LINK: https://www.edutus.hu/cikk/outsourcing-fulfillment-and-last-mile-logistics-a-comparative-analysis-through-the-cases-of-new-york-amazon-and-budapest-kifli-hu/

Outsourcing, Fulfillment, and Last-Mile Logistics: A Comparative Analysis through the Cases of New York (Amazon), and Budapest (Kifli.hu)

BÁLINT LÉVAI, Economist in Commerce and Marketing,
Department for Business Management,
Edutus University, Hungary
e-mail: blevaicontact@freemail.hu

DOI: 10.47273/AP.2025.36.22-38

ABSTRACT

The aim of the study was to explore the differences in outsourcing, fulfillment, and last-mile solutions between Amazon (New York) and Kifli.hu (Budapest) in the context of urban infrastructure and consumer expectations. The literature review indicated that existing knowledge in this area is limited. A developed conceptual model guided the study, and the case study's secondary data were analyzed using descriptive-explanatory methods and thematic analysis. Results showed that logistics practices of Amazon and Kifli.hu are influenced by modern delivery trends, supplier and delivery partnerships, organizational culture and HR management, automation, logistics structures and mobility, infrastructural and logistical challenges, market position, and consumer experience. The study provides guidance for e-commerce companies seeking efficient, sustainable, and cost-effective logistics operations. Future research could ex-tend the analysis to other locations, adopt mixed-methods, and explore the relationships be-tween fulfillment centers, their partners, sustainability projects, and strategic networks.

Keywords: E-commerce, outsourcing, fulfillment, last-mile

1. Introduction

The rapid growth of e-commerce is fundamentally transforming global and urban supply chains, particularly through the roles of outsourcing, fulfillment centers, and last-mile logistics. According to forecasts, by 2030 online purchases may account for as much as one-third of global trade (Ma, 2025), which could place additional strain on urban logistics systems (Campisi et al., 2023). This global trend can be observed in the largest consumer markets – including New York – (Cai et al., 2025; NYCEDC, 2025) as well as in the Central European region, for example in Budapest. Increasing urbanization, the expansion of e-commerce, and rapidly changing online shopping expectations require logistical adaptations in which outsourcing, fulfillment centers, and last-mile solutions play a central role (Cai et al., 2025; Coppola, 2025; Kellermayr-Scheucher et al., 2021).

The rapid growth of online shopping expectations has a significant impact on the entire operation of the supply chain, as companies must adapt with increasing flexibility to changing consumer demands and the logistical challenges resulting from growing urbanization (Kellermayr-Scheucher et al., 2021). Mobility trends in 2025 are emerging as one of the most influential factors in the sector, necessitating the development of supply chain solutions that are both efficient and sustainable in densely populated urban areas. Taken together, these

changes explain why the use of fulfillment centers, outsourcing, and last-mile delivery has become essential in the operations of e-commerce companies.

The literature highlights that the growth of e-commerce has been significantly facilitated by innovations in retail logistics, including fulfillment centers and last-mile solutions, which respond to the challenges posed by increasing urbanization (Li et al., 2023). Logistics outsourcing plays a central role in improving supply chain efficiency, yet it is a complex phenomenon, as it enhances competitive advantage while also carrying inherent risks (Zhu et al., 2017; Grimpe & Kaiser, 2010). Fulfillment centers significantly enhance the performance of the companies that use them (Kawa, 2021), through better inventory availability, faster delivery, and higher customer satisfaction (Vakulenko et al., 2024; Yang et al., 2024). The last-mile service is flexible and customized (Beckers et al., 2023) and affects customer satisfaction (Aljohani, 2024); however, despite technological advancements, it still represents the least efficient stage of the supply chain (Le Pira et al., 2024; Macioszek, 2018). These insights suggest that outsourcing, fulfillment, and last-mile services together shape the urban logistics performance of e-commerce companies.

Regarding the current state of research, although the popularity of outsourcing is undeniable, the phenomenon has so far been studied only to a limited extent (Lahiri, 2015). Furthermore, based on a review of the scientific literature, it can be stated that fulfillment centers and last-mile services are key factors in logistics. However, publications examining them, particularly in the comparative context of different urban and economic environments, are limited in number.

The aim of this study is to contribute to the scientific knowledge on outsourcing, fulfillment centers, and last-mile logistics, as well as to provide an overview of the differences between current international and local practical trends, and to explore and interpret the differences in outsourcing, fulfillment, and last-mile solutions observed in the logistics practices of Amazon (New York) and Kifli.hu (Budapest) in the context of urban infrastructure and consumer expectations. To this end, the study sought to answer the following research question: ‘What differences can be observed in the outsourcing, fulfillment, and last-mile logistics practices of Amazon (New York) and Kifli.hu (Budapest), in the context of urban infrastructure and consumer expectations?

The study examined the research phenomenon by following the strategy of qualitative comparative case studies. The secondary data were collected using a single data collection technique and analyzed through thematic analysis. The research results provide valuable insights for both e-commerce companies and logistics service providers regarding logistics outsourcing networks, technologies employed in fulfillment centers, and modern last-mile solutions, and they also contribute to certain existing theoretical models.

2. Research methodology

Following a pragmatic research philosophy, the study adopted a deductive approach and compared the New York and Budapest case studies qualitatively in a descriptive-explanatory manner. The mono-method study examined outsourcing, fulfillment, and last-mile logistics practices at a specific point in time. The research sample consisted of the critical case of Amazon, a global leader in e-commerce and logistics, and the typical case of Kifli.hu, illustrating common practices in the Hungarian online grocery sector. These cases were selected using a combined purposive sampling method. While the study did not aim to produce widely generalizable theory, the typical case (Kifli.hu) allows for an illustrative demonstration of common practices in the Hungarian online grocery sector. At the same time,

the critical case (Amazon) enables logical generalizations regarding best practices in outsourcing, fulfillment, and last-mile logistics, without implying statistical generalizability.

Data collection relied on a single qualitative data collection technique, supported by source and theoretical triangulation. All secondary data sources were critically evaluated for reliability and credibility. Corporate reports, research articles, statistics, and other relevant documents were selected based on transparency, authorship, methodological rigor, and relevance to the research questions. Source triangulation further enhanced the validity of the findings by cross-checking information from multiple independent sources, while theoretical triangulation ensured that the data were interpreted in line with established frameworks. Due to the timeline of the research project, which was prepared for a scientific student conference and completed within two months, only publicly available secondary data were used.

