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LAST-MILE INNOVATION REPORT 2026

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parcel and postal technology INTERNATIONAL

June 2026

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EXECUTIVE SUMMARY

According to Clayton Christensen, disruption is not a single breakthrough moment, but a process through which challengers can reshape established markets. In the last mile, that idea has become more relevant than ever.

In fact, our sector is no longer innovating because it would be interesting to do so, but because legacy operating models are under pressure from almost every direction at once, from labour costs and network density to customer expectations, sustainability demands, and the shift towards out-of-home delivery.

E-commerce, re-commerce, B2C, and C2C volumes continue to grow, while parcel flows become more fragmented, lower density, and harder to predict. Consumers expect delivery to be reliable, fast, flexible, transparent, and convenient. Merchants want lower costs, fewer failures, and better customer retention.

Cities are under pressure to reduce congestion, emissions, and the visual impact of logistics infrastructure. Carriers and posts face labour shortages, wage pressure, volatile energy costs, increasingly complex regulation, and rising expectations around emissions reporting.

Accordingly, this report looks at last-mile innovation not as a single category, but as a system of responses to these pressures.

Some innovations reduce emissions. Some reduce costs. Some improve service quality. Some make networks more resilient, and the most valuable ones increasingly do all of these things at the same time.

EXECUTIVE SUMMARY

The numbers underline the scale of the challenge. Global B2C e-commerce parcel volumes were estimated at some 121 billion shipments in 2025, while broader global parcel deliveries were around 400 billion pieces.

These volumes are expected to continue growing over the coming years. In Europe, the environmental stakes are equally significant; by 2032, last-mile delivery in the EU, the United Kingdom, Switzerland and Norway could involve around 40 billion B2C parcel deliveries.

Depending on the level of out-of-home and electric vehicle adoption, emissions could vary from 139g CO_2 per parcel in the least favourable scenario to 13g CO_2 per parcel in the most ambitious scenario[MR1] .

This is why the report places strong emphasis on the combination of out of home delivery and electric vehicles. Neither is sufficient alone; OOH delivery can materially reduce failed deliveries, vehicle kilometres and delivery stops, but only when networks are dense enough, close enough and attractive enough for consumers to use without making dedicated car trips.

Electric vehicles reduce tailpipe emissions, but they do not solve congestion, failed delivery or poor asset utilisation.

The strongest results come when dense OOH infrastructure, EVs, intelligent delivery management and consumer behaviour all move in the same direction.

The contribution from SwipBox shows how parcel lockers are evolving from standalone hardware into adaptable OOH infrastructure.

The key point isn't about whether a locker has an app, a PIN pad or a screen, but whether the platform can adapt to different markets, regulatory requirements, accessibility needs and user behaviours without increasing operational complexity.

In this view, while the ability to support key peripherals is important, the software is the backbone or "secret suce" that allows hardware to remain flexible, scalable and compliant.

The IPC contribution adds an important caveat to the discussion around sustainability. OOH delivery is not automatically greener.

In dense urban environments, where consumers can walk, cycle or collect parcels as part of an existing journey, the benefits can be substantial.

EXECUTIVE SUMMARY

However, in suburban and rural markets, dedicated car trips can offset much of the delivery side benefit.

The practical implication is clear; operators need dense networks, at “slipper distance” to the consumer and with high accessibility to both the courier, consignor, and consignee if OOH is to deliver its full environmental promise.

The report also argues that the traditional to-door model is not disappearing, but it is clearly changing.

Diesel vans, manual routing, and human-intensive doorstep delivery are increasingly exposed to cost pressure, regulation, and operational limits.

A more resilient model will combine APMs, PUDOs, microhubs, cargo bikes, compact electric vehicles, shared infrastructure, state-of-the-art AI-based planning, and selective use of robotics or drones where the economics make sense.

The chapter on structural change makes an important distinction between visible innovation and operationally meaningful innovation.

The last year has produced many headlines around drones, robots, and futuristic delivery models, but the most important changes are often less visible.

Scanning is becoming sensing, and manual interventions are being replaced by embedded data capture.

Reverse logistics is becoming more intelligent, and routing is moving from static planning to continuous recalibration.

Crowd delivery is becoming more structured around known nodes such as lockers and PUDOs. The common theme is not about adding complexity, but about removing it.

Technology architecture is another major theme; Software Mind’s chapter on TMS in the AI era argues that legacy systems are no longer fit for modern last-mile operations.

AI, dynamic routing, real-time data, driver apps, geocoding, customer communication, and operational exception handling all require systems that are modular, scalable, and designed to evolve.

The Kuchnia Vikinga project illustrates the point in practice; a fast-growing fresh meal delivery operator moved from a fragile legacy environment to a modular, AI-ready TMS in six months, achieving zero system crashes after go-live, a 50% reduction in route generation time, and a 70% reduction in manual administrative steps.

EXECUTIVE SUMMARY

The year 2026 project submissions bring these themes to life across multiple markets.

Allegro's Packaging Standard addresses one of the most practical parts of sustainable e-commerce, namely better packaging, lower void space, fewer damages and readiness for PPWR (packaging waste regulations).

ARKA's Lumen locker shows how off-grid, solar-powered parcel machines can unlock locations where electricity access would otherwise block deployment, and D-carbN Analytics shows how emissions reporting is moving beyond average CO_2 estimates towards route, vehicle, NO_x, particulate matter, and well-to-wheel analysis.

ElifTech's locker utilisation intelligence solution demonstrates how AI can help operators identify blocked cells, long-stay parcels, anomalies, and underused capacity before they become service problems.

Emapa's EV-aware route optimisation project shows how planning tools can increase the share of deliveries handled by electric vehicles while still meeting operational constraints.

The GRETA project in Poznań proves that cargo bike microhubs can reduce van traffic and emissions, while also showing that utilisation, shared use, and public support are critical to financial viability.

MaddWill AI's Tarviq platform moves freight audit from a post-payment recovery process to a pre-bill intelligence layer, using AI agents to detect billing errors, reconciliation gaps and SLA credits before money leaves the business.

Nova Post contributes two different but complementary projects. Its computer vision quality monitoring initiative turns existing camera infrastructure into a continuous service quality tool.

Its self-service branch concept combines Digital Sendy terminals, app integration and light-based guidance to make branch operations faster, more accessible and less dependent on manual support.

Rovenma's Rovlocker R7 project, developed for The Courier Guy in South Africa, highlights the importance of security, field resilience and local deployment strategy in high-risk public environments.

Scandit's work with La Poste, Swiss Post, CTT and Yodel shows how smartphone scanning and smart data capture can replace dedicated hardware, improve accuracy and reduce time at the doorstep or in the vehicle.

EXECUTIVE SUMMARY

Żabka's "izizwrot" (Eng. "izireturn") project demonstrates how existing retail logistics flows can be reused for e-commerce returns, creating a dual-use model that lowers cost and makes better use of vehicles already moving through the network.

The report also looks at microhubs in Poland more broadly; their environmental and social potential is clear, especially when combined with cargo bikes and city centre access restrictions.

Yet microhubs will not scale simply because the idea is attractive; they require suitable locations, safe and practical layouts, support from local authorities, and critically, shared-use models and procedures that make them commercially workable for more than one operator.

The environmental modelling in the final analytical chapter reinforces the same message. The last mile can become dramatically cleaner, but only through combined adoption of OOH, EVs, better capacity use and smarter delivery management.

A base-case scenario already implies meaningful emissions reduction, but the most ambitious reduction paths require much greater use of OOH infrastructure, faster parcel collection, higher locker and PUDO utilisation and a stronger link between operational planning and carbon outcomes.

Taken together, this year's report shows that last-mile innovation is becoming more disciplined.

The strongest innovations are not necessarily the most spectacular, but are the ones that reduce failed deliveries, reduce idle capacity, reduce manual work, reduce unnecessary kilometres, reduce emissions, and reduce customer effort.

The future of the sector will depend less on isolated pilots and more on the ability to integrate these improvements into everyday operations.

The last mile is no longer simply the final step in delivery, but more a strategic operating system for e-commerce, re-commerce, urban mobility, customer experience, and sustainability.

The winners of the "new last mile" will be those who combine density, data, customer trust, and operational excellence, and the challenge for the sector is to move from claims to measurable impact.

[MR1] Sources:
ECDB, Global Parcel Market 2025: Growth at Scale, Power in Few Hands, 15 December 2025.
Capital One Shopping, Package Delivery Statistics, last updated 4 June 2026, based on Pitney Bowes Parcel Shipping Index.
Green Last Mile Europe Report, 2022, environmental impact section, UPIDO estimates and calculations based on previous studies commissioned by InPost.

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TERMS AND DEFINITIONS

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TERMS AND DEFINITIONS

Terms and abbreviations used in this report

- 3PL Third-Party Logistics
- AI Artificial Intelligence
- APM Automated Parcel Machine
- AV Autonomous Vehicles
- B2B Business-to-Business
- B2C Business-to-Consumer
- BYOD Bring Your Own Device
- BVLOS Beyond Visual Line of Sight
- C2C Consumer-to-Consumer
- C2X Consumer-to-Anyone
- CAGR Compound Annual Growth Rate
- CEO Chief Executive Officer
- CEP Courier Express Parcel
- COO Chief Operating Officer
- CO_2 Carbon Dioxide
- CO_2e CO_2 Equivalent
- CSEE Central & Southeastern Europe
- CX Customer Experience
- D2D Door-to-Door Delivery
- DACH Germany, Austria, Switzerland

TERMS AND DEFINITIONS

Terms and abbreviations used in this report

- DSP Delivery Service Provider
- DVLA Driver and Vehicle Licensing Agency
- ERP Enterprise Resource Planning
- ESG Environmental, Social, and Governance
- EV Electric Vehicle
- GHG Greenhouse Gas
- GLEC Global Logistics Emissions Council
- IoT Internet of Things
- KPI Key Performance Indicator
- Last Mile Leg of a journey comprising the movement of goods from a distribution centre to a final destination
- LED Light Emitting Diode
- LME Last Mile Experts
- LNG Liquefied Natural Gas
- LTZ Limited Traffic Zone
- M&A Mergers and Acquisitions
- NPS Net Promoter Score
- NOx Nitrogen Oxides
- OOH Out-of-Home (Delivery)

TERMS AND DEFINITIONS

Terms and abbreviations used in this report

- OTC Over-the-Counter (medication)
- PM Particulate Matter
- PMO Project Management Office
- PPWR Packaging and Packaging Waste Regulation
- PUDO Pick-up and Drop-off Location
- SDK Software Development Kit
- SLA Service Level Agreement
- TCO Total Cost of Ownership
- TMS Transportation Management System
- UX User Experience
- WMS Warehouse Management System
- WTW Well-to-Wheel
- VRP Vehicle Routing Problem

WHAT IS THE LAST MILE?

The term 'Last Mile' has been borrowed from the telecommunications industry, where it describes the difficulty of connecting users' homes or businesses to the main telecommunication network.

Our definition of the 'last mile', in logistics, covers all of the parcel flows from the moment an item leaves the outbound ramp at a manufacturing, retail, or e-commerce warehouse.

This can actually involve the 'first mile' to a carrier logistics facility, the 'middle mile' between various hubs and depots, and the last mile from the local delivery facility to the end consignee. The last mile is crucial because it is critical for any retail/e-commerce customer experience. An item that is undelivered, damaged, or late is arguably the most important service failure on the part of the merchant.

Moreover, based on LME's internal research and calculations, the last mile makes up around 30-60% of all supply chain costs for B2C parcels and, more relevant to this report, is a key element of the carbon footprint created by e-commerce B2C parcel flows.

WHAT IS AN INNOVATION?

How do you understand innovation in the CEP sector in correlation with new technologies, in particular with AI tools?

That's the question we asked artificial intelligence, let's see what the answer was...

Innovation in the CEP sector is the ability to dramatically improve key business metrics such as delivery cost, especially last-mile, which often accounts for more than 50% of total distribution costs, lead time, reliability, sustainability, and customer experience by intelligently combining new technologies, including, above all, AI tools.

It is not just about "implementing a technological innovation", but about creating a lasting competitive advantage in the conditions of growing competition (InPost in Poland, Amazon Logistics globally), cost pressure, staff shortages, and growing customer expectations.

Innovation is measured by the effects of:

- Reduction of empty mileage,
- Increase in first-attempt delivery rate
- Reducing CO_2 emissions
- Scalability with growing volumes of e-commerce and re-commerce

AI is no longer an add-on to the planning of operations; it becomes the central nervous system of the entire logistics operation. Here are the most important areas of correlation:

1. Optimisation of routes and planning (the most mature application)

- Algorithms that analyse traffic in real time, weather, historical data, customer time windows, and new orders.
- The results: a reduction in mileage by 15-30%, fuel and emission savings.
- Dynamic rerouting - The route changes throughout the day.

2. Predictive analytics and demand forecasting

- AI predicts demand at the zip code or even street level, allowing for better inventory positioning (micro-fulfilment) and capacity planning.
- I adjust the number of vehicles and staff not only depending on the volume, but also thanks to a very effective analysis of historical data and predictions of the current day.

WHAT IS AN INNOVATION?

3. Automation of sorting and warehouses

- Robots with computer vision and AI that sort thousands of packages per hour with very high accuracy and, importantly, without fatigue from monotonous work.
- AI helps with optimal packaging, container loading, and error reduction.

4. The Last-mile – the most innovative and difficult area

- Prediction of failed deliveries, AI analyses customer behavior and flags risky shipments.
- Integration with drones, delivery robots, and autonomous vehicles.
- Personalised delivery windows and communication thanks to the use of chatbots and predictive notifications.

5. Customer Experience and Additional Services

- AI-powered chatbots and voice agents handling complaints, address changes, etc.
- Personalisation of notifications, e.g.: "the package will be at the neighbor's at 5:30 p.m."
- Fraud detection and address validation.

6. Sustainability (increasingly important KPIs)

- AI optimises not only the cost, but also the carbon footprint (choosing the route with the lowest emissions, consolidating shipments, scheduling the charging of electric vehicles).

As a COO who has spent over three decades planning and executing operations, I agree with many of them, but some of them still raise my doubts, especially the mass replacement of customer service employees with chatbots that are not yet well tested and "learned their role in a given company.

And how do you assess AI's response?

Mirek Gral
VP Last Mile Experts

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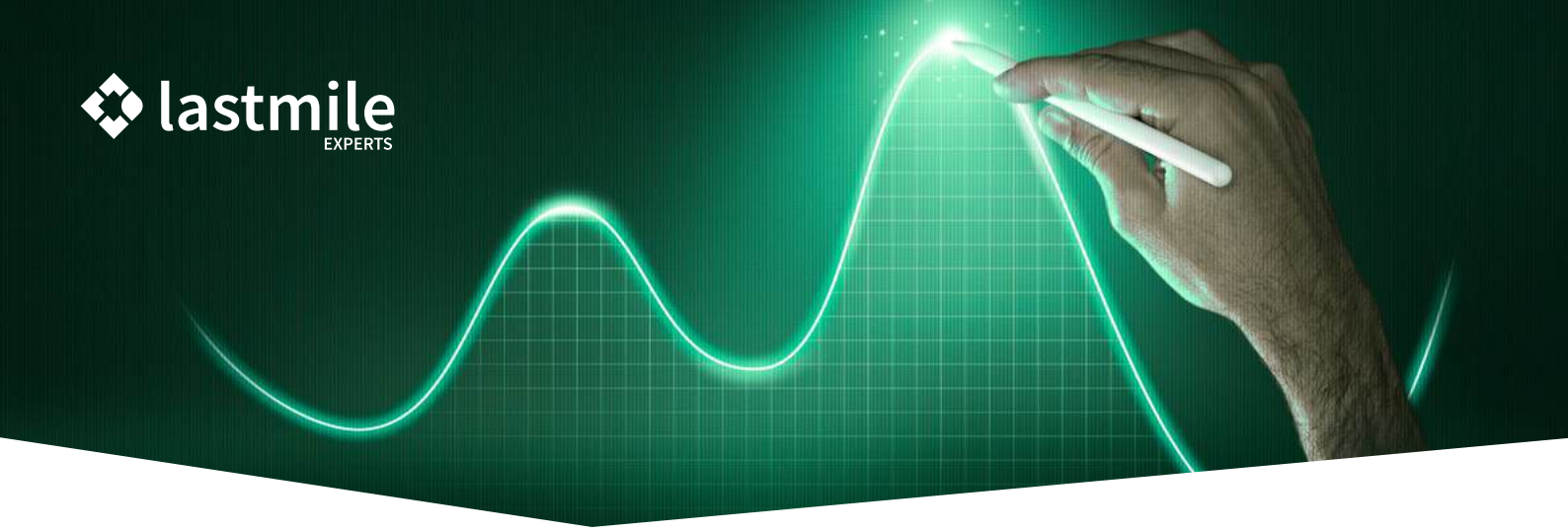
ABOUT THE AUTHORS AND PARTNERS



Last Mile Experts is a specialist **last-mile**, **CEP, and e-commerce consultancy.**

Our team has several hundred years of joint experience and is supported by partnered specialists throughout the globe, who help us deliver industry best practices in the most focused of areas.

In addition to the above, we have relationships with many key suppliers of hardware and software for route optimisation, sortation or tracking, and control.

Very few consultancies are so specialised, and hence our motto:

Our focus drives your success!

Why choose Last Mile Experts

EXPERIENCE AND KNOWLEDGE

Our experts have the necessary know-how, resulting from years of experience in the CEP industry.

COMMITMENT

We believe that only full commitment can bring success, so we devote ourselves fully to our clients' projects.

ANALYSIS

We conduct in-depth analysis of operational processes, taking into account the specificity of a given enterprise. They result in recommendations of specific solutions together with the implementation programme.

FLEXIBILITY

For the duration of the project, Last Mile Experts becomes part of your company. We adapt to your processes and structures.

INNOVATION

We are constantly looking for new solutions. We have a great understanding of the processes in the CEP industry and know the future technologies dedicated to the last mile.

ETHICS

Because we believe that the basis for effective cooperation is trust, we always maintain the highest ethical standards.

AUTHORS

MAREK RÓŻYCKI

Managing Partner

Marek is a recognised industry subject matter expert. He advises clients on strategic and commercial matters and co-hosts the Last Mile Prophets video podcast, where he discusses the key trends shaping parcel delivery and logistics.

Marek was part of the start-up team for DHL Poland and went on to found Masterlink Express, now DPD Polska. As CEO of Geopost CSEE, he built and led a 16-country region under the DPD brand. Until 2015, he served as VP of Amazon Logistics EU. Marek has also acted as deal advisor to Advent International on its acquisition of InPost and is a board advisor to several private equity funds and carriers.

MIREK GRAL

Vice President, Partner

Mirek has been working in the CEP sector since 1992. He started as a courier before going on to manage several projects in Poland and abroad. While at MS Stolica, he also worked with the likes of OCS, Airborne Express, FedEx, Aramex, and GDA.

In 2005, Mirek joined UPS and took up the position of COO, coordinating the integration of the two networks in Poland.

Since 2020, having been a partner at LME for six years, he has been responsible for the operational aspects of M&A projects, advising clients on how to optimise last-mile processes and maintain a high standard of service. He also directly oversees data collection and the preparation of all LME reports.

OUR PARTNER

SOFTWARE MIND

Software Mind is a global technology partner with over 25 years of experience that helps companies accelerate growth and drive measurable business value.

Driven by domain expertise and deep business understanding, they provide consultancy and software development that foster smarter optimisation, decision-making, and transformation.

Their hands-on experience with machine learning, AI, cloud, data engineering, and a range of AI accelerators empowers organisations across industries to capture technological opportunities suited to their complex goals.

Software Mind's experts bring ownership, transparency, and active engagement to every cooperation, turning their passion and know-how into proven strategies, high-quality, and robust security. Offering flexible and reliable support, Software Mind advises and delivers so that companies can thrive in any market environment.

Founded in 1999, Software Mind has evolved over the past quarter century from a boutique software house into a global partner serving clients in more than 35 countries.

Today, the company works across industries including logistics, financial services, telecommunications, biotech, manufacturing, media and entertainment, and real estate, bringing the same depth of engagement and technical rigor to every project.

Operating across Europe, North America, and Latin America, Software Mind helps organisations navigate complex technology challenges, from strategy and consultancy through implementation and long-term evolution. This global reach ensures continuity, flexibility, and long-term partnership, wherever clients operate.

For more information, visit softwaremind.com.

OUR PARTNER

SWIPBOX

Where Smart Meets Simple in Parcel Delivery

SwipBox® develops smart parcel locker solutions that make delivery and collection effortless.

Combining intuitive network management software with app-, PIN pad- and screen-operated lockers, we create seamless convenience for logistics providers, retailers, and end users alike.

At the heart of our portfolio is the Infinity range – modular, battery-powered lockers designed for rapid deployment and easy scalability.

Each unit runs independently with no need for wiring or civil works, and app-based configurations do not require Wi-Fi. Where connectivity is needed, a built-in modem provides reliable coverage, with offline synchronisation available if required.

Backed by powerful software that provides full network insight and control, SwipBox empowers partners to make smarter, data-driven decisions.

Trusted by leading logistics providers and retailers in more than 30 countries, we're redefining how parcels are delivered, making logistics smarter, simpler, and more flexible.

CONTRIBUTOR

Henk Slotboom
Co-founder and Managing Partner at 'the IDEA!'

Henk Slotboom is a seasoned financial analyst with over 40 years of experience in the financial sector, including senior management roles at leading Dutch and international banks.

In 1989, he established the institutional equities desk at Amstgeld NV (a subsidiary of NN Group). In 1999, he joined Julius Baer as Managing Director to build and lead its Dutch operation.

He later headed the international institutional equities business at Bank Insinger de Beaufort.

In 2007, Henk co-founded the Idea-Driven Equities Analyses company (the IDEA!), an independent, employee-owned research boutique.

Initially focused on in-depth, idea-driven investment research for institutional investors, hedge funds, and private equity firms, the firm has expanded its value proposition.

By analysing not only individual companies but also their suppliers, clients, and competitors, the IDEA! delivers a broader market perspective.

This has led to growing demand from corporations, which use its research to complement internal intelligence for strategic decision-making. Henk and the team also serve as trusted advisors on complex financial matters, business valuations, and M&A.

Today, Henk specialises in the e-commerce and e-commerce logistics sector, regularly contributing insightful analysis on major European players such as InPost, PostNL, bnode, DHL, IDS, CTT Correos, and Austrian Post.

CONTRIBUTOR

Łukasiewicz
Poznański Instytut Technologiczny

Marta Cudziło
Deputy Director of Modern Mobility Center, Head of Logistics Research Group at the Łukasiewicz Research Network – Poznań Institute of Technology.

Project manager and logistics consultant for over 18 years. During her career, she has led and co-implemented dozens of consulting projects for companies in the field of supply chain logistics optimisation of large companies as well as SMEs, including Grupa Żywiec, Leroy Merlin, NEUCA, PGF S.A., Media Markt, ENEA, and Żabka.

Apart from logistics consultancy, for several years she has been coordinating and co-implementing R&D projects co-financed by national institutions and EU bodies, consisting in researching new trends and creating innovative solutions to support logistics in Europe.

Currently, as a coordinator or executor, she is involved in projects such as: Cristal (Climate resilient and environmentally sustainable transport infrastructure, with a focus on inland waterways), Green Turn (Enabling stakeholder-centric zero emission e-commerce delivery and return practices through transparent and collaborative supply chains), Greta (Greening Regional freight Transport in fuAs).

She coordinates Łukasiewicz–PITs activities within the EiT Urban Mobility partnership. In her career, she has also collaborated with the Higher School of Logistics, teaching classes on logistics controlling, forecasting, and simulation, digital transformation of supply chains.

She has also authored or co-authored industry and specialised articles and reports on e-commerce logistics and supply chain optimisation.

CONTRIBUTOR

Software Mind

Michał Mołdrzyk
Logistics Software Delivery Director, Software Mind

A manager with over 20 years' experience in the IT industry, Michał combines broad business and functional knowledge with exceptional management skills and a strong background in system architecture and technology.

In his past role as a Consulting Services Director at CGI, he was responsible for managing one of the largest IT outsourcing programmes for a mobile operator in Europe. Currently at Software Mind,

Michał leads a business unit that develops and integrates innovative last-mile software for the largest courier companies in Poland.

His unique combination of technical expertise and domain knowledge has empowered him to successfully conduct many IT audits and consulting projects in the last mile sector.

CONTRIBUTOR

International Post Corporation

Jakub Rymkiewicz
Market Research Manager at the International Post Corporation (IPC)

Jakub is responsible for translating large-scale e-commerce and consumer research into actionable insights for postal operators worldwide.

He plays a central role in shaping IPC's understanding of how online shoppers choose delivery options, how these preferences evolve over time, and what this means strategically for national posts operating in increasingly competitive last-mile markets.

Jakub leads analytical work across IPC market research, including the Cross-Border E-commerce Shopper Survey, providing member posts with detailed evidence on delivery location choice, out-of-home (OOH) adoption, parcel locker usage, dwell time, returns behaviour, and sustainability expectations.

His work helps postal operators benchmark their performance against peers, identify structural differences between markets, and anticipate where consumer behaviour is moving next – especially around international e-commerce, OOH, and e-commerce strategy overall.

CONTRIBUTOR

Christian Ostergaard
Lead Visionary and Senior Group Strategist focusing on PostNord's IT-Production incl. IoT, AI, ML

With more than 40 years of experience in the Postal and Logistics sector, he has extensive experience in creating value for business with the help of technology. As former Head of Logistics at Post Denmark, he was involved in building the parcel business from the ground up.

Following this success in Denmark, he moved to Belgium as Program Director, re-engineering the logistics business in Bpost. From here, he worked on the merger that formed PostNord, contributing across both IT and operations.

He has, as Business CIO, overseen a paradigm change of the entire backbone of Production IT as he led the development of an operational Nordic IT backbone spanning four countries. And in recent years, his focus has been on navigating the accelerating intersection of technology, data, and operations, where the pace of change is only increasing.

His work helps postal operators benchmark their performance against peers, identify structural differences between markets, and anticipate where consumer behaviour is moving next – especially around international e-commerce, OOH, and e-commerce strategy overall.

For the last 7 years, he has worked on bringing new technologies into use at PostNord by challenging the current ways of working. He is a vivid advocate of using new technologies to face the challenges of the postal and logistics industry. His many years in the industry mean that he has a broad network spanning across the globe.

These years, during which technology has developed faster than ever, he has taken a special interest in connecting the start-up environment to the postal world to leverage that angle as well.

