Scientific Journal of Silesian University of Technology. Series Transport
Zeszyty Naukowe Politechniki Śląskiej. Seria Transport

Volume 129 **2025**

p-ISSN: 0209-3324

e-ISSN: 2450-1549

DOI: https://doi.org/10.20858/sjsutst.2025.129.8

Journal homepage: http://sjsutst.polsl.pl

Article citation information:
Koźlak, A., Iwaszko, D. Determinants of customer satisfaction in on-demand food delivery: the role of last-mile logistics. *Scientific Journal of Silesian University of Technology. Series Transport*. 2025, **129**, 131-145. ISSN: 0209-3324.
DOI: https://doi.org/10.20858/sjsutst.2025.129.8

Aleksandra KOŹLAK[1], Dominik IWASZKO[2]

DETERMINANTS OF CUSTOMER SATISFACTION IN ON-DEMAND FOOD DELIVERY: THE ROLE OF LAST-MILE LOGISTICS

Summary. This study investigates the determinants of customer satisfaction with on-demand restaurant food delivery services, focusing on last-mile logistics factors. The research aims to identify which service characteristics most significantly influence customer satisfaction levels and usage patterns in the rapidly growing food delivery sector. An empirical study was conducted using a custom-designed online questionnaire distributed via the CAWI method through Google Forms. Data were collected from 335 respondents in Poland who actively use food delivery platforms to order restaurant meals. The findings revealed that key factors influencing platform selection include a wider restaurant choice, promotions and discounts, and lower delivery costs. Customer satisfaction levels remain generally positive, with delivery time and app usability receiving the highest satisfaction ratings. The findings provide actionable insights for food delivery platforms regarding service optimization priorities, particularly emphasizing the importance of delivery reliability, cost transparency, and restaurant variety. This research addresses a gap in empirical literature by examining the relationship between last-mile logistics performance and customer satisfaction in on-demand food delivery services.

[1] Faculty of Economics, University of Gdansk, ul. Armii Krajowej 119/121, 81-824 Sopot, Poland. Email: aleksandra.kozlak@ug.edu.pl. ORCID: https://orcid.org/ 0000-0003-4127-6911
[2] Faculty of Economics, University of Gdansk, ul. Armii Krajowej 119/121, 81-824 Sopot, Poland. Email: d.iwaszko.639@studms.ug.edu.pl. ORCID: https://orcid.org/0009-0002-3526-9707

Keywords: last-mile logistics, on-demand food delivery, customer satisfaction, food delivery platforms, delivery services, consumer behavior

1. INTRODUCTION

Consumer trends in the logistics industry have been significantly influenced by the growing popularity of e-commerce in recent years. Consumer lifestyle research shows that patterns of meal preparation and consumption have also changed. An increasingly intensive lifestyle has been observed; therefore, consumers seek convenience—they reach for semi-processed products that have already undergone preliminary processing, ready meals, meal replacements, or use restaurant services or catering companies [17].

The rapid digitalization of consumer markets has fundamentally transformed traditional food service industries, with on-demand food delivery emerging as one of the most dynamic sectors in contemporary e-commerce. This transformation has been particularly accelerated by changing consumer lifestyles, urbanization trends, and the global impact of the COVID-19 pandemic, which significantly altered dining behaviors and accelerated the adoption of digital food ordering platforms [25]. In subsequent years, consumer habits have remained consistent, as evidenced by the expansion of this business model.

Last-mile logistics in food delivery present unique challenges that distinguish them from other e-commerce sectors. The perishable nature of food products, time-sensitive delivery requirements, temperature maintenance needs, and the expectation for real-time tracking create a complex operational environment [13]. These challenges are further compounded by urban density issues, traffic congestion, and the need to coordinate multiple simultaneous deliveries while maintaining service quality standards. From an economic perspective, last-mile delivery represents the most cost-intensive component of the food delivery value chain, often accounting for a substantial portion of operational expenses [3].

Despite the growing importance of this sector, there remains a significant gap in comprehensive empirical research examining the relationship between last-mile logistics performance and customer satisfaction in the context of on-demand food delivery. While existing studies have explored various aspects of e-commerce logistics and consumer behavior separately, limited research has specifically investigated how delivery service characteristics influence customer satisfaction levels and usage patterns in the food delivery domain [9]. Our study addresses this research gap by examining the determinants of customer satisfaction with on-demand restaurant food delivery services, with particular emphasis on last-mile logistics factors. Through empirical analysis of consumer experiences and preferences, this research aims to identify the most critical factors influencing satisfaction levels and understand how demographic characteristics and usage patterns interact with service quality perceptions.

The findings of this research have significant implications for multiple stakeholders in the food delivery ecosystem. For delivery platforms, understanding satisfaction drivers can inform strategic decisions regarding service optimization and resource allocation. For restaurants participating in delivery networks, these insights can guide partnership strategies and service quality investments. From an academic perspective, this study contributes to the growing body of literature on digital commerce logistics and consumer behavior in technology-mediated service environments.

