1007/978-981-10-0099-7_5.

Muñoz-Villamizar A., J. Santos, J. R., Montoya-Torres, J. C., Velázquez-Martínez (2020). Measuring environmental performance of urban freight transport systems: A case study. *Sustainable Cities and Society, 52*, 101844. doi: 10.1016/j.scs.2019.101844.

Nagatsu, M. (2015). Social nudges: Their mechanisms and justification. *Review of Philosophy and Psychology*, *6*(3), 481–494. doi: 10.1007/s13164-015-0245-4.

Nguyen, D. H., de Leeuw, S., Dullaert, W., & Foubert, B. P. J. (2019). What is the right delivery option for you? Consumer preferences for delivery attributes in online retailing. *Journal of Business Logistics*, *40*(4), 299–321. doi: 10.1111/jbl.12 210.

Paddock, J. (2017). Household consumption and environmental change: Rethinking the policy problem through narratives of food practice. *Journal of Consumer Culture*, *17*(1), 122–139. doi: 10.1177/14695 40515 586869.

Papadopoulou, M., Papasolomou, I., & Thrassou, A. (2021). Exploring the level of sustainability awareness among consumers within the fast-fashion clothing industry: A dual business and consumer perspective. *Competitiveness Review, 32*(3), 350–375 doi: 10.1108/CR-04-2021-0061.

Parry, E., & Battista, V. (2019). Generation Z in the UK: More of the same – High standards and demands. In C. Scholz, & A. Rennig (Eds.). *Generation Z in Europe (The changing context of managing people)* (pp. 89–107). Bingley: Emerald Publishing Limited. doi: 10.1108/978-1-78973-491-120191013.

Pellizzoni, L. (2011). Governing through disorder: Neoliberal environmental governance and social theory. *Global Environmental Change*, *21*, 795–803. doi: 10.1016 /j.gloenvcha. 2011.03.014.

Pichert, D., & Katsikopoulos, K. V. (2008). Green defaults: Information presentation and pro-environmental behaviour. *Journal of Environmental Psychology*, *28*, 63–73. doi: 10.1016/j.jenvp.2007.09.004.

Prandtstetter, M., Seragiotto, C., Braith, J., Eitler, S., Ennser, B., Hauger, G., Hohenecker, N., Schodl, R., & Steinbauer, M. (2021). On the impact of open parcel lockers on traffic. *Sustainability, 13*(2), 755. doi: 10.3390/su13020755.

Rai, H. B., Verlinde, S., & Macharis, C. (2019). The next day, free delivery myth unravelled. Possibilities for sustainable last mile transport in an omnichannel environment. *International Journal of Retail & Distribution Management*, *47*(1), 39–54. doi: 10.1108/IJRDM-06-2018-0104.

Ranieri, L., Digiesi, S., Silvestri, B., & Roccotelli, M. (2018). A review of last mile logistics innovations in an externalities cost reduction vision. *Sustainability*, *10*(3), 782. doi: 10.3390/su10030782.

Reckwitz, A. (2002). Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory, 5*(2), 243–263. doi: 10.1177/136843 10222225432.

Rosal, I. D. (2016). Factors influencing the choice of delivery terms used in Spanish seaborne container trade. *International Journal of Shipping and Transport Logistics*, *8*(3), 318–333. doi: 10.1504/IJSTL.2016.076261.

Schubert, Ch. (2017). Green nudges: Do they work? Are they ethical? *Ecological Economics, 132*, 329–342. doi: 10.2139/ssrn.2729899.

Severo, E. A, De Guimarães, J. C. F., & Dorion, E. C. H. (2018). Cleaner production, social responsibility and eco-innovation: Generations' perception for a sustainable future. *Journal of Cleaner Production*, *186*, 91–103. doi: 10.1016/j.jclepro.2018. 03.129.

Shove, E., & Pantzar M. (2005). Consumers, producers and practices. Understanding the invention and reinvention of Nordic walking. *Journal of Consumer Culture 5*(1), 43–64. doi: 10.1177/1469540505049846.

Shove, E., & Walker G. (2010). Governing transitions in the sustainability of everyday life. *Research Policy*, *39*, 471–476. doi: 10.1016/j.respol.2010.01.019.