In recent years, he has been leading the team from PostNord that won the Parcel & PostExpo's Transport Innovation of the Year (2022), the Parcel & PostExpo's Sorting and Warehouse innovation of the year (2023), and the Parcel & PostExpo's Sorting Innovation of the Year (2025).

For years, he has been a keynote speaker and panel participant at various international events about the logistics industry and the future from a technology angle.

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BACKGROUND TO THE REPORT

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BACKGROUND TO THE REPORT

Driven by the continued expansion of e-commerce and re-commerce, B2C and C2C shipments are now the primary engines of volume growth across both European and global CEP markets. In many countries, these segments already account for approximately 60–70% of total parcel volumes handled by carriers and postal operators, and their share continues to increase.

This structural shift places sustained pressure on operators to reduce unit delivery costs, as B2C and especially C2C flows are typically more fragmented, lower density, and more operationally complex than traditional B2B volumes.

At the same time, increasingly informed and demanding consumers expect greater flexibility, speed, and transparency in delivery, intensifying competition among CEP providers.

This is accelerating the adoption of innovative delivery solutions, particularly out-of-home networks, automation, and digital customer interfaces, aimed at improving service quality while maintaining cost efficiency.

As a result, the rapid growth of B2C and C2C volumes is acting as a key catalyst for ongoing innovation across the CEP sector.

particularly in solutions designed to optimise last-mile operations and reduce overall delivery costs.

Based on various sources and expert interviews, the CEP market was valued globally between $455–$580 billion in 2025, and is expected to reach up to approximately $1.1–$1.2 trillion by 2034, with a CAGR range between 5.5%–9.5%.
That is why every penny saved and every gram of CO_2 avoided counts.
Our report includes projects from different areas of the CEP industry, and all the solutions presented are aimed at more efficient, cheaper, yet green solutions for the sector.

We are aware that the projects presented in our report are just a few of countless innovations around the globe, but we aim to show much more project diversity in future editions.

A big thank you goes out to everyone who has made the second edition of the Last Mile Innovation Report possible, including:

- Partners **Software Mind** and **SwipBox** for substantive and financial support.
- Tried and trusted contributors: **The Idea**, **Łukasiewicz Institute,** and **IPC**.
- Media Partners: **DELIVER**, **Leaders in Logistics**, **Parcel and Postal Technology International,** and **Last Mile Prophets**.
- To all the companies that shared their projects.

BACKGROUND TO THE REPORT

We invite all companies, especially startups that would like to share their projects, to contact us at **REPORT@lmexpert.com**.

The report is published once a year, and we collect applications (at no charge) from the beginning of the first quarter.

Another goal the authors of the report share with our partners is to **Educate** stakeholders and share ideas to accelerate the development of future projects.

LME has extensive knowledge of this market and has already shared various studies and reports in the public domain. Along with our partners, we aim to make this report the first of its kind.

We have directly contacted all key operators and used industry media, as well as business and social media, especially our sister business (Last Mile Prophets), to gather project submissions.

This has resulted in 14 varied projects across several markets that cover various aspects of the last mile.

NOTE:

- Data has been obtained from contributors, publicly available sources, and commercially accessible sources. The data published represents the latest information available from these sources at the time the research was conducted.

- The authors have reviewed company websites, publications, and news items. Moreover, we have conducted numerous interviews (with CEOs or senior-level CEP experts and data & research consultancies) to develop this report. Finally, we have used the Last Mile Experts team's market know-how and expectations for future developments.

- Except for spelling and grammar corrections, the content of the projects is not altered by Last Mile Experts. Materials submitted for inclusion in the report may not be withdrawn by the authors. By submitting, authors grant permission for their content to be published by the report's authors and partners.

BACKGROUND TO THE REPORT

What Can You Find in This Report?

- The report covers last-mile projects from all Logistics & CEP organisations that have shared information about their INNOVATIONS.
- In the footnotes, you will find interactive links to the data sources (where applicable).

What Are the Sources and Methodology?

The main sources for the report are:

- Projects shared by last-mile stakeholders.
- Chapters prepared by our partners and contributors.
- Use of UPIDO's advanced internet search algorithm outcomes to estimate CO_2 emissions in 27 EU countries plus Norway, Switzerland, and the UK.
- Our own research and interviews, and collaboration with subject matter experts.
- Where the actual or published data is not available, we have made estimations based on our market knowledge.

Who Will Benefit from Our Report?

The report is intended for:

- Owners and operators of CEP networks.
- Governmental departments and local authorities.
- Entrepreneurs working on technological innovations and solutions for logistics.
- Market regulators and policymakers.
- Journalists and editors of newspapers and magazines.
- Analysts, consultants, and other stakeholders.

Photo: SwipBox

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DESIGNING FOR THE GLOBAL LAST MILE: WHY ADAPTABILITY IS THE CORE OF MODERN OOH INFRASTRUCTURE

Contribution by SwipBox

Media Partners:

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DESIGNING FOR THE GLOBAL LAST MILE: WHY ADAPTABILITY IS THE CORE OF MODERN OOH INFRASTRUCTURE

At SwipBox, we believe that the future of last-mile logistics lies in unified, adaptable Out-of-Home (OOH) ecosystems.

As parcel lockers evolve from niche conveniences into critical urban infrastructure, the challenge for network operators has become a trilemma: maximising user adoption, controlling Total Cost of Ownership (TCO) and navigating a complex regulatory landscape.

For too long, the industry has been faced with a choice between operationally complex solutions and models that do not accommodate all users.

However, designing for the future is not about choosing one type of locker; it is about building a modular, software-driven platform that supports broader adoption through flexibility.

Our journey reflects this shift: beginning with the Classic locker and evolving through the app-operated Infinity, into a modular ecosystem where accessibility and compliance are built into the core design.

This ensures that lockers remain an integrated component of the modern delivery network.

From Classic to Infinity: Designing for a Digital Age

The transition from our early screen-based SwipBox Classic lockers to the Infinity platform was driven by a need for scalability and operational efficiency.

By moving the user interface to the smartphone, we not only increased usability, but we also eliminated the primary barriers to rapid network expansion: the need for mains power and the high maintenance overhead of integrated screens.

DESIGNING FOR THE GLOBAL LAST MILE: WHY ADAPTABILITY IS THE CORE OF MODERN OOH INFRASTRUCTURE

This digital-first, battery-powered, Wi-Fi-independent architecture created an operationally lean asset, enabling deployment in previously unviable locations – from residential basements to remote outdoor spots.

Crucially, this new design also solved a fundamental accessibility challenge. While physical touchscreens are often impossible for visually impaired users to navigate, the Infinity app leverages native smartphone screen readers, providing a more inclusive experience from the outset.

DESIGNING FOR THE GLOBAL LAST MILE: WHY ADAPTABILITY IS THE CORE OF MODERN OOH INFRASTRUCTURE

By removing the modem and the screen – instead communicating with apps via Bluetooth (BLE) – we created a highly durable solution with fewer points of failure, ensuring the locker functions as a reliable, low-maintenance asset within a larger, unified logistics ecosystem.

Market Adaptability: The Strategic Value of Interface Choice

A purely app-based solution is a highly viable and efficient strategy in many digitally mature markets. However, our experience across diverse geographies shows that a single interaction model is not a universal fix.

As networks scale internationally, relying solely on an app can create a barrier for certain demographics, including older users, non-smartphone owners or those in markets where a shareable code is simply preferred.

To address this without reintroducing the high operational overhead of traditional screens, we introduced the PIN pad – a physical interface that remains operationally lean and battery-powered.

DESIGNING FOR THE GLOBAL LAST MILE: WHY ADAPTABILITY IS THE CORE OF MODERN OOH INFRASTRUCTURE

With this addition, we could offer an adaptable solution, allowing carriers to optimise their hardware to match the specific cultural and digital maturity of their market while keeping the core solution efficient and flexible.

Future-Proofing Through Compliance and Modularity

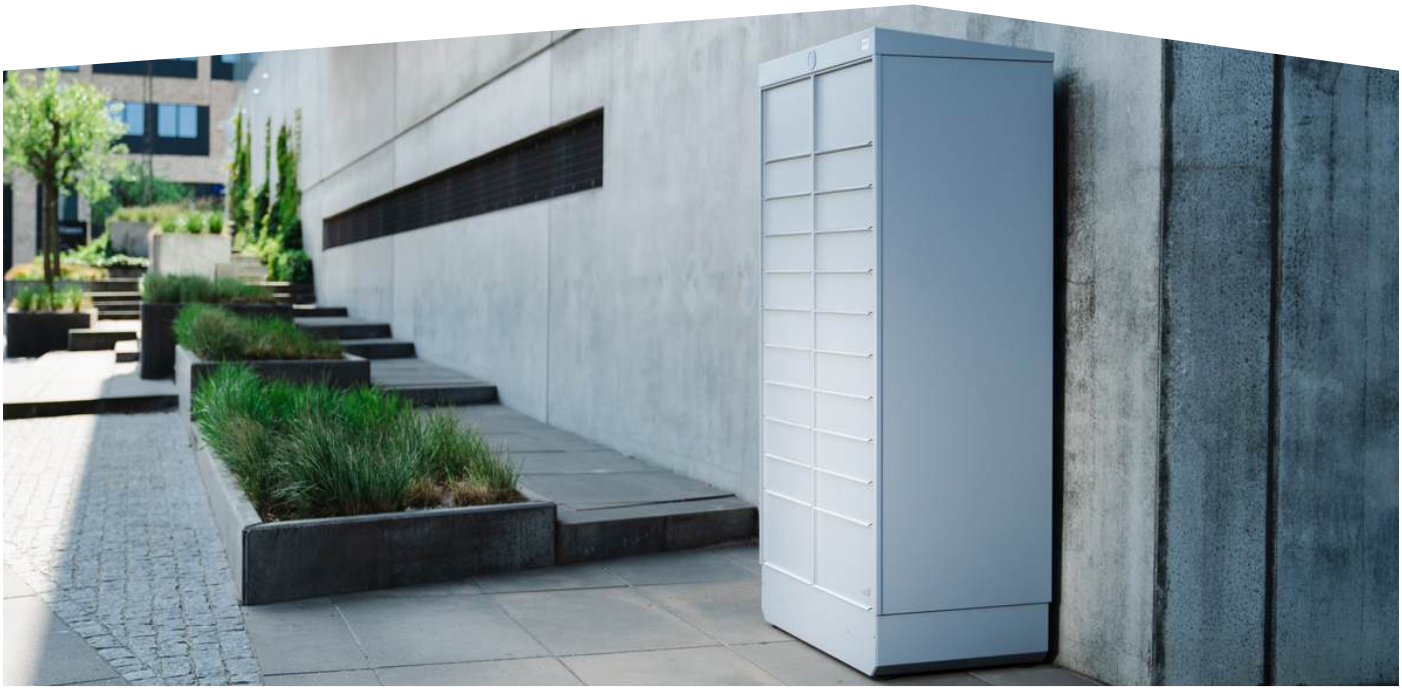
At SwipBox we view regulatory compliance not as a constraint, but as a catalyst for innovation, and hence the latest phase of the Infinity evolution – the SwipBox Infinity Flex 10 and Infinity Connect 10 – was driven by the European Accessibility Act (EAA).

These newest generations reintroduce a built-in screen module, designed specifically to meet European accessibility standards and provide a barrier-free experience while maintaining the platform's signature operational efficiency.

To achieve this, on service points where a physical interface is used, only one is needed to control a bank of up to ten lockers. The rest of the lockers remain lean, minimising hardware, operational, and maintenance costs.

By designing for compliance from the outset, we empower our partners to future-proof their networks against shifting legislation and location scarcity.

Accessible to more users, inclusive lockers in turn become a growth driver for carriers. And the reason this is made possible must be found beneath the surface in our software infrastructure.



DESIGNING FOR THE GLOBAL LAST MILE: WHY ADAPTABILITY IS THE CORE OF MODERN OOH INFRASTRUCTURE

Because the Infinity platform is built on a unified backbone of firmware, software, APIs and SDKs, these new physical interfaces integrate seamlessly into the existing network.

This also means that for the operator, the experience is unchanged: lockers with a PIN pad or screen remain entirely app-driven in every other sense, from initial configuration and installation to ongoing maintenance.

This modularity ensures that new interfaces can be introduced without increasing system complexity or requiring a complete network overhaul.

Key Learnings: Software as the Backbone of OOH

The evolution of the Infinity system underscores a fundamental truth: while hardware provides the physical presence, software provides the intelligence and the scale.

Our journey has provided several valuable insights:

Accessibility is a strategic asset: Building inclusive products from the core results in a more intuitive and consistent experience for everyone, not just those with specific needs.

Modularity optimises TCO: A modular architecture allows operators to match their hardware investment and its associated operational footprint precisely to the needs of each location.

Adaptability is key to global scale: There is no "perfect" interface for every market. The goal is to provide a flexible ecosystem that lets operators choose the right path – app, PIN pad or screen – for their specific demographic needs.

A unified platform unlocks efficiency: Hardware flexibility must be supported by a shared software ecosystem to ensure operational complexity does not increase as new interfaces are introduced.

In SwipBox's case, building all locker types on the same core platform means that any locker with a physical interface can also be operated using the end user app, adding any locker with a physical interface – be it a PIN pad or a screen – can also be operated using the app, adding a level of redundancy and giving users the freedom to choose their preferred access method.

"Our evolution reflects the broader transformation of the industry," says SwipBox CCO Kasper Cort."

The future of OOH logistics will be defined by the consolidation of services and technologies, driving greater operational and economic efficiency through seamless integration."

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THE ENVIRONMENTAL IMPACT OF E-COMMERCE AND RE-COMMERCE DELIVERIES IN THE CEP SECTOR AND THE ROLE OF INNOVATIONS

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THE ENVIRONMENTAL IMPACT OF E-COMMERCE AND RE-COMMERCE DELIVERIES IN THE CEP SECTOR AND THE ROLE OF INNOVATIONS

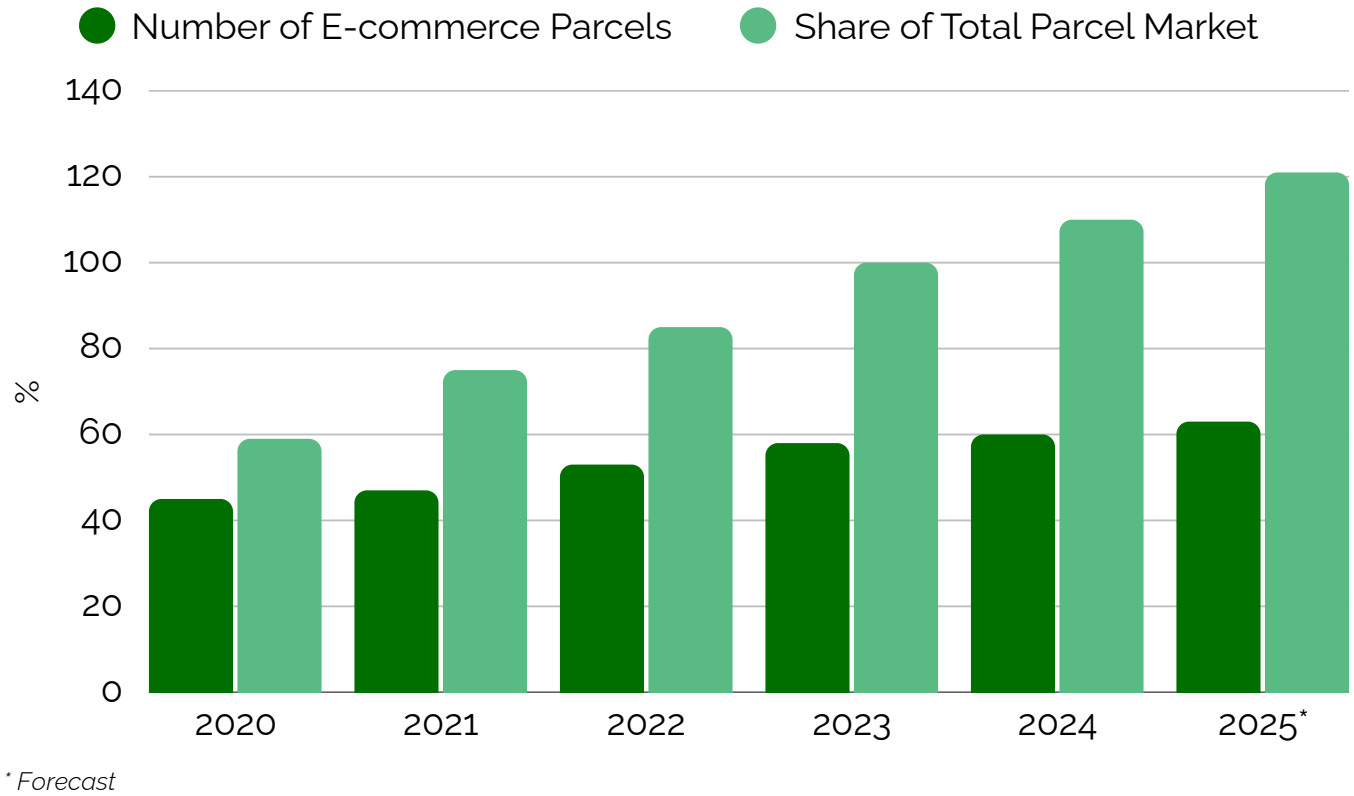
Global Shipment Volumes: Current Scale and Forecasts

Global e-commerce continues to drive parcel growth. In 2025, B2C e-commerce parcel volumes are estimated at approximately 121 billion shipments, reflecting roughly 10% year-over-year growth.

Total global parcel deliveries (including all categories) reached around 407 billion packages in 2025, with projections climbing toward 435 billion in 2026 and approaching 500 billion by 2028.

B2C e-commerce market value (revenue) in 2025 is projected in the range of USD 6.4–7.8 trillion, depending on the source, with continued CAGR estimates of 6–8% through the late 2020s. Growth is fueled by emerging markets, mobile commerce, and cross-border trade.

Development of the Global CEP Market (Excluding Returns), in Billions



* Forecast

Figure 1: Development of The Global CEP Market (Excluding Returns), in Billions
Source: ECDB, Pitney Bowes

THE ENVIRONMENTAL IMPACT OF E-COMMERCE AND RE-COMMERCE DELIVERIES IN THE CEP SECTOR AND THE ROLE OF INNOVATIONS

Global Shipment Volumes: Current Scale and Forecasts

Re-commerce C2C-focused resale platforms like Vinted, eBay, or local marketplaces represent a smaller but faster-growing segment aligned with sustainability goals.

The global re-commerce market was valued at roughly USD 200–210 billion in 2025, with forecasts reaching USD 290–310 billion by 2029–2030 at CAGRs of 6–10%.

While specific C2C shipment volumes are harder to isolate (as many overlap with general parcel flows), re-commerce contributes tens of billions of additional parcels annually, particularly in fashion, electronics, and apparel.

It benefits from consumer demand for affordable, eco-conscious options but still adds to delivery traffic.

These volumes strain CEP networks, especially in urban last-mile segments, where delivery density is high, but consolidation is challenging.

And this is where innovation, creativity, and the courage to implement new solutions to reduce CO2 emissions, a topic that has been discussed at length, come into their own.

E-commerce, Re-commerce, and the Environmental Footprint of Parcel Delivery

The continued expansion of e-commerce remains one of the most important growth drivers in the CEP sector, but it also places increasing pressure on transport networks, urban infrastructure, and environmental performance, which reinforces the scale of the operational and sustainability challenge facing parcel operators.

Re-commerce is becoming an increasingly relevant part of this picture. While global C2C parcel volumes are not yet consistently published in a single standardised dataset, the rapid growth of resale platforms indicates that peer-to-peer shipment flows are rising quickly.

In Europe, re-commerce has developed into a major consumer segment, and the expansion of C2C platforms is generating additional parcel demand across both domestic and cross-border routes.

Environmental Impact of Delivery Growth

The environmental consequences of parcel growth are concentrated primarily in the last mile, where low drop density, repeated stops, and failed delivery attempts raise emissions per shipment.

THE ENVIRONMENTAL IMPACT OF E-COMMERCE AND RE-COMMERCE DELIVERIES IN THE CEP SECTOR AND THE ROLE OF INNOVATIONS

Industry research consistently identifies last-mile delivery as the most carbon-intensive stage of the parcel journey, particularly when individual home deliveries replace consolidated flows.

The impact extends beyond greenhouse gas emissions. One of the projects we present in this report concerns the calculation of exhaust emissions.

The application has been designed to accurately estimate emissions from road transport, effectively addressing several significant limitations.

Higher delivery frequency contributes to congestion, local air pollution, noise, and pressure on curbside infrastructure in urban areas.

At the same time, packaging volumes increase as operators and retailers seek to protect goods shipped in smaller, more fragmented consignments.

In re-commerce, these effects are amplified by return flows, which add further transport activity and material use.

Role of Operational Innovation

The most effective mitigation strategy is to improve delivery efficiency per parcel.

Network optimisation, load consolidation, and route planning reduce vehicle kilometres and improve fleet utilisation, while parcel lockers and parcel shops help concentrate deliveries into denser out-of-home networks.

Research and industry analysis suggest that these models can reduce emissions relative to traditional door-to-door delivery, especially in urban environments with high delivery density.

Fleet electrification is another critical lever. Electric vans, cargo bikes, and other low-emission delivery solutions are increasingly deployed on urban routes where distance is limited and stop density is high.

In parallel, digital tools such as predictive routing, dynamic dispatch, and delivery-slot management improve first-attempt success rates and help avoid inefficient repeat journeys.

Re-commerce Logistics Requirements

Although re-commerce supports circular consumption by extending product lifecycles, it also creates a highly fragmented logistics profile. Shipments are often small, dispersed, and return-heavy, especially in fashion, accessories, and consumer electronics.

THE ENVIRONMENTAL IMPACT OF E-COMMERCE AND RE-COMMERCE DELIVERIES IN THE CEP SECTOR AND THE ROLE OF INNOVATIONS

As a result, the environmental performance of re-commerce depends not only on the resale transaction itself, but also on the efficiency of the associated collection, sorting, consolidation, and delivery processes.

For CEP operators, this creates an opportunity to design specialised services for peer-to-peer trade: simplified label generation, dense drop-off networks, integrated locker access, and optimised reverse logistics. The more efficiently these flows are consolidated, the stronger the environmental case for re-commerce becomes.

Segment	2025 volume / value	Outlook
Global B2C e-commerce parcels	121 billion shipments	Continued growth, with e-commerce retaining a larger share of parcel demand.
European re-commerce market	€120 billion	Further expansion driven by resale platforms and consumer price sensitivity.
Global e-commerce retail revenue	$6.86 trillion	Growth is expected to remain strong through the second half of the decade.

Figure 2: Market context for 2025
Source: Own desk research, ECDB, Pitney Bowes, Business Reporter, Searchlab

The main implication for CEP operators is clear: parcel volumes will keep rising, but environmental performance will increasingly shape competitiveness.

Companies that combine density, electrification, and out-of-home delivery solutions will be best positioned to serve e-commerce and re-commerce demand with lower emissions intensity.

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WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

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WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

The landscape of Out-of-Home (OOH) delivery - comprising Automated Parcel Machines (APMs or lockers) and Pick-up and Drop-off (PUDO) points - has evolved from a fringe service that was used primarily during peak into an essential part of modern logistics, especially in a cluster of countries such as Poland, the Baltics, and the Nordics.

In those markets, and to a lesser extent, across the rest of Europe, innovation in this sector will no longer be just about last-mile convenience. New approaches are necessary for managing capacity, reducing costs, and meeting ambitious sustainability targets. These challenges require a certain innovation stack.

Innovation Across OOH is Not Uniform

While both are OOH solutions, parcel lockers and PUDO points represent fundamentally different operational models and innovation trajectories.

An overview of this is as follows:

- Automated parcel machines (APMs): These offer a contactless experience, typically available with extended opening hours, and are often described as being "born out of frustration" with missed home deliveries. Innovation in lockers focuses on hardware - such as sloped doors to prevent freezing in Nordic climates, off-grid or hybrid capabilities, and software – including predictive compartment allocation, multi-operator systems, and multi-parcel compartments.
- PUDO points: These leverage existing retail infrastructure, such as post offices, corner shops, petrol stations, etc. Their main advantage is rapid scalability and lower entry costs – no building permissions needed, and they usually operate on a per-parcel fee and not a fixed rent fee. While they lack the 24/7 access of lockers, they provide a "human interface" that is still essential for older or less tech-savvy consumers.

Innovations in PUDO typically depend on ownership type:

  - Owned PUDO points (post offices or fully owned parcel shops): End-to-end process redesign, national standardisation, long-term CAPEX optimisation via robotics, indoor lockers, etc.
  - Rented PUDO points: “Plug-and-play” parcel setups, one-shelf solutions, scanning stations that work in 1–2 m^2, low-friction onboarding, app-based training, commission and incentive models, dynamic capacity allocation and overflow rules.

WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

OOH, as a More Sustainable Delivery is Possible, but it's Not a Given

The environmental benefits of OOH delivery are not a given; they are deeply influenced by the consumer's mode of transport and the density of the network.

Key considerations from the sustainability point of view are:

- Urban "slipper distance": In dense urban environments, like those in Poland, all locker networks aim for a "slipper distance" of roughly below 300m from the consumer's home. This proximity encourages "trip-chaining" (collecting a parcel "on the way" to work or shopping) or active transport like walking and cycling. When consumers walk to a locker or PUDO, CO2 savings can reach up to 90% compared to traditional home delivery (bpost and VUB).

- The rural challenge: In rural or low-density areas, parcels travel an average of 2.3 times farther than the national average. Because density is lower, consumers are more likely to make dedicated trips by private vehicle to collect their items. Data from Gustave Eiffel University's study shows that a dedicated car trip can emit five to ten times more CO_2 than public transport, potentially negating the operator's consolidation gains.

- Fleet innovation: To mitigate these impacts, carriers are increasingly shifting toward Low-Emission Vehicles (LEVs) and electric delivery vans, which currently have a much higher electrification rate compared to the general passenger car fleet – for example, over one-fourth of all postal vehicles are EVs according to the IPC SMMS 2025 results. When last mile delivery is performed by EVs or using cargo bikes, the emissions reduction advantage for OOH does not work anymore.

One recent empirical research from France illustrates just how nuanced – and often counter-intuitive – the sustainability case for out-of-home delivery is.

A study conducted by Gustave Eiffel University in collaboration with Chaire Logistics City and La Poste combined detailed carrier delivery data (2.5 million parcels) with a nationwide mobility survey of 6,000 consumers.