The structure of this article is as follows: a comprehensive literature review that examines existing research on last-mile logistics and customer satisfaction in food delivery services, followed by the presentation of research questions and hypotheses derived from theoretical

foundations. The methodology section details the empirical approach employed, including data collection procedures and analytical techniques. The analysis and results section presents findings from the empirical investigation, followed by a discussion of implications and conclusions that synthesize the research contributions and suggest directions for future research.

2. LITERATURE REVIEW

The dynamic growth of e-commerce across key economic sectors has brought increasing pressure to last-mile logistics, particularly in densely populated urban areas worldwide. The term 'last-mile delivery' refers to all logistics activities associated with the delivery of customer orders to private households in urban areas [4, 20]. Piecyk et al. [15] understand the concept more broadly as the final commercial transport stage in the supply chain of goods purchased online by consumers, where the final point of delivery is the location nominated by the consumer, which could be their home, workplace, or another place from which the consumer collects the goods. Tiwapat et al. [21] outline that last-mile delivery is the final leg of a business-to-customer delivery service, during which the consignment is delivered either to the recipient's home or to a collection point. Last-mile logistics includes services such as home grocery delivery from a local store, on-demand food from restaurants and package delivery by a courier carriers.

Last-mile delivery is an important aspect of contemporary logistics that directly affects operational costs, efficiency, and customer satisfaction. Although the last-mile is the final and shortest segment of the journey, it is the most expensive and the most challenging one for implementation [24, 12]. Last-mile delivery can take place in two ways: through home delivery or pick-up points (Fig.1).

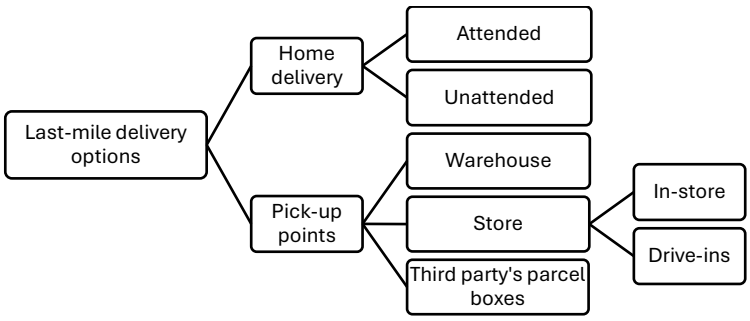

Fig. 1. Online delivery options [22]

Home delivery has been practiced for many years. In this case, the delivery time slot is particularly important when the order is delivered directly to the consumer (attended home delivery). Other options include placing the order in a secured box near the consumer's home for pickup, or leaving the goods at the consumer's doorstep without direct handover (unattended home delivery). Pickup points have developed as an alternative to home delivery and have become increasingly popular. Many people prefer to collect goods purchased online from parcel lockers, partner collection points, or stores located near their homes, due to greater flexibility in the choice of collection time.

The online food sector can be broadly divided into two categories: online food retail (groceries and packaged foods) and online food delivery. These terms refer to different supply

chains, consumer behaviors, and logistics models. In this article, the focus will be on online food delivery from restaurants. Online food delivery, also known as on-demand meal delivery or restaurant food delivery, refers to the process of ordering prepared meals from restaurants via digital platforms or mobile apps, with delivery directly to the consumer's home, workplace, or chosen location. This segment includes both direct restaurant-to-consumer delivery and delivery through third-party platforms (e.g., Pyszne.pl, Uber Eats, Glovo, Deliveroo). On-demand meal delivery must take into account short delivery times time and convenience in pickup collection. Last-mile delivery is crucial in online food delivery because it directly impacts customer satisfaction, as timely delivery is essential for maintaining food quality and temperature.

Scientific research related to online food delivery is both interdisciplinary and multifaceted, encompassing aspects of logistics, business models, digital platforms, consumer behavior and their satisfaction from with services, and sustainability. Research on last-mile logistics emphasizes the operational challenges associated with the final stage of delivery, particularly in dense urban areas. Scholars have examined effectiveness efficiency [8, 20]; routing optimization [19, 21,14, 20]; delivery speed [26]; and alternative models such as attended versus unattended delivery [22]. Efficient last-mile delivery not only plays a pivotal role in customer satisfaction but also significantly impacts operational costs and environmental sustainability.

Athira and Devakumar [2] discussed different the business models adopted in the online food delivery service services, which are shaped by technological advancements, consumer preferences, and regional market conditions . The primary business models in this sector include the Restaurant to Consumer Model (R2C), Platform Platform-to-Consumer Model (P2C), and Full Stack Model (FS), each offering unique value propositions and operational frameworks. The comparison of these models contains Table 1.

