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PREFERENCES OF THE YOUNGER GENERATION IN THE SUSTAINABLE DEVELOPMENT OF LAST-MILE LOGISTICS

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Purpose: Consumer behavior is one of the most volatile factors influencing the development of services, businesses, and so on. The purpose of article is to examine the extent to which innovation and environmental considerations shape the younger generation's consumer behavior in the context of sustainable last-mile logistics.
Design/methodology/approach: The identified research gap pertains to the limited knowledge and research findings regarding the aspects of innovation and environmentalism that shape the awareness and preferences of the younger generation. A survey conducted using the CAWI method in 2025 among 335 young respondents.
Findings: The survey found that young people have a positive attitude (68%) toward eco-friendly deliveries, but view modern solutions such as drones and robots (79%) and subsidies for eco-friendly solutions negatively.
Research limitations/implications: A limitation of the study is the younger generation's low environmental awareness and lack of knowledge about alternative delivery methods.
Practical implications: The findings of this article can help logistics companies and the e-commerce sector adapt their delivery models to the expectations of young consumers by developing eco-friendly and innovative distribution solutions.
Social implications: The development of sustainable last-mile logistics solutions can help reduce the negative environmental impact of transportation and raise public awareness of responsible consumption and environmental protection.
Originality/value: The value lies in combining the challenges of last-mile logistics with an analysis of the preferences of the younger generation of consumers in the context of innovation and the sustainable development of operational efficiency in deliveries.
Keywords: innovations, young consumer generation, ecology, last-mile logistics, consumer preferences.
Category of the paper: Research paper.

1. Introduction

Logistics is one of the fundamental areas of operation for modern businesses, responsible for organizing and coordinating the flow of goods, services, and information in economic processes from the point of production to the final recipient. Carrying out these tasks requires maintaining high-quality service, the rational use of resources, and cooperation among many market participants, such as raw material suppliers, manufacturers, logistics operators, and distributors. The result is a complex system of organizational and process-related links known as the supply chain, the efficiency of which significantly impacts the competitiveness of enterprises.

Current economic conditions, including advancing globalization, the development of digital technologies, and rising customer expectations, necessitate the continuous improvement of logistics processes. This is particularly evident in the e-commerce services sector, where the rapid growth in online orders is driving an increasing demand for fast and reliable deliveries. In this context, last-mile logistics is becoming increasingly important; it encompasses the final phase of the distribution process, which involves delivering a shipment from a local distribution hub directly to the end recipient. This stage is considered one of the most complex elements of the logistics system, as it is often carried out in densely urbanized areas, involving a large number of individual deliveries and high service quality requirements. At the same time, in response to the growing scale and complexity of distribution processes, logistics companies are implementing a variety of solutions to streamline delivery operations. These include, among other things, the use of modern IT systems supporting the planning and optimization of transport routes, the development of infrastructure enabling the pickup of shipments outside the recipient's place of residence, as well as the implementation of innovative transport technologies. Among the solutions used, parcel lockers and pickup points are playing an increasingly important role, as they help increase the flexibility of the delivery process and reduce the number of failed delivery attempts (Galkin et al., 2018). At the same time, the development of these solutions is increasingly being analyzed in the context of sustainable development, which includes, among other things, reducing the negative impact of transportation on the environment and making more efficient use of urban infrastructure.

The direction of development for modern logistics systems is largely determined by changing consumer behavior. Younger generations of market users play a particularly significant role in this regard, especially members of Generations Y and Z, who operate in an environment marked by rapid advancements in digital technology and widespread internet access. A high level of digital literacy, frequent use of online shopping, and greater awareness of social and environmental issues mean that the preferences of this group of consumers can significantly influence how distribution processes are organized. In particular, there is a growing interest in solutions that enhance the convenience of package delivery while simultaneously reducing the negative environmental impact of transportation.