While out-of-home delivery significantly reduced emissions on the operator side through better consolidation, these gains were more than offset (in essence, annulled), on average, by the emissions generated by consumers travelling to collect their parcels.

WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

Nationally, the study found that a single parcel collection trip generates around 250g of CO_2, compared with an average delivery-side saving of just 74g. Once consumer mobility is included, OOH delivery produces higher average emissions than home delivery across all territorial configurations.

Only in dense urban areas – where walking, cycling, and public transport dominate – does parcel collection have a limited carbon impact. In contrast, in suburban and rural areas, car-based collection trips quickly negate any delivery-side efficiency gains.

At a pan-European level, OOH parcel delivery is characterised by speed, proximity, and routine convenience rather than destination travel, the IPC study of international e-commerce shows.

Nearly two-thirds of European online shoppers collect OOH parcels within 24 hours, and almost nine in ten do so within 48 hours. However, in some markets, like Poland, 48 hours is the maximum time to collect with major parcel locker operators.

Collection is predominantly local: walking is the single most common mode overall, followed by car trips that are combined with other errands rather than made specifically for parcel pickup.

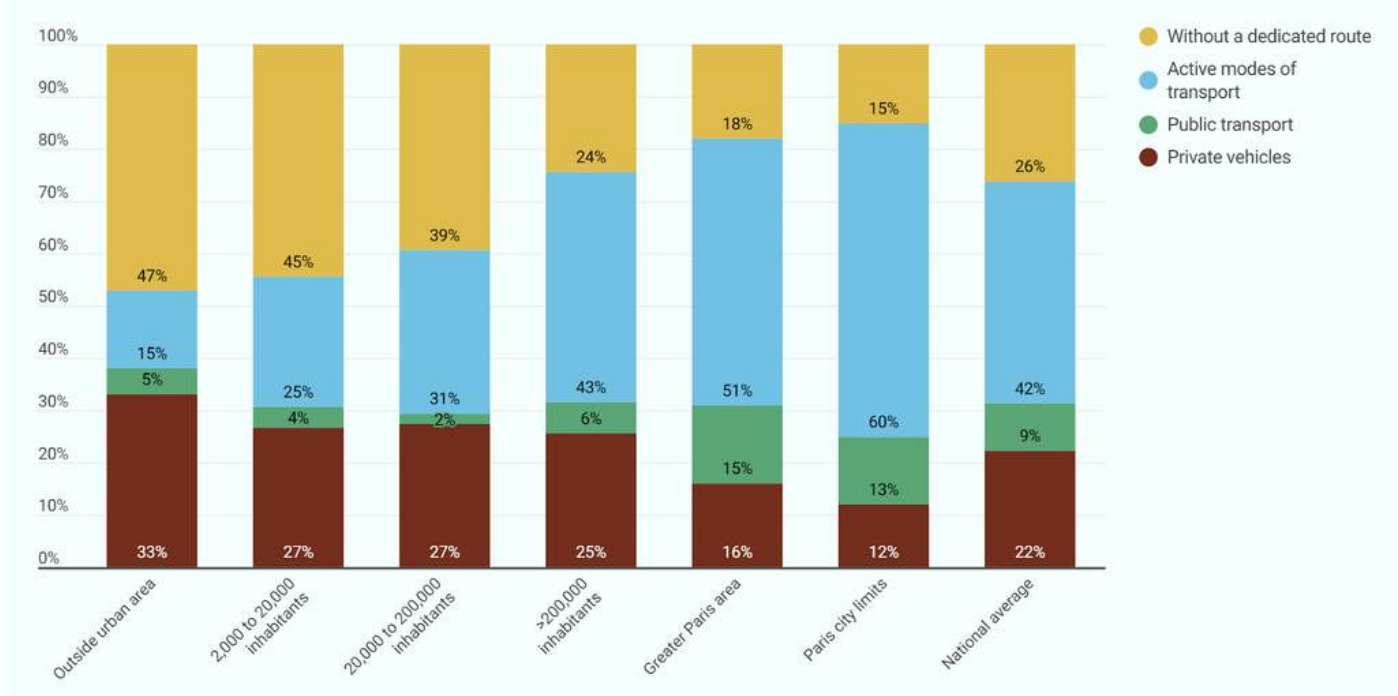


Figure 1: Modal split for consumer pick-up, % of parcels; Home or Out of Home Pick-up "DOMIREDO"
Source: Gustave Eiffel University

WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

Differences emerge primarily along demographic and dwelling type lines. Older consumers tend to collect slightly faster and rely less on dedicated car trips, reflecting more habitual patterns of use, while younger users show marginally higher car dependence.

Housing type, however, creates the strongest divide. 22% of shoppers who live in houses made a dedicated car trip to the OOH point as opposed to 12% for those living in apartments (16% on average).

Apartment dwellers are far more likely to walk and to collect parcels quickly, benefiting from higher locker and PUDO density in ultra urban areas.

To ensure OOH is used more and in a way that supports sustainable goals, the delivery industry must focus on increasing the density of OOH points. How do you make the case for it without being able to prove it?

Enter Poland. A country with over 50,000 individual parcel lockers (varying significantly in number of compartments, though) and a lot more PUDOs, where the average mode of pick-up is already greener than in other European markets.

According to the IPC study, almost 75% of Polish shoppers picked up their parcel from an OOH location without extra emissions – on foot or by bike/scooter.

Pick-up Mode and Time for OOH Deliveries

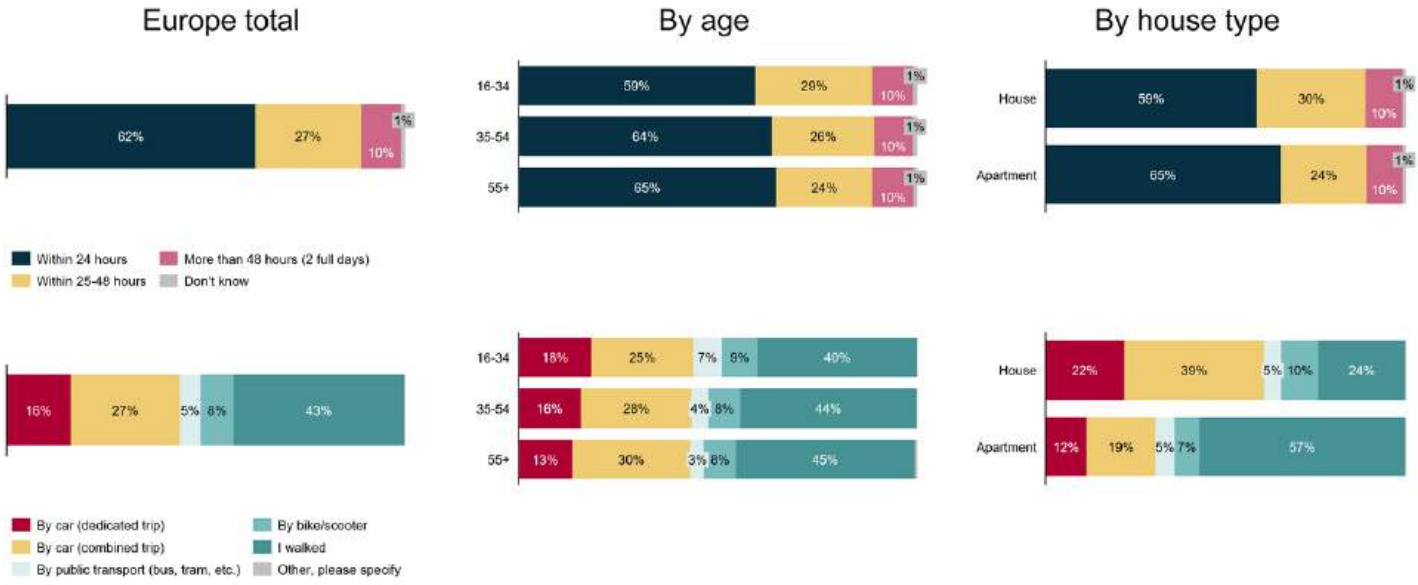


Figure 2: Pick-up mode and time for OOH deliveries, Europe, N=8,253; Source: IPC Cross-Border E-Commerce Shopper Survey 2025

WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

With further location expansion, especially in urban settings, parcel lockers located within 100m from the shopper's house become de facto residential lockers – requiring virtually no emissions during pick-up.

But even then, if those points are not accessible for orders from all retailers, they might have to travel further away to pick the order up, and the reduced emissions advantage may be limited or lost entirely.

Despite signals from some studies, OOH parcel pick-up is not automatically good or bad in terms of overall sustainability if you count all emissions.

Environmental performance of this mode of delivery, including lockers, depends critically on location density, proximity, and consumer transport mode – the latter factor often overlooked in decision making or marketing material around OOH.

Figure 3: Pick-up mode for OOH deliveries, Poland, N=299
Source: IPC Cross-Border E-Commerce Shopper Survey 2025

Location scarcity: the last missing part for network sharing and innovation?

As OOH delivery competition intensifies, the demand for "street-side" real estate is growing, leading to location scarcity.

The industry is only beginning to confront a hard physical constraint: good locations are finite.

Outdoor, public-space parcel lockers face numerous issues, namely those listed on the next page:

WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

- Municipal location permit hurdles
- Aesthetic objections: already appeared in Bratislava, Slovakia and Wroclaw, Poland
- Competing claims for curbside space
- Power and connectivity constraints
- Increased requirements/expectations for an open network from cities

As locker penetration increases, many operators are discovering that the key question, especially in Western and Central Europe, is not how many lockers to deploy and where, but where they can deploy at all directly in public spaces.

Solutions for both locations and sustainability challenges include:

- **The indoor model:** This innovation allows operators to bypass the physical constraints of constricted city centres and ensure they can deploy enough locker compartments to justify the high infrastructure investment. Examples include bbox Boutique from bpost in Brussels and Antwerp, and InPost indoor lockers in London (like this one in Wentworth Street). Indoor models have one key disadvantage – accessing them outside regular opening hours is either impossible or requires an extra layer of identification (scanning a parcel code or using an app).

Photo: Bpost press materials

WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

- **Residential parcel lockers/boxes:** These individual or collective lockers at the place of residence combine the convenience of door-to-door delivery with the flexibility of OOH. While they are highly customer-centric, they only work if correctly placed in building lobbies or in front of gates, entrances, or driveways. Examples include An Post's Delivery Boxes (around 50,000 parcel boxes, which fit a shoebox parcel, installed across Ireland), similar parcel boxes in France (called normalised letterboxes), Community Parcel Lockers in Estonia (rolled out by Omniva with plans for 2,000 such machines across Estonia by 2030) and a recent strategy shift from Swiss Post and Canada Post to communal lockers/boxes to ensure local close-to-home and unattended delivery in the future.

- **Going agnostic:** To combat scarcity, operators are moving toward open (agnostic) networks. These systems allow multiple carriers to share the same physical infrastructure, reducing duplication and ensuring that every available square metre is used to its maximum potential. Examples include the open locker networks of CTT Portugal, PostNL, and DeinFach (subsidiary of DHL). Most recently, DPD and GLS announced that they launched inboxx as their shared open parcel locker brand in Germany – shoppers using GLS or DPD will have access to 20,000 shared OOH points for sending and receiving their parcels, including up to 6,000 parcel lockers (planned by end of 2027).

- Innovations like multiskrytka (delivery of multiple parcels for the same shopper to one locker compartment, introduced in Poland by InPost in 2020, and recently introduced by Allegro, too). This and similar solutions ensure the highest possible usage of the spacious compartments of most street curb parcel lockers and address sustainability and location scarcity challenges in OOH.

Conclusion: OOH is Entering Its Systems-Innovation Phase

OOH delivery supporters no longer need to prove that lockers and PUDO work. That question has been answered.

As the OOH market matures, the next phase is harder and requires a focused strategy:

- Though complementary in handling the parcel volumes, lockers and PUDO must be treated as different tools, not interchangeable nodes.
- Sustainability claims must be sensitive to consumer mobility; they risk being challenged by regulators and consumer organisations.

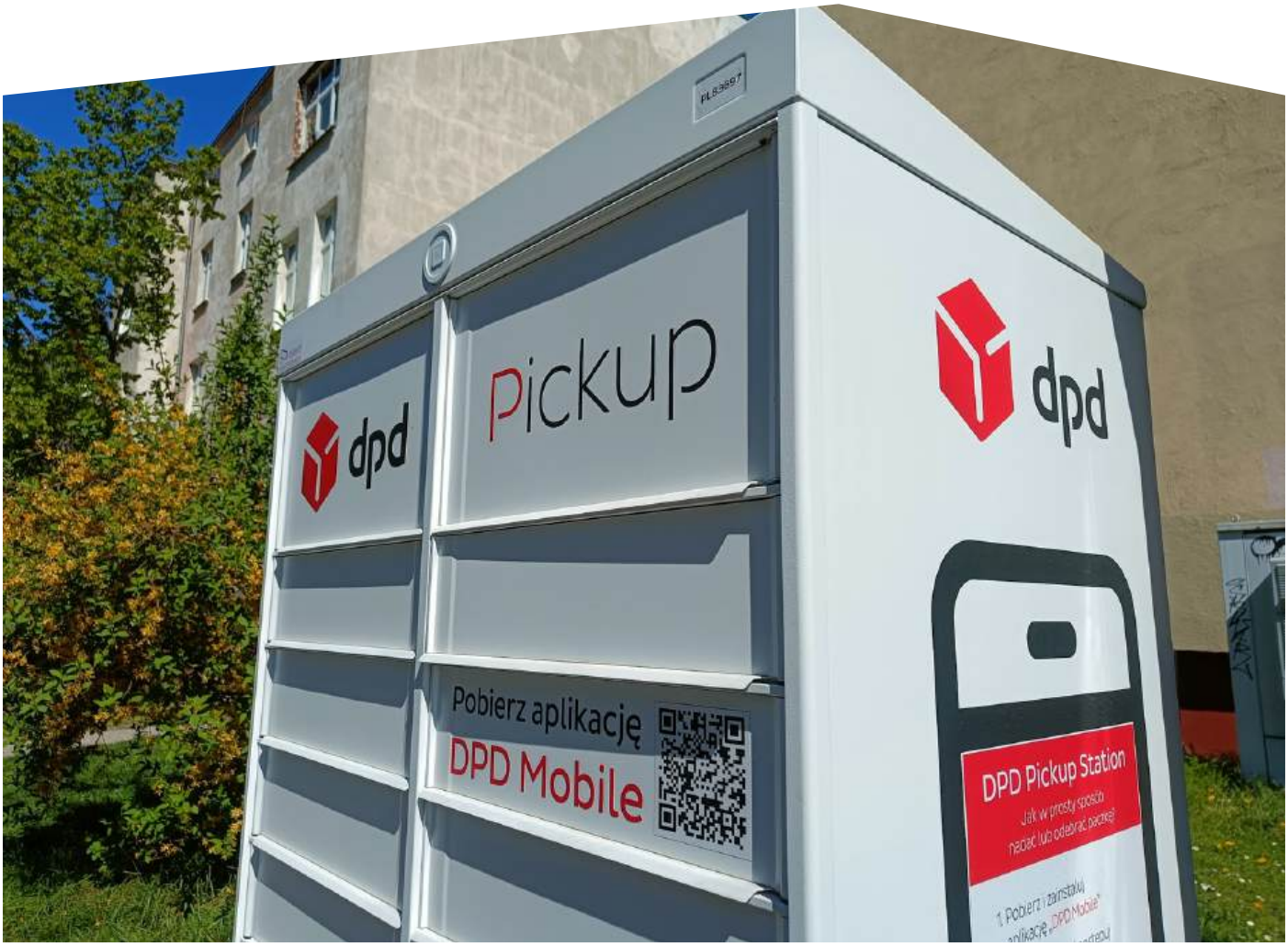
WHAT'S NEXT FOR INNOVATION IN OOH DELIVERY?

- Location scarcity will force a shift towards indoor spaces like transport hubs/stops, supermarkets, and other commercial areas. In city centres, lockers will move to small indoor rented spaces (like InPost lockers in London or bpost boutique in Belgium).

- Innovation will move upstream - into network design, pricing, incentives, volume consolidation, etc.

- Sharing access to points (already commonplace with PUDOs) will come to parcel locker networks soon – either as partnerships or a legal requirement.

The OOH network operators that will succeed are not those that deploy the most lockers, but those that orchestrate OOH ecosystems in a way that is economically viable, strike a balance of public and residential lockers and traditional PUDOs, and are both socially acceptable and genuinely sustainable.



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WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

Contribution by **Henk Slotboom**
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WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

Never Waste a Good Crisis

The conflict in the Persian Gulf has once again highlighted the world's vulnerability to supply chain disruptions.

Hostilities in the region and the subsequent blockade of the Strait of Hormuz — through which around 20% of global oil and LNG supplies normally transit each day — have led to significant supply shortages.

The International Energy Agency (IEA) estimates that between March and June, global oil consumption will exceed production by roughly 6 million barrels per day, while other estimates suggest deficits could reach as high as 9 million barrels per day. In response, around 80 countries have introduced emergency measures to shield their economies.

These range from energy-saving initiatives — such as reducing the opening days of public buildings, fuel rationing, and restricting private vehicle use through alternating license plate schemes — to targeted energy subsidies. In addition, many governments have begun drawing on their strategic reserves.

Meanwhile, rising input and transportation costs are increasingly being felt across multiple sectors of the global economy. In a recent interview with the Financial Times (14 May 2026), EU Transport Commissioner Apostolos Tzitzikostas warned: "If the Middle East conflict does not end in the coming weeks and we don't see the reopening of the Strait of Hormuz, I'm afraid a global recession could be on the table."

Adding to these concerns, the International Monetary Fund warned in its April World Economic Outlook that a prolonged closure of the Strait of Hormuz could trigger a global recession and push inflation above 6%.

Although a reopening of the Strait of Hormuz would undoubtedly provide some relief, substantial damage to major production facilities — including Ras Laffan, Ras Tanura, and the Ruwais refinery — may take months, if not longer, to repair.

Unsurprisingly, the parcel logistics sector is also expected to feel the impact. Large global and integrated operators are likely to benefit in the short term from increased complexity-driven demand and stronger pricing power, particularly integrated players such as DHL. However, they will also face mounting operational costs, capacity constraints, delays, and the risk of weaker volumes over time.

By contrast, domestic and European-focused parcel operators — including many national postal and parcel services — are less directly exposed, though they will still face indirect pressure from higher fuel prices and increased costs for imported goods.

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

While the impact on these domestic operators may appear more limited, they remain heavily exposed through last-mile delivery operations. According to a recent study by Boston Consulting Group, last-mile delivery accounts for approximately 50–60% of total delivery costs. Labour and energy expenses constitute the largest share of these costs, making the sector particularly vulnerable to sustained inflationary pressures.

Most courier companies have introduced fuel surcharges, providing a certain degree of protection against rising energy costs. However, this does not make them immune to broader global developments.

Higher inflation and the prospect of an economic slowdown stemming from the conflict are weighing on consumer sentiment and are likely to reduce overall parcel volumes going forward.

The earlier-mentioned study by Boston Consulting Group — conducted well before the escalation of the Gulf crisis — already showed that nine out of ten shippers and carriers viewed cost reduction as their primary challenge, ranking well ahead of speed, geographic reach, or customer experience.

The latest developments in the Gulf are likely to have reinforced this focus even further.

The "Last Mile" Now Represents More Than 50% of Total Delivery Costs

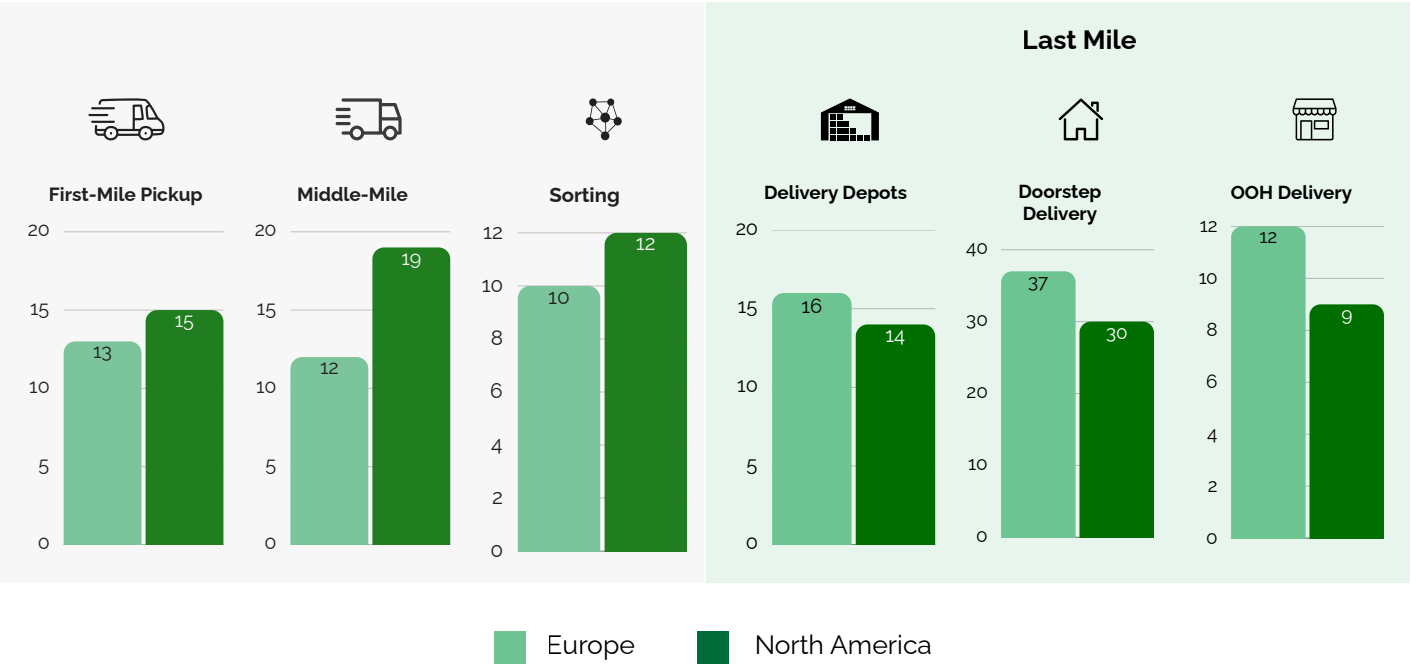

Figure 1: The "Last Mile" Now Represents More Than 50% of Total Delivery Costs
Source: BCG 2025 Parcels Study

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

In addition, there are several structural challenges the sector is facing, like e.g., the continued growth in e-commerce volumes (driven by strong growth in social commerce, re-commerce, and a tsunami of low-margin parcels from China), increasingly stringent regulations on emissions and urban congestion, increasing competition (both from existing players and new market entrants like e.g., GOFO, DragonFly, and JoyExpress), and the insourcing of logistics operations by large e-commerce platforms.

It is becoming increasingly clear that the traditional delivery model — primarily centred around diesel vans delivering door-to-door with human drivers — will need to evolve in order to address these mounting challenges.

A solution will have to cover more than dealing with costs alone; i.e., a transition toward a multi-layered delivery ecosystem combining automation, out-of-home infrastructure, electrification, and AI-driven logistics.

"The Chinese use two brush strokes to write the word 'crisis'. One brush stroke stands for danger; the other for opportunity. In a crisis, be aware of the danger, but recognize the opportunity," John F. Kennedy.

The Next Big Thing: Switching to OOH as the Default Option

Much has already been said about the advantages of out-of-home (OOH) delivery compared with to-door delivery. Therefore, I will limit myself here to summarising the key benefits in the table below:

	Traditional to-door	Out-of-home	Remarks
Cost per stop	High	Very low	One OOH stop can replace dozens of to-door deliveries
Failed deliveries	Frequent	Minimal	
Driver productivity	Low	High	
Urban scalability	Weak	Strong	
Consumer flexibility	Medium	High	
CO_2 efficiency	Weak	Strong	OOH also helps to reduce congestion

Figure 2: Traditional to-Door vs Out-of-Home Delivery
Source: theIDEA!

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

Traditionally, the out-of-home (OOH) channel has been built primarily around PUDOs (pick-up and drop-off points). In recent years, however, Automated Parcel Machines (APMs) have grown rapidly in popularity, particularly among younger generations such as Gen Z and Millennials.

Most APMs offer 24/7 accessibility, providing maximum flexibility for both parcel recipients and senders, including returns.

Significant investments have been made to increase network density — as proximity strongly drives usage — and to enhance the user experience through features such as label-free returns and app-enabled locker access.

Ultimately, user experience is what creates a loyal customer base. InPost provides a textbook example of how to execute this successfully. Its app sits at the centre of a highly integrated ecosystem.

In Poland (population: 37.8 million, with approximately 26 million online shoppers), InPost has built a loyal APM user base of 21 million customers, 17 million of whom actively use the app.

Courier companies are also benefiting from the broader consumer shift towards OOH delivery solutions. Younger generations are leading the adoption of OOH delivery, while Gen X and Baby Boomers remain the primary users of parcel shop returns. More than half of Baby Boomers (54%) return items via a parcel shop, compared with only 40% of Gen Z consumers.

The picture changes, however, when it comes to parcel lockers. Younger consumers show a much stronger preference for this return method: 27% of Gen Z and 23% of Millennials use parcel lockers for returns, compared with 19% of Gen X and just 15% of Baby Boomers.

	APMs (Lockers)	PUDOs (Shop/Store Points)	NPS Impact
Availability	24/7, self-service	Store hours, staffed	Strongly favours APM
Convenience	Quick walk-up, no queue, app-based	Potential waits, staff interaction	Strongly favours APM
Reliability	Consistent tech experience	Varies by location/staff	Favours APM
Customer Preference	High for tech-savvy/urban users	Better for those preferring human help	APM higher overall

Figure 3: APMs vs PUDOs
Source: theIDEA!

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

Given the more attractive economics of APMs, courier companies are likely to position parcel lockers as the default OOH option going forward. As noted earlier, the superior Net Promoter Scores (NPS) associated with APM usage suggest that consumers stand to benefit as well.

"There's no place like home," Dorothy Gale (in The Wizard of Oz)

To-Door: A Deeply Rooted Habit That Will Survive, Albeit in a Different Manner

Despite the increasing adoption of the OOH channel by online shoppers, to-door delivery is still the online shoppers' preferred option, as is illustrated below.

When it comes to returns, the gap between 'home' and out-of-home is significantly smaller. In fact, PUDOs are leading when it comes to returns.