Tab. 1

The comparison of basic models of on-demand food delivery [2]

Feature	Restaurant-to-Consumer	Platform-to-Consumer	Full Stack Model
Order management	Own restaurant website/app	Own platform	Own platform
Food preparation	Own restaurant kitchen	Partner restaurants	Own dark kitchens or partners
Logistics and delivery	Usually own delivery staff or external courier	Own fleet (key element)	Own fleet
Quality control	Full control in kitchen, limited control in delivery	Focused on delivery	Full control (kitchen + delivery)
Objective of the model	Maximize margins and brand experience through full control of order processing and fulfillment	Direct delivery to the customer without logistic intermediaries	Comprehensive management of the entire value chain

Restaurant to Consumer model is where restaurants directly deliver food to consumers. This approach allows restaurants to maintain control over the delivery process and customer experience. It is often used by restaurants that have their own delivery infrastructure and prefer to manage the entire process from order to delivery.

The Platform to Consumer Model involves third-party platforms that facilitate the delivery of food from restaurants to consumers. Food-delivery platforms connect online customers to restaurants, manage their payments, and recruit for-hire couriers to pick up the food from restaurants and deliver the orders to customers [2]. Restaurants partner with these platforms to reach a broader audience without having to manage the logistics of delivery themselves. This model is popular because it allows restaurants to leverage the platform's technology and customer base to expand their reach and boost sales. However, they pay significant commission fees to third-party platforms, which can reduce their profit margins. It is reported that food-delivery platforms can charge restaurants up to 30% per order for delivery services [10].

The Full Stack Model of food delivery is an end-to-end approach in which a single operator manages the entire process, from food preparation to delivery. This model is typically used by companies that own both the kitchen and the delivery network, allowing them to control the quality and efficiency of the service. It is a more integrated approach compared to the other models [2].

The next set of scientific studies focuses on consumer behavior and satisfaction with on-demand food delivery. The growth of online delivery services during the COVID-19 pandemic significantly altered consumer behavior and helped many restaurants remain in business. Security concerns and lockdowns led to increased demand for contactless delivery. Post-pandemic, this shift toward online food ordering has persisted, as consumers have embraced the convenience, making it a lasting industry trend. Online delivery providers focus on enhancing the user experience to sustain growth [16].

The rise of online food delivery services has transformed the restaurant industry, with last-mile delivery emerging as a critical factor influencing customer satisfaction. Numerous studies have investigated the motivations and preferences that drive consumers to choose on-demand food delivery services. Recent empirical studies consistently demonstrate that the specific characteristics of last-mile food delivery services have a significant impact on customer satisfaction across diverse geographic contexts. Convenience, time-saving, and the desire to try new foods are consistently cited as primary motivators [18]. Factors such as delivery cost, user ratings, food variety, and platform usability also influence consumer choice.

Additionally, demographic variables including age, income, and place of residence are found to affect ordering frequency and platform loyalty significantly. Key delivery-related attributes such as delivery speed and punctuality, the condition and temperature of food upon arrival, courier professionalism and courtesy, and the reliability and usability of mobile ordering applications emerge as primary determinants of customer satisfaction [11, 23, 5]. For example, research conducted in Southeast Asia and South America confirms that on-time delivery and preserved food quality directly influence perceived service value and user satisfaction [11, 23]. Furthermore, studies highlight the importance of customer interaction with couriers, suggesting that positive interpersonal experiences can enhance satisfaction and brand perception [1, 5]. Other relevant factors include price fairness and transparency in tracking systems, which contribute to a more favorable user experience [7, 6]. Consequently, it is clear that delivery characteristics do not merely facilitate the completion of services but actively influence the customer's overall assessment of both the restaurant and the platform. These findings suggest that investments in optimizing delivery logistics, enhancing digital interfaces, and training delivery personnel can meaningfully improve customer satisfaction in the food delivery sector.

3. RESEARCH QUESTION AND HYPOTHESES

Based on the literature review, a research question and five hypotheses were formulated:

RQ: What factors are the most important determinants of satisfaction levels with on-demand restaurant food delivery services?

H1: The frequency of using food delivery applications depends on the level of satisfaction with delivery services (delivery time, cost, quality, and ease of app use).

H2: Users who do not encounter delivery issues tend to use the services more frequently than those who experience problems.

H3: Delivery time and cost affect customer satisfaction with on-demand food delivery services.

H4: User age significantly affects satisfaction levels with food delivery apps.

H5: User age influences food delivery app selection and frequency of use.

4. METODOLOGY

The objective of the study was to investigate consumer trends related to the purchase of ready-made meals and to assess the level of satisfaction with their delivery to home or workplace homes or workplaces.

The data was were collected through a custom-designed online questionnaire. The survey included a combination of closed-ended, multiple-choice, Likert-scale, and open-ended questions. These questions focused on topics such as ordering frequency, type types of meals ordered, reasons for choosing delivery services, satisfaction with service quality, delivery time, pricing, and user experience.