The collected data were analyzed through document analysis using a semantic approach to thematic analysis.

3. Theoretical background

Based on the literature review method of Tranfield et al. (2003), the literature review covers the following topics: e-commerce, outsourcing, fulfillment centers, and phenomena related to last-mile logistics.

3.1. E-commerce

E-commerce refers to the online business transactions of goods and services that are conducted through digital communication channels and information technologies (Gupta, 2014). Technological advancements, digitalization, increasing consumer demands, and demographic changes have collectively facilitated the rise of online platforms in the retail value chain (Grewal et al., 2017; Reinartz et al., 2019). These e-commerce platforms, on one hand, provide direct interaction between consumers and suppliers, thereby strengthening customer loyalty (Hanninen et al., 2018), and on the other hand, play a significant role in enhancing corporate performance and efficiency (Hautala-Kankaanpaa, 2022).

Based on global trends, in 2024 approximately 2.78 billion users participate in online commerce, a number that could rise to 4 billion by 2030 (SellersCommerce, 2025; Statista, n.d.). E-commerce sales are expected to reach 3.6 trillion US dollars in 2025 and, with an annual growth rate of 6%, could approach 5 trillion dollars by 2030 (Statista, n.d.). By 2025, 21% of total global retail sales are expected to occur online (Ma, 2025).

The rapid expansion of e-commerce has fundamentally transformed urban logistics and transportation systems (ESCP Business School, 2024; Keim et al., 2023; Savelsbergh & Van Woensel, 2016). The growth of online shopping has led to a sharp increase in delivery demand, significantly increasing urban freight traffic and the load on transportation networks (Campisi et al., 2023; ESCP Business School, 2024). The increased vehicle traffic can further contribute to urban congestion, pollution, and accidents (Cattaruzza et al., 2017; European Commission, 2011). Forecasts indicate that by 2030, the number of delivery vehicles in the world's 100 largest cities could increase by approximately 36%, accompanied by more than a 30% rise in emissions (Póka, 2024; World Economic Forum, 2020). Intensifying urban freight transport paradoxically represents both a challenge and a fundamental prerequisite for the economic functioning of cities (Betanzo-Quezada et al., 2015; Dorta-González, 2014). The continuous increase in consumer expectations – speed, flexibility, reliability – along with rising order volumes, labor shortages, and technological competition, necessitates increasingly complex logistics operations (Fioravanti et al., 2023).

Cities therefore respond with various regulatory and infrastructural interventions, including optimized loading and parking areas, freight lanes, traffic restrictions, toll and access limitations, as well as the designation of low- and zero-emission zones (ESCP Business School, 2024; Ferran, 2024; Gibson & Carnovale, 2015; World Economic Forum). These zones favor clean-fuel vehicles and can significantly reduce local air pollution; however, they may also generate congestion in surrounding areas (Burgalassi & Luzzati, 2015; Cui et al., 2021; Weinberger et al., 2020).

Overall, the rise of e-commerce results in a macro-level transformation of urban logistics (ESCP Business School, 2024; Keim et al., 2023; World Economic Forum, 2024), which requires the integrated implementation of economic, environmental, and social considerations to achieve sustainable urban freight transport (Fioravanti et al., 2023; Merkert et al., 2020). However, due to increasing logistics complexity and capacity management challenges, as well as the characteristics of the urban environment, companies are increasingly turning to external logistics service providers (Büyüközkan & Ilıcak, 2022; Han et al., 2008; International Transport Forum, 2024; Jaller & Pahwa, 2020; Kellermayr-Scheucher et al., 2021; Mukherjee et al., 2013; Szegedi, 2017).

3.2. Logistics Outsourcing

Outsourcing refers to the involvement of external service providers to perform certain activities that the company would otherwise carry out itself, thereby gaining access to specialized resources and expertise, which can enhance its competitiveness and flexibility (Hsiao et al., 2011; Lahiri, 2015; Szegedi, 2017; Twin, 2025). The goal of logistics outsourcing is to reduce costs, while allowing the company to focus more on leveraging its core business capabilities through process optimization (Ang & Straub, 1998; Christopher, 2011; Szegedi, 2017). The economies of scale, advanced infrastructure, and flexible capacity management of external logistics service providers enable cost-efficient operations and the handling of seasonal fluctuations, while also increasing customer satisfaction for companies (Vinay et al., 2009; Tezuka, 2011; Szegedi, 2017). However, in logistics outsourcing, poorly selected service providers, inadequate outsourcing management, and geographical factors can negatively impact a company's performance, profitability, and customer satisfaction (Büyüközkan et al., 2008; Han et al., 2008; McIvor, 2000; Cho et al., 2008).

3.3. Fulfillment Centers

Fulfillment encompasses the entire e-commerce order fulfillment process, which logistics service providers carry out – from supply and warehousing, through inventory management, order processing, and packaging, to preparation for delivery and handling of returns – using automated and robotic tools (Kawa, 2021; Liang et al., 2015; Rouwenhorst et al., 2000). The core of the process is flexible warehousing and fast delivery, which companies often outsource to a fulfillment provider to improve efficiency and reduce costs. This allows for agile and scalable operations, as well as lower operational expenses through reduced labor, facility, and technology costs (Zhu et al., 2017; Hwang & Kim, 2018; Kalinzi, 2016; Kenyon et al., 2015). Fulfillment partnerships are based on IT-integrated operations, allowing webshop orders to reach the 3PL center in real time (Liu et al., 2015; Hwang & Kim, 2018). Warehouse management systems and optimized order-picking processes enable fast and accurate order handling with minimal human error (Boysen et al., 2017; Gu et al., 2010; Liu & Lee, 2018).

Fulfillment centers are physical facilities where goods are stored, packaged, and distributed (Houde et al., 2017), often functioning as full-service logistics hubs with strategic geographic locations (Karaoulanis, 2024). Their proliferation is driven by the growth of e-commerce and

a consumer culture that demands fast delivery (Zebra Technologies, 2018). Urban fulfillment centers offer additional competitive advantages with their short delivery times, yet their physical proximity also poses challenges due to high urban real estate costs and the difficulty of integrating them into existing infrastructure (Bimschleger et al., 2019; Karaoulanis, 2024).