Given the above circumstances, it is reasonable to gain a deeper understanding of the younger generation's preferences regarding last-mile logistics solutions. The purpose of this article is to examine the extent to which innovation and environmental considerations shape the younger generation's consumer behavior in the context of sustainable last-mile logistics. Despite the rapid growth of research on last-mile logistics and consumer behavior, particularly in e-commerce, a research gap remains, as the impact of environmental factors and innovative logistics solutions on the preferences of the younger generation of consumers has not been sufficiently explored. Previous studies have focused mainly on the operational efficiency of deliveries, cost optimization, or the development of logistics infrastructure, while to a limited extent analyzing the level of awareness among Generations Y and Z regarding the sustainable development of last-mile logistics and their willingness to accept eco-friendly and alternative forms of delivery.

2. Supply chain

Logistics is one of the key areas of modern business operations, responsible for planning, executing, and controlling the flow of goods, services, and information in economic processes (Cooper, Ellram, 1993). Its primary task is to ensure the efficient movement of products from their point of origin to the end recipient, while maintaining high-quality service and optimizing costs (Soler, 2024). Logistics operations encompass several core functions, primarily including transportation, warehousing, inventory management, and customer service (Gołembska, 2009). The execution of these logistics functions requires the coordination of activities among numerous entities involved in the process of delivering products to the market. These include, among others, raw material suppliers, manufacturers, logistics operators, distributors, and trading companies. The cooperation of these entities leads to the creation of a complex system of interconnections known as the supply chain. This concept refers to an integrated system of organizations and processes aimed at the efficient delivery of a product or service to the end customer. In addition to the flow of physical goods, the flow of information also plays a significant role, as it enables the coordination of activities among the various participants in the system

Today, the efficiency of supply chains (Szudrowicz, Ciesielski, 2003) is one of the most important factors influencing a company's competitiveness. In the context of economic globalization, intensifying competition, and rising customer expectations, organizations are compelled to continuously improve their logistics processes. This is because deliveries are expected to be fast, reliable, and flexible, allowing for adaptation to changing market needs. An effective supply chain should ensure a high level of customer service while reducing operating costs and minimizing waste of time and resources (Coyle et al., 2002). The drive to

increase supply chain efficiency is achieved through the implementation of various optimization measures. These include, among other things, shortening order fulfillment times, improving inventory management systems, eliminating unnecessary logistics operations, and reducing delays in the flow of goods. An important element of these efforts is also improving cooperation among business partners participating in the supply chain (Dos Santosa, Alcantary, 2015). Modern companies are also increasingly introducing changes in work organization and modifying their business models so that they better respond to dynamic market conditions. Examples include management concepts based on process integration, outsourcing of logistics services, and the development of partnerships among market participants. Technological innovations play a particularly important role in the process of improving supply chains. The ongoing digitization of the economy enables the use of advanced IT systems that support the planning, monitoring, and analysis of logistics processes. These tools allow for real-time tracking of the flow of goods, the collection and analysis of operational data, as well as the coordination of activities among individual supply chain participants in real time. As a result, companies can respond more quickly to changes in demand, minimize the risk of disruptions, and make more accurate strategic decisions. The implementation of innovations also includes the automation of warehouse processes, the development of intelligent transport systems, and the use of technologies supporting information management.

One area of logistics where the importance of operational efficiency is particularly evident is the CEP (courier, express, parcel) industry. This sector focuses on the fast and reliable delivery of shipments to end recipients and plays an increasingly important role in the functioning of the modern economy (Gulc, 2020; Kawa 2017). The dynamic growth of e-commerce, increasing consumer mobility, and changing purchasing preferences mean (Foltyński, 2016) that the demand for courier services is steadily rising. Customers expect not only short delivery times but also high flexibility in choosing the delivery method and the ability to track the status of their shipment.

The courier sector is growing rapidly, particularly on three continents: North America, Europe, and Asia. The most popular delivery method is parcel lockers (86 percent), the number of which is steadily increasing. Direct delivery to the home or workplace ranks second, followed closely by delivery to a partner location. All of these services are offered by courier companies operating in the Polish market (REE, 2024).