The survey was conducted using the CAWI method (Computer-Assisted Web Interviewing). A questionnaire was distributed via Google Forms using a snowball sampling method. The survey was optimized for completion on both desktop and mobile devices, allowing respondents to participate at their convenience. Due to the open distribution method, where the link was publicly available and shared through digital means (e.g., social media, email, messaging apps), the sampling was non-probabilistic and convenience-based. This means that the results cannot be considered representative of the entire population, but they offer valuable insights into the behavior and opinions of a self-selected group of consumers who engage with food delivery services.

The questionnaire survey was conducted from February to March 2025. Participants were individuals in Poland who used food delivery platforms for ordering meals, and in total, 431 questionnaires were collected. Of this group of respondents, 335 people ordered ready-made meals from restaurants.

5. ANALYSIS OF EMPIRICAL RESEARCH

Demographic Characteristics of Respondents

The demographic structure shows a female majority (63%, n=212) compared to males (37%, n=123). The age distribution is dominated by young adults aged 18-24 years (48%, n=160), followed by those aged 25-40 years (30%, n=102), and those aged 41-55 years (17%, n=56), with minimal representation of respondents under 18 (1%, n=3) and over 56 years (4%, n=14). Regarding education, the majority held higher education degrees (56%, n=187) while those

with secondary education comprised 43% (n=143). Other education levels were minimally represented. In terms of residence, most respondents lived in large cities with over 250,000 inhabitants (55%, n=185), followed by those in medium-sized cities of 50,000-250,000 inhabitants (19%, n=62). The sample structure indicates a predominance of young, educated residents of large urban centers, which is characteristic of food delivery platform users. Details of the demographic characteristics of the survey respondents are presented in Table 2.

Tab. 2

Demographic characteristics of the survey respondents (n = 335)

Category Type	Category	Frequency	Percent
Gender	Male	123	37
	Female	212	63
Age	Less than 18	3	1
	18-24	160	48
	24-40	102	30
	41-55	56	17
	56 and above	14	4
Education	Higher education	187	56
	Secondary education	143	43
	Vocational training	2	0.5
	Primary education	3	0.5
Place of living	Large city (population over 250,000)	185	55
	Medium-sized city (50,000-250,000)	62	19
	Small town (under 50,000)	38	11
	Rural area	50	15

Analysis of survey responses

Table 3 presents customers' views on online food delivery services. Regarding ordering frequency, 40% order less than once a month, 35% order a few times a month, 20% order once a month, and only 6% order a few times a week. The main reasons for choosing food delivery include the desire for restaurant food (64%), convenience (58%), lack of desire to cook (46%), and lack of time to cook (40%). Platform preferences show Pyszne.pl as the most popular, followed by Glovo and Uber Eats.

Key factors influencing app choice are wider restaurant selection, promotions and discounts, and lower delivery costs. Unfortunately, 79% of respondents experienced problems with delivery, while only 21% reported no problems. Late delivery was the most common issue (69%), followed by missing items (35%), and food arriving in poor condition (24%).

Tab. 3

Customers' Views on Online Food Delivery Services (n = 335)

Question	Response Options	Frequency	Percent
How often do you order food online?	A few times a week	19	6
	A few times a month	116	35
	Once a month	66	20
	Less than once a month	134	40

What is the main reason you choose food delivery? *(Multiple answers possible)*	Convenience	194	58
	Lack of time to cook	135	40
	Promotions / discounts	57	17
	Desire for restaurant food	214	64
	Desire to try new dishes	57	17
	Emergency situations (e.g. unexpected guests, failed dinner)	79	23
	Lack of desire to cook	154	46
	Others	5	1
Which platform do you use most often to order food? *(Multiple answers possible)*	Uber Eats	129	38
	Glovo	132	39
	Bolt Foods	28	8
	Wolt	30	9
	Pyszne.pl	179	53
	Other	15	4
What factors influence your choice of a food delivery app? *(Multiple answers possible)*	Lower delivery cost	141	42
	Promotions and discounts	171	51
	Wider choice of restaurants	173	52
	Delivery speed	56	17
	Quality of customer service	26	8
	App usability and design	97	29
	Loyalty programs/points	12	4
	Other	33	10
Have you experienced any problems with delivery?	Late delivery	230	69
	The wrong dish was delivered	64	19
	Missing items in the order	116	35
	The food arrived in poor condition	81	24
	The order was not delivered	37	11
	No problems experienced	70	21
	Other	19	6

Table 4 presents customer experience ratings for online food delivery services across four key dimensions: delivery time and cost, consistency of delivered food quality, and user-friendliness of the app.