3.4. Last-Mile Logistics

Last-mile logistics is the final stage of the supply chain, extending from the last distribution center to the destination chosen by the customer (Gevaers et al., 2009; Harrington et al., 2016; Lim et al., 2018). The delivery process consists of storage, transportation, and final delivery, supported by a variety of vehicle types – from traditional vans to micromobility devices and automated systems (Boysen et al., 2021). The most common model is personal delivery (aHome); however, due to urban congestion, the two-step approach is becoming increasingly prevalent, where packages are first sent to micro-distribution centers and then delivered, for example, using electric cargo bikes (Boysen et al., 2021). Last-mile logistics is particularly significant due to the growth of e-commerce and urbanization, as the increase in online orders leads to a higher number of delivery vehicles, thereby exacerbating traffic congestion, putting additional pressure on urban infrastructure, and increasing environmental impact (Olsson et al., 2019; Shukla & Raval, 2018).

The last-mile stage is one of the most costly and complex elements of the supply chain (Campisi et al., 2023; Gevaers et al., 2014; Olsson et al., 2019). The constraints of urban infrastructure – traffic congestion, lack of parking, and access restrictions – increase delivery time variability and fuel consumption (Dablanc & Montenon, 2015; Olsson et al., 2019). Increasing order volumes, narrow time windows selected by customers, and courier shortages pose additional challenges (Agatz et al., 2011; Boysen et al., 2021; Wang et al., 2022). Failed deliveries can also generate additional costs (Shaoke, 2025) and reduce customer satisfaction (Descartes Systems Group, 2022). Returns management, which requires separate processes and additional resources, also increases costs and emissions (Alkahtani et al., 2021; Frei et al., 2020). In addition, environmental regulations – such as low-emission zones or access charges – make fleet renewal necessary (Dablanc et al., 2015; Rowe, 2025).

In response to these challenges, companies are increasingly adopting sustainable and innovative solutions (Andruetto et al., 2024; Bruno, 2025; Plazier, 2024). Autonomous vehicles and mobility-on-demand systems can reduce costs associated with the role of drivers (Fehn et al., 2022; Schlenther et al., 2020). ntegrating freight transport into public transit, private mobility, or taxi systems can increase the efficiency of urban mobility (Alnaggar et al., 2021; Chen & Pan, 2015; Fehn et al., 2022; De Langhe, 2019; Pernkopf & Gronalt, 2021). The use of electric vehicles, e-cargo bikes, and micromobility devices can significantly reduce CO_2 emissions and noise pollution (Boysen et al., 2020; Malladi et al., 2020). Two-tier models – depot → microhub → micromobility – reduce downtown congestion (Boysen et al., 2020). Robots and drones enable fast and direct delivery of small parcels, either from depots or operating within a combined chain (Berg et al., 2016; Boysen et al., 2021). Shifting deliveries to off-peak hours can also further reduce urban traffic (World Economic Forum, 2024).

Emerging business models in urban logistics, such as microhubs, support micromobility and rapid commerce operations (Boysen et al., 2021; World Economic Forum, 2024). Outsourcing allows for flexible management of seasonal fluctuations and the reduction of capacity and infrastructure costs (Szegedi, 2017). The role of logistics service providers – especially in the CEP sector – has thus become strategically significant: in addition to physical delivery, they handle planning and coordination tasks, and increase efficiency while reducing urban congestion through PUDO points, parcel lockers, and alternative delivery methods (e.g., smart

door locks with courier-enabled access, delivery to car trunks) (Boysen et al., 2020; Amazon, 2020; DHL, 2017). These developments form the foundation for more sustainable, agile, and reliable urban supply chain operations (Boysen et al., 2020).

3.5. Conceptual Framework of the Study

The conceptual framework of the study integrates five interrelated models to examine the complex urban operations of outsourcing, fulfillment, and last-mile logistics. Its starting point is the outsourcing framework by Mahmoodzadeh et al. (2009), which provides the logic for the strategic outsourcing of logistics subsystems. This is complemented by the fulfillment framework developed by Gomez et al. (2021), which focuses on operational decisions and performance metrics. The logical chain is extended by the last-mile framework of Olsson et al. (2019), which illustrates how fulfillment centers are linked to the customer experience.

Last-mile operations are heavily dependent on the characteristics of urban infrastructure, which justifies the integration of the sustainable urban freight transport theory proposed by He and Haasis (2020). The expectation-confirmation theory developed by Oliver (1980) helps to understand how fulfillment and last-mile solutions meet consumer expectations. The integrated approach is thus suitable for a holistic interpretation of the logistics practices of Amazon (New York) and Kifli.hu (Budapest), in the context of urban infrastructure, technological innovation, and consumer expectations.

4. Main research findings/Results

The codebook was linked to the five research sub-objectives, which examined different aspects of the logistics practices of Amazon (New York) and Kifli.hu (Budapest): a) Outsourcing (RO1): Exploring the outsourcing methods applied by Amazon and Kifli.hu in their logistics processes; b) Fulfillment centers (RO2): Investigating the structure of fulfillment centers and the technological solutions implemented; c) Last-mile logistics (RO3): Examining last-mile delivery solutions in urban environments; d) Urban infrastructure (RO4): Assessing the impact of the relevant urban infrastructure on logistics decisions; e) Consumer expectations (RO5): Analyzing the influence of US and Hungarian consumer expectations and experiences on the operation of fulfillment centers.

For the sake of analyzability, the codebook was reorganized so that the themes and subthemes were aligned with the five research sub-objectives (Table 1).