This suggests that OOH is not a one-size-fits-all solution. In sparsely populated areas in particular, APMs may not always represent a viable option.

Locker utilisation must reach a critical threshold for the economics to work, and achieving that level of density is inherently more challenging in rural areas.

Preferred delivery option	Home delivery	APM	PUDO
Gen Z	58%	13%	14%
Millennials	61%	12%	14%
Gen X	67%	11%	13%
Baby Boomers	73%	9%	12%

Home collection	Home collection	APM	PUDO
Gen Z	32%	27%	40%
Millennials	35%	23%	43%
Gen X	36%	19%	45%
Baby Boomers	31%	15%	54%

Figure 4: Delivery Preferences by Generation
Source: DHL 2025 E-Commerce Trend Report

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

PUDOs could offer an alternative in that respect, although the elements, e.g., vicinity and limited opening hours, could weigh on OOH adoption. Next to more convenience for the online shoppers, the use of electric vans for to-door delivery would align with EU climate goals.

In a lot of European cities, this would not always work, though. Streets are often narrow, several cities have anti-congestion regulations, and parking is often difficult.

One of the most rational solutions to solve this problem is the creation of micro-hubs from which the last mile takes place via parcel bikes or compact light electric vehicles (LEVs).

Cargo bikes or LEVs can outperform vans in dense urban areas because parking time is near zero, routes are shorter, the congestion impact is less, and operating costs are lower as well.

Last year, the European Commission issued a publication on this topic in which it highlighted three different initiatives in Logroño (Spain), Bologna (Italy), and Athens (Greece). Yet, these are all local projects.

Oddly enough, there are many better examples that were not mentioned in this publication. For this, I would like to zoom in on the structure of DHL eCommerce (hereafter: DHL) in the Netherlands. Here, it operates five large national sorting hubs, 14 regional hubs, and 131 Cityhubs.

DHL's national hubs handle the volume of the very large domestic and international e-commerce clients (direct feed), whereas the 14 regional hubs collect and sort the parcels from small and mid-sized domestic clients. Next to that, these regional hubs serve as local Cityhubs.

Figure 5: DHL City Hubs Delivery Model
Source: DHL 2025 E-Commerce Trend Report

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

The Cityhubs are responsible for the final sorting (on delivery round) for both parcels and higher value mail items (i.e., mail items of more than 50 grams and registered mail) and handle the last-mile delivery in most cases by means of cargo bikes and LEVs. Large cities have multiple Cityhubs (e.g., the City of Amsterdam has seven).

Because Cityhubs are positioned on the urban periphery, the first-drop time is typically <5 minutes, enabling short, high-density delivery rounds.

This materially improves route productivity and supports the use of flexible, part-time labour models (e.g. students, supplementary-income workers), reducing structural exposure to the tight full-time labour market.

The deployment of small BEVs also enhances operational resilience - improving traffic navigation, winter-weather reliability, and urban access - while lowering energy and maintenance costs.

All combined, this model delivers superior unit economics, greater scalability, and improved labour flexibility, translating into a sustainable structural cost advantage in last-mile logistics.

This illustrates that, when organised in the right way, efficient and clean to-door delivery is still possible despite today's challenges.

However, the same route inefficiencies still exist: one or only a few parcels per stop, labour-heavy routing and low(er) density economics, as a result of which even this alternative does not match the high degree of efficiency offered by OOH."

"The future belongs to those who prepare for it today," Malcolm X.

Man or Machine?

All of the trends and developments discussed earlier share a common feature: labour continues to play a dominant role in the economics of the last mile.

This is particularly striking given that the previously mentioned BCG survey found that — even before the Gulf crisis — nine out of ten shippers and carriers identified cost reduction as their primary challenge.

To put this into perspective, industry estimates suggest that labour-related expenses — including driver wages, benefits, loading and unloading time, and operational overhead — account for approximately 40–60% of total last-mile delivery costs.

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

Against this backdrop, it is unsurprising that companies are investing heavily in innovations designed to replace labour-intensive processes with automated solutions.

Two of the most prominent examples are autonomous delivery robots and drones.

Automated Parcel Delivery Robots

Autonomous parcel delivery robots — whether sidewalk robots or larger road-based vehicles — offer clear advantages, but they also face important limitations.

The first commercial autonomous delivery robots were introduced to the public in late 2018. Eight years later, industry estimates suggest that at least 13,000 automated delivery robots are operating in the United States, with several thousand more deployed across Asia and Europe.

By comparison, there are more than 2.5 million courier businesses in the United States alone. This illustrates that delivery robots still occupy a relatively small niche within the broader logistics market, with most deployments concentrated in food and grocery delivery.

One of the principal barriers remains the high upfront investment. A mid-range commercial robot equipped with advanced sensors such as LiDAR and GPS, as well as features like temperature-controlled compartments, typically costs between USD 8,000 and USD 15,000.

These robots are commonly used in services such as Uber Eats. More advanced enterprise or hybrid robots — capable of crossing streets, operating on roads, and integrating fully with enterprise systems — generally require investments ranging from USD 15,000 to more than USD 70,000.

To reduce these financial barriers, companies such as Starship Technologies and Kiwibot also offer Robotics-as-a-Service (RaaS) models, under which customers pay either a monthly leasing fee or a fee per delivery. In most cases, delivery-based pricing ranges from approximately USD 2.00 to USD 2.50 per parcel.

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

A second major challenge is the regulatory environment, which remains fragmented and inconsistent across jurisdictions.

Summarising, the most important pros and cons of autonomous parcel delivery robots are:

All in all, autonomous robot delivery continues to represent a niche market segment for the time being.

Nevertheless, ongoing technological advances are expected to improve both the capabilities and reliability of these systems, while increased scale and mass production could gradually reduce costs.

Industry observers generally expect broader commercial adoption to take another five to ten years.

Aspect	Pros	Cons
Cost	Lower long-term operating costs	High initial investment
Operations	24/7, consistent, contactless	Limited payload/range/terrain
Environment	Lower emissions, less congestion	Weather-sensitive
Society	Addresses labour shortages	Job impacts, pedestrian conflicts, vandalism
Adoption	Scalable in campuses/dense areas	Regulatory fragmentation, infrastructure needs

Figure 6: Pros and Cons of Delivery Robots
Source: theIDEA!

Autonomous Parcel Delivery Drones

Parcel delivery drones represent a promising but still maturing technology for last-mile logistics, especially for lightweight items and for use in remote, rural and hard-to-reach areas.

What drone delivery has in common with the delivery robots is the high cost per delivery.

Drone delivery currently remains more expensive than ground-based alternatives in most use cases.

According to Business Insider, Amazon projected that a single drone delivery would cost approximately USD 63 in 2025, compared with roughly USD 6–10 for conventional ground delivery.

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

Similarly, DroneUp — Walmart's drone delivery partner — currently incurs delivery costs of around USD 30 per shipment, although the company aims to reduce this figure to below USD 7 over time.

A second hurdle for large-scale adoption is regulatory friction. In the US, the FAA requires Beyond Visual Line of Sight (BVLOS) approvals for large-scale drone operations.

Until August 2025, operators were required to obtain individual waivers for each operating location, creating a significant barrier to scalability.

A proposed Part 108 regulation aims to standardise the approval process and establish a clearer regulatory framework for commercial drone operations.

Although the final rules were expected to be implemented before the spring of 2026, this is not yet the case.

In April, several industry sources reported that the FAA had finalised the rule framework, but the practical implementation and operational rollout are expected to occur gradually over the next 6–12 months.

Finally, the drones have physical restrictions as well. Current drones carry a maximum of five pounds, cannot operate in extreme heat (above 40°C for Amazon's fleet), and face weather limitations. This restricts eligible products and operational hours.

Summarising, the most important pros and cons of autonomous parcel delivery drones are:

Aspect	Pros	Cons
Speed & Access	Extremely fast, reaches remote areas	Limited range/payload
Cost	Potential big savings at scale	High current costs & upfront investment
Environment	Lower emissions for light/short trips	Battery production impact; weather reduces efficiency
Operations	24/7 potential, contactless	Weather-dependent, regulatory limits
Society	Reduced traffic, labor relief	Noise, privacy, safety/public concerns

Figure 7: Pros and Cons of Delivery Drones
Source: theIDEA!

WHY THE TRADITIONAL DELIVERY MODEL IS ON LIFE SUPPORT

All in all, delivery by autonomous drone represents a niche segment as well for now.

In practice, current retail drone programmes focus on urgent, small-item deliveries (e.g., OTC medication) in remote/rural areas. In view of the high costs per delivery, we would still see drones as complementary to trucks and lockers, not standalone replacements.

However, in the view of the first movers (including large names like Walmart and Amazon), this could change in the years ahead, especially since the regulatory framework in the US is expected to be completed in the near future.

However, this time, the EU is ahead of the US, because it has already established a unified regulatory framework for drone operations through the European Union Aviation Safety Agency and the European Commission.

Central to this framework is the concept of "U-space," a dedicated digital airspace management system designed specifically for drones and autonomous operations.

However, in practice, the situation is more fragmented than the legislative framework suggests.

Although the overarching regulatory structure is set at the European level, implementation still depends heavily on individual Member States. National aviation authorities retain significant discretion over key aspects such as the designation of U-space zones, authorisation of BVLOS operations, urban operating conditions, noise and privacy regulations, and infrastructure approvals.

As a result, operators continue to face a patchwork of requirements across Europe, particularly when it comes to commercial parcel delivery in densely populated urban environments.

AI to the Rescue

Since a large-scale adoption of autonomous delivery technology looks still years into the future, the dependence on labour (as the main contributor to the costs of the last mile) will prevail for now.

Although the alternatives I addressed in this article (OOH and APMs in particular), in combination with a more sophisticated to-door delivery infrastructure (including micro-hubs), can help to improve efficiency and better align the courier's activities with the EU's ESG strategy, there is still room for further improvement in the meantime.

Artificial Intelligence (AI) can help to achieve this, for example, with route optimisation and predictive logistics.

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AI systems can deliver significant cost reductions and efficiency gains by optimising:

- **Delivery Sequencing:** Intelligently orders stops to minimize distance and time, reducing fuel/labour costs by 10-25%.
- **Traffic Routing:** Real-time predictive routing avoids congestion, improving on-time performance and lowering operational expenses.
- **Parcel Clustering:** Groups deliveries by geography and priority, increasing drop density and vehicle utilisation.
- **Customer Availability Prediction:** Forecasts when recipients will be home, cutting failed deliveries (often 8-15% of volume) and associated redelivery costs.
- **Dynamic Rerouting:** Adjusts routes instantly to disruptions, maximising asset productivity and service levels.

Overall, these AI capabilities can drive 15-30% last-mile cost savings while boosting capacity and customer satisfaction.

All in all, this leaves enough for the courier firms to concentrate on until and bridge the period until autonomous parcel delivery robots and drones can take them into the next phase of their efficiency drive.

Prepared with the support of:

Software Mind

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LAST MILE INNOVATION: A YEAR OF QUIET BUT STRUCTURAL CHANGE

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LAST MILE INNOVATION: A YEAR OF QUIET BUT STRUCTURAL CHANGE

If you look at the last twelve months through the lens of headlines, last-mile innovation appears dominated by drones, robotics, and futuristic concepts. But that lens is misleading. The real transformation has not been driven by what looks revolutionary, but by what fundamentally changes how operations behave at scale.

The most important developments have taken place not in isolated pilots, but inside the core mechanics of parcel networks, how parcels are identified, how routes are structured, how delivery points are selected, and how exceptions are handled.

What defines this period is not technological novelty, but operational consequence. Across markets, operators have converged on a similar direction: reducing manual intervention, increasing density, consolidating flows, and improving delivery certainty. The innovations that matter are the ones that remove touches, not the ones that add new layers.

From Scanning to Sensing

One of the clearest examples is the shift from scanning to sensing. For decades, parcel networks have relied on discrete scan events to maintain visibility. Every handover required human confirmation. This model has always been a compromise; it's labour-intensive, error-prone, and inherently delayed.

Over the past year, players like UPS have begun to industrialise a different paradigm, embedding RFID into parcel labels and deploying sensing infrastructure across terminals, vehicles, and retail points.

The implication is profound: the network no longer depends on workers to confirm parcel movement; it begins to register movement autonomously. What disappears is not just the scan itself, but the entire layer of manual validation around it.

Misloads are reduced, latency is compressed, and operational control improves precisely where networks historically struggle most, at the interfaces between processes. It would be wrong to label this as a mere digital upgrade; its key benefit is actually the removal of a fundamental dependency. UPS has worked on this programme for years, but now it's really taking off.

What is equally important is that this shift is not confined to a single operator or geography. In Europe, companies such as DHL Group are increasingly integrating IoT and computer vision into their operations, moving toward environments where parcel flow is captured continuously rather than recorded at fixed checkpoints.

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Similarly, PostNord has been advancing camera-based tracking and data capture within terminal operations, using visual recognition to monitor load quality, flow adherence, and process execution without relying solely on manual scans.

In both cases, the direction is consistent: visibility is being embedded into the infrastructure itself, rather than generated through human interaction.

In China, this paradigm is already more deeply embedded at scale. Players such as JD Logistics and Cainiao have built highly instrumented logistics environments where sensors, computer vision, and automated sorting systems continuously track parcel movement across hubs and last-mile interfaces.

Out-of-Home Delivery Network Design

A similar structural shift is visible in the rapid maturation of out-of-home delivery, particularly through parcel lockers. **What has changed over the last year is not the technology itself, but the role it plays in network design.**

Operators like InPost have demonstrated that locker networks, when deployed at sufficient density, cease to be an alternative channel and become a superior operating model.

Hybrid Delivery Networks

This naturally leads to the next development: the emergence of hybrid networks where operators control both home delivery and out-of-home infrastructure. The significance of moves such as InPost acquiring Yodel lies not in scale alone, but in flexibility.

A hybrid network allows parcels to be dynamically routed to the most efficient delivery point based on cost, capacity, and service promise. It introduces a level of flexibility that single-mode networks cannot match.

Operationally, this means demand can be shaped rather than simply absorbed. At peak, this becomes a decisive advantage. Instead of overloading door delivery, volume can be redirected into lockers or pick-up points, stabilising both cost and performance.

Route Density

Parallel to this, there has been a quiet but important shift in how route density is protected. As traditional mail volumes decline, **the historical model of maintaining separate delivery structures becomes increasingly inefficient.** Operators such as DHL Group have responded by scaling joint delivery models, combining mail and parcels within the same route architecture.

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This is not a technological innovation in the conventional sense, but it is operationally transformative. It addresses one of the core structural challenges in the industry: how to maintain efficient route density in the face of changing volume composition.

By consolidating flows, the network preserves utilisation and reduces duplication. In an environment where margins are under pressure, this type of innovation, using existing assets more intelligently, arguably carries more weight than large capital-intensive bets.

The Last Mile as a Shared Resource

At the same time, **the boundaries of last-mile networks themselves are beginning to shift**. The move by the United States Postal Service to open its delivery infrastructure through a bidding platform introduces a new dynamic: the last mile as a shared resource.

This transforms delivery capacity into something that can be accessed, traded, and integrated into broader logistics flows. The implication is that network ownership becomes less binary.

Instead of building end-to-end capabilities, operators can increasingly leverage existing infrastructure through access models.

This shift is visible across multiple fronts. Amazon is increasingly allowing external merchants to plug into its fulfilment and delivery backbone, effectively decoupling network usage from ownership.

In parallel, platforms such as Uber and DoorDash are scaling models where last-mile capacity can be accessed on demand, integrated directly into retailer workflows, and utilised without any underlying infrastructure commitment.

In China, Cainiao and JD Logistics have taken this even further by building orchestration layers that connect multiple carriers, warehouses, and delivery providers into unified, programmable networks. Even traditional operators such as DHL Group are moving in this direction, exposing elements of their network through digital access layers that allow third parties to integrate more directly.

What emerges from these developments is a consistent pattern. The last mile is no longer defined purely by who owns the network, but increasingly by who can access and orchestrate it most effectively. Capacity becomes fluid rather than fixed, partnerships become dynamic rather than contractual, and network design shifts from static structures to adaptable systems.

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The implication is not that ownership disappears, but that it becomes less decisive. Competitive advantage moves toward those who can aggregate, allocate, and optimise delivery capacity across multiple sources. In that sense, the last mile is beginning to resemble a platform, one where infrastructure still matters, but where the ability to expose, integrate, and monetise that infrastructure ultimately determines its value.

Reverse Logistics

Another area where the past year has seen **meaningful progress is reverse logistics**. Returns have long been treated as an unavoidable cost, managed for efficiency but rarely optimised for control.

That is beginning to change. Initiatives within UPS, particularly through its Happy Returns operation, illustrate how artificial intelligence is being embedded into the return flow itself. Instead of passively accepting returned goods, systems now evaluate, classify, and in some cases challenge returns before refunds are issued.

This introduces a new layer of operational intelligence into what has historically been a low-control process. Given the scale of returns in e-commerce and the growing exposure to fraud, this shift is not marginal.

It repositions reverse logistics as a domain where value can be protected rather than simply lost.
What is equally important is that this development is no longer confined to the U.S.; it is clearly taking hold in Europe as well, although often expressed through slightly different operational levers.

Operators such as Zalando have begun to industrialise returns management by using data models to influence customer behavior, flag abnormal return patterns, and dynamically adjust refund and acceptance logic.

This move returns from a purely reactive process to one where the operator actively shapes the flow before it even enters the network. At the same time, players like InPost are scaling structured, locker-based return flows that introduce greater control at the intake point, reducing handling variability and enabling earlier data capture on returned items.

Similarly, DPDgroup has expanded digital return solutions that pre-classify returns through consumer interfaces, effectively shifting part of the decision-making upstream and reducing ambiguity once the parcel enters the network.

In parallel, technology providers such as ReBound Returns are building pan-European return orchestration layers that allow retailers to apply rule-based routing, fraud detection, and value recovery strategies across markets.

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These platforms integrate inspection logic, resale pathways, and localised processing options, ensuring that returned goods are not simply transported back to origin, but directed toward the highest-value outcome. The common denominator across these European examples is not the specific technology, but the intent: to regain control over a flow that has historically been opaque, inconsistent, and financially erosive.

Delivery Robots

While much of the focus in public discourse remains on automation technologies such as robots and drones, their real progress over the last year has been more grounded.

Pavement delivery robots, led by companies like Starship Technologies, have moved beyond isolated pilots into repeatable deployment models. The key insight is that these systems are not attempting to replace the broader network. Instead, they are finding specific operating environments, high-density areas, short delivery radii, and predictable demand patterns, where they can function economically.

This is a shift from ambition to applicability. It reflects a broader lesson in last-mile innovation: scalability is achieved not through universal solutions, but by identifying where a solution fits naturally within the network.

Amazon's acquisition of DLIVR fits precisely into this pattern. It is not a bet on robots replacing the last mile, but a targeted move to internalise a capability that already works in constrained environments.

Rather than scaling a generic solution, Amazon is doubling down on a specific operating envelope, ultra-local, high-density, short-radius delivery, where automation can consistently outperform human labour. The signal is clear: even at Amazon scale, the path to automation is not universal deployment, but disciplined integration of niche solutions where the economics are already proven.

Drone Delivery

Drone delivery follows a similar trajectory. Companies such as Amazon and Zipline have continued to expand operational use cases, but within clearly defined boundaries. Drones are proving effective in scenarios where speed, distance, and infrastructure constraints align.

They are not reshaping the entire last-mile landscape, but they are becoming a viable layer within it, though still on a very small scale; the movement is noticeable. The importance lies not in their scale, but in their precision. They demonstrate that new delivery modalities can coexist with traditional networks, provided they are applied selectively.

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This pattern is increasingly visible in Europe as well, particularly in the UK and Ireland, where deployments have moved beyond controlled trials into repeatable, service-oriented operations.

In Ireland, Manna Drone Delivery has established one of the most advanced urban drone delivery models globally, operating daily commercial flights for food and convenience retail within tightly defined suburban zones.

The model is deliberately constrained, with short distances, lightweight payloads, and high-frequency demand, but within those parameters, it delivers consistent performance and strong unit economics. Similarly, in the UK, Royal Mail has been scaling drone deliveries in remote and island communities, where traditional transport infrastructure creates cost and reliability challenges.

These operations are not designed to compete with core parcel networks, but to solve very specific logistical problems where drones offer a clear advantage over conventional modes.

What these examples underline is a broader operational truth. The viability of drone delivery is not determined by its ability to scale universally, but by its ability to integrate precisely where the network has structural inefficiencies, whether due to geography, urgency, or infrastructure limitations.

In that sense, drones are not a replacement layer, but a complementary one, reinforcing the idea that the future last mile will not be defined by a single dominant model, but by the intelligent combination of multiple, highly specialised delivery modalities.

Routing

Less visible, but equally impactful, is the evolution of routing. The acquisition of RouteSmart by FedEx signals a recognition that route optimisation is no longer a peripheral capability. It is central to operational performance. In a system where small improvements in route design translate directly into cost savings and service improvements, controlling the optimisation logic becomes a strategic priority.

This reflects a broader trend: the internalisation of capabilities that were previously outsourced or standardised. As networks become more complex, generic solutions are no longer sufficient. Optimisation must be tailored to the specific characteristics of each operator's network.

This shift is further reinforced by a new generation of European technology providers that are redefining what routing means in operational terms.

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Companies such as Greenplan are applying advanced mathematical optimisation and AI-driven heuristics to redesign route structures dynamically, moving beyond static planning toward continuous recalibration based on real-world conditions.

At the same time, Kardinal is leveraging machine learning to orchestrate delivery flows in real time, enabling operators to adapt routes intra-day as constraints shift, rather than relying on fixed plans defined hours in advance.

This introduces a level of responsiveness that aligns routing more closely with actual network behavior.

Equally important is the increasing focus on the final meters of the last mile, where theoretical route efficiency often breaks down in practice. Solutions from Bettermile address this gap by optimising driver execution at the stop level, sequencing tasks, guiding drivers through complex delivery environments, and reducing micro-inefficiencies that accumulate across thousands of stops.

In parallel, Truemetric is enhancing geospatial precision through AI-driven location data, ensuring that parcels are not just routed to the correct address, but to the exact point of delivery. This level of accuracy is critical in dense urban environments where traditional address data is insufficient for efficient execution.

What unites these developments is a fundamental shift in how routing is perceived. It is no longer a planning exercise performed upstream, but a continuous, intelligence-driven process that extends all the way to the point of delivery. AI is not simply improving routes; it is closing the gap between planned efficiency and executed reality.

In doing so, it transforms routing from a static optimisation problem into a dynamic control system, one that increasingly determines both the cost structure and the service quality of the last mile.

The Repositioning of Inventory

There is also a shift that sits slightly upstream of the last mile but has direct operational consequences: **the repositioning of inventory**. The continued expansion of same-day fulfilment nodes by Amazon illustrates how delivery performance can be improved not just by optimising routes, but by reducing the distance those routes need to cover. By placing high-demand inventory closer to the end customer, operators effectively compress the last mile itself.

This changes the economics of speed. Faster delivery is no longer achieved solely through increased operational effort, but through better network design.

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This strategy is now clearly extending into continental Europe, where Amazon is accelerating its footprint across markets such as Belgium, the Netherlands, France, and Italy.

The pattern is consistent: smaller, more localised fulfilment nodes positioned closer to demand clusters, enabling tighter delivery windows and more predictable execution. What is being built is not just additional capacity, but a different topology, one where inventory is distributed with far greater granularity, allowing the last mile to operate within shorter, more controllable radii.

The implication is that network performance is increasingly determined before the parcel even enters the delivery route.

At the same time, developments in China are pushing this logic even further. Players such as JD.com, through its logistics arm JD Logistics, and emerging ultra-fast delivery models like Gofo Express, are advancing highly localised fulfilment ecosystems that operate at a near-neighbourhood level.

These models combine micro-warehousing, dense delivery networks, and high-frequency replenishment to enable delivery within minutes rather than hours.

The operational principle remains the same, but the execution is more extreme: inventory is not just closer, it is embedded within the consumption environment itself.

Crowd-Based Delivery Models

A final development, still early, but increasingly visible, is the emergence of **crowd-based delivery models** in Europe. For years, this concept has existed more as a theoretical alternative than a viable operating model. Earlier attempts, including those explored by DHL Group, struggled to scale due to a lack of control, inconsistent service quality, and the absence of a stable physical backbone. What is different now is not the idea itself, but the context in which it is being deployed.

Operators such as Omniva are beginning to explore structured crowd delivery approaches, while startups like Tourmix are building models that leverage existing urban density and flexible labour pools. The critical enabler behind this renewed viability is the rapid expansion of locker and PUDO networks across Europe.

These networks provide something earlier crowd models lacked: fixed, controllable anchor points within the delivery flow.

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Instead of relying on fully decentralised, door-to-door handovers, crowd delivery can now be orchestrated between known nodes, where parcels are pre-positioned, consolidated, and handed over in a more predictable manner.

This fundamentally changes the operating logic. The model shifts from loosely coordinated peer-to-peer delivery toward a semi-structured system where crowd capacity is integrated into the network rather than operating outside it.

Lockers and pick-up points effectively act as micro-depots, allowing operators to inject and extract volume in a controlled way while still benefiting from flexible, on-demand delivery resources. This reduces variability, improves traceability, and aligns the model more closely with industrial logistics standards.

What emerges is not a replacement for traditional last-mile operations, but an additional layer of elasticity, one that can absorb peaks, extend reach, or handle specific delivery profiles without requiring permanent capacity investments.

In that sense, crowd delivery in its current European form is less about disruption and more about augmentation.

It reflects a broader pattern seen across the last mile: new models become viable not when they stand alone, but when they are anchored within an increasingly dense and well-structured network infrastructure.

What these developments underline is a fundamental shift in how last-mile performance is engineered. The focus is moving away from accelerating the final leg, toward structurally shortening it. As inventory positioning becomes more precise and demand forecasting more granular, the boundary between fulfilment and delivery begins to blur. In that sense, the last mile is no longer just a transport problem; it becomes a network design problem, where the location of inventory ultimately dictates the speed, cost, and reliability of the entire delivery experience.

Concluding Remarks

Taken together, these developments point to a clear conclusion.

The last twelve months have not been defined by breakthrough technologies, but by the systematic removal of inefficiencies embedded in existing operations.

The direction is consistent across players and geographies: fewer manual interventions, higher density, more flexible networks, and greater control over both forward and reverse flows.

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The underlying pattern is one of subtraction rather than addition.