Delivery time receives generally positive evaluations, with 51% rating it as good and 9% as very good, which appears paradoxical given that 69% experienced late delivery problems. Delivery cost presents the most mixed results, with 47% neutral responses, 34% good ratings, 13% poor, 4% very good, and 2% very poor, indicating that this remains the most contentious aspect of the service experience. App user-friendliness demonstrates the highest satisfaction levels, with 45% rating it as good and 45% rating it as very good. Food quality consistency shows strong performance, with 61% rating it as good and 12% as very good.

Tab. 4

Customer experience with online food delivery services (n = 335)

	Very poor	Poor	Neutral	Good	Very good
Delivery time	7	0	33	51	9
Delivery cost	2	13	47	34	4
Consistency of delivered food quality	0	4	23	61	12
User-friendliness of the app	0	1	9	45	45

Hypothesis testing

Hypothesis testing was performed using Spearman's correlation, the Mann-Whitney U test, the Kruskal-Wallis H test, and the chi-square test. Different types of variables and different measurement scales require the use of different statistical tests to verify whether significant relationships exist between them. Table 5 presents a comprehensive summary of the hypothesis testing findings.

Tab. 5

Summary of findings

Hypotheses	Findings	Hypotheses (Supported/ Not Supported)	Test
H1: The frequency of using food delivery applications depends on the level of satisfaction with delivery services (delivery time, cost, quality of food, ease of app use).	No statistically significant Influence was observed for delivery time and delivery cost. Food quality and ease of app use show a significant impact on usage frequency, but the correlation is weak.	Partially supported	Spearman's correlation
H2: Users who did not encounter delivery issues tend to use the services more frequently than those who experienced problems.	No statistically significant differences in app usage frequency were found	Not supported	Mann-Whitney U
H3: Delivery time and cost affect customer satisfaction with on-demand food delivery services.	Delivery time has a significant impact on satisfaction with on-demand food delivery services; the correlation is moderate. Delivery cost has a significant impact on the evaluation of delivered food quality, but the correlation is weak.	Supported	Spearman's correlation
H4: User age significantly affects satisfaction levels with on-demand food delivery.	Age significantly affects user satisfaction with delivery applications in two key areas:	Partially supported	Kruskal-Wallis H

	delivery cost evaluation and application usability. There are no significant differences between age groups concerning delivery time and food quality.		
H5: User age influences food delivery app selection and frequency of use.	Age significantly influences food delivery app selection and frequency of use.	Supported	χ^2 Kruskal-Wallis H

H1: The Spearman's rank correlation coefficient was utilized as the appropriate statistical measure for ordinal data to assess monotonic relationships between variables. Such aspects of satisfaction as delivery time, delivery cost, food quality, and ease of use were taken into account. The hypothesis H1 testing results show that a significant relationship with the frequency of app usage occurs for: ease of app use ($\rho = 0.231$) and food quality ($\rho = 0.125$). The relationship is significant ($p < 0.05$), but the correlation is weak. Delivery time and delivery cost do not show significant relationships ($p > 0.05$). There is insufficient evidence that a positive evaluation of delivery cost and time is associated with more frequent app usage.

H2: The Mann-Whitney U test for comparing two independent groups was applied. The Mann-Whitney U test results were as follows: U statistic: 6644.0, p-value: 0.9998. This means that there are no statistically significant differences in app usage frequency between people who experienced delivery problems and those who did not experience any. Hypothesis H2 was not supported.

H3: The Spearman's correlation test was applied because both variables are ordinal (Likert scales). Delivery time and delivery cost were designated as independent variables, while quality of delivered food was used as the dependent variable to represent overall satisfaction.

The test results were as follows: delivery cost vs. food quality ρ (rho) 0.280, p-value 0.0000; and delivery time vs. food quality ρ (rho) 0.326, p-value 0.0000. These results show weak to moderate positive correlations between food quality and both delivery factors. Delivery time affects the overall perception of service quality, because food delivered quickly is fresher, warmer, and more in line with expectations, which translates into higher satisfaction. Delivery cost has a significant impact on the evaluation of delivered food quality. A higher cost rating (i.e., perceived as more fair or acceptable) is associated with a better quality assessment. Therefore, hypothesis H3 was supported.

H4: The impact of age on satisfaction with on-demand food delivery was examined using the Kruskal-Wallis test to compare five independent groups (age groups). Age significantly affects user satisfaction with delivery applications in two areas: delivery cost (H statistic = 26.834 and p-value = 0.0000) and application usability (H statistic = 30.257 and p-value = 0.0000). This part of H4 is supported. However, no significant differences occurred between age groups regarding delivery time and food quality. All age groups have similar satisfaction levels for these aspects, so the second part of H4 is not supported.

H5: To examine whether age is related to the choice of food ordering apps, a chi-square test was applied to test the association between two categorical variables. This test confirmed that there are significant differences between age groups regarding app choice (χ^2 statistic 36.58, p-value 0.001). The pattern of food delivery app preferences across different age groups shows that younger users tend to favor international platforms (Uber Eats, Glovo), while older users prefer the local Polish platform (Pyszne.pl). The study of the relationship between age and frequency of home food delivery usage was conducted using the Kruskal-Wallis H test.