As a result, so-called “last-mile logistics”—the final stage of the delivery process, involving the transport of a shipment from a local distribution center directly to the recipient—takes on particular importance. This stage is considered one of the most demanding elements of the entire supply chain, as it involves the need to complete many individual deliveries in a short time and often under conditions of limited transportation infrastructure. At the same time, it is precisely at this point that direct contact between the company and the customer occurs, which means that the quality of delivery has a significant impact on the perception of the entire service.

3. Last-mile logistics

Last-mile logistics refers to the final stage of the distribution process, in which a product is transported from the last link in the supply chain (most often a distribution center, warehouse, or transshipment point) directly to the end customer. It is one of the most demanding and costly elements of the logistics system, and at the same time a stage of critical importance for assessing the quality of customer service. In practice, it is the moment of order delivery that constitutes the direct point of contact between the company and the consumer; therefore, the manner in which the delivery is carried out influences the level of customer satisfaction (Pluta-Zaręba, Rutkowski, 2005), their brand loyalty, and the overall perception of the quality of logistics services.

The importance of last-mile logistics has grown significantly, particularly with the rapid expansion of e-commerce. The rising number of online orders is placing greater strain on distribution systems and necessitating the adaptation of logistics processes to meet new consumer expectations. Customers increasingly demand short order fulfillment times, the ability to choose a convenient delivery date, and real-time tracking of their shipments. As a result, logistics companies are forced to seek solutions that increase operational efficiency while maintaining a high level of service.

Last-mile deliveries are most often entrusted to CEP (courier, express, parcel) operators, who specialize in handling courier and parcel shipments. However, operating in an urban environment means that this process involves numerous organizational challenges. High levels of urbanization, limited parking spaces, narrow streets, and heavy traffic make deliveries time-consuming and generate significant operational costs. For this reason, last-mile logistics is considered one of the most complex elements of the entire supply chain. Transportation in the final stage of distribution can be carried out using various modes of transport. Delivery vans are the most commonly used, but in urban areas, courier bicycles, scooters, and electric vehicles are also being used more and more frequently. Innovative solutions, such as the use of drones or autonomous delivery robots, are also emerging in the literature and in logistics practice. Depending on the nature of the shipment, specialized services are also utilized, including, for example, white-glove delivery of high-value products, transport of temperature-controlled goods, or the delivery and installation of electronic equipment (PanattoniEurope, 2024). One of the most significant challenges facing logistics companies is reconciling high customer expectations with the need to optimize operating costs (Gupta, Agrawal, 2018, Joshi, Rahman, 2015). In response to these needs, numerous innovative technological solutions are being implemented to support logistics process management. These include, among others, the use of eco-friendly modes of transport, systems for planning and optimizing delivery routes, analytical tools enabling demand forecasting, as well as applications allowing customers to track shipments in real time. The use of modern IT systems enables better coordination of couriers'

work, shorter order fulfillment times, and fewer operational errors (SAP, 2022), as well as improved customer satisfaction and a reduced environmental impact of logistics operations (Olkiewicz, Dyczkowska, 2025a). The use of modern IT systems enables better coordination of couriers' work, shorter order fulfillment times, and fewer operational errors, as well as improved customer satisfaction and a reduced environmental impact of logistics operations. As a result, last-mile logistics is becoming one of the key areas of development in modern logistics systems, integrating organizational, technological, and social elements.