Scans are replaced by sensing. Failed deliveries are replaced by consolidated handovers. Parallel networks are replaced by integrated ones.

Manual decisions are replaced by automated logic. Distance is reduced rather than accelerated.

This is where the real transformation lies. Not in creating new complexity, but in eliminating what should not have been there in the first place.

And that leads to a final, perhaps uncomfortable, observation.

The competitive advantage in last mile is shifting away from those who can deploy the most advanced technology, toward those who can apply technology with the greatest discipline. Innovation is no longer about what you add to the network. It is about what you are able to remove.

In that sense, the last year has not been a period of visible disruption. It has been something more important: the beginning of a structural simplification of last-mile logistics.

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BUILT FAST. BUILT TO LAST. THE NEW RULES OF TMS IN THE AI ERA

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BUILT FAST. BUILT TO LAST. THE NEW RULES OF TMS IN THE AI ERA

In the high-pressure world of last-mile logistics, technology is either an engine or a cage. For years, the industry relied on rigid, monolithic systems designed for fixed loads. Today, traditional development is no longer fast enough or flexible enough to meet the conditions of tomorrow.

In a landscape where AI is shifting from a tool to a core operational partner, the old way of building – whether starting from a blank slate or buying inflexible licences – is no longer just inefficient; it is a strategic liability.

Three Scenarios of Obsolescence: Identifying the Strategic Need

The classic model of software development has reached its limit. It's fundamentally ill-equipped for the AI era. Older systems were never designed for the fluid data exchange or intelligent automation required for modern scaling. The demand for a new architectural approach typically manifests in three critical business scenarios:

Scenario A: The Hyper-Growth Struggle.

This happens when the underlying system cannot support the weight of its own growth. Many operators are tethered to legacy frameworks designed for yesterday's volume that inevitably fracture when growth accelerates. This "scalability ceiling" isn't merely a technical glitch; it's an architectural dead end that traps dispatchers in a maze of disconnected systems – a hidden payroll cost that doesn't appear on the software budget but shows up on the salary bill and the customer complaint log.

Scenario B: Post-M&A Complexity

Following a merger or acquisition, an operator is often left with two different TMS platforms, two courier apps and two conflicting ways of calculating Cash on Delivery (COD). The pressure to unify these into one system within a strict 12-month window exposes the inherent lack of flexibility in legacy code. For organisations operating under PE ownership or integrating an acquisition, this window is not a project timeline but a covenant. Missing it directly impacts valuation and investor confidence.

Scenario C: The Legacy Trap

Operating on decades-old systems that hinge on "tribal knowledge" – undocumented logic stored in the heads of a dwindling pool of veteran employees – and with no vendor support. In this terminal stage of technical debt, every modification becomes a month-long project carrying a high risk of total system failure.

BUILT FAST. BUILT TO LAST. THE NEW RULES OF TMS IN THE AI ERA

According to Gartner, 44% of last-mile operators rate their own technology maturity as immature or worse – and that was before AI became a core operational requirement. In a market where the gap between tech-enabled and tech-constrained operators is now measured in market share points, not efficiency percentages, the scenarios above are not exceptions.

They are the industry norm (Gartner, 2024, Top Trends in Last-Mile Delivery Technologies).

Practical Impact: Solving the Freshness Logic

For our client – a fast-scaling B2C cold chain operator running a fully owned last-mile fleet across Poland – logistics is a race against the clock that happens while the country sleeps.

Their operation is uniquely unforgiving: hundreds of thousands of freshly prepared meals delivered every night to customers' doorsteps.

In this line of work and at this scale, there's no room for error. Because unlike standard parcel delivery, fresh food has a shelf life measured in hours; a missed delivery window results in immediate waste and a hungry customer.

Over the years, as the business grew, the legacy system failed to keep up. Every crash was not an IT incident. It was a risk to thousands of deliveries.

But that was only part of the problem – the deeper issue was fragmentation.

Without a unified digital backbone, the operation was held together by a patchwork of tools, leaving the business unable to scale further without a total system collapse.

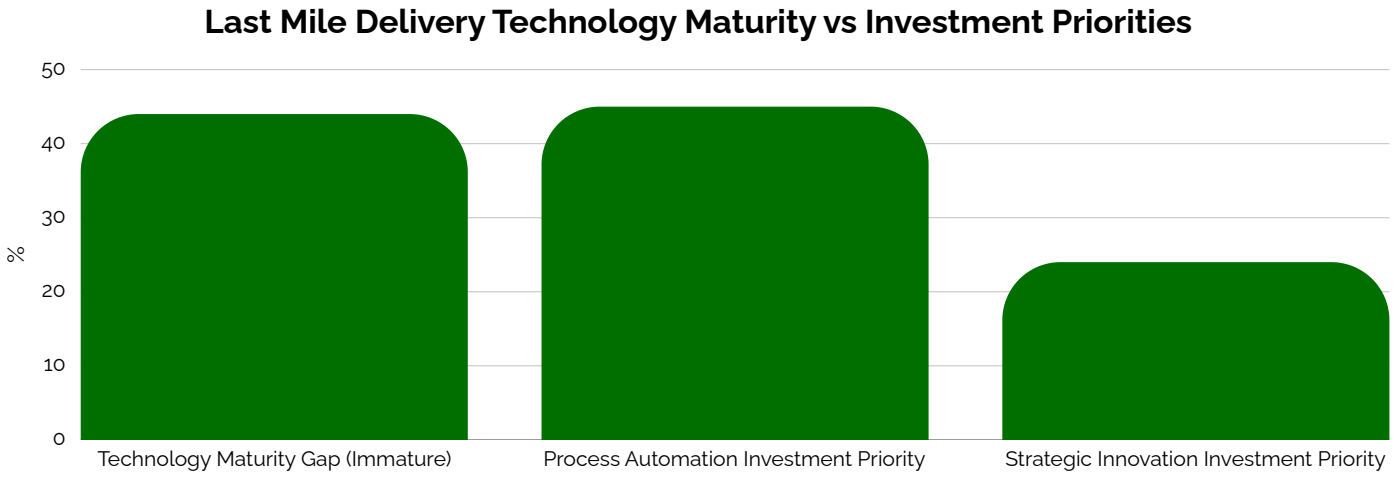

Figure 1: Last Mile Delivery Technology Maturity vs Investment Priorities
Source: Gartner, 2024, Top Trends in Last-Mile Delivery Technologies

BUILT FAST. BUILT TO LAST. THE NEW RULES OF TMS IN THE AI ERA

We replaced our client's failing legacy system with a modern, bespoke platform built on a modular framework, thanks to which they achieved:

- **Rapid scalability:** The operator is growing at 30% year-on-year, and the system was built to handle three times the current volume without architectural changes.
- **Quantifiable efficiency:** A 50% reduction in geocoding and route generation time and a 70% decrease in manual process steps.
- **Strategic agility:** New feature deployment time dropped from six months to just three days.
- **Unmatched reliability:** zero system crashes since go-live, even during peak loads.

Instead of a standard vendor-client relationship, the engagement was structured around an outcome-based model, with a significant portion of the fee tied to the actual achievement of jointly defined operational KPIs. This is not a billing model – it is a statement about shared accountability.

"Six months to a full TMS replacement – courier app, geocoding, route planning, exception handling, real-time reporting – delivered on time and on budget. What made it work was that the Software Mind team didn't wait for us to come to them.

They were in the sorting facilities, they rode with our couriers, and they supported us through the operational change management. The cutover was seamless – the next day, the operation ran as if it had never been any other way."

Jacek Wiśniewski, Head of IT, Analytics and Administration Projects at Flota Vikinga (Logistics Entity of Kuchnia Vikinga)

Hybrid Architecture for the AI Era

This level of impact was achieved in just six months – a fraction of the 18–36-month industry standard. This is made possible by our "best of both worlds" approach to developing a Transport Management System. How did we get there?

The "build vs. buy" dilemma is a relic of the past. Deployment in months, not years, means the organisation can respond to market changes, competitive moves, and acquisition opportunities in the same business cycle – not the next one.

At Software Mind, we advocate for a hybrid approach, a 70/30 rule, if you like: leveraging a core of pre-built, production-proven modules that cover roughly 70% of foundational logistics needs. This allows us to focus exclusively on the 30% that sets your brand apart.

BUILT FAST. BUILT TO LAST. THE NEW RULES OF TMS IN THE AI ERA

This isn't starting from scratch; it's starting with a head start. With an AI-ready foundation in place from day one, we remove the "discovery gap" where business needs get lost in translation. This modularity ensures your technology is never finished but always evolving – capable of moving from a new feature idea to live deployment in days, not months.

Critically, this approach provides:

- **Smart standardisation:** We don't reinvent the wheel for basic routing or address validation. We use proven building blocks for standard tasks and innovate only where it creates unique market value.
- **Component-based agility:** Think of your TMS as a collection of independent services. This "Lego-like" architecture allows you to swap or upgrade individual modules without risking a total system blackout.
- **AI-first by design:** Your operational data feeds your models, not your vendor's. Every year on a proprietary system is a year of accumulating the data advantage that AI requires – and one that SaaS cannot replicate.
- **Zero-glitched transition:** A phased, low-risk migration replaces legacy components in stages rather than all at once. By modernising the system in increments, we ensure your mission-critical operations maintain full velocity.
- **Immediate tangibility:** Instead of waiting months for a prototype, stakeholders interact with a functional, "clickable" system from day one. This provides a constant feedback loop, giving you the final product that perfectly aligns with your operational reality.

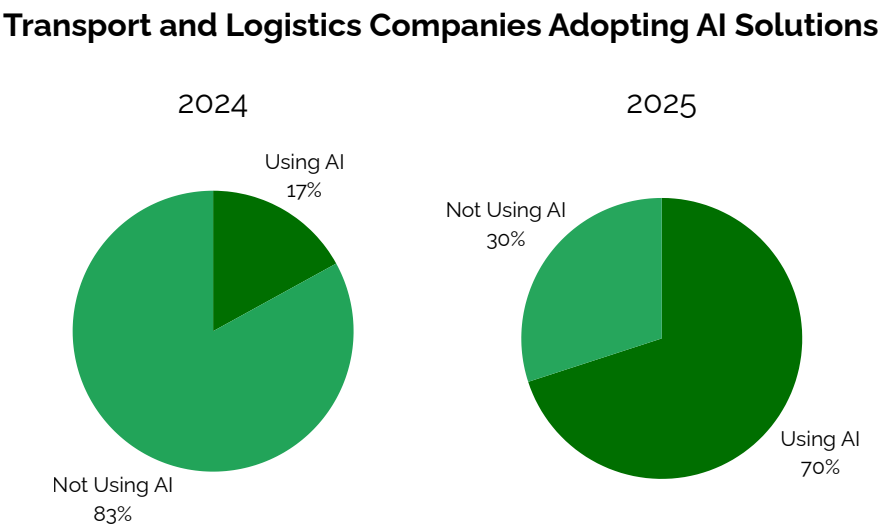

Figure 2 Transport and Logistics Companies Adopting AI Solutions
Source: Penske's 2025 Transportation Leaders Survey: A Road to AI Adoption

BUILT FAST. BUILT TO LAST. THE NEW RULES OF TMS IN THE AI ERA

The Strategic Imperative: Architecture for Tomorrow

Every quarter spent on an outdated system is a quarter a competitor uses to deploy capabilities you cannot match. This doesn't appear on today's P&L. It appears in market share data 18 months from now – by which point the gap is structural, not tactical.

The era of viewing a TMS as a static tool is over. It must now be an AI-ready digital backbone. By choosing a component-based, hybrid architecture, logistics operators move away from the risk of future obsolescence.

You aren't just replacing an old system – you are installing a platform designed to evolve alongside market volatility. Choosing a partner compensated for results, rather than hours, strategically changes the engagement.

For a logistics company, it means a different risk profile and a different budgeting model: instead of CAPEX with uncertain ROI, it becomes an investment tied directly to operational value generated. This is not a new pricing model. It is a new model of relationships.

https://softwaremind.com/services/courier-software-development/

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allegro

żabka

Tale commerce.

emapa

Łukasiewicz
Poznański Instytut Technologiczny

Atlas Pickup Points

Romania

ARKA
SMART PARCEL LOCKERS

Switzerland

SCANDIT

Türkiye

rovenma

United Kingdom

D-carbN Analytics

United States

MaddWill AI

Ukraine

ELIFTECH

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REVIEW OF INNOVATIVE PROJECTS

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allegro

POLAND

SUMMARY

The Allegro Packaging Standard is a set of material recommendations and good practices designed to help sellers prepare products for dispatch, ensuring their safety during transport and the client's positive unboxing experience.

By standardising parcel stability and durability, this initiative helps to reduce operational costs caused by manual sorting exceptions, repacking fees, and damage claim rates.

A key driver for this project is to proactively prepare sellers for the EU's upcoming PPWR Regulation, which limits the environmental impact of packaging and comes into effect in August 2026.

By adopting these guidelines, sellers can enhance buyer satisfaction, avoid additional fees from carriers, and contribute to more sustainable e-commerce logistics.

Figure 1: Allegro Smart Promotional Image
Source: Allegro

INTRODUCTION AND BACKGROUND

The project was initiated to address both the issue of the unboxing experience and the environmental impact of e-commerce packaging set by the EU's PPWR Regulation.

We frequently receive feedback from our transportation partners regarding the challenges of processing a high volume of poorly prepared parcels, which are often damaged, inadequately secured, cause disruption in automated sorting systems, or are excessively wrapped in stretch film, contributing to client frustration.

To highlight these concerns, we chose to aggregate these various viewpoints into a comprehensive set of material recommendations and best practices. Furthermore, our goal was to provide advance notice and assist our sellers in getting ready for the forthcoming EU PPWR Regulation, which is set to take effect in August 2026.

This regulation will impose mandatory rules on e-commerce sellers, primarily requiring them to minimise packaging volume by limiting void space to a maximum of 50% and ensuring all materials are designed for high-quality recycling.

METHODOLOGY

Our research indicated that 60-70% of shipments are delivered in cardboard boxes, yet sustainable fillers are present in only 30-40% of cases, and 5-10% utilise paper-based fillers (or no tape at all).

Furthermore, plastic packaging—such as stretch wrap or poly mailers—is used for approximately 30% of parcels. These plastic components often fail to reach recycling streams, and the use of synthetic adhesive tape on fiber-based boxes complicates the separation and processing of packaging waste. These preliminary findings identified key areas for improvement, which we then synthesised with PPWR mandates to formulate the initial version of the Standard.

The final Allegro Packaging Standard was developed through collaboration between our sellers, carriers, and packaging suppliers. The core strategy involved creating and distributing a clear list of recommended and non-recommended packaging materials, along with specific guidelines on how to pack parcels properly.

To facilitate the transition to these new standards, we provide compliant packaging through our dedicated shop 'Allegro Pack' at very attractive rates. By covering all handling and storage expenses ourselves, we ensure these materials are available to sellers without any added profit margin.

The shop offers a portfolio of paper and cardboard packaging products—including boxes, bags, tapes, and recyclable fillers— certified and fully compliant with the Standard and PPWR requirements. The Allegro Pack store currently features 15 offers, the cheapest being a set of 10 boxes made from 100% recycled paper for a price of PLN 4.24 (incl. VAT).

RESULTS

Released on March 18, the Allegro Packaging Standard (APS) has been met with significant acclaim from industry stakeholders.

While it is too soon to collect comprehensive, quantifiable results on the day of application, initial visual observations indicate a positive shift, with an increase in parcels packed in cardboard boxes and a reduction in the use of black stretch foil.

Following the implementation of the PPWR regulation in August 2026, we anticipate a further shift toward paper-based packaging solutions.

LEARNINGS

A crucial lesson from this initiative emerged before the official publication, when we shared the Allegro Packaging Standard with selected sellers to gather their feedback.

Their insights proved invaluable, highlighting specific edge cases and providing a perspective that we previously lacked.

Consequently, we made several changes to the Standard, ensuring it was significantly more feasible for their day-to-day business operations.

Furthermore, this collaborative process revealed that the biggest barrier to adopting APS-compliant packaging is cost. To address this blocker directly, we decided to open the Allegro Pack store and offer affordable, sustainable materials.

By negotiating prices directly with manufacturers, operating without a margin, and absorbing all storage and handling costs ourselves, we secured prices that will remove the financial barrier for our partners.

Figure 2: Allegro Promotional Image
Source: Allegro

Atlas Pickup Points

POLAND

SUMMARY

Pickup points have moved from a competitive edge to a default expectation across European ecommerce.

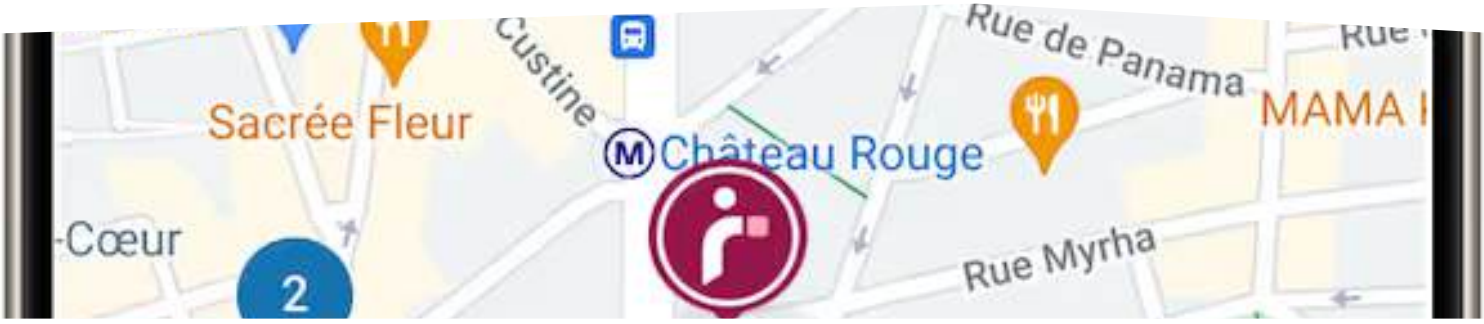
Belgium has it in law: established B2C online stores must offer at least two delivery options, including a PUDO point or parcel locker.

Other markets are reaching the same place through customer behaviour rather than legislation.

The hard part is not adding pickup points to one country. It is adding them to five. Each market has a dominant local network - Mondial Relay in France, InPost in Poland, Packeta in Czechia, PostNord across the Nordics, Bpost in Belgium - and shoppers fall back to international carriers only when their preferred local network is missing.

Atlas Pickup Points is the integration layer between European carrier networks and ecommerce checkout. One install gives merchants 50+ carrier integrations, 1.5 million unique pickup points across 35+ countries, and 32+ checkout languages out of the box.

2025 Shopify Build Award winner.



INTRODUCTION AND BACKGROUND

Cross-border ecommerce in Europe has a checkout problem before it has a logistics problem. Carrier contracts are signed and warehouses are stocked. The integration layer that turns those contracts into a usable checkout experience has not existed at scale.

The complication is that the European carrier ecosystem is more fragmented than the logos suggest.

DPD Group operates Chronopost, Colissimo, and DPD France as three networks with different pickup point inventories and ID schemes. DHL runs a global API alongside separate APIs for DHL Poland, DHL Netherlands, and others. GLS Europe and GLS Iberia are different systems entirely.

Country-specific rules also have to be enforced at checkout, not fulfilment. A DHL Packstation in Germany cannot be selected without a validated Postnummer (DHL customer ID), or the parcel cannot be collected.

Most carrier pickup point APIs were built in the early 2000s. Documentation is incomplete or absent. Response formats are inconsistent. Many edge cases are undocumented entirely.

Merchants facing this had two options. Build integrations themselves against APIs that have not fundamentally changed in 20 - 30 years. Or embed each carrier's own checkout widget, accepting fragmented UX, multiple third-party scripts, and security overhead per carrier.

Neither scales past two or three countries.

The initial assumption was that a single integration layer, treating each carrier sub-network as its own integration and surfacing them through one consistent checkout UX, could collapse this complexity into a configuration step. The expected outcome: cross-border merchants would gain access to local networks in every market without per-country integration cost.

METHODOLOGY

Atlas integrates each carrier separately, with code written specifically for that carrier's API.

Where a single brand operates multiple distinct systems - GLS Iberia alongside GLS Europe, DHL Poland alongside DHL's global API, DPD France's three sub-brands - each system gets its own integration.

Most of the engineering work goes into the edge cases, not the happy path.

The carrier API landscape is closer to archaeology than software integration. Most APIs were built in the early 2000s. Documentation is incomplete or absent.

Many quirks have to be discovered by sending requests and observing the responses. The integration layer absorbs this irregularity so it does not leak into the merchant-facing UX.

A unified checkout layer sits on top. Merchants configure carriers once, and shoppers see one consistent selection flow regardless of which carriers are active.

Pickup points overlapping between carriers - often the same physical APM or PUDO indexed by multiple networks - are deduplicated for the shopper.

Carrier-specific rules are enforced at checkout, not fulfilment. DHL Packstation in Germany validates the Postnummer in real time before the order completes. Address and parcel-dimension constraints filter pickup points before they reach the shopper.

The UI is mobile-first, drawing on patterns from leading European retailers rather than reproducing carrier-supplied widgets. One local accent is preserved deliberately: pins use each carrier's native icon and colour - Mondial Relay purple, InPost yellow, Packeta red - so shoppers recognise their preferred network at a glance.

RESULTS

50+ live carrier integrations, including dedicated integrations for sub-networks operated separately by their parent brands: Chronopost, Colissimo, and DPD France as three integrations; GLS Europe and GLS Iberia as two; DHL global, plus DHL Poland and DHL Netherlands as three.

1.5 million unique pickup points (deduplicated across overlapping networks) spanning 35+ countries.

Adding a new country to an existing install is a configuration step, not a project. Building this in-house would mean weeks per carrier against APIs that have not fundamentally changed since the early 2000s. Atlas removes per-country integration cost from cross-border expansion entirely.

Median pickup point query time of 150 ms across all 35+ markets. Shoppers see results immediately on entering an address or moving the map.

One map and selection UI across all enabled carriers, mobile-first. Pins use each carrier's native icon and colour, distinguishing APM, PUDO, and postal office types so shoppers recognise both their preferred network and the kind of location. Carrier-specific validation like DHL Postnummer is handled before the order is placed. No third-party widgets, no injected scripts at checkout.

Figure 1 Mobile App View
Source: Atlas Pickup Points

In production at Westwing, Rouje, Newcastle United, TOMS, and other leading European brands. The merchant base spans 30+ countries, with France, Poland, Belgium, Germany, and Italy as the largest markets.

LEARNINGS

Three lessons stood out across the project.

First, carrier APIs are archaeology. Most were built in the early 2000s and have barely changed since. Documentation is incomplete or absent.

Edge cases - the kind that determine whether an order is actually deliverable - have to be discovered through trial and error.

The work cannot be commodified by better tooling, only accumulated over years. That is where durable value sits in this category.

Second, one carrier rarely means one integration. DPD Group's three French brands have separate networks and ID schemes.

DHL operates a global API alongside parallel APIs per market. GLS Europe and GLS Iberia are different systems.

Sizing a project like this by carrier logos significantly understates the scope. Treating each sub-network as its own integration is what makes coverage scale.

Third, carrier breadth is not a feature - it is the product. In every European market with a dominant local network, that network is the one shoppers select.

Merchants offering only international carriers in France, Poland, or Czechia consistently underperform competitors offering Mondial Relay, InPost, or Packeta.

The clearest takeaway: when shoppers cannot find their preferred local network, they do not switch carriers. They switch merchants.

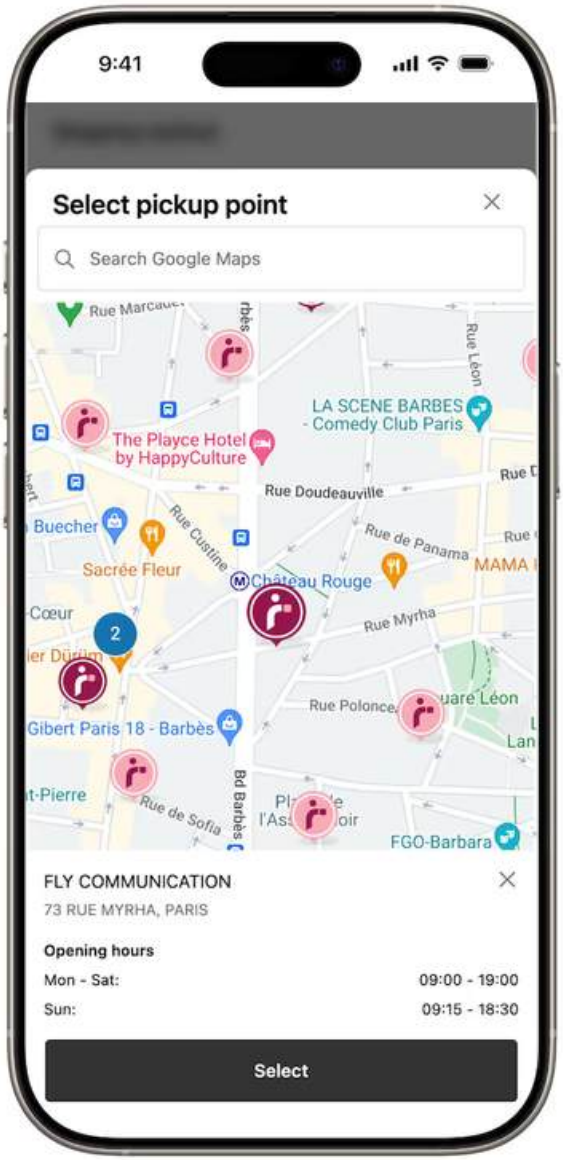


Figure 2 Mobile App View
Source: Atlas Pickup Points

ARKA
SMART PARCEL LOCKERS

ROMANIA

SUMMARY

Parcel locker networks are now a well-established solution for optimising last-mile delivery, with major courier companies deploying thousands of units across their operating regions.

However, network expansion reaches a natural limit when relying on conventional installation locations. In many countries, access to prime locations becomes a matter of competition, where the best sites are difficult to secure and even harder to equip with the required infrastructure. A key constraint is access to electricity.

In practice, installing a traditional plug-in locker often requires a separate power contract, meter installation, and civil works, which are not always feasible.

As a result, many high-traffic, strategically valuable locations remain inaccessible despite their strong potential.

Lumen locker (Fig. 2) is powered by photovoltaic solar panels, ensuring sustainable and off-grid operation. It is one of the few solutions on the market featuring a 12-inch touchscreen display, designed for enhanced user interaction.