The findings indicate that age significantly differentiates the frequency of using food ordering apps (H statistic 16.93 and p-value 0.002). Younger people use these apps more frequently than older people.

6. DISCUSSION

This empirical study provides valuable insights into the determinants of customer satisfaction with on-demand restaurant food delivery services, focusing on last-mile logistics factors. The findings reveal a complex landscape of consumer preferences and satisfaction drivers, with significant implications for both theoretical understanding and practical application. The research reveals that consumers prioritize wider restaurant choice (52%), promotions and discounts (51%), and lower delivery costs (42%) when selecting food delivery platforms. The prominence of restaurant variety as the top selection criterion indicates that platforms operating as aggregators with extensive restaurant networks possess competitive advantages over those with limited partnerships. Interestingly, delivery speed ranks relatively low (17%) among selection criteria, despite being frequently emphasized in platform marketing. This suggests a divergence between platform positioning strategies and actual consumer priorities.

The high prevalence of delivery problems (79% of respondents) highlights persistent operational challenges in last-mile food delivery logistics. Late delivery emerges as the most common problem, followed by missing items and food condition issues. These findings underscore the complexity of coordinating multiple simultaneous deliveries while maintaining service quality standards.

One of the most intriguing findings is the apparent paradox between reported delivery problems and satisfaction ratings. While 69% of respondents experienced late delivery issues, 51% still rated delivery time as "good" and 9% as "very good. This may reflect the multi-dimensional nature of service quality, where positive experiences in other dimensions (food quality or app usability) compensate for delivery time shortcomings. This suggests that platforms can maintain overall satisfaction through excellence in other service areas while improving delivery punctuality.

The research demonstrates significant age-related variations in platform preferences and satisfaction evaluation criteria. Younger consumers (18-24 years) prefer international platforms like Uber Eats and Glovo, while older users gravitate toward Pyszne.pl. This pattern suggests that digital nativity and global brand familiarity influence platform adoption.

Younger users demonstrate higher sensitivity to delivery costs and application usability, while showing similar satisfaction levels to older users regarding delivery time and food quality. This indicates that different age cohorts prioritize different service aspects, requiring platforms to develop differentiated value propositions for demographic segments..

The study confirms that delivery time and cost significantly influence customer satisfaction (H3 supported), with moderate correlation strength ($\rho = 0.326$) suggesting that these factors operate within a broader ecosystem of service quality dimensions. The positive correlation between perceived delivery cost fairness and food quality evaluation indicates that pricing strategies directly influence quality perceptions.

The research findings have several implications for last-mile logistics optimization in food delivery services. The strong relationship between delivery time and overall satisfaction (despite the satisfaction paradox discussed earlier) confirms that punctuality remains a critical performance indicator that platforms must prioritize. The significance of delivery cost in

satisfaction evaluation suggests that platforms must balance operational efficiency with pricing strategies. The findings imply that transparent pricing and cost optimization can serve as competitive differentiators in addition to operational improvements. The age-related differences in service evaluation criteria suggest that platforms may benefit from implementing adaptive service models that adjust delivery options and pricing structures based on customer demographics and preferences. This could include premium services for users who prioritize speed and economical options for price-sensitive segments.

7. CONCLUSIONS

This study contributes to the growing literature on digital commerce logistics and consumer behavior by providing empirical evidence for the relationship between last-mile logistics performance and customer satisfaction in the food delivery context. The empirical investigation provided comprehensive insights into the determinants of customer satisfaction with on-demand restaurant food delivery services, with particular emphasis on last-mile logistics factors, which enabled answering the main research question. The findings reveal that customer satisfaction in food delivery services is influenced by a complex interplay of factors, with restaurant variety, pricing fairness, and delivery reliability emerging as the primary determinants.

The research demonstrates that while operational challenges persist, particularly regarding delivery punctuality and order accuracy, customers maintain generally positive satisfaction levels, suggesting resilience in service evaluation. Age-related differences in platform preferences and satisfaction evaluation criteria highlight the importance of demographic segmentation in service design and marketing strategies.

The study contributes to both theoretical understanding of customer satisfaction in digital commerce environments and practical knowledge for industry stakeholders seeking to optimize their service offerings. The findings emphasize that successful food delivery services must balance multiple service dimensions while addressing the specific preferences and expectations of their target demographic segments.

As the food delivery industry continues to evolve, the insights from this research provide a foundation for both academic inquiry and practical application in service optimization, strategic planning, and customer experience enhancement. The persistent challenges identified in last-mile logistics performance underscore the continued importance of operational excellence and innovation in this rapidly growing sector.