4.1. Table

Table 1. The edited codebook, with themes and subthemes arranged according to the research objectives

Edited codebook		
Research sub-objectives	**Themes**	**Subthemes**
RSO 1 – Outsourcing	Modern delivery trends	Alternative pickup network
	Supplier and delivery partnerships	Diverse delivery network
		Supplier partnerships
RSO 2 – Fulfillment Center	Organizational culture and HR management	Employee mobility
		Operational sustainability risks
		Employee recognition
		Intense performance-driven work culture
	Environmental sustainability of spatial logistics structures	Gaps in environmental sustainability
		Development of regional and local hubs
	Human and automation	Human-machine collaboration
		Cutting-edge automation
RSO 3 – Last-Mile	Organizational culture and HR management	Employee recognition
		Intense performance-driven work culture
	Modern delivery trends	Smart logistics solutions
		Alternative pickup network
		Express delivery trends and solutions
	Supplier and delivery partnerships	Diverse delivery network
	Sustainable urban logistics and mobility development	Traffic reduction measures
		Sustainable last-mile system
		Outdated freight transport network
	Urban infrastructural and logistics challenges	Traffic congestions
RSO 4 – Infratructure	Environmental sustainability of spatial logistics structures	Environmental impact of geographical location
	Sustainable urban logistics and mobility development	Employee development opportunities
		Intermodal transport potential
		Carbon-neutral urban logistics strategy
	Urban infrastructural and logistics challenges	Limitations of parking capacity
RSO 5 – Customer expectations	Market position and customer experience	Diverse customer experiences
		Large and growing consumer market
		International market presence
		Key market player

Source: Author's own compilation, 2025

(RO1) The empirical observations derived from the secondary data analysis indicate that Amazon's outsourcing-related logistics practices can be interpreted using the Business Process Outsourcing approach outlined by Mahmoodzadeh et al. (2009), while Kifli.hu's shift toward fully in-house logistics highlights an alternative organizational approach within the same research objective.

(RO2) Regarding fulfillment centers, the observed structural and technological characteristics of the analyzed facilities are presented in relation to the key evaluation criteria identified in the fulfillment models framework of Gomez et al. (2021).

(RO3) Kifli.hu emphasizes employee recognition, while Amazon faces equipment challenges. Both companies contend with workload pressures. Smart logistics solutions, alternative pickup networks, express delivery trends, and diverse delivery networks support efficiency. In contrast, traffic reduction measures, sustainable last-mile systems, and outdated transport infrastructure pose operational challenges. These findings can be interpreted through the theoretical frameworks of Olsson et al. (2019).

(RO4) Urban infrastructure affects Amazon's and Kifli.hu's logistics. Amazon's fulfillment centers increase congestion and environmental impact, workforce development supports efficiency, intermodal transport and climate-neutral strategies enhance sustainability, and limited parking creates operational challenges. For Kifli.hu, geographic and workforce data are limited, but traffic and loading constraints affect delivery efficiency. These observations align with the theoretical framework of He and Haasis (2020).

(RO5) Consumer expectations influence Amazon's and Kifli.hu's fulfillment operations. Amazon receives mixed feedback, with Prime users reporting fast, reliable delivery, while congestion and tracking issues cause dissatisfaction for others. Kifli.hu reviews are also mixed, highlighting fast delivery and courier interactions but occasional issues with product quality and complaints handling. Amazon's large consumer base and global presence contrast with Kifli.hu's smaller, regional market. The results correspond to Oliver's (1980) Expectation-Confirmation Theory, linking consumer experiences to fulfillment performance.

5. Conclusions, recommendations

The findings of the study are relevant from both practical and scientific perspectives, providing a basis for conclusions and recommendations. At the corporate level, adopting diverse supplier partnerships and outsourcing logistics tasks can enhance operational efficiency, reduce the ecological footprint, strengthen the regional economy, optimize costs, and contribute to operational sustainability. Conclusions drawn from the structure of fulfillment centers and the technologies employed indicate that organizational culture and HR management influence their operations, while also demonstrating the effective practical integration of modern technical solutions with human resources. Additionally, they specifically illustrate how the environmental sustainability of spatial logistics structures can be enhanced. Regarding the last-mile phase, the implementation of sustainable, smart, performance-oriented, and partnership-based solutions is required to address the complex urban logistics challenges. According to further research conclusions, the relationship between urban infrastructure and logistics determines mobility development and environmental sustainability, while intermodal transport, employee development, and carbon-neutral urban logistics strategies offer additional, previously untapped opportunities for sustainable urban freight transport. Based on the analysis of consumer expectations, a clear relationship emerges between a company's market position and the customer experience: a positive consumer experience increases loyalty in the long term, thereby enhancing the company's reputation and market share.

6. Summary

The aim of the research was to explore the differences between the logistics practices of Amazon (New York) and Kifli.hu (Budapest), with particular emphasis on outsourcing, fulfillment centers, and last-mile solutions, examined in the context of urban infrastructure and consumer expectations. All sub-objectives of the investigation were achieved: the operational practices of the two companies were successfully identified and compared, and the influencing factors were revealed.

Regarding outsourcing strategies, Amazon employs diverse delivery and alternative pickup networks, whereas Kifli.hu currently no longer relies on any outsourcing strategy. Based on the comparison of fulfillment centers, the development of the two companies' hubs followed their respective business strategies, emphasizing human–machine collaboration and a performance-oriented culture, even though alongside the risks associated with operational sustainability. Regarding environmental sustainability, Amazon is more transparent than Kifli.hu. From a technological perspective, Amazon employs cutting-edge automation, whereas Kifli.hu is still planning to implement such developments. The centers are easily accessible in terms of mobility. Additionally, Amazon also implements employee recognition initiatives.

The examination of last-mile solutions highlighted that urban congestion, traffic-reducing measures, outdated freight infrastructure, and sustainable mobility initiatives have a significant impact on company operations. While Amazon responds to these challenges with rapid delivery solutions, intelligent logistics systems, and alternative pickup points, Kifli.hu focuses on valuing its couriers to achieve fast deliveries to customers' addresses. The role of urban infrastructure in logistics decisions is also significant: in Amazon's case, environmental impacts and labor market implications arising from the geographic location of the hubs are observable, whereas in Budapest's case, much of the data is missing. Regarding consumer expectations, it can be concluded that the customer experience significantly influences the operations of both companies. Additionally, in Amazon's case, the effects of a large and growing consumer market are also observable.

The study had several limitations, including the exclusive reliance on secondary qualitative data, small sample size, narrow timeframe, challenges in verifying the credibility and reliability of certain sources, and limited generalizability of the findings. Incorporating primary, quantitative data and conducting a larger sample comparative study would have provided a more holistic view of the investigated phenomenon.

Future research could be expanded in several directions, including the incorporation of additional cities and countries, the application of a mixed-methods approach, and a more comprehensive analysis of partnership relationships. These approaches could provide a more integrated and generalizable view of the practices shaping the global development of e-commerce logistics.