The system incorporates an optimised power consumption architecture to support continuous operation of the display and embedded electronics.

Key hardware components include a modular structure with up to eight extensions (192 compartments), 4G connectivity, a power management system, LED lighting, a QR scanner, an alarm system, and a 10-year battery lifespan without replacement.

Over the past year, innovations have focused on improving energy efficiency and operational performance.

INTRODUCTION AND BACKGROUND

ARKA was selected by the largest open network in the DACH region as a technology partner to deliver a fully autonomous parcel locker solution, supporting the expansion of their open network (carrier-agnostic).

While the network already had lockers deployed in the field, the objective was to access a wider range of locations, including areas where grid connection is limited or unavailable, without compromising user experience by adopting small or no-touchscreen displays.

The project was initially validated through a pilot phase of 50 lockers, enabling real-world testing and iterative improvements. Based on customer feedback, both hardware and software features were refined, leading to a final design.

Our most recent innovations were developed within this project, which started deployment in May 2025 (Fig. 3). To date, production includes over 1,200 master units and 3,300 extension modules, totalling over 9,000 columns, as the project continues to scale.

These advancements were supported by the expansion of ARKA's production facilities, increased manufacturing capacity, and team growth, enabling reliable delivery at scale.

ARKA brought the Lumen locker to its most advanced version to date. The impact of this project is the rapid expansion of the network into key locations, supporting the growth and long-term success of the largest open network in the DACH region.

Figure 1 Lumen Locker
Source: ARKA Smart Parcel Lockers

METHODOLOGY

The first step that led to ARKA's latest advancements in the Lumen locker was the pilot phase of this collaboration.

50 lockers were deployed in real operational environments to validate system performance, user interaction, and energy efficiency.

Data collected during this phase formed the basis for both technical and functional improvements.

Feedback from the client and field operations was analysed and translated into hardware and software updates.

Figure 2 Lumen Locker in the Field
Source: ARKA Smart Parcel Lockers

A second key factor was the strength of the collaboration. Close coordination between R&D engineers, production teams, and field technicians enabled continuous improvement throughout the project.

Regular on-site visits helped assess performance and identify further optimisation opportunities. In parallel, production processes were standardised and scaled.

New digital tools were introduced to improve traceability, logistics coordination, and maintenance tracking.

This structured methodology supported a controlled transition from the pilot phase to large-scale production, ensuring a reliable and scalable solution.

Figure 3 Lumen Locker
Source: ARKA Smart Parcel Lockers

RESULTS

The project resulted in the successful industrialisation of the Lumen locker and its transition from pilot phase to full-scale production.

Following the validation of the pilot project, 4 subsequent orders were placed, equivalent to over 9,000 locker columns.

A key outcome was the establishment of a stable and scalable production process.

This was supported by the expansion of ARKA's production facilities, increased manufacturing capacity through new equipment and team growth, contributing to increased external revenue (Fig. 5).

Exclusively for the Lumen locker project, ARKA achieved a production capacity of up to 250 lockers per week, corresponding to a capacity of up to 44 full truckloads per month.

Deliveries were maintained at an average of 32 truckloads per month, aligned with the project's rollout pace and deployment requirements.

Product improvements also delivered measurable technical benefits.

Enhanced solar panels, with 360° adjustable positioning and increased capacity, improved energy autonomy and system performance in diverse conditions (Fig. 4).

Figure 4 Adjustable solar panels
Source: ARKA Smart Parcel Lockers

Figure 5: ARKA Revenue and Number of Employees 2022-2025
Source: ARKA Smart Parcel Lockers

LEARNINGS

This project highlighted two key learnings:

1. Continuous Improvement is Essential in Building Scalable Infrastructure.

Real progress is achieved not only through initial design, but through constant refinement based on real-world performance and direct user feedback.

Field data provides insights that cannot be replicated in controlled environments, making it a critical driver for product evolution. Flexibility and openness to change are key in this process.

ARKA's ability to adapt, iterate, and continuously improve its solution has supported both product maturity and operational readiness, enabling large-scale deployment (Fig. 6).

2. Equally Important is the Role of Collaboration.

ARKA is not a traditional supplier, but a technology partner built on long-term trust. (Fig. 6).

Strong and continuous collaboration between teams, supported by open communication, enables faster decision-making and more effective solutions. This close cooperation ensures that both technical and operational aspects evolve in line with the deployment needs.

Figure 6: The ARKA Smart Parcel Lockers Factory
Source: ARKA Smart Parcel Lockers

D-carbN Analytics

UNITED KINGDOM

SUMMARY

D-carbN Analytics has created an online platform, DATa Analytics®. Further to a comprehensive year-long beta testing phase, the application has been designed to accurately quantify vehicle emissions from road transport, effectively addressing several critical limitations.

Conventional tools can often rely on broad reports or generic fleet-level data based on average metrics, rather than incorporating route-specific details or information pertaining to individual vehicle models.

Using basic vehicle registration details, D-carbN also determined that available data was predominantly limited to CO_2 measurements only, leaving an opportunity to enhance the service by adding NOx, PM, and WTW emissions they could source from additional validated databases.

NOx emissions fluctuate based on engine temperature, which is obviously influenced by trip and route dynamics. To enhance precision, the development team collaborated with research institutions, utilising laboratory results and sophisticated algorithms.

The platform is intended to assist businesses in accurately understanding their emissions profiles, evaluating real-world vehicle performance, and optimising operational efficiency.

It facilitates comprehensive delivery route assessments by mapping emissions down to postal code sectors. Beginning in October 2025, GLEC Scope 3 requirements now encourage integration of third-party and subcontractor data. The centralised DATa dashboard can deliver the emissions substantiation required for ESG reporting compliance.

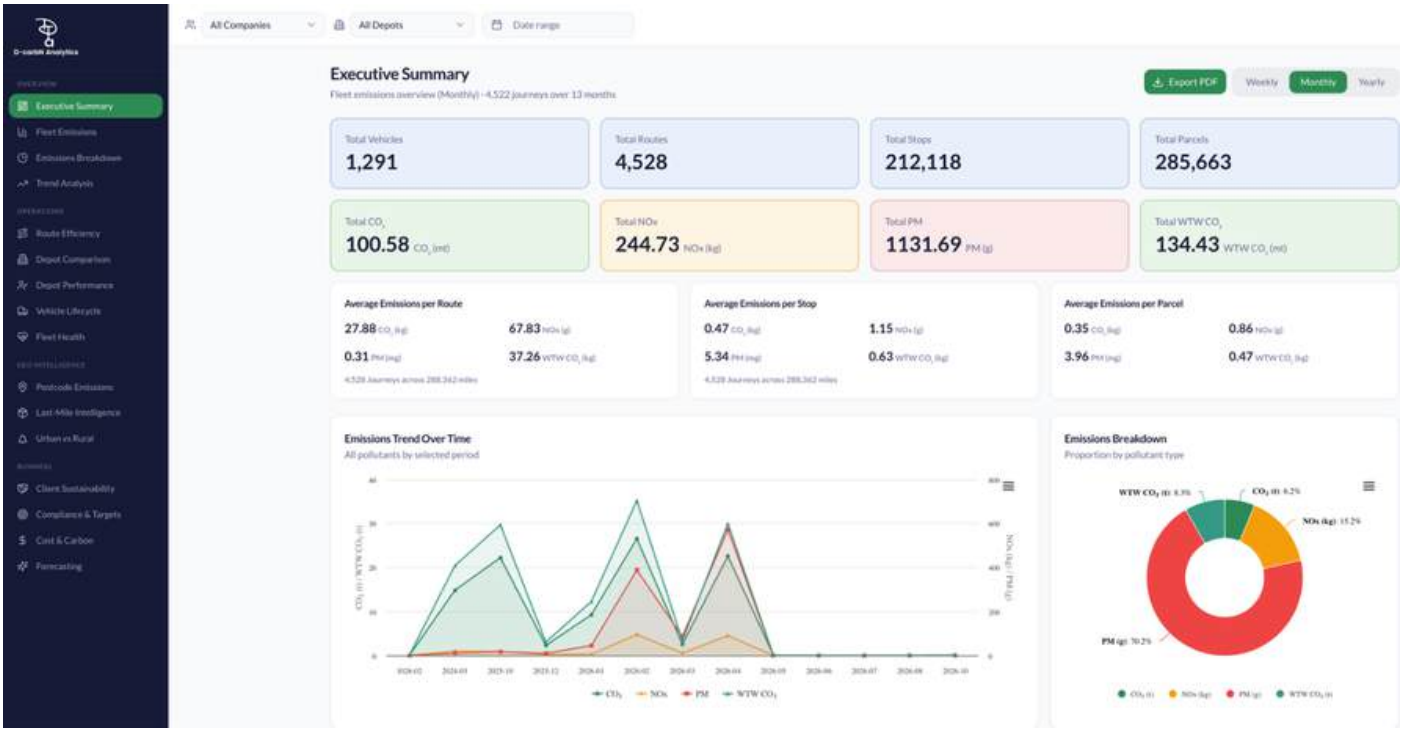


Figure 1: DATa Dashboard – Executive Summary
Source: D-carbN Analytics Ltd

INTRODUCTION AND BACKGROUND

D-CarbN has identified gaps in reporting processes and a tendency to rely on planned data rather than actual figures. While some vehicles are equipped with live tracking and delivery devices that verify exact locations, others provide only basic information.

By utilising a range of data sources, the team is able to predict accurate usage data even when information is limited. D-CarbN assists organisations in enhancing final-mile operational efficiency, delivering quantifiable cost savings alongside reductions in environmental impact.

The DATa Analytics platform offers accurate, near real-time reporting of CO_2, NOx, and Particulate Matter emissions based on route-specific and vehicle-specific data, minimising dependency on estimates.

The solution is supported by robust data architecture and can be rapidly deployed globally via standard API integrations.

Fleet efficiency is also evaluated across several core pillars, including telematics, route optimisation, and emissions measurement.

Comprehensive audits are conducted to establish baselines and inform improvement strategies.

Leveraging six decades of collective final-mile logistics expertise, D-CarbN bridges the gap between planned inputs and real-world vehicle and route performance by segmenting emissions according to route, stop, and parcel.

Interactive reporting features facilitate detailed analysis, operational target setting, and benchmarking against industry standards and GLEC guidelines.

Current integrations include fleet management providers, delivery partners, and address-quality specialists.

The overarching goal is to deliver a scalable, evidence-based methodology for reducing emissions while increasing service reliability and cost efficiency.

The primary focus remains on road emissions, with future integration plans for platforms specialising in air, rail, and sea transport.

METHODOLOGY

D-CarbN securely receives vehicle and route data from clients via API to generate detailed emissions profiles by location, route, vehicle, stop, and parcel.

By combining route, vehicle, and driver data, it highlights operational inefficiencies that drive excess fuel use, higher maintenance costs, and avoidable emissions.

The system provides accurate, near real-time reporting of CO_2, NOx, and Particulate Matter based on robust, auditable inputs rather than generic benchmarks.

This supports internal performance audits, transparent client/supplier reporting, and alignment with recognised logistics emissions standards (including DVLA data where relevant) and GLEC Framework Scope 3 disclosure expectations.

D-CarbN integrates with existing systems through secure APIs and scalable data infrastructure to optimise the various pillars of fleet efficiency; for example, vehicle ownership and control measures, service and maintenance standards, vehicle telemetry and driver behaviour, route planning and optimisation, and end-to-end emissions tracking.

The DATa platform can also calculate total emissions by Transport Chain Element (TCE) (e.g., hub-to-hub legs) using transport activity data such as fuel consumption, distance and payload/weight, and applies a data quality indicator (DQI) to distinguish primary data (actual fuel use) from secondary estimates.

Clients have access to an intuitive dashboard to view statistics, forecast emissions and compare trends across periods or benchmarks.

Reporting boundaries can be defined to include relevant modes (road, maritime, rail, air, inland waterway) and associated transhipments or warehousing, using a standardised GLEC-aligned methodology for consistent benchmarking and decarbonisation tracking.

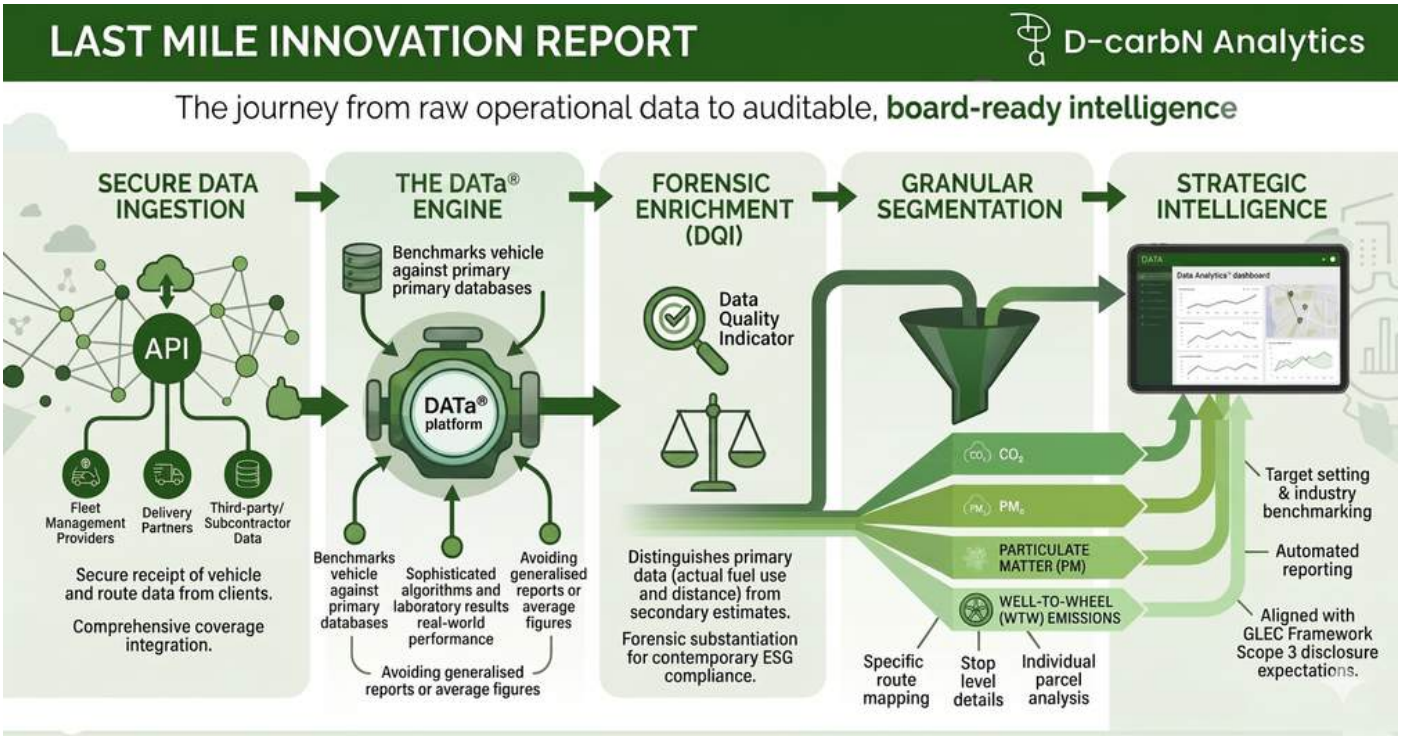


Figure 2: The DATa process – the key steps
Source: D-carbN Analytics Ltd

RESULTS

Route-specific data was supplied by operators with distinct delivery profiles. Fleet A specialises in B2C final mile services, catering to multiple residential addresses, while Fleet B provides B2B solutions through a 'milkround' service targeting commercial clients, i.e., with fewer stops. The D-carbN Analytics platform recorded emissions over a 30-day period, with key results outlined below.

Fleet A delivered **94,364 parcels over 61,228 miles**, achieving an average emissions intensity of **0.16 kg CO_2 per parcel**. The platform identified an efficient emissions profile, with total **NO_x emissions at 20.07 kg**, demonstrating the effectiveness of the fleet's existing route optimisation strategy.

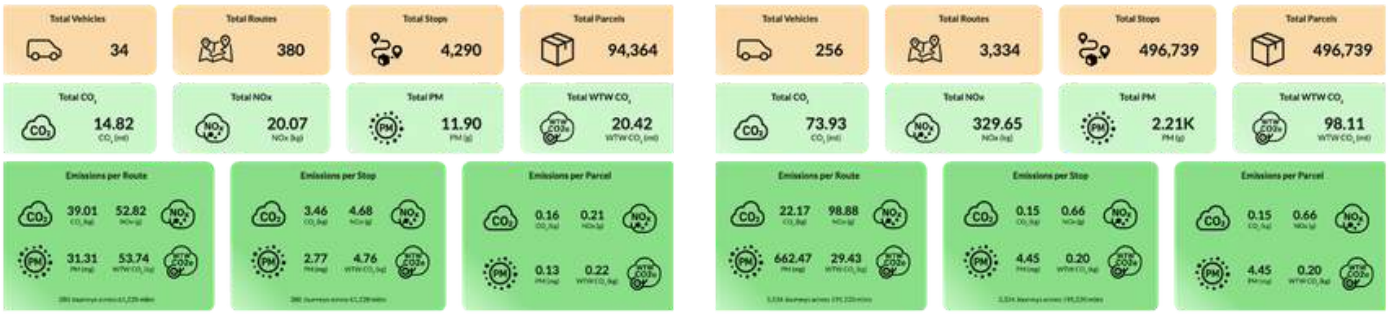


Figure 3 & 4: DATa Dashboard for Fleet A (left), DATa Dashboard for Fleet B (right)
Source: D-carbN Analytics Ltd

Fleet B delivered **496,739** items over **195,220 miles**. While maintaining an average of 0.15 kg CO_2 per parcel, forensic emissions tracking identified a significantly higher total **NO_x output of 329.65 kg**. The age profile of the Clients' vehicles is a factor.

By pinpointing route-specific and location-based emissions, the platform equips operators with validated data to facilitate decision-making.

This may involve minimising idling periods or enhancing route planning and optimisation strategies. The insights provided can strengthen business cases for adopting lower-emission vehicles, such as transitioning from internal combustion engine (ICE) vehicles to electric vehicles (EVs).

All data is verifiable, auditable, and contributes to GLEC Scope 3 Compliance. It is important to note that, in the two fleet examples, operators reported a year-over-year increase in emissions. It was acknowledged to be a consequence of previously relying solely on average vehicle/route data.

LEARNINGS

- Approximately 10 companies purport to specialise in emissions reporting, but few focus exclusively on road transport.
- Although GLEC standards exist, many reports still rely on averaged inputs and therefore provide less detail than DATa. GLEC typically focuses on weight and distance, with results highly dependent on data quality and often based on planned routes rather than actual journeys.

The sector largely prioritises CO_2 reporting, with less emphasis placed on other pollutants.

- Some organisations are reluctant to provide information, as they operate older vehicles and are concerned about how they may compare relative to those with newer fleets or electric vehicles (EVs).
- EVs also generate emissions across their lifecycle. They are often heavier than internal combustion engine (ICE) vehicles and, while they do not emit tailpipe CO_2 or NOx, they still produce tyre-wear particles; this remains an area for future development.
- Some journeys are not captured, particularly where third-party delivery partners are used: while delivery completion is confirmed, the delivery method is not always known.
- For self-employed couriers, data is not always recorded. consistently or accurately.
- Emissions analysis can also highlight operational inefficiencies.
- Reviewing historic client outputs suggests emissions may have been underreported, which is unsurprising, where only averages and planned-route data are used.
- Access to information can be challenging for some SMEs, particularly where tracking data is controlled by third parties. This is common where delivery service providers (DSPs) work with larger parcel carriers that own the delivery device and applications.

ELIFTECH

UKRAINE

SUMMARY

A locker utilisation intelligence solution was developed to support parcel locker operators in managing their networks more effectively.

The solution is designed to uncover hidden inefficiencies, support faster operational response, and improve decisions around capacity and network performance.

As parcel lockers take on a bigger role in out-of-home delivery, operators need better ways to scale efficiently without compromising service quality.

That makes utilisation management a real operational priority, not just a reporting exercise.

The system analyses locker events, tracks utilisation, detects anomalies through business rules and machine learning, and brings everything together in one clear operational view.

It helps teams quickly identify lockers with long-stay parcels, unusual access behavior, overloaded or underused cells, and wider utilisation imbalances across the network.

The functionality also includes an AI agent that analyses locker utilisation, recommends capacity adjustments, and provides zone-level demand forecasts for the next 24 hours and 7 days.

By helping operators use existing locker capacity more effectively, reducing manual monitoring, and responding faster to issues, the solution supports higher throughput, lower operational waste, and better-informed decisions on future network expansion.

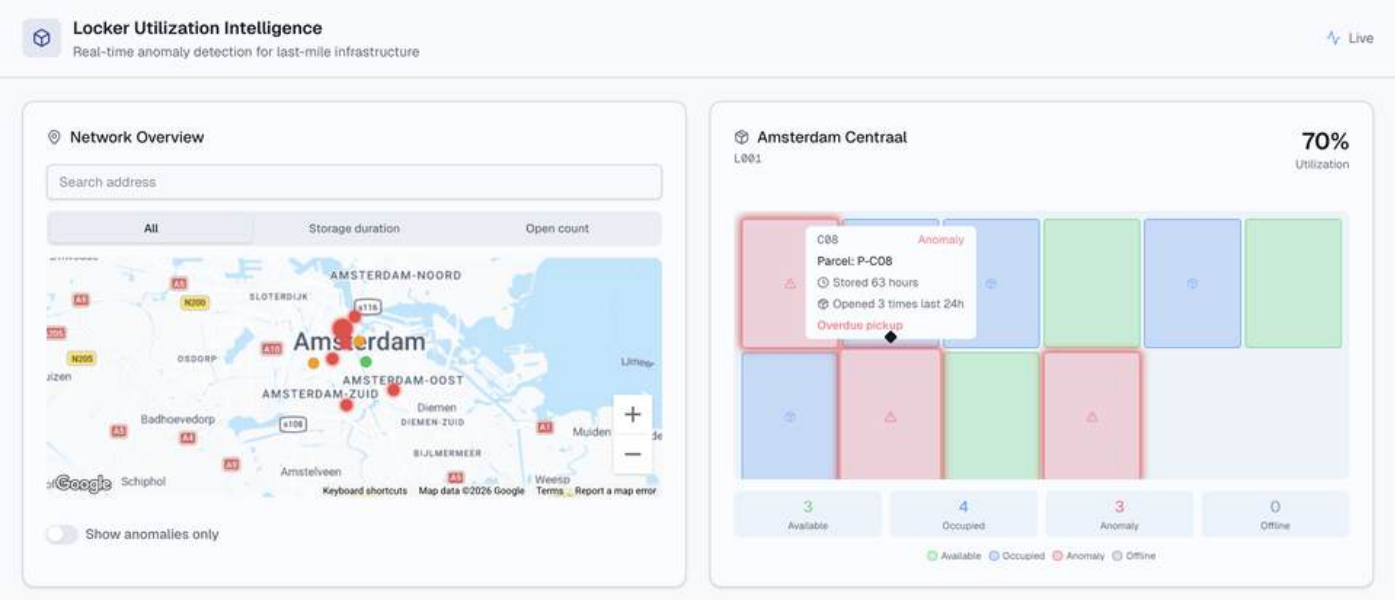


Figure 1: Locker Utilisation Intelligence Dashboard
Source: ElifTech

INTRODUCTION AND BACKGROUND

Parcel locker networks are playing a bigger and bigger role in last-mile delivery, which means operators are under more pressure to keep service levels high while making the most of the capacity they already have. In large networks, though, problems are not always easy to spot early.

Parcels can stay in cells longer than they should; some lockers can be constantly full while others are not used enough, and unusual access patterns can go unnoticed until they start affecting throughput, efficiency, or customer experience.

ElifTech looked at this challenge from a simple perspective: locker utilisation should not rely only on static reports or manual checks.

As networks grow, operators need a smarter and more proactive way to see how capacity is being used, where inefficiencies are building up, and what actions can improve performance.

These issues have a real business impact because blocked cells, uneven occupancy, and slow issue detection all reduce usable capacity, create extra manual work, and make locker operations less efficient overall.

That is why the goal of the project was not just to improve visibility, but to build a more scalable and commercially valuable way to manage locker networks.

ElifTech developed an AI-powered locker utilisation intelligence solution that analyses locker events, tracks operational performance, detects anomalies through configurable rules and machine learning, and turns those insights into practical next steps.

The solution also includes an AI agent that analyses locker utilisation, recommends capacity adjustments, and provides zone-level demand forecasts for the next 24 hours and 7 days.

This helps operators spot issues earlier, respond more effectively, and make better decisions about capacity planning, network performance, and future growth.