Another significant challenge in last-mile logistics is the issue of failed delivery attempts. During standard courier operating hours, many recipients are at work, in educational institutions, or away from home, which makes direct delivery difficult. Additionally, broad delivery time windows and a lack of precise information about the delivery time can lead to the need for redelivery, increasing costs and extending the time required to complete the service. One solution designed to streamline the distribution process is "out-of-home" (OOH) delivery. This model involves routing packages to PUDO (pick-up/drop-off) locations selected by the customer or to APM (automated parcel machines). This solution allows recipients to pick up their packages at a time convenient for them, often within several days of delivery to the point. Consolidating shipments in a single location simultaneously reduces the number of courier trips, minimizes vehicle stops, and cuts operational costs. Parcel machines play a special role in the development of the OOH delivery model, functioning as local micro-distribution centers. In 2024, the number of APM locations for some operators stood at: 2000 for DHL; 21,969 for InPost; 1000 for Poczta Polska; and 6530 for DPD (Last Mile Experts, 2024). These devices enable 24/7 pickup and drop-off of shipments, which significantly increases the convenience of using logistics services. At the same time, PUDO points are also being developed, located, among other places, in stores, service points, kiosks, and gas stations. For example, in 2024, the number of points included: 10,000 at Żabka; 6000 at Orlen Paczka; 16,000 Poczta Polska, 3714 InPost, 19,723 DPD, and 18,500 DHL (Last Mile Experts, 2024). The popularity of parcel lockers is linked to the growth of online shopping. Some companies in the CEP sector offer their own parcel lockers for package pickup. Referring again to the 2023 Gemius report, the most frequently chosen parcel lockers by consumers making online purchases were identified. The most common and unrivaled choice among recipients is the parcel lockers of the Polish company InPost, accounting for as much as 95 percent. Second and third place go to ORLEN Paczka (23 percent) and Allegro One Box (22 percent), which are similarly preferred by consumers. Their location in places frequently visited by consumers allows for easy integration of package pickup with daily activities.

The growth of parcel pickup points helps improve the efficiency of last-mile logistics, but it also involves a partial shift of logistical responsibility to the recipient. Instead of receiving a package directly in person, the customer picks it up themselves from a selected pickup point or parcel locker. As a result, they become an active participant in the logistics process, which in the traditional model was handled entirely by the operator. The growth of out-of-home

delivery models, parcel lockers, and route optimization systems indicates that the future of last-mile logistics will increasingly rely on integrating technological innovations with the needs of modern consumers (Korneta, Lotko, 2021).

4. Consumer behavior among the younger generation

The contemporary consumer market is a significant area of scientific research, as purchasing decisions made by various social groups reflect their values, attitudes, needs, and expectations regarding goods and services (Borgardt, 2017). Analyzing consumer behavior allows us not only to understand the mechanisms of purchasing decisions but also to identify trends in the economy and society (Garoui, Jarboui, 2012). Of particular importance in this context are younger generations of consumers, who are increasingly shaping the contemporary market through their preferences, lifestyles, and use of new technologies.

Consumer behavior is the result of the interaction of many factors, both internal and external. On the one hand, it is shaped by changes in the socioeconomic, technological, and cultural environment; on the other hand, it is influenced by the individual needs and expectations of consumers seeking to maximize their satisfaction with their purchases. Consumption is understood as the process of acquiring and using goods and services to satisfy specific needs of an individual or household. This phenomenon is analyzed in many academic disciplines, including economics, sociology, and psychology, as it encompasses economic, social, and cultural aspects (McCrindle, Wolfinger, 2014; Rauvola et al., 2019).

Today, consumption also serves a communicative and informational function within the market system. On the one hand, it is an element of consumerism, which supports the development of competition, globalization, and technological innovation; on the other hand, it is associated with consumerism, which emphasizes the importance of an individual's needs, emotions, and aspirations in purchasing processes (Olkiewicz, Dyczkowska, 2025). Information generated by consumer behavior allows companies to better align their marketing strategies and product offerings with market expectations. The purchasing decision-making process is complex and involves several key components. The first is the cognitive aspect, related to existing knowledge, experience, and information obtained from various sources, such as the media, websites, or other users' reviews. The second element is the behavioral aspect, which refers to actual purchasing actions resulting from rational calculations, habits, or impulses. The third factor is the emotional dimension, encompassing feelings and attitudes that influence the evaluation of products, brands, or shopping experiences. The interaction of these elements makes consumer behavior multidimensional and difficult to predict with certainty (Janoś-Kresło, Mróz, 2006; Perchla-Włosik, Wardzała, 2015). The literature on the subject also points to a wide range of determinants influencing buyer behavior. The most

frequently analyzed include demographic factors (e.g., age, gender, education level, or place of residence), economic factors related to income level and purchasing power, social factors resulting from membership in specific groups or value systems, as well as technological, psychological, and legal factors (Błoński et al., 2023; Mazurek-Łopacińska, Sobocińska, 2018; Sobczyk, 2018; Fandrejewska, 2017). Technological determinants have gained particular significance in recent years, linked to the development of the internet, mobile devices, and digital communication channels, which have significantly changed the way people search for product information and complete purchasing transactions (Kucner et al., 2018).