REFERENCES

Publications and studies:

Agatz, N. A., Campbell, A., Fleischmann, M. and Savelsbergh, M. W. P. (2011). Time-slot management in attended home delivery, Transportation Science, 45(3), 435-449. https://doi.org/10.1287/trsc.1100.0346

Aljohani, K. (2024). The Role of Last-Mile Delivery Quality and Satisfaction in Online Retail Experience: An Empirical Analysis, Sustainability, 16(11), 4743. https://doi.org/10.3390/su16114743

Alkahtani, M., Ziout, A., Salah, B., Alatefi, M., Abd Elgawad, A. E., Badwelan, A. and Syarif, U. (2021). An insight into reverse logistics with a focus on collection systems. Sustainability, 13(2), 548. https://doi.org/10.3390/su13020548

Alnaggar, A., Gzara, F. and Bookbinder, J. H. (2021). Crowdsourced delivery: A review of platforms and academic literature, Omega, 98(1), 102139. https://doi.org/10.1016/j.omega.2019.102139

Andruetto, C., Stenemo, E. and Pernestal, A. (2024). Towards sustainable urban logistics: Exploring the implementation of city hubs through system dynamics. Transportation Research Interdisciplinary Perspectives, 27, 101204. https://doi.org/10.1016/j.trip.2024.101204

Ang, S. and Straub, D. W. (1998). Production and Transaction Economies and IS Outsourcing: A Study of the U.S. Banking Industry. MIS Quarterly, 22, 535-552. https://doi.org/10.2307/249554

Beckers, J., Cardenas, I., Le Pira, M. and Zhang, J. (2023). Exploring logistics-as-a-service to integrate the consumer into urban freight, Research in Transportation Economics, 101, 101354. https://doi.org/10.1016/j.retrec.2023.101354

Betanzo-Quezada, E., Romero-Navarrete, J. A. and Obregón-Biosca, S. A. (2015). Researches on urban freight transport in the Mexican city of Queretaro: From central to peri-urban areas, Journal of Urban and Environmental Engineering, 9(1), 12-21. https://doi.org/10.4090/juee.2015.v9n1.012021.

Boysen, N., Fedtke, S. and Schwerdfeger, S. (2021). Last-mile delivery concepts: A survey from an operational research perspective, OR Spectrum, 43(1), 1-58. https://doi.org/10.1007/s00291-020-00607-8.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101. ISSN 1478-0887. Available at: http://eprints.uwe.ac.uk/11735 (Access on October 21, 2025) https://doi.org/10.1191/1478088706qp063oa

Bruno, G., Diglio, A., Piccolo, C. and Pipicelli, E. (2025). Solutions for sustainable last-mile delivery: Pick-up points location with customers' choice. Research in Transportation Economics, 113, 101612. https://doi.org/10.1016/j.retrec.2025.101612

Burgalassi, D. and Luzzati, T. (2015). Urban spatial structure and environmental emissions: A survey of the literature and some empirical evidence for Italian NUTS 3 regions, Cities, 49, 134-148. https://doi.org/10.1016/j.cities.2015.07.002.

Büyüközkan, G., Feyzioğlu, O. and Nebol, E. (2008). Selection of the strategic alliance partner in logistics value chain, International Journal of Production Economics, 113(1), 148-158. https://doi.org/10.1016/j.ijpe.2007.01.016.

Cai, Y., Chen, J. and Li, S. (2025). Spatial Heterogeneity of Intra-Urban E-Commerce Demand and Its Retail-Delivery Interactions: Evidence from Waybill Big Data, Journal of Theoretical and Applied Electronic Commerce Research, 20(3), 190. https://doi.org/10.3390/jtaer20030190 .

Campisi, T., Russo, A., Bouhouras, E., Tesoriere, G. and Basbas, S. (2023). The increase in e-commerce purchases and the impact on the newest European city logistics development, The Open Transportation Journal, 17. https://doi.org/10.2174/0126671212279047231128105715.

Cattaruzza, D., Absi, N., Feillet, D. and González-Feliu, J. (2017). Vehicle routing problems for city logistics, EURO Journal on Transportation and Logistics, 6(1), 51-79. https://doi.org/10.1007/s13676-016-0090-0.

Christopher, M., Mena, C., Khan, O. and Yurt, O. (2011). Approaches to managing global sourcing risk, Supply Chain Management: An International Journal, 16(2), 67-81. https://doi.org/10.1108/13598541111115338

Cho, J. J. K., Ozment, J. and Sink, H. (2008). Logistics capability, logistics outsourcing and firm performance in an e-commerce market, International Journal of Physical Distribution and Logistics Management, 38(5), 336-359. https://doi.org/10.1108/09600030810882825

Dablanc, L. and Montenon, A. (2015). Impacts of environmental access restrictions on freight delivery activities, Transportation Research Part D: Transport and Environment, 41, 1-10. https://doi.org/10.1016/j.trd.2015.09.001

De Langhe, K., Meersman, H., Sys, C., Voorde, E. and Vanelslander, T. (2019). How to make urban freight transport by tram successful?, Journal of Shipping and Trade, 4. https://doi.org/10.1186/s41072-019-0055-4

Fehn, F., Engelhardt, R., Dandl, F., Bogenberger, K. and Busch, F. (2023). Integrating parcel deliveries into a ride-pooling service - An agent-based simulation study. Transportation Research Part A: Policy and Practice, 169, 103580. https://doi.org/10.48550/arXiv.2205.04718.

Frei, R., Jack, L. and Brown, S. (2020). Product returns: A growing problem for business, society and environment, International Journal of Operations & Production Management, 40, 1613-1621. https://doi.org/10.1108/IJOPM-02-2020-0083

Gevaers, R., Van de Voorde, E. and Vanelslander, T. (2014). Cost modelling and simulation of last-mile characteristics in an innovative B2C supply chain environment with implications on urban areas and cities, Procedia - Social and Behavioral Sciences, 125, 398-411. https://doi.org/10.1016/j.sbspro.2014.01.1483

Gibson, M. and Carnovale, M. (2015). The effects of road pricing on driver behavior and air pollution, Journal of Urban Economics, 89, 62-73. https://doi.org/10.1016/j.jue.2015.03.004

Grewal, D., Roggeveen, A. L. and Nordfält, J. (2017). The future of retailing, Journal of Retailing, 93(1), 1-6. https://doi.org/10.1016/j.jretai.2016.12.008

Grimpe, C. and Kaiser, U. (2010). Balancing Internal and External Knowledge Acquisition: The Gains and Pains from R&D Outsourcing, Journal of Management Studies, 47(8), 1483-1509. https://doi.org/10.1111/j.1467-6486.2010.00946.x

Gu, J., Goetschalckx, M. and McGinnis, L. F. (2010). Research on warehouse design and performance evaluation: A comprehensive review, European Journal of Operational Research, 203(3), 539-549. https://doi.org/10.1016/j.ejor.2009.07.031.