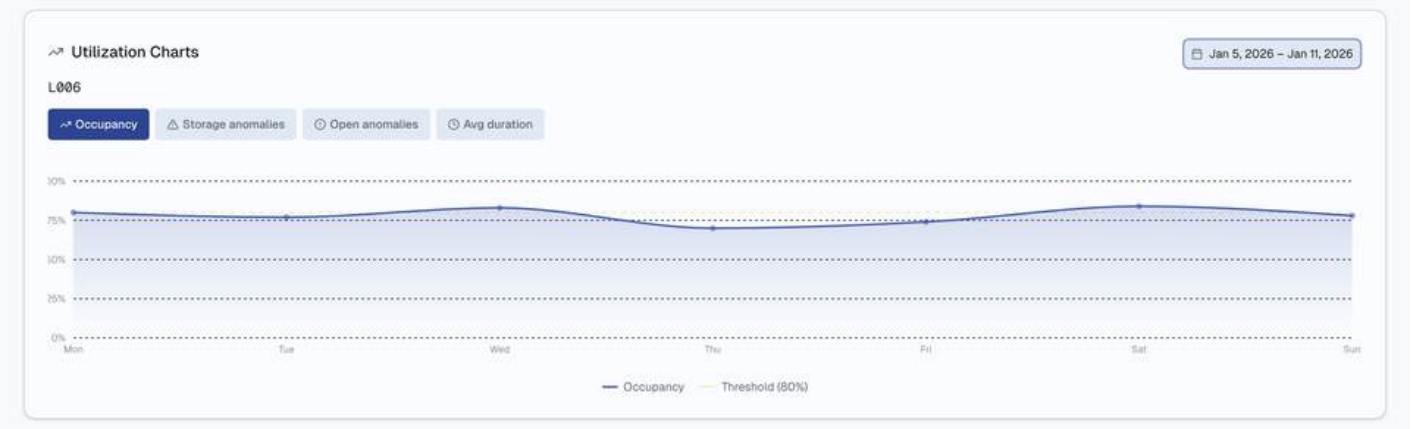


Figure 2: Locker Utilisation Trends and Anomaly Monitoring
Source: ElifTech

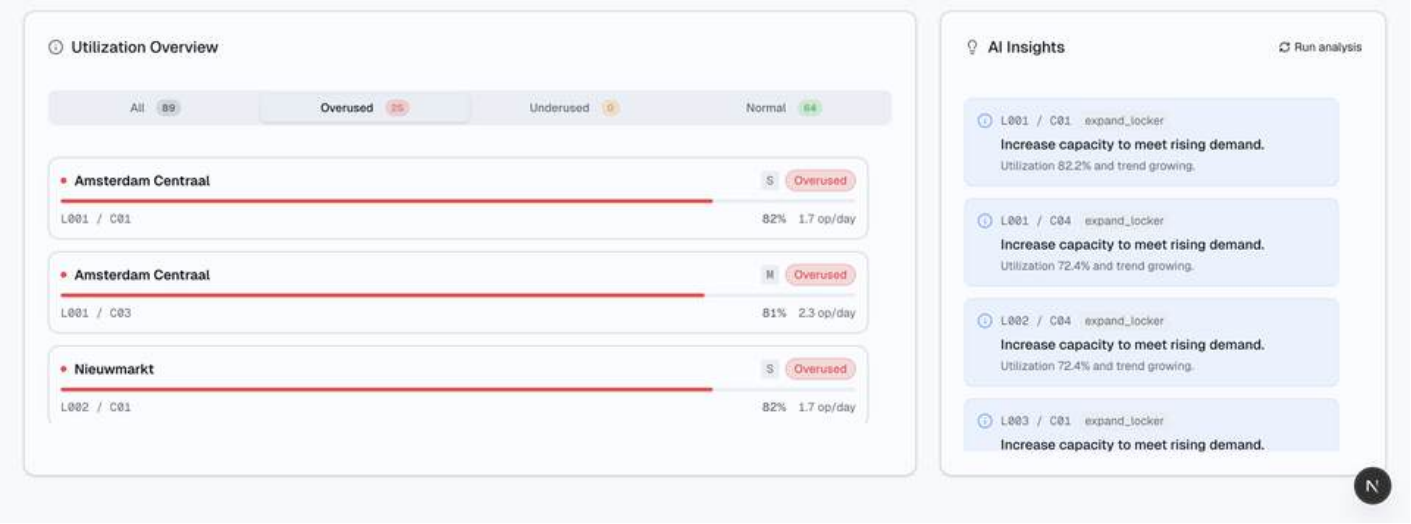


Figure 3: AI Insights and Utilisation Overview Panel
Source: ElifTech

METHODOLOGY

The solution was built as a modular locker intelligence layer based on operational locker event data.

The first step was to create a clear framework for understanding how lockers perform across the network, both at the location level and cell level.

This included tracking metrics such as occupancy rate, storage duration, anomaly counts, open-count behavior, and other usage indicators that help reveal where inefficiencies are starting to appear.

All of this information is presented through an interactive map and detailed locker drill-down views, so teams can move easily from a network-wide overview to specific cell-level insights. To detect anomalies, the project combined business rules with machine learning.

Storage-related issues were monitored through configurable SLA rules, making it possible to flag parcels that remained in cells longer than expected.

Unusual open-count behavior was identified through machine learning, which helped detect patterns that would be difficult to capture through fixed thresholds alone.

This combination made the solution both practical and flexible, giving operators clear logic where needed while also allowing the system to identify more complex patterns.

The methodology went beyond anomaly detection alone. It also included utilisation analytics, cell efficiency classification, AI-generated recommendations, and ML-based forecasting.

Each locker cell could be assessed based on its usage pattern, while the AI agent analysed performance data and suggested actions such as reallocating capacity, resizing underperforming cells, or taking action on problematic lockers.

To support planning, the forecasting module grouped lockers into zones and generated demand forecasts for the next 24 hours and 7 days.

As a result, the solution helps operators not only identify issues but also plan capacity more proactively and make better decisions about future network development.

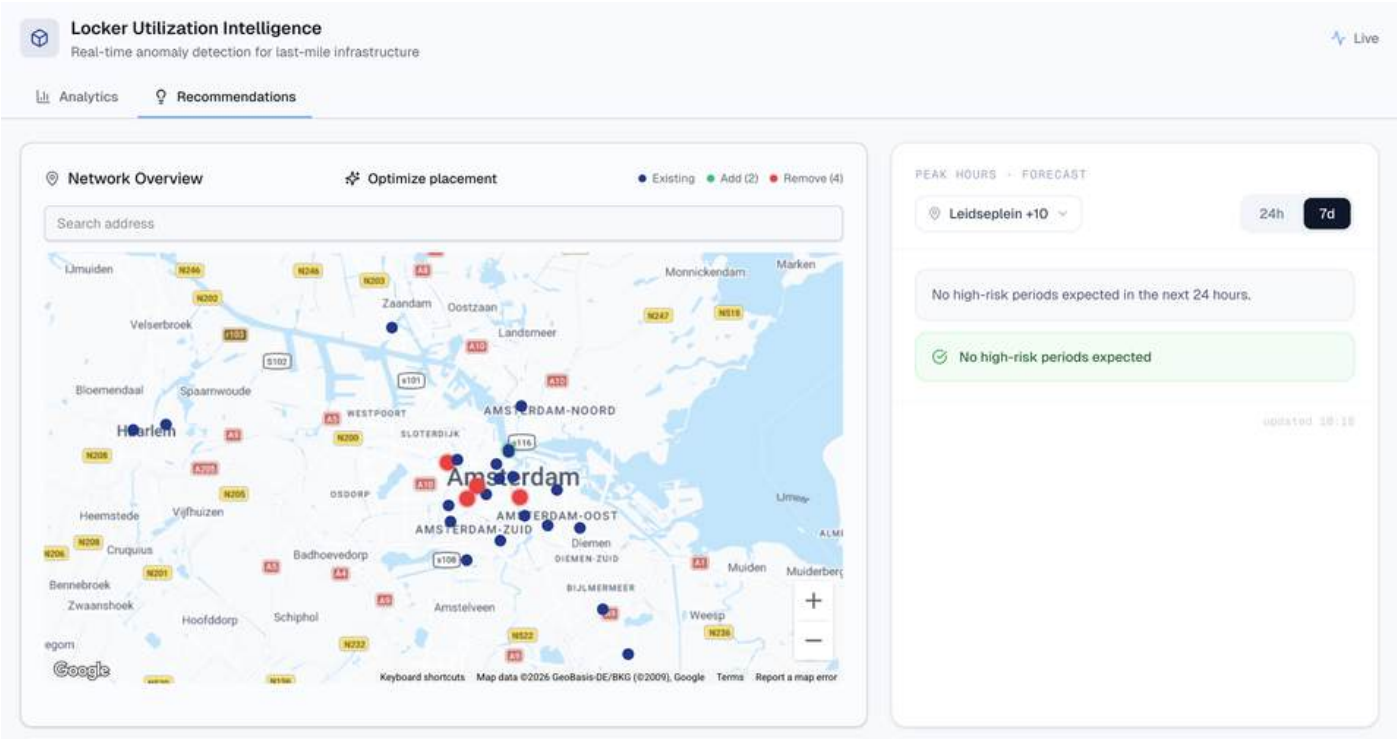


Figure 4: Network Overview and Demand Forecasting Interface
Source: ElifTech

RESULTS

- Delivered 50-80% less manual monitoring time by turning locker event data into a clear operational view, helping teams detect issues faster and reduce time spent on manual checks.
- Increased usable capacity by 5-15% at busy locations by identifying blocked cells, long-stay parcels, and local utilisation imbalances earlier.
- Enabled 20-40% faster issue detection and response by making anomalies easier to detect, assess, and prioritise across the network.
- Improved the management of distributed locker networks by giving operators a more structured and scalable way to monitor utilisation across locations and maintain a clearer view of network health.
- Helped operators make better use of existing infrastructure before committing to further physical expansion, supporting more efficient capacity decisions and stronger asset productivity.

LEARNINGS

The key lesson from this project was that effective locker network management requires more than a status dashboard.

As out-of-home delivery grows, operators need to understand where capacity is being lost, where anomalies are emerging, and where action is needed to protect performance.

A second learning was that the most practical innovation comes from combining multiple layers of intelligence into a single solution.

Business rules help identify clear SLA breaches, machine learning improves anomaly detection, and AI-generated recommendations and forecasting make the output more actionable for operational teams.

The project also showed that the value of locker intelligence goes beyond better monitoring.

In large and growing networks, using existing infrastructure more effectively can be just as important as adding new capacity, creating both operational value and stronger long-term infrastructure efficiency.

emapa

POLAND

SUMMARY

The goal of this project was to provide support for day-to-day service and delivery planning operations for a furniture logistics company specialising in home appliances and furniture deliveries.

Each optimisation problem covered between 41 and 370 locations and utilised a heterogeneous fleet between 4 and 28 vehicles.

Apart from covering the standard requirements of minimising the total number of vehicles and being on time (with special attention to premium customers), the main challenge of the solution was to ensure delivery of as many goods as possible via electric vehicle (EV).

The attached map presents a sample distribution of delivery and service locations, including the location of the main depot. Locations easily achievable by EV (less than half range for round trip) are marked in green, theoretically achievable by EV are marked in orange (total range of 160km for round trip), and the rest is marked in red.

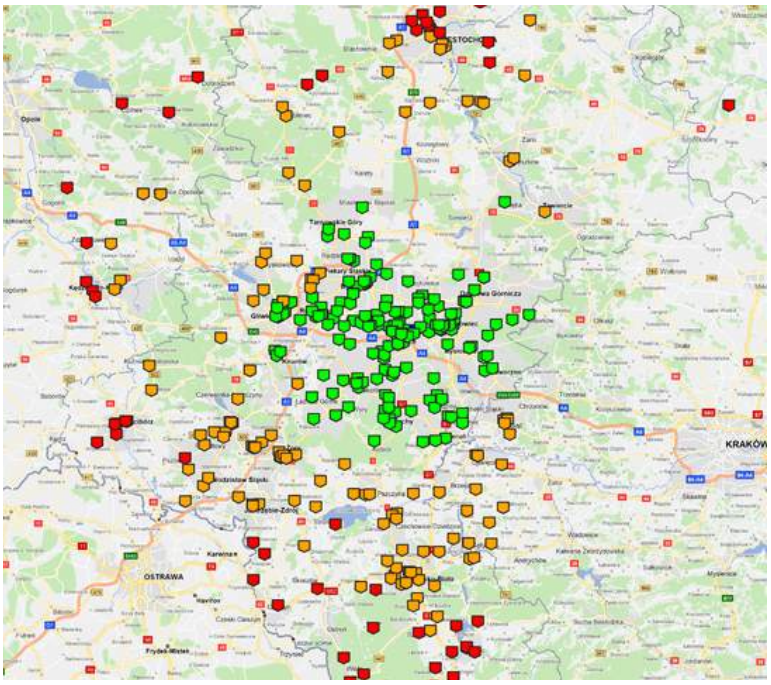


Figure 1: Distribution of delivery locations and their EV feasibility relative to the main depot
Source: Emapa

INTRODUCTION & BACKGROUND

At the beginning of the cooperation, the client presented specific expectations and business practices that should be considered during the project.

A fully individualised approach to the client, precise preliminary interviews, and regular meetings with the client allowed Emapa Telematics to find a balance between conflicting optimisation conditions.

In the case of the described furniture logistics company, the following boundary conditions were considered when planning optimal routes:

- Limited depot throughput (2-3 ramps with up to 40 vehicles, with each loading taking a half-hour time window)
- Premium customers with strict 3-hour time windows
- Minimise the number of engaged vehicles
- Maximise the number of orders delivered with electric vehicles
- Electric vehicles' range is limited to 160 kilometres (later upgraded to 300km)
- Additional intermediate cargo pickup location

Our goal was to provide a tool supporting daily planning operation for 3 depots.

METHODOLOGY

Data Audit and Verification of Work-Time Assumptions

The initial step involved a thorough data audit to verify if historical data aligns with work time and max load assumptions.

This allowed us to tune travel time estimation and cargo size estimation in order to fit actual delivery plans typically carried out.

Defining Measurable Criteria

After initial data analysis, we defined a set of measurable criteria, including:

- Total number of routes
- Total number of involved vehicles
- Overall routes length
- Average cargo load on each route (additional metric)
- Percentage of cargo delivered by electric vehicle
- Percentage of on-time deliveries

Optimisation with VRP Optimisation

Using a customised VRP optimisation tool, routes are optimised to minimise the total number of routes and total number of vehicles involved (some vehicles do one or even two reloads during the day), while maintaining a high number of goods served by EVs.

The Vehicle Routing Problem (VRP) is a class of optimisation problems focused on determining the most efficient set of routes for a fleet of vehicles serving a given set of locations under specific constraints.

Continuous Tuning

The obtained results are being monitored with regard to their quality or any additional requirements that have arisen on the business side (e.g., intermediate pick-up points for some of the cargo).

RESULTS

We have delivered a route optimisation tool that allows for several rounds of planning with various parameters (e.g., max work time and max allowed number of vehicles) so that the planning analyst can choose from various options.

The project was executed in several phases. Initial R&D work supporting the sales process was carried out between October 2024 and February 2025, followed by the core development phase in March 2025.

The first operational optimisation results were achieved shortly after this stage, enabling early validation of the approach.

The solution was then further stabilised in terms of functionality and quality between April and May 2025. Subsequent months (June–December 2025) focused on ongoing development and customisation of the algorithm, particularly in response to evolving business needs.

The attached charts present the achieved percentage of goods delivered by EV, and the impact of larger utilisation of EVs on total distance travelled with regard to the number of locations to be served.

A customised version of the VRP solving algorithm allowed for utilisation of EVs over 91% of their time availability, while initially it was at the level of 62%.

When business needs required an increase in the number of requests served by EVs, we have successfully customised the algorithm.

This resulted in a significant rise (+10 percentage points) of goods handled by EVs, with an insignificant difference in total distance travelled by the whole fleet.

Figure 2: Total Distance with Regards to Number of Locations, Ratio of Locations Served by EV
Source: Emapa

LEARNINGS

- It is possible to customise standard VRP algorithms to handle special business needs like handing over a considerable amount of goods to electric vehicles
- The feasibility of using EVs should be verified by the spatial spread of clients and/or providing infrastructure for simultaneous cargo and electricity load to reduce wasted driver break time.
- High-quality standardised input data is a key enabler of reliable optimisation results, as inaccuracies in travel times, service durations, or cargo parameters can significantly impact solution performance.
- Close collaboration with the client is critical to success, particularly in understanding operational constraints and balancing often conflicting optimisation objectives.
- Clearly defined business goals and expected outcomes (e.g. cost reduction, EV adoption, service level improvements) are essential to properly configure and evaluate optimisation models.

Łukasiewicz
Poznański Instytut Technologiczny

POLAND

Stakeholders:

POZnań GLS

SUMMARY

The GRETA project implemented and tested a pilot urban transhipment microhub in Poznań to support last-mile parcel deliveries using cargo bicycles in the city centre.

The initiative addressed urban environmental and traffic challenges in the city centre.

The pilot was implemented as a living lab in cooperation with municipal, research, and logistics partners. Over six months (December 2024–May 2025), parcels were reloaded from delivery vans to cargo bikes and distributed within a 5.2 km² service area near restricted central zones.

The results confirmed strong environmental and operational performance. The pilot significantly reduced delivery van traffic and greenhouse gas emissions, while maintaining delivery reliability and service quality.

At the same time, it revealed limited economic efficiency, with higher delivery costs mainly driven by low hub utilisation and increased labour intensity.

Overall, the project demonstrated the technical and environmental viability of cargo bike-based last-mile logistics. It also highlighted that higher utilisation rates, shared use between operators, and appropriate regulatory support are critical for improving economic performance and enabling scalable deployment.

Interreg CENTRAL EUROPE Co-funded by the European Union

GRETA

Figure 1: GRETA project logo
Source: GRETA project

INTRODUCTION AND BACKGROUND

Large cities such as Poznań face growing challenges from air pollution, excessive noise, and traffic congestion, with urban freight transport identified as a significant contributor.

These problems are particularly critical in historic city centres, where narrow streets, high pedestrian activity, and intensive commercial and tourist functions make traditional delivery operations inefficient and disruptive.

At the same time, Polish cities, including Poznań, are preparing to introduce Clean Transport Zones and implement Sustainable Urban Mobility Plans more widely, which require low- and zero-emission solutions for last-mile logistics.

Against this background, the project explored the potential of cargo bicycles supported by a dedicated urban transhipment microhub for parcel deliveries.

The pilot action was implemented in Poznań within the Interreg CENTRAL EUROPE framework, using a living lab approach that combined real-world operations with systematic data collection and evaluation.

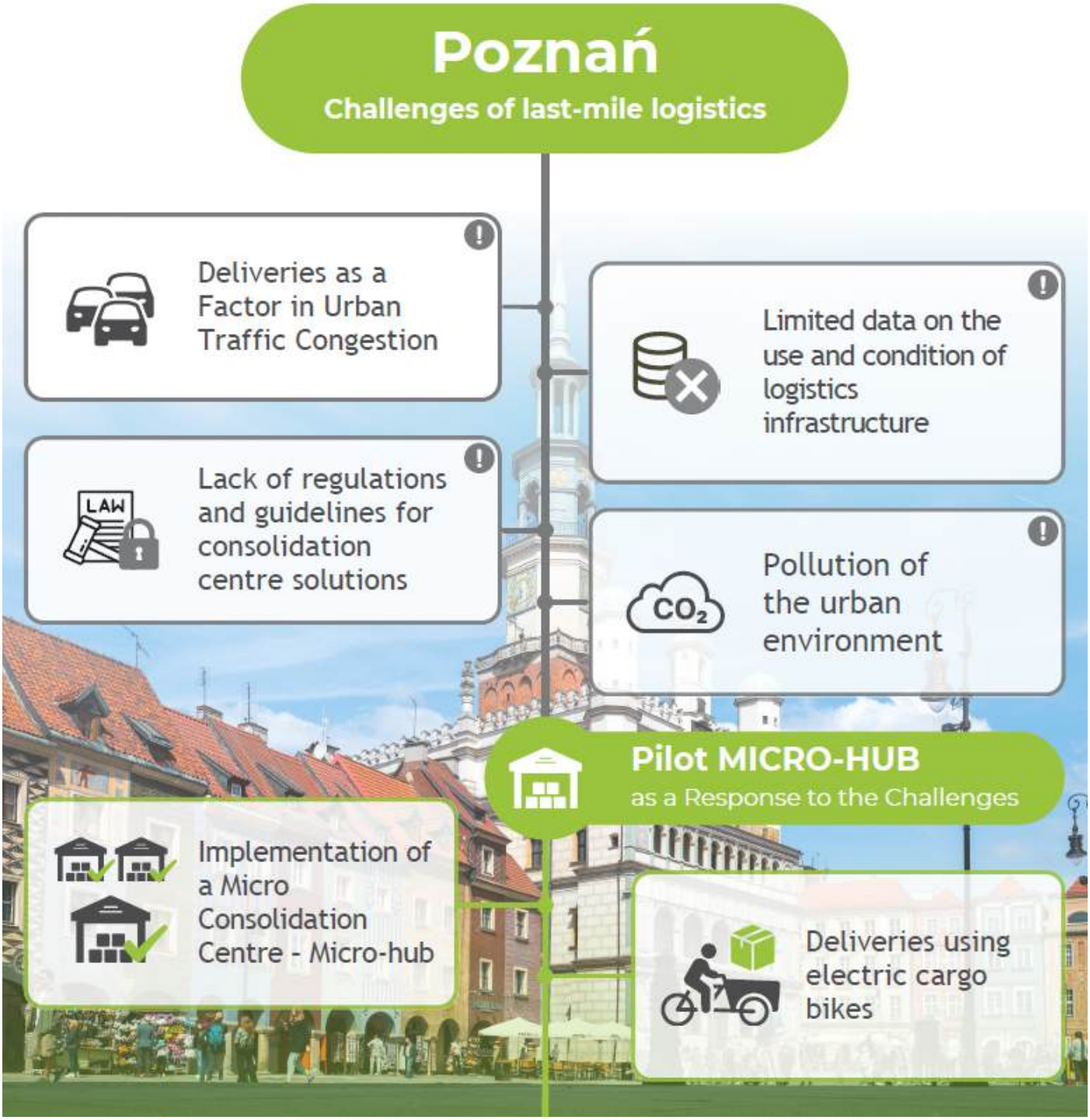
The City of Poznań and Łukasiewicz–PIT collaborated with a logistics operator (GLS Poland) to select a suitable hub location near the city centre and to define realistic operational conditions.

The initial assumption was that a microhub would support the transfer of parcels from delivery vans to cargo bikes, reducing the number of conventional vehicles entering sensitive urban areas.

It was expected that this would lower greenhouse gas emissions, noise, and congestion without negatively affecting delivery reliability or service quality.

The pilot also assumed that operational data gathered during the implementation period would allow verification of process efficiency, environmental benefits, and cost implications.

The expected outcomes included confirmation of the environmental effectiveness of cargo-bike-based deliveries, identification of organisational and regulatory barriers, and development of a transferable microhub model suitable for scaling up and replication in other cities facing similar urban logistics challenges.



METHODOLOGY

The pilot project applied a living lab methodology, combining real operational conditions with systematic monitoring, stakeholder cooperation, and iterative learning.

This approach enabled the solution to be tested in everyday urban logistics while generating robust qualitative and quantitative evidence.

Figure 2: Challenges of Last-Mile Logistics in Poznań
Source: Łukasiewicz–PIT

This was followed by stakeholder engagement, involving the City of Poznań, Łukasiewicz–PIT, the logistics operator (GLS Poland), and an external hub provider, ensuring that operational, technical, and regulatory requirements were aligned.

Next, a site selection and service area definition process was undertaken, based on municipal land availability, transport accessibility, and operator needs.

A temporary microhub was then designed, tendered, installed, and commissioned, complying with local regulations for temporary construction and urban safety standards.

The operational phase involved daily parcel transhipment from delivery vans to cargo bicycles, serving a defined urban area.

To support evaluation, a data collection strategy was implemented, which combined operator delivery data with dedicated GPS sensors mounted on cargo bikes to track routes, distances, speeds, and working time.

Finally, an evaluation and analysis framework was applied to assess environmental impacts, process efficiency, and costs, comparing cargo-bike deliveries with conventional van-based operations. The strategy emphasised realistic conditions, transparency of assumptions, and transferability, ensuring that the results could inform future scaling, shared-use models, and replication in other cities.

Figure 3: Microhub Cargo Bike in Poznań
Source: Łukasiewicz–PIT

RESULTS

The pilot delivery solution produced clear, measurable outcomes across environmental, operational, customer-facing, and financial dimensions. Environmental benefits were the most significant.

Using cargo bicycles supported by a microhub reduced delivery van traffic in the pilot area by about 30%, resulting in an estimated reduction of approximately 2.6 t eCO_2 over six months when replacing combustion-engine vehicles.

Noise levels and local air pollution also decreased, contributing to improved environmental quality in the city centre.

Operational outcomes showed the solution was technically reliable and process-neutral. Parcel delivery performance was maintained, with no reported deterioration in service reliability or delivery times.

The microhub enabled efficient transhipment, safe, weatherproof handling of parcels, and access in no-van areas, such as pedestrian zones.

However, hub utilisation reached only 37%, highlighting substantial potential for efficiency gains through longer operating hours or shared use by multiple operators.
Customer-facing benefits were positive.

Recipients generally perceived no difference in delivery quality, and many were unaware that parcels were delivered by cargo bikes. Couriers reported positive public reactions and improved working conditions in dense urban areas due to easier parking and shorter walking distances.

Financial outcomes were mixed. While no capital investment was required by the operator, delivery costs increased by 6–14%, driven by higher labour intensity and limited utilisation during the pilot.

The results demonstrate that while the solution delivers strong environmental and social value, improved operational scale and cooperation are key to achieving better financial performance.

Figure 4: Microhub in Poznań
Source: Łukasiewicz–PIT

LEARNINGS

The project delivered several important technical, organisational, and strategic lessons relevant to the implementation of cargo-bike-based last-mile logistics supported by microhubs.

A key learning was that strong municipal involvement is essential. Without the active participation of the City, particularly in providing land and navigating permitting procedures, the pilot would have been very difficult to implement.

Even for a temporary structure, administrative processes proved complex and time-consuming, highlighting the need to streamline regulations for experimental urban logistics solutions.

From an operational perspective, the pilot confirmed that cargo bike deliveries supported by a microhub are reliable and environmentally effective, but their economic performance strongly depends on utilisation rates.

Cooperation with only one courier operator limited hub use to short daily operating windows, resulting in underutilisation of infrastructure and higher unit costs.

This demonstrates the importance of sharing hubs and equipment among multiple operators or extending operating hours, improving financial viability.

In terms of hub design, the pilot showed that some initially assumed features, such as full interior heating, were unnecessary. Instead, targeted solutions (e.g., battery charging temperature management) are more efficient.

Couriers also rarely use storage space, preferring to complete deliveries in a single round, which has implications for future layout optimisation.

Finally, the project highlighted that environmental benefits come at a cost when scale is limited.

Achieving substantial emission reductions required additional expenditure, underlining that public support, incentives, or regulatory pressure may be needed to encourage wider adoption.

Figure 5: Results of the microhub implementation in Poznań
Source: Łukasiewicz–PIT own study

Overall, the pilot confirmed high environmental and social value, while emphasising the need for scale, cooperation, and regulatory adaptability.

Future initiatives in this area will focus on scaling the solution by expanding the microhub's functionality (e.g., cargo bike repair services, PUDO options for customers), as well as enabling multiple independent operators to share transshipment space (several microhub modules at a designated location).

Figure 6: Future directions for mobility initiatives in Poznań
Source: Łukasiewicz–PIT own study

MaddWill AI

USA

SUMMARY

Tarviq is a pre-bill audit and reconciliation platform for shippers and 3PLs that ship freight at volume. It catches billing errors and margin leakage in carrier invoices before payment, and reconciles freight data across TMS, WMS, and ERP systems that rarely agree on the same shipment.

Source: MaddWill AI internal architecture, 2026
Most freight operations absorb 6 to 8% of carrier spend in undetected billing errors.