Given the high complexity of consumer processes, researchers have developed various models to explain buyer behavior, such as the Howard-Sheth model and the Nicosia model (Aziewicz, 2023). These models take into account both individual factors and the influence of the market environment, highlighting the dynamic nature of consumer decision-making processes. The diversity of factors influencing purchasing decisions makes the analysis of consumer behavior a broad field of research, enabling the identification of market trends and changes in the structure of demand (Kotler et al., 2024; Kucner et al., 2018). Research on consumption currently focuses particularly on the younger generation of consumers, which primarily includes Generation Y (so-called millennials) and Generation Z. These groups are distinguished by a different approach to technology, communication, and lifestyle, which also influences their market behavior. Members of Generation Y grew up during a period of rapid development in digital technologies and the internet, which is why they are often referred to as "digital natives." Access to a vast amount of information and the rise of social media have significantly influenced how they seek information about products and services. Consumers in this group are typically well-informed, open to innovation, and aware of the importance of social and ethical values in business operations (Plichta, Pyżalski, 2013; Hennelly, Schurman, 2023; Korczyk-Ulman, 2023; Suvalova et al., 2021; Parzonko, 2015; Drzewiecki, Głębicka-Giza, 2018; Rudolph et al., 2018; Czarnecka, 2018; Biesbroek et al., 2010; Hagen et al., 2016; Cecchin et al., 2021; Hariram et al., 2023).

Another group of young consumers is Generation Z, which grew up in a fully digital environment. Unlike previous generations, these individuals have been active on the internet and social media from a very young age, which influences how they communicate, acquire knowledge, and make purchasing decisions. Social media, video platforms, and influencer recommendations play a significant role in shaping opinions about products and brands. At the same time, research indicates that members of Generation Z are paying increasing attention to ethical, social, and environmental issues, which translates into the growing importance of corporate social responsibility initiatives in shaping purchasing decisions (Cochoy et al., 2020; Morris, 2021)

It is also worth noting that young consumers (Generations Y and Z) are highly active in the digital environment and tend to search for product information online. The purchasing process often begins with analyzing other users' reviews, comparing offers, or following

recommendations on social media (Parzonko, 2015). At the same time, younger generations show greater openness to new forms of consumption, such as online shopping, resource sharing, and the use of digital services. Their purchasing decisions are strongly linked to the development of digital technologies, market globalization, and growing social and environmental awareness (Joshi, Rahman, 2015).

5. Methods

The efficient flow of materials within a specified timeframe and at a specific cost is crucial in an era of growing use of modern tools by end-users, particularly the younger generation. Consumer behavior shapes the scale and pace of consumption, which in turn affects the efficiency of logistics systems. The aim of this article is to examine the extent to which aspects of innovation and ecology shape the consumer behavior of the younger generation in the sustainable development of last-mile logistics. The research gap lies in the lack of knowledge and research findings regarding the aspects of innovation and ecology that shape the state of awareness and consumer preferences of the younger generation. The following research hypotheses were formulated for the purposes of this study:

- H1. The younger generation of consumers is aware of the need to implement innovative solutions in logistics.
- H2. The younger generation tends to prefer eco-friendly delivery methods.

The choice of the research method was deliberate because it ensured the respondents' anonymity, the low cost of conducting the research, and in particular easier access to a large number of recipients, in this case the young generation. The research tool was a survey questionnaire, which, in addition to the customer's personal data, included a group of questions related to: identifying preferences for delivery methods and times, perceptions of innovation and environmental friendliness in modern logistics solutions (including those not yet implemented), cost-effectiveness, and quality. Important to the study was the quick and easy distribution method, which allowed for word-of-mouth access to a broader group of participants on platforms, portals, and thematic groups related to the broadly understood world of shopping, e-commerce, environmental protection, and logistics. A limitation is the lack of direct verification of the respondent and the possibility (sometimes necessary) of re-answering in the event of uncertainty or misunderstanding.