Han, H. S., Lee, J. N. and Seo, Y. W. (2008). Analyzing the impact of a firm's capability on outsourcing success: A process perspective, Information & Management, 45(1), 31-42. https://doi.org/10.1016/j.im.2007.09.004

Hanninen, M., Smedlund, A. and Mitronen, L. (2017). Digitalization in retailing: multi-sided platforms as drivers of industry transformation, Baltic Journal of Management. https://doi.org/10.1108/BJM-04-2017-0109

Harrington, T. S., Srai, J. S., Kumar, M. and Wohlrab, J. (2016). Identifying design criteria for urban system 'last-mile' solutions–A multi-stakeholder perspective, Production Planning & Control, 27(6), 456-476. https://doi.org/10.1080/09537287.2016.1147099

Hautala-Kankaanpaa, T. (2022). The impact of digitalization on firm performance: examining the role of digital culture and the effect of supply chain capability, Business Process Management Journal, 28(8), 90-109. https://doi.org/10.1108/BPMJ-03-2022-0122

He, Z. and Haasis, H. D. (2020). A Theoretical Research Framework of Future Sustainable Urban Freight Transport for Smart Cities. Sustainability, 12(5), 1975. https://doi.org/10.3390/su12051975

Hsiao, H., Kemp, R. G. M., van der Vorst, J. G. A. J. and Omta, S. W. F. (2011). Logistics outsourcing by Taiwanese and Dutch food processing industries, British Food Journal, 113(4), 550-576. https://doi.org/10.1108/00070701111124014

Hwang, T. and Kim, S. T. (2018). Balancing in-house and outsourced logistics services: effects on supply chain agility and firm performance, Service Business. https://doi.org/10.1007/s11628-018-00394-x

Kalinzi, C. (2016). Outsourcing (logistics) services and supply chain efficiency – A critical review of outsourcing function in Mukwano Group of Companies, Journal of Outsourcing and Organizational Information Management. https://doi.org/10.5171/2016.937323

Karaoulanis, A. (2024). The role of micro fulfilment centers in alleviating, in a sustainable way, the urban last mile logistics problem: A systematic literature review, Sustainability, 16(20), 8774. https://doi.org/10.3390/su16208774

Kawa, A. (2021). Fulfilment as Logistics Support for E-Tailers: An Empirical Studies, Sustainability, 13(11), 5988. https://doi.org/10.3390/su13115988

Kellermayr-Scheucher, M., Niedermeier, M., Brandtner, P. and Schauer, O. (2021). Urban fulfillment centers – Perceptions and expectations from retailers, in Jahn, C., Kersten, W. and Ringle, C.M. (eds.) Adapting to the Future: Maritime and City Logistics in the Context of Digitalization and Sustainability. Hamburg: TUHH, 13-35. https://doi.org/10.15480/882.3994

Kenyon, G. N., Meixell, M. and Westfall, P. H. (2015). Production Outsourcing and Operational Performance: An Empirical Study using Secondary Data, International Journal of Production Economics, 171(3). https://doi.org/10.1016/j.ijpe.2015.09.017

Lahiri, S. (2015). Does Outsourcing Really Improve Firm Performance? Empirical Evidence and Research Agenda, International Journal of Management Reviews, 18(4), 464-497. https://doi.org/10.1111/ijmr.12075

Le Pira, M. C., Nascimento, D. O. L., Giuffrida, R. J., Tapia, F., Pilla, L. A. and Tavasszy, L. (2024). Innovations in last mile logistics: Towards inclusivity, resilience and sustainability, Research in Transportation Economics, 101446. https://doi.org/10.1016/j.retrec.2024.101446

Li, Z., Gu, W. and Meng, Q. (2023). The impact of COVID-19 on logistics and coping strategies: A literature review. Regional Science Policy & Practice, 15(8), 1768-1795. https://doi.org/10.1111/rsp3.12665

Liang, C., Chee, K. J., Zou, Y., Zhu, H., Causo, A., Vidas, S., Teng, T., Chen, I-M., Low, K. H. and Cheah, C. C. (2015). Automated robot picking system for e-commerce fulfilment warehouse application, Proceedings of the 14th IFToMM World Congress, 398-403. https://doi.org/10.6567/IFToMM.14TH.WC.OS13.077

Lim, S. F. W. T., Jin, X. and Srai, J. S. (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. https://doi.org/10.1108/IJPDLM-02-2017-0081

Liu, C. and Lee, M. (2018). Integration, Supply Chain Resilience, and Service Performance in Third-Party Logistics Providers. The International Journal of Logistics Management, 29, 5-21. https://doi.org/10.1108/ijlm-11-2016-0283

Macioszek, E. (2017). First and last mile delivery – Problems and issues, in Sierpiński, G. (ed.) Advanced solutions of transport Systems for Growing Mobility. Advances in Intelligent Systems and Computing. Springer, Cham, 147-154. https://doi.org/10.1007/978-3-319-62316-0_12 https://doi.org/10.1007/978-3-319-62316-0_12

Mahmoodzadeh, E., Jalaliniya, S. and Nekui Yazdi, F. (2009). A business process outsourcing framework based on business process management and knowledge management, Business Process Management Journal, 15(6), 845-864. https://doi.org/10.1108/14637150911003748

Malladi, S. S., Christensen, J. M., Ramírez, D., Larsen, A. and Pacino, D. (2022). Stochastic fleet mix optimization: Evaluating electromobility in urban logistics. Transportation Research Part E: Logistics and Transportation Review, 158, 102554. https://doi.org/10.1016/j.tre.2021.102554

McIvor, R. (2000). A practical framework for understanding the outsourcing process, Supply Chain Management: An International Journal, 5(1), 22-36. https://doi.org/10.1108/13598540010312945

Merkert, R., Bushell, J. and Beck, M. J. (2020). Collaboration as a service (CaaS) to fully integrate public transportation: Lessons from long distance travel to reimagine mobility as a service, Transportation Research Part A: Policy and Practice, 131, 267-282. https://doi.org/10.1016/j.tra.2019.09.024

Mukherjee, D., Gaur, A. S. and Datta, A. (2013). Creating value through offshore outsourcing: An integrative framework, Journal of International Management, 19(4), 377-389. https://doi.org/10.1016/j.intman.2013.03.015

Oliver, R. L. (1999). Whence Consumer Loyalty. Journal of Marketing, 63, 33-34. https://doi.org/10.2307/1252099

Olsson, J., Hellström, D. and Palsson, H. (2019). Framework of last mile logistics research: A systematic review of the literature, Sustainability, 11(24), 7131. https://doi.org/10.3390/su11247131.