Smagacz-Poziemska, M., Bukowski, A, & Martini, N. (2020). Social practice research in practice. Some methodological challenges in applying practice-based approach to the urban research. *International Journal of Social Research Methodology*, *24*(1), 65–78. doi: 10.1080/13645579.2020.1760577.

Southerton, D., Warde, A., & Hand M. (2004). The limited autonomy of the consumer: Implications for sustainable consumption. In D. Southerton, H. Chappells & B. Van Vliet (Eds.). *Sustainable consumption: The implications of changing infrastructures of provision* (pp. 32–48). London: Edward Elgar.

Spotswood, F., Chatterton T., Tapp A., & Williams D. (2015). Analysing cycling as a social practice: An empirical grounding for behaviour change. *Transportation Research, Part F:Ttraffic Psychology and Behaviour, 29*, 22–33. doi: 10.1016/j.trf.2014. 12.001.

Statista (2020). Last mile logistics worldwide. https://www.statista.com/study/ 49682/last-mile-delivery/.32–48.

Strambach, S., & Pflitsch, G. (2018). Micro-dynamics in regional transition paths to sustainability – An analysis of organizational and institutional change in Augsburg's transition topology. *Applied Geography*, *90*, 296–307. doi: 10.1016/j.apgeog. 2017.04.012.

Strauss, W., & Howe, N. (1991). *Generations*. New York: William Morrow.

Tadić, S., & Veljović M. (2021). Home delivery: A framework for structuring. *International Journal for Traffic and Transport Engineering, 11*(1), 30–74. doi: 10.7708 /ijtte.2021.11(1).03.

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge*. Penguin.

Thompson, C. J., & Kumar, A. (2018). Beyond consumer responsibilization: Slow Food's actually existing neoliberalism. *Journal of Consumer Culture, 21*, 317–336. doi: 10.1177/ 1469540518818632.

Turku, V., Ari, J., & Pekka, J. (2022). How do time-bound practices initiate local sustainability pathways? *Sustainable Cities and Society*, *79*. 103697. doi: 10.1016/ j.scs.2022.103697.

Van Duin, J. H. R., Wiegmans, B. W., Van Arem, B., & Van Amstel, Y. (2020). From home delivery to parcel lockers: A case study in Amsterdam. *Transportation Research Procedia*, *46*, 37–44. doi: 10.1016/j.trpro.2020.03.161.

Virglerova, Z., Ivanova, E., Dvorský, J., Belas, J., & Krulický, T. (2021). Selected factors of internationalisation and their impact on the SME perception of the market risk. *Oeconomia Copernicana, 12*(4), 1011–1032. doi: 10.24136/oc.2021.033.

Visser E. J., & Lanzendorf M. (2004). Mobility and accessibility effects of B2c e-commerce: A literature review. *Tijdschrift voor Economische en Sociale Geografie, Royal Dutch Geographical Society KNAG, 95(2),* 189–205. doi: 10.1016/j.trpro.2020.03.161.

Welch, D. (2017). Behaviour change and theories of practice: Contributions, limitations and developments. *Social Business*, 7(3-4), 241–261. doi: 10.1362/204440817X 15108539431488.

Welch, D., Swaffield, J., & Evans, D. (2021). Who's responsible for food waste? Consumers, retailers and the food waste discourse coalition in the United Kingdom. *Journal of Consumer Culture, 21*, 236–256. doi: 10.1177/1469540518773801.

Wey Smola, K., & Sutton, C. D. (2002). Generational differences: Revisiting generational work values for the new millennium. *Journal of Organizational Behavior, 23*, 363–382. doi: 10.1002/job.147.

Wilhelm, W. (2009). The relationship between student knowledge of sustainability concepts and product choice. In G. H. Brodowsky & R. A. Lupton (Eds). *MEA 2009 conference proceedings*. Newport Beach: Marketing Educators' Association.

Williams, K. C., & Page, R. A. (2011). Marketing to the generations. *Journal of Behavioral Studies in Business, 5*(1), 1–17.

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94. doi: 10.20982/tqmp.09.2.p079.