However, several limitations should be acknowledged. The non-probabilistic sampling method limits generalizability to the broader population. The geographic focus on Poland may limit applicability to markets with different cultural contexts. The cross-sectional nature of the study prevents examination of how satisfaction levels evolve over time.

Future research could explore comparative studies across different geographic markets, the investigation of specific operational metrics and satisfaction relationships, and the examination of emerging technologies' impact on customer satisfaction and usage patterns. Research into the environmental sustainability aspects of last-mile food delivery and their influence on customer satisfaction could address growing consumer awareness of ecological impacts.

References

1. Aljohani Khalid. 2024. "The role of last-mile delivery quality and satisfaction in online retail experience: an empirical analysis". *Sustainability* 16(11): 4743. ISSN: 2071-1050. DOI: https://doi.org/10.3390/su16114743.
2. Athira R., P.S. Devakumar. 2021. "Online food delivery- a solution for upsurging restaurant business". *Commerce & Business Researcher* 14(2): 87-97. ISSN: 0976-4097. DOI: https://doi.org/10.59640/cbr.v14i2.87-97.
3. Boyer Kenneth K., Andrea M. Prud'homme, Wenming Chung. 2009. "The last mile challenge: evaluating the effects of customer density and delivery window patterns". *Journal of Business Logistics* 30(1): 185-210 ISSN: 2158-1592. DOI: https://doi.org/10.1002/j.2158-1592.2009.tb00104.x.
4. Boysen Nils, Stefan Fedtke, and Stefan Schwerdfeger. 2021. "Last-mile delivery concepts: a survey from an operational research perspective". *OR Spectrum* 43(1): 1-58. ISSN: 0171-6468. DOI: https://doi.org/10.1007/s00291-020-00607-8.
5. Caberoy Kim-J E., Carl Louise G. Carsula, Raymund Joseph L. Chua, Christine Gabrielle B. Tingson, Rofe Blaise B. Uy, Archimedes L. Valderama. 2025. "Factors affecting customer satisfaction of last-mile delivery logistics". *American Journal of Management* 25 (2):43-83. ISSN: 2165-7998. DOI: https://doi.org/10.33423/ajm.v25i2.7630.
6. Dewi Utari, Dimas Angga Negoro. 2024. "Exploring customer satisfaction in online food delivery services: the role of product involvement, brand familiarity, and consumer attitudes". *Jurnal Manajemen Dan Pemasaran Jasa* 17(2): 277-292. ISSN: 2442-9732. DOI: https://doi.org/10.25105/v17i2.19883.
7. Hsu Yi, Loan Thi Le. 2021. "Factors influencing customer satisfaction with online food delivery services in Vietnam". *International Journal of Business and Social Science* 12(11): 34-46. ISSN: 2219-6021. DOI: http://dx.doi.org/10.30845/ijbss.v12n11p5.
8. JenithaKarthiga S., V. Pavithra, S.Kayathri. 2024. "Optimizing last-mile delivery in e-commerce logistics a multi-faceted approach". *South Asian Journal of Engineering and Technology* 14(6): 1-12. ISSN: 2454-9614. DOI: https://doi.org/10.26524/sajet.2024.14.2.
9. Lim Stanley Frederick W.T., Xin Jin, Jagjit Singh Srai. 2018. "Consumer-driven e-commerce: a literature review, design framework, and research agenda on last-mile logistics models". *International Journal of Physical Distribution and Logistics Management* 48(3): 308-332. ISSN: 0960-0035. DOI: https://doi.org/10.1108/IJPDLM-02-2017-0081.
10. Liu Yang, Sen Li. 2023. "An economic analysis of on-demand food delivery platforms: impacts of regulations and integration with ride-sourcing platforms". *Transportation Research Part E: Logistics and Transportation Review* 171: 103019. ISSN: 1366-5545. DOI: https://doi.org/10.1016/j.tre.2023.103019.
11. Macias Washington, Katia Rodriguez, Holger Barriga. 2023. "Determinants of satisfaction with online food delivery providers and their impact on restaurant brands". *Journal of Hospitality and Tourism Technology* 14(4): 557-578. ISSN: 1757-9880. DOI: https://doi.org/10.1108/JHTT-04-2021-0117.
12. Mangiaracina Riccardo, Alessandro Perego, Arianna Seghezzi, Angela Tumino. 2019. "Innovative solutions to increase last-mile delivery efficiency in B2C e-commerce: a literature review". *International Journal of Physical Distribution & Logistics Management* 49(9): 901-920. ISSN: 0960-0035. DOI: https://doi.org/10.1108/IJPDLM-02-2019-0048.