Pernkopf, M. and Gronalt, M. (2021). An aerial ropeway transportation system for combined freight and passenger transport – a simulation study. Transportation Planning and Technology, 44(1), 45-62. https://doi.org/10.1080/03081060.2020.1851450

Plazier, P., Rauws, W., Neef, R. and Buijs, P. (2024). Towards sustainable last-mile logistics? Investigating the role of cooperation, regulation, and innovation in scenarios for 2035.

Research in Transportation Business & Management, 56, 101198. https://doi.org/10.1016/j.rtbm.2024.101198

Póka, V. (2024). A last-mile logisztika hatásai és lehetőségei a klímaváltozás területén. In: Mészáros, K., Szerb, B. and Lehota, Zs. (eds.) Fenntarthatóság és hatékonyság a logisztikában / Sustainability and efficiency in logistics: Day of Logistics at Hungarian University of Agriculture and Life Sciences. Gödöllő: MATE Press, 7-21. ISBN 978-963-623-110-1.

Reinartz, W., Wiegand, N. and Imschloss, M. (2019). The impact of digital transformation on the retailing value chain. International Journal of Research in Marketing, 36(3), 350-366. https://doi.org/10.1016/j.ijresmar.2018.12.002

Rouwenhorst, B., Reuter, B., Stockrahm, V., van Houtum, G. J., Mantel, R. J. and Zijm, W. H. M. (2000). Warehouse design and control: Framework and literature review. European Journal of Operational Research, 122(3), 515-533. https://doi.org/10.1016/S0377-2217(99)00020-X

Savelsbergh, M. and van Woensel, T. (2016). City logistics: Challenges and opportunities. Transportation Science, 50(2), 579-590. https://doi.org/10.1287/trsc.2016.0675

Schlenther, T., Martins-Turner, K., Bischoff, J. F. and Nagel, K. (2020). Potential of private autonomous vehicles for parcel delivery. Transportation Research Record, 2674(11), 520-531. https://doi.org/10.1177/0361198120949878

Tezuka, K. (2011). Rationale for utilizing 3PL in supply chain management: A shippers' economic perspective, IATSS Research, 35(1), 24-29. https://doi.org/10.1016/j.iatssr.2011.07.002

Tranfield, D., Denyer, D. and Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review, British Journal of Management, 14(3), 207-222. https://doi.org.10.1111/1467-8551.00375

Vakulenko, Y., Figueirinhas, D., Hellström, D. and Palsson, H. (2024). The impact of order fulfillment on consumer experience: Text mining consumer reviews from Amazon US, International Journal of Physical Distribution and Logistics Management, 54(6), 558-585. https://doi.org/10.1108/IJPDLM-11-2023-0434

Vinay, V. P., Kannan, G. and Sasikumar, P. (2009). Conceptual study on 3PL/4PL/new trends for service industry, International Journal of Services Technology and Management, 12(1), 3-22. https://doi.org/10.1504/IJSTM.2009.025033

Wang, M., Wood, L. C. and Wang, B. (2022). Transportation capacity shortage influence on logistics performance: Evidence from the driver shortage, Heliyon, 8(5), e09423. https://doi.org/10.1016/j.heliyon.2022.e09423

Weinberger, R. R., Millard-Ball, A. and Hampshire, R. C. (2020). Parking search caused congestion: Where's all the fuss?, Transportation Research Part C: Emerging Technologies, 120, 102781. https://doi.org/10.1016/j.trc.2020.102781

Zhu, W., Ng, S. C. H., Wang, Z. and Zhao, X. (2017). The role of outsourcing management process in improving the effectiveness of logistics outsourcing, International Journal of Production Economics, 188, 29-40. https://doi.org/10.1016/j.ijpe.2017.03.004

Yang, Q., Wang, Z. S., Feng, K. and Tang, Q. Y. (2024). Investigating the crucial role of logistics service quality in customer satisfaction for fresh e-commerce: A mutually validating method based on SERVQUAL and service encounter theory, Journal of Retailing and Consumer Services, 81, 103940. https://doi.org/10.1016/j.jretconser.2024.103940

Online Sources:

Amazon. (2020). Key by Amazon Smart Lock Kit. Amazon. Available at: https://www.amazon.com/-/de/gp/help/customer/display.html/ref=hp_bc_nav?ie=UTF8& nodeId=202103620 (Access on October 22, 2025)

Bimschleger, C., Patel, K. and Kammerer, W. (2019). Urban fulfillment centers Helping to deliver on the expectation of same-day delivery. Deloitte. Available at: https://www.deloitte.com/content/dam/Deloitte/us/Documents/process-and-operations/us-urban-fulfillment-centers.pdf (Access on September 20, 2025)

Chen, C. and Pan, S. (2016). Using the crowd of taxis to last mile delivery in e-commerce: A methodological research. In Post-Print hal-01480533. HAL. https://doi.org/10.1007/978-3-319-30337-6_6

Coppola, D. (2025). Average number of products bought per e-commerce order worldwide 2025, Statista. Available at: https://www.statista.com/statistics/829220/share-of-retail-sales-by-channel-us (Access on October 04, 2025)

Cui, H., Gode, P. and Wappelhorst, S. (2021). A global overview of zero-emission zones in cities and their development progress, International Council on Clean Transportation. Available at: https://theicct.org/sites/default/files/publications/global-cities-zez-dev-EN-aug21.pdf (Access on October 10, 2025)

Descartes Systems Group, Inc. (2022). Ecommerce: Is retailer fulfillment and delivery performance keeping up with sales growth?, Descartes Research Report. Available at: https://www.descartes.com/sites/default/files/media/documents/2022-04/Descartes-Buying-Habits-2022-WP-Final_V6.pdf (Access on October 04, 2025)