The results of a CAWI survey conducted in 2025 among 335 young respondents (including 31% from Generation Y and 69% from Generation Z) revealed variations in the perception of the importance of factors influencing conscious consumption within the context of sustainable last-mile logistics. The survey included 50% women, 47% men, and 2% who did not wish to specify their gender. The largest group of respondents (38%) came from urban areas with

100,000 to 500,000 residents, followed by 27% representing areas with over 500,000 residents. 21% were respondents from towns (21,000-99,000 residents), 4% from towns with up to 20,000 residents, and as many as 10% of respondents represented rural areas. The respondents' educational levels varied, with 58% holding a college degree, 38% a high school diploma, and 4% a vocational diploma.

6. Results and Discussion

In order to better understand the consumer behavior of young people, it is important to determine how often they make online purchases. As many as 61% of respondents indicated that they shop online regularly (several times) a month, 17% indicated sporadically (a few times) a week, and as many as 22% of respondents indicated less than once a month. When analyzing the younger generation of consumers operating in the rapidly evolving e-commerce environment, they are increasingly guided by various conveniences within last-mile logistics, ensuring comfort, speed, and the ability to choose a convenient delivery date and method. The survey revealed an uneven distribution of responses regarding delivery preferences, as 59% chose a parcel locker (APM), 22% opted for home delivery, and 19% selected a local store pickup (PUDO).

The results indicate that the younger generation expects flexibility in line with their lifestyle, as clearly demonstrated by the growing popularity of a solution that offers convenience, eliminates the need to interact with a delivery person, and allows for pickup at a convenient time of day (Fig. 1).

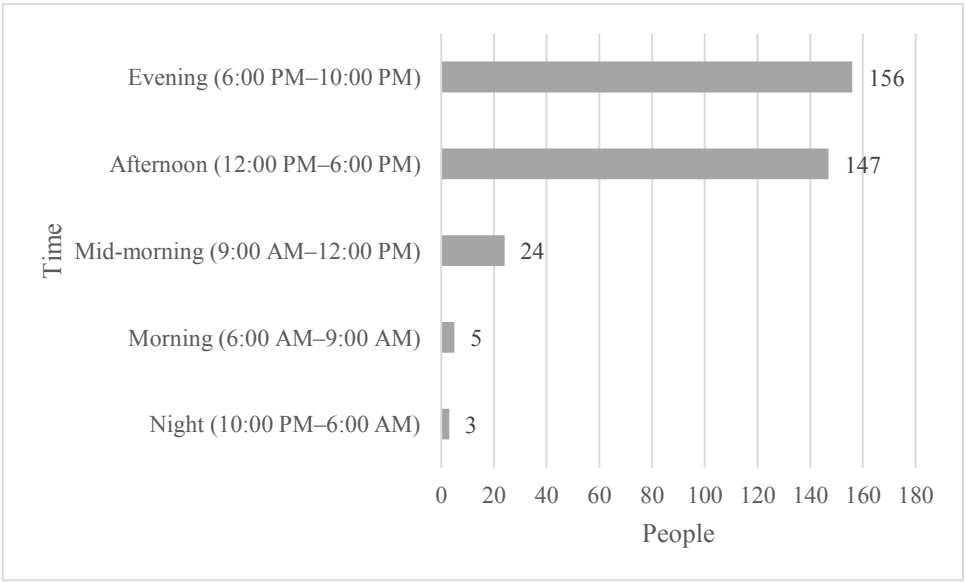

Figure 1. The most convenient time slot for package pickup.

The survey found that as many as 34% of respondents "always" use a parcel locker, 60% "often" while 2% said "rarely" and 4% of respondents said "don't know—can't say", 4% of respondents. This may indicate that the younger Generations Y and Z prioritize values such as sustainability, innovation, convenience, and safety. The ability to pick up a package at a time and place convenient for the customer, in a monitored location secured by an access code, allows customers to shape their requirements and expectations of potential product suppliers. This confirms Hypothesis 1. At the same time, existing conveniences are driving companies to develop innovative technological tools and solutions related to sustainable transport, particularly in the area of last-mile logistics. An analysis of the literature and the results of the study indicate that public awareness and corporate social responsibility in the area of environmental protection are growing through the implementation of innovative eco-friendly solutions in the context of order fulfillment, thereby shaping consumer preferences.