Annex

Table 1. Structure of sample

Sex	Age				Sum
	19-34	**35-44**	**45-64**	**65 and more**	
Woman	143	123	172	164	602
Men	136	119	148	105	508
Sum	279	269	242	320	1100

Table 2. Matrix of factor loadings

Variable	Factor 1	Factor 2	Factor 3
Z1 – delivery price	0.75		
Z2 – free return	0.62		
Z3 – delivery security	0.69		
Z4 – delivery speed	0.73		
Z5 – delivery date	0.66		
Z6 – distance to the place of collection	0.59		
Z13 – trust in the supplier	0.70		
Z7 – the weight of the package			0.85
Z8 – the size of the package			0.85
Z9 – environmentally friendly delivery method		0.82	
Z10 – the possibility of returning purchased products in an ecological manner		0.82	
Z11 – restrictions related to the possibility of movement (e. g. related to disability)		0.62	
Z12 – the possibility of changing the place of delivery of products during the delivery		0.56	
Explained variance	3.42	2.51	1.90
Share (%)	26.33	19.32	14.60

Note: Factor loadings below 0.42 have been removed.

Table 3. Eigen-values and singular values in the original and modified versions

K	Eigen-values γ_k	Singular values λ_k	Percentage of inertia λ_k / λ	Cumulative percentage τ_k	Modified eigen-values $\tilde{\lambda}_k$	Percentage of inertia $\tilde{\lambda}_k / \tilde{\lambda}$	Cumulative percentage $\tilde{\tau}_k$
1	**0.6010**	**0.3612**	**16.6685**	**16.6685**	**0.2716**	**23.3466**	**23.3466**
2	**0.5586**	**0.3120**	**14.3990**	**31.0676**	**0.2211**	**19.0097**	**42.3562**
3	**0.4663**	**0.2174**	**10.0354**	**41.1029**	**0.1293**	**11.1130**	**53.4692**
4	**0.4170**	**0.1739**	**8.0239**	**49.1268**	**0.0902**	**7.7542**	**61.2235**
5	**0.4097**	**0.1679**	**7.7481**	**56.8749**	**0.0851**	**7.3128**	**68.5363**
6	0.4071	0.1657	7.6475	64.5224	0.0832	7.1532	75.6894
7	0.3891	0.1514	6.9894	71.5119	0.0713	6.1271	81.8165
8	0.3654	0.1335	6.1637	77.6755	0.0569	4.8907	86.7072

Table 3. Continued

K	Eigen-values γ_k	Singular values λ_k	Percentage of inertia λ_k / λ	Cumulative percentage τ_k	Modified eigen-values $\tilde{\lambda}_k$	Percentage of inertia $\tilde{\lambda}_k / \tilde{\lambda}$	Cumulative percentage $\tilde{\tau}_k$
9	0.3522	0.1241	5.7267	83.4023	0.0496	4.2632	90.9704
10	0.3229	0.1043	4.8128	88.2151	0.0352	3.0222	93.9926
11	0.3218	0.1035	4.7784	92.9935	0.0346	2.9775	96.9702
12	0.2998	0.0899	4.1474	97.1408	0.0255	2.1929	99.1631
13	0.2489	0.0619	2.8592	100.0000	0.0097	0.8369	100.0000

$$\tilde{\lambda}_k = 1.0000$$

Table 4. Green nudges and suggestions for last mile delivery

Types of green nudges	Suggestions for last mile delivery
Disclosure of costs	Providing information on the environmental costs associated with each delivery option
Eco-labelling	Branding various delivery methods according to their environmental impact (i.e. as a traffic light system)
Ecological priming	Providing environmental information about various delivery methods by e-commerce companies in the delivery section on their websites
Default options	Opt-in/out: green delivery as a default option
Active choice	Forcing households to choose between a green or fast delivery without a default option
Social norms	Providing households with information about the average environmental impact of the delivery method selected in their neighborhood
Modeling	Providing an example for people to aspire to or imitate, i.e. eco-celebrity
Incentivise greener choices	Developing incentives and "choice architecture" that encourage consumers to receive deliveries in more sustainable ways
Increase ease	Removing barriers or reducing the perceived consequences of making a choice, i.e. reduced cost of a regular delivery compared to the instant option, reduced risk of regular delivery of a perishable product by using a safer packaging, etc.

Source: own elaboration based on Boruchowicz (2022), Evans *et al.* (2017), Michie *et al.* (2011), Accenture (2021).

Figure 1. Presentation of the results of correspondence analysis