DHL. (2017). DHL now delivering to trunks of VW cars, DHL. Available at: https://www.dpdhl.com/en/media-relations/press-releases/2017/dhl-now-delivering-to-trunks-of-vw-cars.html (Access on October 22, 2025)

Dorta-González, P. (2014). Urban freight and mobility in agglomerations, in Transporte y Logística Internacional, Universidad de Las Palmas de Gran Canaria. Available at: https://accedacris.ulpgc.es/bitstream/10553/11886/4/Transporte_logistica_internacional.pdf (Access on October 10, 2025)

ESCP Business School. (2024). Urban Logistics 4.0: A smarter and more sustainable future for freight in cities. Available at: https://escp.eu/news/urban-logistics-40 (Access on October 22, 2025)

European Commission. (2011). Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system (COM(2011) 144). Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52011DC0144 (Access on October 14, 2025)

Ferran, V. (2024). D2.1: Observatory of strategic developments on urban logistics – Final version [PDF]. ULaaDS, Miebach Consulting, JLL, & Research Lab Urban Transport, Frankfurt University of Applied Sciences. Available at: https://ulaads.eu/wp-content/uploads/2024/03/D2.1.pdf (Access on October 04, 2025)

Fioravanti, R., Lima Jr, O. F., Montoya Moreno, G. N. and Pinto, J. A. (2023). Urban Logistics as a Service Platform: Proposing a Sustainable Digital Business Model for Logistic Services in Urban Areas, Preprints.org [Preprint]. https://doi.org/10.20944/preprints202311.1156.v1

Gevaers, R., Van de Voorde, E. and Vanelslander, T. (2009). Characteristics of innovations in last-mile logistics: Using best practices, case studies and making the link with green and sustainable logistics, European Transport Conference, Leeuwenhorst, The Netherlands. Available at: https://aetransport.org/past-etc-papers/conference-papers-pre-2009/conference-papers-2009 (Access on October 12, 2025)

Gomez, D., Bellido, J. and Cabrini, R. (2021). E-commerce fulfillment models framework: Supply chain & logistics. Unpublished manuscript. Available at: https://studylib.net/doc/27923503/gomez-et-al-2021 (Access on October 02, 2025)

Gupta, A. (2014). E-COMMERCE: Role of E-COMMERCE in Today's Business, International Journal of Computing and Corporate Research, 4(1). Available at: https://www.ijccr.com/January2014/10.pdf (Access on October 04, 2025)

Houde, J. F., Newberry, P. and Seim, K. (2017). Economies of Density in E-Commerce: A Study of Amazon's Fulfillment Center Network, NBER Working Paper Series, No. 23361. Available at: https://www.nber.org/system/files/working_papers/w23361/revisions/w23361.rev1.pdf (Access on October 04, 2025)

International Transport Forum. (2024). ITF Summit 2024: Greening Transport, Keeping Focus in Times of Crisis. Available at: https://summit.itf-oecd.org/2024 (Access on October 04, 2025)

Jaller, M. and Pahwa, A. (2020). Analytical modeling framework to assess the economic and environmental impacts of residential deliveries, and evaluate sustainable last-mile strategies. Report No. NCST-UCD-RR-20-11. University of California, Institute of Transportation Studies. https://doi.org/10.7922/G21Z42PK

Keim, A., Sarrió, N. and Ferran, V. (2023). Two urban logistics solutions for the last-mile delivery problem. ULaaDS. Available at: https://ulaads.eu/two-urban-logistics-solutions-for-the-last-mile-delivery-problem (Access on October 04, 2025)

Ma, Y. (2025). E-commerce as share of total retail sales worldwide, 2017-2030. Statista. Available at: https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide (Access on October 02, 2025)

NYCEDC. (2025). Freight NYC: A Modern Freight Network for New York City [PDF]. Available at: https://edc.nyc/sites/default/files/2025-01/NYCEDC-FreightNYC-Digital-Book.pdf (Access on October 04, 2025)

Rowe, A. (2025). What Is Fleet Electrification? Strategies, Costs, and Benefits. Tech.co. Available at: https://tech.co/fleet-management/what-is-fleet-electrification (Access on October 20, 2025)

SellersCommerce. (2025). 51 E Commerce Statistics In 2025 (Global And U.S. Data). Available at: https://www.sellerscommerce.com/blog/ecommerce-statistics (Access on October 20, 2025)

Shaoke. (2025).The real cost of failed deliveries – and how to fix it. Shaoke. Available at: https://shaoke.com/the-real-cost-of-failed-deliveries-and-how-to-fix-it/ (Access on October 04, 2025)

Shukla, R. and Raval, P. (2018). Impact of e-commerce on urban freight. SSRN Electronic Journal. https://doi.org/10.2139/SSRN.3258392

Szegedi, Z. (2017). Ellátásilánc-menedzsment (2nd e-book ed.). Kossuth Kiadó. Available at: https://www.lira.hu/upload/M_28/rek3/1327047.pdf (Access on October 04, 2025)

Statista. (n.d.). eCommerce – Worldwide. Statista Market Outlook. Available at: https://www.statista.com/outlook/emo/ecommerce/worldwide?currency=USD (Access on October 04, 2025)

Twin, A. (2025). How outsourcing reduces business costs: strategies and examples. Investopedia. Updated 21 August. Available at: https://www.investopedia.com/terms/o/outsourcing.asp (Access on October 20, 2025)

World Economic Forum. (2024).Transforming urban logistics: Sustainable and efficient last mile delivery in cities [White paper]. Available at: https://reports.weforum.org/docs/WEF_Transforming_Urban_Logistics_2024.pdf (Access on October 12, 2025)

Zebra Technologies. (2018).Reinventing the supply chain: The future of fulfillment vision study. Confronting logistics challenges in an omnichannel shopping landscape [Report]. Available at: https://www.zebra.com/content/dam/zebra_dam/en/reports/vision-study/fulfillment-vision-study-report-en-us.pdf (Access on October 04, 2025)

Patents:

Berg, P. W., Isaacs, S. and Blodgett, K. L. (2016). Airborne fulfillment center utilizing unmanned aerial vehicles for item delivery (U.S. Patent No. 9,305,280). Amazon Technologies Inc. Available at: https://patents.google.com/patent/US9305280B1/en (Access on October 04, 2025)