13. Olsson John, Daniel Hellström, Henrik Pålsson. 2019. "Framework of last mile logistics research: a systematic review of the literature". *Sustainability (Switzerland)* 11(24) 7131: 1-25. ISSN: 2071-1050. DOI: https://doi.org/10.3390/su11247131.
14. Paithane Pradip M., Sarita Jibhau Wagh, Sangeeta N. Kakarwal. 2023. "Optimization of route distance using k-NN algorithm for on-demand food delivery". *System Research and Information Technologies* 1: 85-101. ISSN: 2308-8893. DOI: https://doi.org/10.20535/SRIT.2308-8893.2023.1.07.
15. Piecyk Maja, Julian Allen, Allan Woodburn, Mengqiu Cao. 2021. "Online ready-to-eat meal orders and last-mile deliveries – summary report". Cambridge. Available at: https://www.csrf.ac.uk/wp-content/uploads/2022/01/SRF-Online-shopping-Summary-Report-Ready-To-Eat-Meals-Final-version-Jan-2021.pdf.
16. Precedence Research. 2024. "Online food delivery services market size, share, and trends 2025 to 2034." July 22, 2024. Available at: https://www.precedenceresearch.com/online-food-delivery-services-market.
17. Pyrzyńska Ewa. 2018. "Zachowania konsumenta na rynku usług cateringowych na przykładzie cateringu dietetycznego". *Ekonomiczne Problemy Turystyki* 42: 265-271. [In Polish "Consumer behavior in the catering services market on the example of dietary catering". *Economic Problems of Tourism*]. ISSN: 1644-0501. DOI: https://doi.org/10.18276/ept.2018.2.42-25.
18. Ray Arghya, Amandeep Dhir, Pradip Kumar Bala, Puneet Kaur. 2019. "Why do people use food delivery apps (FDA)? A uses and gratification theory perspective". *Journal of Retailing and Consumer Services* 51: 221-230. ISSN: 0969-6989. DOI: https://doi.org/10.1016/J.JRETCONSER.2019.05.025.
19. Reyes Damian, Alan L. Erera, Martin W.P. Savelsbergh, Sagar Sahasrabudhe, Ryan J.O. 'Neil. 2018. "The meal delivery routing problem". *Optimization Online*. Available at: https://optimization-online.org/wp-content/uploads/2018/04/6571.pdf.
20. Shuaibu Abdullahi Sani, Ashraf Sharif Mahmoud, Tarek Rahil Sheltami. 2025. "A review of last-mile delivery optimization: strategies, technologies, drone integration, and future trends". *Drones* 9(3) 158: 1-46. ISSN: 2504-446X. DOI: https://doi.org/10.3390/drones9030158.
21. Tiwapat Noppakun, Choosak Pomsing, Peerapop Jomthong. 2018. "Last mile delivery: modes, efficiencies, sustainability, and trends". In: *2018 3rd IEEE International Conference on Intelligent Transportation Engineering, ICITE 2018*: 313-317. DOI: https://doi.org/10.1109/ICITE.2018.8492585.
22. Trienekens Jacques, Hans-Henrik Hvolby, Paul Turner. 2017. "Challenges and opportunities in 'last mile' logistics for on-line food retail". In: *Advances in Production Management Systems. The Path to Intelligent, Collaborative and Sustainable Manufacturing*, edited by Hermann Lödding, Ralph Riedel, Klaus-Dieter Thoben, Gregor von Cieminski, and Dimitris Kiritsis, 122-129. Springer Cham. ISBN: 978-3-319-66923-6 DOI: https://doi.org/10.1007/978-3-319-66926-7_15.
23. Wu Mengling, Jingzu Gao, Naeem Hayat, Siyu Long, Qing Yang, Abdullah Al Mamun. 2024. "Modelling the significance of food delivery service quality on customer satisfaction and reuse intention". *Plos One* 19(2) e0293914: 1-19. ISSN: 1932-6203. DOI: https://doi.org/10.1371/journal.pone.0293914.
24. Xiao Zuopeng, James J Wang, James Lenzer, Yonghai Sun. 2017. "Understanding the diversity of final delivery solutions for online retailing: a case of Shenzhen, China". *Transportation Research Procedia* 25: 985-998. ISSN: 2352-1465. DOI: https://doi.org/10.1016/j.trpro.2017.05.473.

25. Zhao Yuyang, and Fernando Bacao. 2020. "What factors determining customer continuingly using food delivery apps during 2019 novel coronavirus pandemic period?". *International Journal of Hospitality Management* 91(102683): 1-12. ISSN: 0278-4319. DOI: https://doi.org/10.1016/j.ijhm.2020.102683.
26. Zhu Lin, Wei Yu, Kairong Zhou, Xing Wang, Wenxing Feng, Pengyu Wang, Ning Chen, and Pei Lee. 2020. "Order fulfillment cycle time estimation for on-demand food delivery". In: *Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining*, 2571-2580. New York, NY, USA: ACM. ISBN: 978-1-4503-7998-4. DOI: https://doi.org/10.1145/3394486.3403307.

Received 14.06.2025; accepted in revised form 05.10.2025