The first step toward environmental sustainability is utilizing the OOH delivery model, which reduces the frequency of courier visits caused by the recipient's absence at the designated delivery location (home), directly leading to lower exhaust emissions and a reduced carbon footprint. Another common practice is the use of an innovative solution such as real-time package tracking, which 38% of respondents always use, 47% sometimes use, 13% rarely use, and 2% never use. The survey showed that young people have a positive attitude (68%) toward deliveries via eco-friendly transport (car, bicycle, scooter); 14% of respondents have a negative attitude, and 17% have not formed an opinion, thereby confirming Hypothesis 2. This attitude among Generations Y and Z, despite their openness to modern solutions, has influenced their willingness to use deliveries via robot or drone. In practice, these solutions provide a sense of security and guarantee it, which is particularly important because "security of supply" is a key factor in the younger generation's online shopping preferences. (Fig. 2).

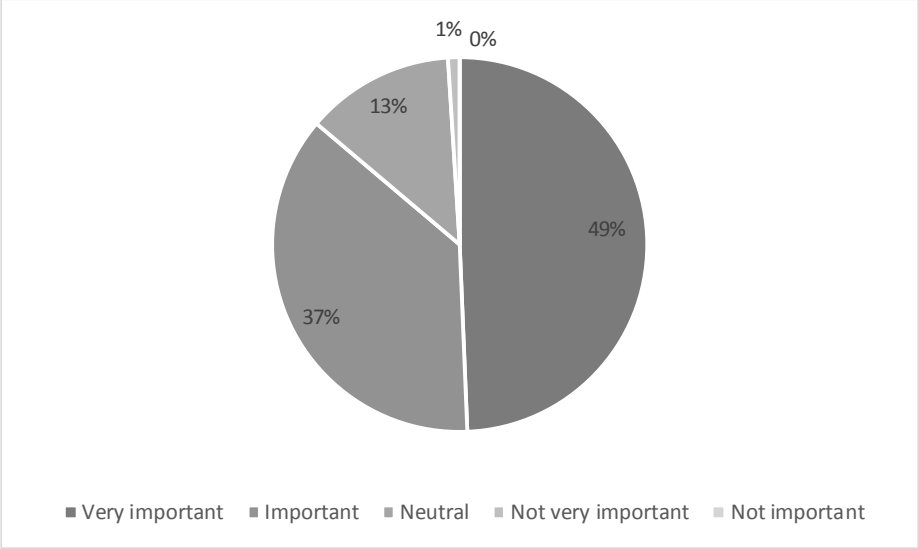

Figure 2. Security of supply as a preference for sustainable supply.

The survey revealed that only 12% of respondents have a positive attitude toward modern logistics solutions (with only 5% answering a decisive "yes"), 9% were undecided, and as many as 79% expressed a negative view. This distribution of responses indicates that although autonomous delivery technologies are perceived as innovative, their acceptance among the younger generation is still in its infancy and may stem from a lack of knowledge, trust, or experience with such delivery methods. Customers likely need more information, demonstrations of effectiveness, and assurances of safety before they accept such solutions as a viable alternative to traditional delivery methods. There was also a negative attitude among respondents (as high as 75%, including 56% who strongly said "no") toward the option of paying extra for delivery via eco-friendly transportation. Thirteen percent of respondents answered positively, and 12% were undecided.

Thanks to the ever-expanding opportunities for online shopping and the growing popularity of mobile devices with Internet access, mobile commerce, known as m-commerce, has emerged (Sarkar et al., 2020, p. 286). This form of commerce is treated as a new channel, though in practical terms it still pertains to online distribution (Skorupska, 2017, p. 26). It is generally described as one of the components of online commerce, though in exceptional cases it is treated separately, depending on the context. Modern e-commerce solutions utilize advanced technologies that streamline online shopping and enhance the customer experience.

Nevertheless, the survey results indicate that the younger generation, when considering various delivery options, including eco-friendly ones, in the context of sustainable delivery practices, tends to be rather skeptical despite the significant climate changes felt in recent years (Fig. 3).

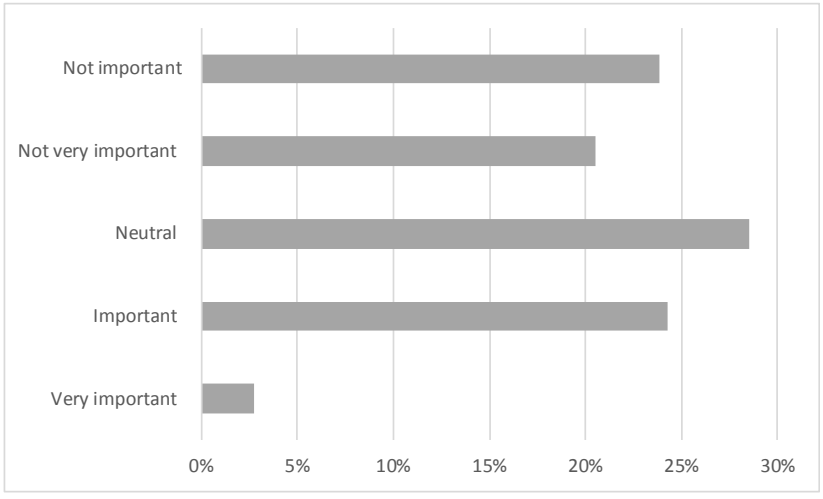

Figure 3. Preference for an eco-friendly solution as part of a sustainable supply chain.

Therefore product offerings are personalized and tailored to customers' needs. Data analysis facilitates this process by, among other things, tracking user behavior online. Social media commerce enables interaction and the exchange of opinions. An important element in this process is the security of both the buyer and the seller. Modern tools make online commerce more tailored to users and ensure adequate data protection.

An analysis of the results indicates that the younger generation is aware of the importance of environmental protection, but the idea of paying additional fees for this type of service is viewed negatively. This may mean that, given the high frequency of online shopping, the environmental aspect will not be as significant. Furthermore, a low level of skepticism or a lack of confidence in innovative transportation solutions may limit their development, while improving operations within the PUDO and APM frameworks.

7. Summary

Recent years have seen dynamic development in the e-commerce industry. Despite the growing demand for effective and flexible logistics solutions, particularly in last-mile delivery, analytical research in Poland and abroad is limited. Limited access to analytical data prevents in-depth comparative studies that would identify best practices or effective solutions. A few studies indicate that the expectations of young generations Z and Y, heightened by the era of digitalization, globalization, and consumerism, shape purchasing behaviors, including delivery methods and environmental awareness, which directly impacts the development directions of companies in the CEP sector. The aim of this article was to examine the extent to which aspects of innovation and ecology shape the consumer behavior of the young generation in the sustainable development of last-mile logistics. The results of this study, which fall within the research area of "Management and Quality Sciences" and other disciplines, indicate that the preferences of the young generation in delivery, particularly the last mile, are shaped by delivery methods such as parcel lockers (APM) and pickup points (PUDO). The data obtained confirms this trend presented in the "E-commerce in Poland 2022" report (Gemius, 2022). A key aspect of the study was the environmental aspect, which is becoming increasingly important in sustainable delivery solutions. This is particularly evident in the context of delivery methods, as they are most often perceived (defined) through the prism of cost. This finding was confirmed when respondents did not have to incur additional costs and chose (or were willing to choose) an eco-friendly mode of transport; otherwise, environmental considerations were irrelevant. The study also found that modern delivery methods have not yet gained widespread acceptance among young consumers. Nevertheless, last-mile logistics is an area that will evolve in close connection with consumer preferences, technological developments, and economic conditions. Therefore, a multi-faceted comparative analysis across EU countries should be conducted in the future.

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