For a shipper or 3PL with $50M in annual freight spend, this represents $3 to 4M lost annually to accessorial drift, weight and class corrections, fuel surcharge miscalculations, and reconciliation gaps between operational and financial systems.

Tarviq is built around three coordinating AI agents: a Billing Agent that detects seven distinct error types in carrier invoices pre-payment; a Reconciliation Agent that surfaces mismatches across TMS, WMS, and ERP data; and a Shipment Agent that monitors SLA performance and surfaces penalty credits.

The agents are supported by Marvin, an AI copilot trained exclusively on customer data.

The platform is currently entering the pilot phase with mid-market 3PLs and shippers.

The innovation is not the audit itself, but moving the audit layer to pre-payment and reconciling across operational and financial systems that have historically remained siloed.

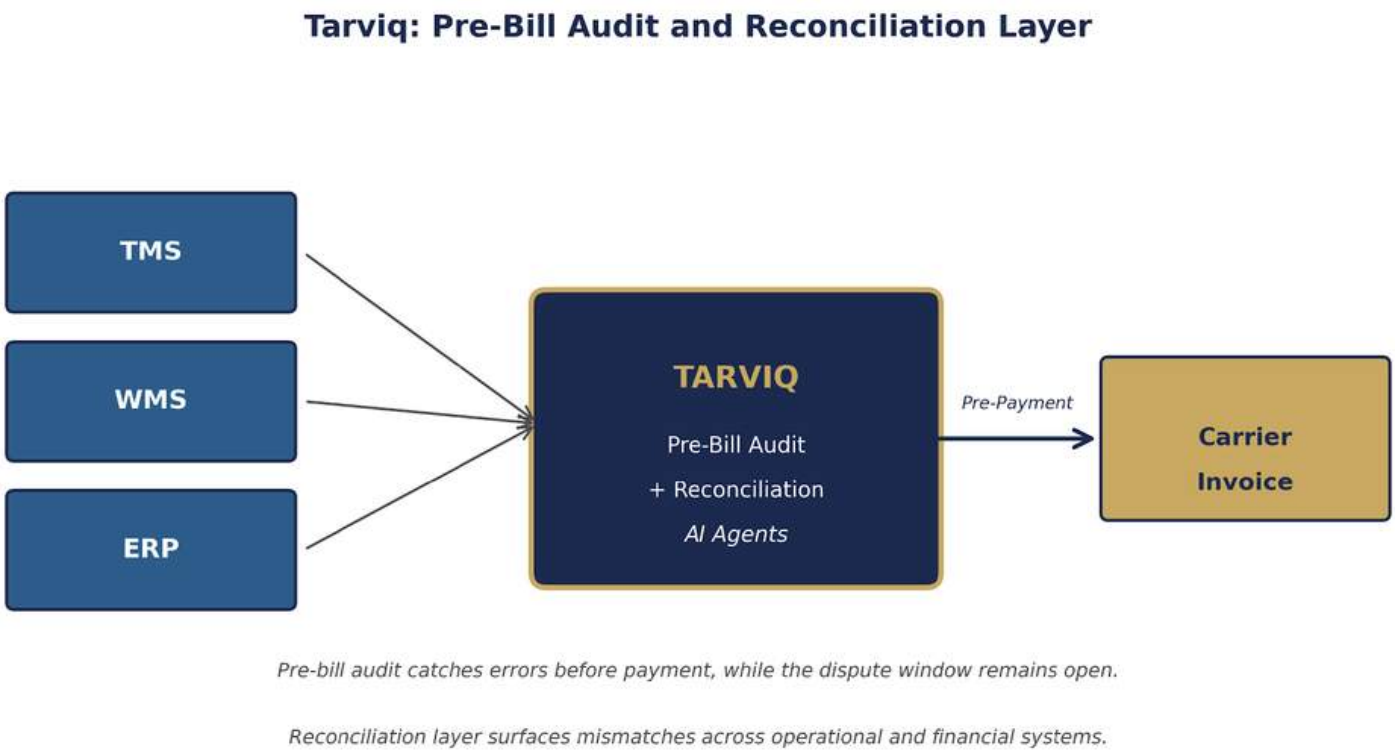


Figure 1: Tarviq's pre-bill audit and reconciliation layer between TMS, WMS, ERP and the carrier invoice.
Source: MaddWill AI internal architecture, 2026

INTRODUCTION AND BACKGROUND

Freight billing audit has historically been a post-payment activity. Companies like Cass Information Systems and Trans Impact built their businesses on auditing carrier invoices after payment, recovering overcharges through dispute processes that can take 90 to 180 days under federal statute 49 U.S.C. 13710.

This model leaves capital tied up in disputed claims and limits recovery to errors significant enough to justify the dispute effort. Smaller errors, accessorial drift, and reconciliation gaps between systems are absorbed silently as a cost of doing business.

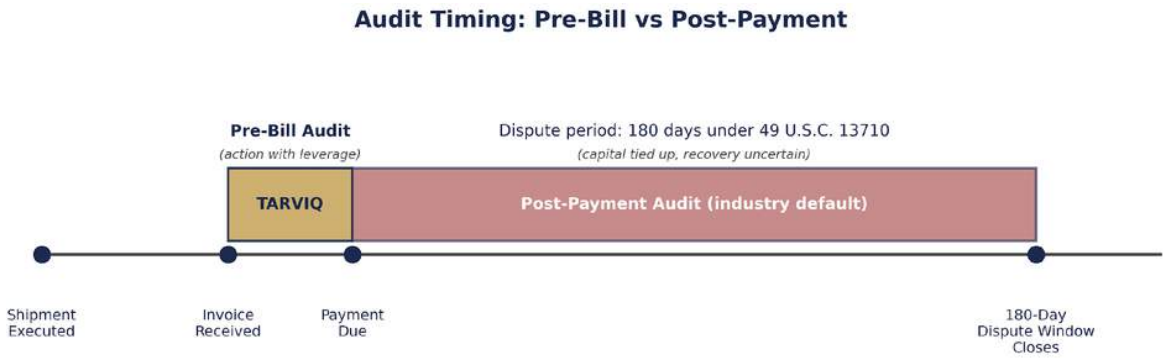


Figure 2: Re-bill audit acts within the dispute window, while leverage remains high. Post-payment audit recovers afterwards through dispute processes.
Source: MaddWill AI analysis based on 49 U.S.C. 13710, 2026

Through more than two hundred conversations with shippers, 3PLs, and freight operators across Europe, the Middle East and North America, MaddWill AI identified a structural blind spot: while carriers, shippers and 3PLs all maintain operational systems (TMS, WMS) and financial systems (ERP), no single layer reconciles the three against each other before invoices are paid.

The initial assumption was that pre-bill audit, combined with cross-system reconciliation, would unlock material recoverable value for mid-market operators (companies with $20M to $75M in annual revenue) who are currently underserved by enterprise-grade audit providers due to pricing and integration complexity.

The expected outcome is a platform that recovers 6 to 8% of carrier spend pre-payment, reduces audit headcount requirements by 70 to 80%, and provides operational visibility across previously siloed systems, all at a price point ($4,000 per month) that makes the solution accessible to mid-market operators rather than only enterprise accounts.

METHODOLOGY

Development began with a discovery phase rooted in operator conversations rather than technical specifications.

Over twelve months, the team conducted in-depth interviews with consultants, finance directors, operations leaders, and freight forwarders across multiple geographies to map the actual workflow of carrier invoice handling and identify where errors and reconciliation gaps occur.

From these conversations, seven distinct error patterns emerged as universally present across freight operations: rate card mismatches, weight and class corrections (reweighs), fuel surcharge miscalculations, duplicate charges, accessorial drift, missing records, and SLA penalty credits not claimed.

Each pattern was validated against multiple operator workflows before being designated a detection type.

The technical architecture was designed around three principles.

First, all data integration is API-based via webhooks, eliminating the manual integration burden that has historically excluded mid-market operators from enterprise audit platforms.

Second, the AI layer is built on a hybrid Claude and Ollama foundation, with each customer instance trained exclusively on its own data, ensuring no cross-contamination between client environments.

Third, the system is structured as three coordinating agents (Billing, Reconciliation, Shipment) rather than a single monolithic engine, allowing each to specialise in its domain and surface findings to the others.

The platform was built and tested internally over six months before entering the external pilot phase.

Pilot structure includes pre-defined success criteria, weekly progress checkpoints, and pre-agreed commercial conversion triggers, ensuring each pilot produces measurable outcomes within four weeks rather than open-ended evaluation periods.

RESULTS

Tarviq is currently in the pilot phase. The following outcomes represent expected results based on internal validation, industry benchmarks, and the commercial structure of active pilots:

Recoverable revenue: 6 to 8% of annual carrier spend identified pre-payment, equating to $3 to 4M annually for a shipper with $50M in freight spend, or $1.2 to 1.6M for a $20M operation.

Audit time reduction: Manual invoice review historically requires 2 to 4 days per month per finance staff member at mid-market operators.

Tarviq automates the detection layer, reducing manual review to validation of flagged items only, an estimated 70 to 80% time saving.

System reconciliation: For operators running separate TMS, WMS and ERP environments, Tarviq surfaces 12 to 18% of shipment records with data inconsistencies between systems, the majority of which would otherwise have been absorbed silently.

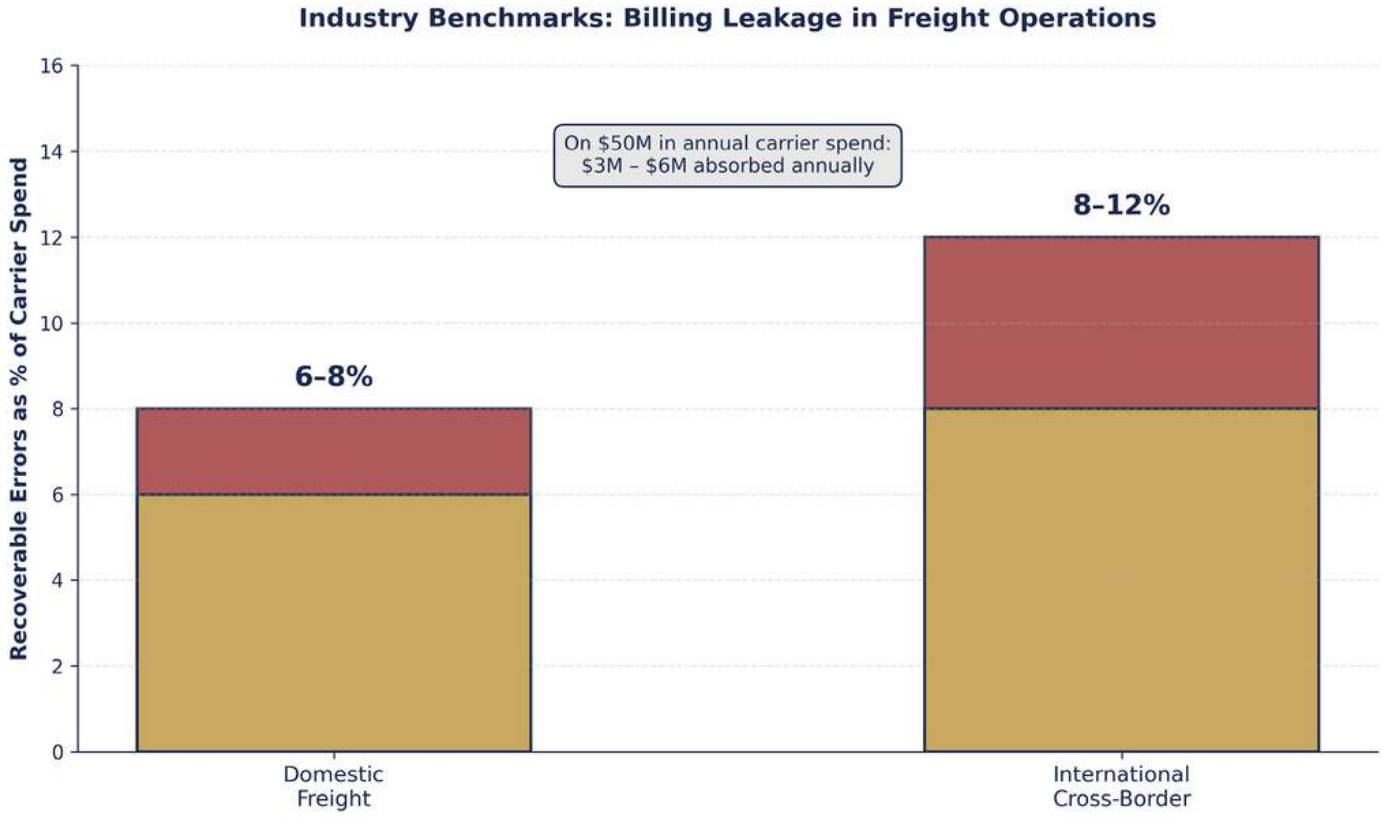


Figure 3: Recoverable billing errors as a percentage of carrier spend, by operational profile
Source: MaddWill AI synthesis of industry benchmarks (Cass Information Systems, Trans Impact, internal validation), 2026

Pricing accessibility: At a $4,000 per month flat fee, Tarviq sits at approximately 5 to 8% of the cost of comparable enterprise solutions ($50,000 to $120,000 per month), opening pre-bill audit to a mid-market segment historically excluded from this category.

Onboarding speed: API-based integration via webhooks reduces the typical implementation from 60 to 90 days (industry standard for enterprise audit) to under 14 days, validated through internal testing across SAP, Microsoft Dynamics, and mid-market TMS environments.

LEARNINGS

The most significant lesson is that operators value recoverable savings over visibility. Validation conversations confirmed what feedback from peer operators in the fulfilment audit space (notably Capabl by Izba Group) reinforced: visibility is a nice-to-have, while measurable savings are the lever that justifies spend.

This shaped how Tarviq surfaces findings, leading with dollar values rather than dashboard insights.

A second learning is that mid-market operators are systematically underserved by the freight audit category. Dominant providers are priced for enterprise accounts, leaving operators in the $20M to $75M revenue range to either build internal teams or absorb errors silently. This created the opportunity for a platform priced and architected for this segment.

A third learning concerns timing. Pre-bill audit requires action within the 180-day window defined by U.S. federal statute 49 U.S.C. 13710, with tighter equivalents in EU and APAC markets. Post-payment audit works against the clock; pre-bill audit works with it. Moving the audit layer earlier in the invoice lifecycle is the primary innovation, not the detection technology itself.

A fourth learning is that distrust of AI in traditional logistics is real and well-founded.

The platform was therefore designed so the AI layer trains exclusively on customer data, never feeding into a shared model, addressing both data sovereignty concerns and the reality that no two freight operations have identical fingerprints.

Finally, the operator-led discovery process proved more valuable than any market research. The next phase continues to be shaped by pilot operator feedback.

NOVA POST

UKRAINE

SUMMARY

Nova Post's "From Invisible to Instant" project represents a structural shift in how service quality is managed across a rapidly expanding logistics network.

As the company scaled across Ukraine and into Europe, maintaining consistency across thousands of locations became increasingly complex. Traditional audit models, based on physical visits and delayed feedback, struggled to keep pace with growth.

Instead of adding new infrastructure, Nova Post leveraged its existing camera network. By integrating computer vision, cameras evolved from passive recording tools into active analytical systems capable of continuously assessing branch conditions.

The system evaluates cleanliness, workspace organisation, and brand compliance, automatically flagging deviations and providing concise, image-based insights to managers.

With 96.3% accuracy, coverage across approximately 95% of cameras, and operating costs of around $0.10 per camera per day, the solution is scalable and economically sustainable.

Most importantly, service quality is no longer something that is checked occasionally.

It is continuously visible, measurable, and actionable, enabling a shift from reactive control to proactive management at scale.

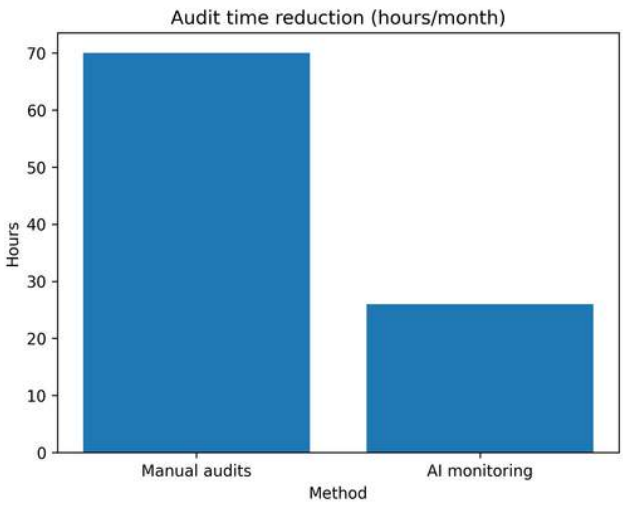


Figure 1: Audit time reduction
Source: Nova Post internal data

INTRODUCTION AND BACKGROUND

Rapid expansion across Ukraine and into European markets introduced increasing complexity in maintaining consistent service quality.

The network includes both company-owned branches and partner-operated locations, often embedded within third-party retail environments. While standards were defined, execution naturally varied, creating inconsistencies in customer experience.

Traditional audits required time, travel, and coordination. More importantly, they were inherently reactive. Issues were often identified only after customers had already experienced them.

The challenge was not growth itself, but maintaining consistency at scale.

Nova Post recognised that a fundamentally different approach was required, one that could provide continuous visibility without increasing operational burden.

This led to the idea of transforming existing camera infrastructure into a real-time quality monitoring system.

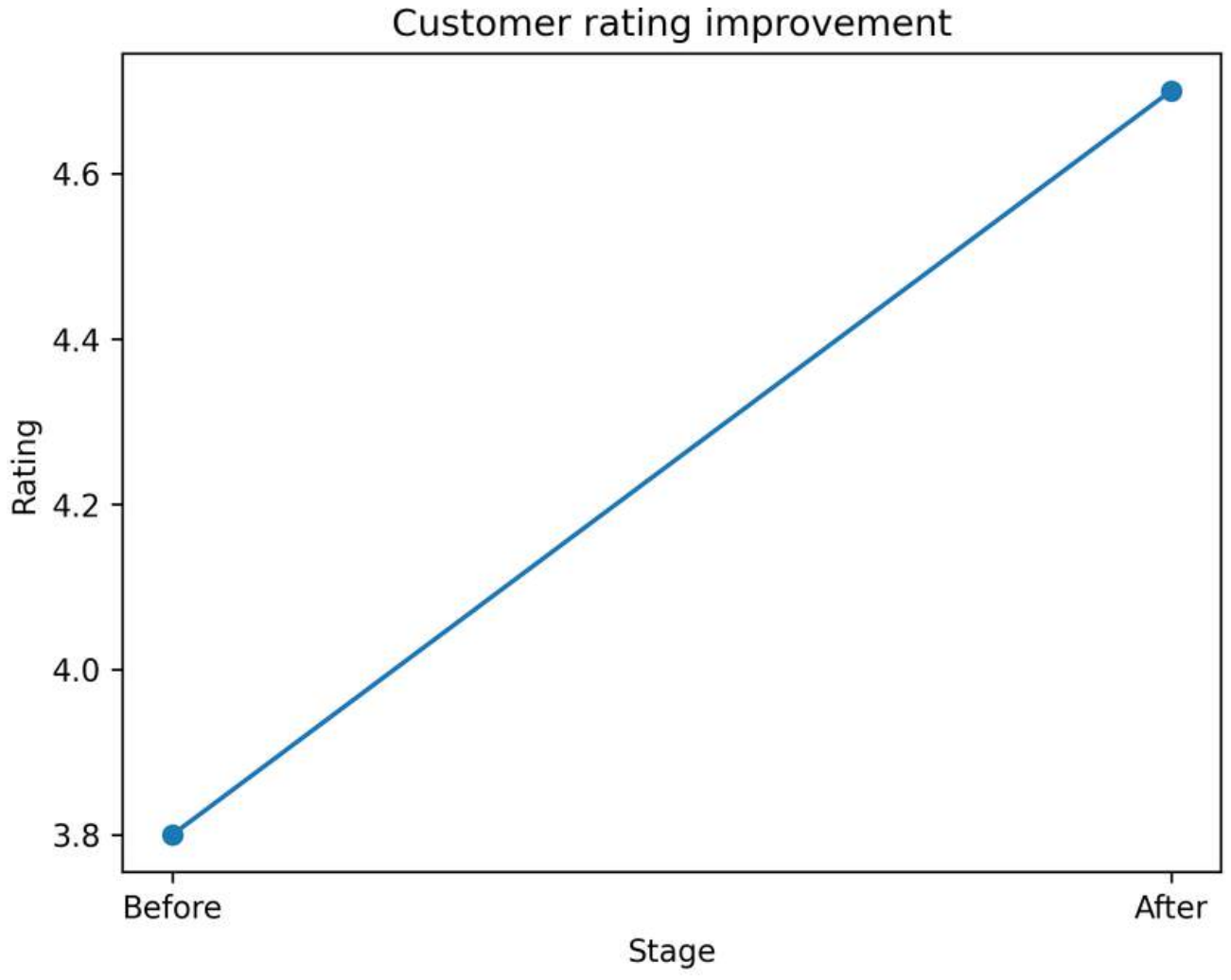


Figure 2: Customer rating improvement
Source: Nova Post

METHODOLOGY

The project followed a phased and iterative development approach.

The initial pilot was launched in April 2025 within the European pickup network, focusing on validating whether computer vision could provide more timely and objective insights than manual audits.

Following successful validation, the system was expanded across Ukraine's network of thousands of locations and later extended into additional operational areas such as terminal monitoring.

The solution is built on three key pillars:

• leveraging existing camera infrastructure, avoiding additional hardware investment
• applying computer vision models trained to detect predefined quality standards
• delivering automated, image-based reporting to managers

This approach ensured rapid scalability, cost efficiency, and minimal operational disruption, while maintaining high analytical accuracy.

RESULTS

The implementation delivered significant improvements in both operational efficiency and service quality management.

Audit processes became substantially more efficient. Regional managers reduced audit time from over 70 hours per month to approximately 26 hours, while also significantly reducing travel requirements.

The system enabled a shift from reactive to proactive management. Issues are now identified earlier, often before customers are impacted, reducing reliance on complaint-driven processes.

Customer experience improved through increased consistency across locations. Small operational issues are corrected more quickly, improving perception without requiring large-scale investment.

A practical example from Spain highlights the impact. A branch improved its customer rating from 3.8 to 4.7 through consistent use of AI insights and incremental improvements.

As Oleksii Taranenko, Group Business Development Director, notes:

"We expected better visibility, but what we gained was a completely different level of control over service quality. For the first time, we can see what is happening across the network almost continuously."

He adds:

"This allows us to act earlier, correct issues before they escalate, and manage consistency at a scale that simply wasn't possible before."

METRIC	IMPACT
Audit Time	-63%
Detection Speed	Near real-time
Customer Rating	3.8→4.7
Accuracy	96.3%

LEARNINGS

The project demonstrates that visibility is fundamental to managing quality at scale.

Leveraging existing infrastructure enables rapid and cost-efficient innovation.

Continuous monitoring replaces periodic audits, enabling earlier detection and faster response.

Objective, data-driven insights improve alignment across teams and partners, reducing ambiguity and accelerating corrective action.

Beyond operational efficiency, the project drives a cultural shift from reactive control to proactive improvement, fundamentally changing how service quality is managed.

It establishes a scalable model for large, distributed logistics networks and demonstrates how AI can be applied pragmatically to solve real operational challenges.

NOVA POST

UKRAINE

SUMMARY

Nova Post's Self-Service Branch project redesigns the traditional parcel branch into an autonomous, technology-driven environment.

Instead of incremental optimisation, Nova Post deployed an integrated ecosystem combining Digital Sendy terminals, mobile app integration, and a proprietary light-based navigation system embedded within storage infrastructure.

This creates a seamless journey where identification, payment, navigation, and collection are unified. Customers complete transactions in 20–30 seconds, guided by clear on-screen instructions and physical visual cues that reduce friction and errors.

Results are material. Service time decreased by 55%, operational costs by 34%, and more than 80% of users returned to self-service after their first use, evidencing sustained behavioural change.

The project shows how physical logistics infrastructure can evolve into scalable, autonomous systems that improve efficiency, capacity, and customer experience while preparing the network for continued volume growth.

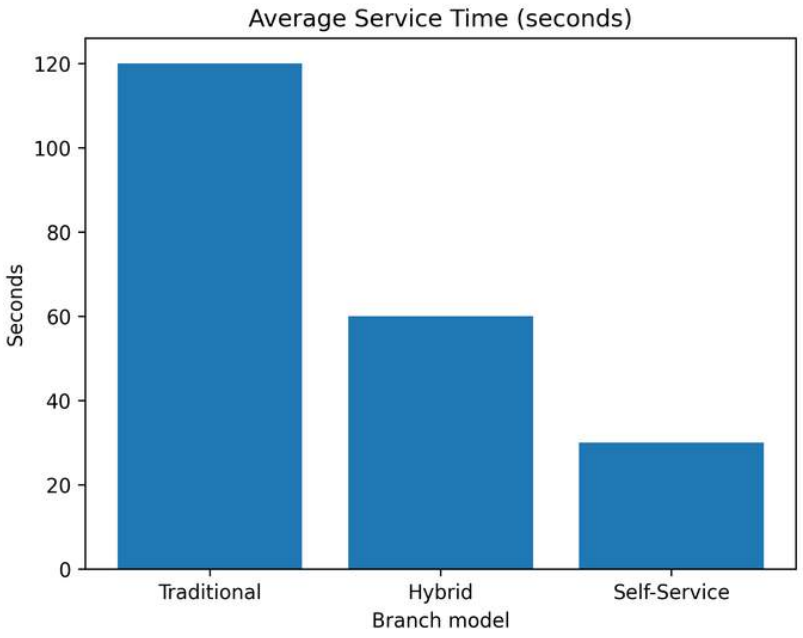


Figure 1: Customer Journey Time Reduction
Source: Nova Post internal data

INTRODUCTION AND BACKGROUND

E-commerce growth continues to place pressure on last-mile infrastructure, particularly physical branches where peak-time congestion and staffing constraints directly affect service quality.

Nova Post identified that operator-dependent models would not scale under rising volumes and customer expectations for speed and predictability. Queueing, manual handling, and reliance on staff availability created structural limits.

The initiative was therefore designed as a structural transformation rather than an optimisation exercise, redefining how customers interact with branch infrastructure and enabling a transition to autonomous service environments.

The objective was to improve efficiency, reduce operating cost, and create a scalable, future-ready model capable of absorbing growth without proportional increases in complexity or headcount.

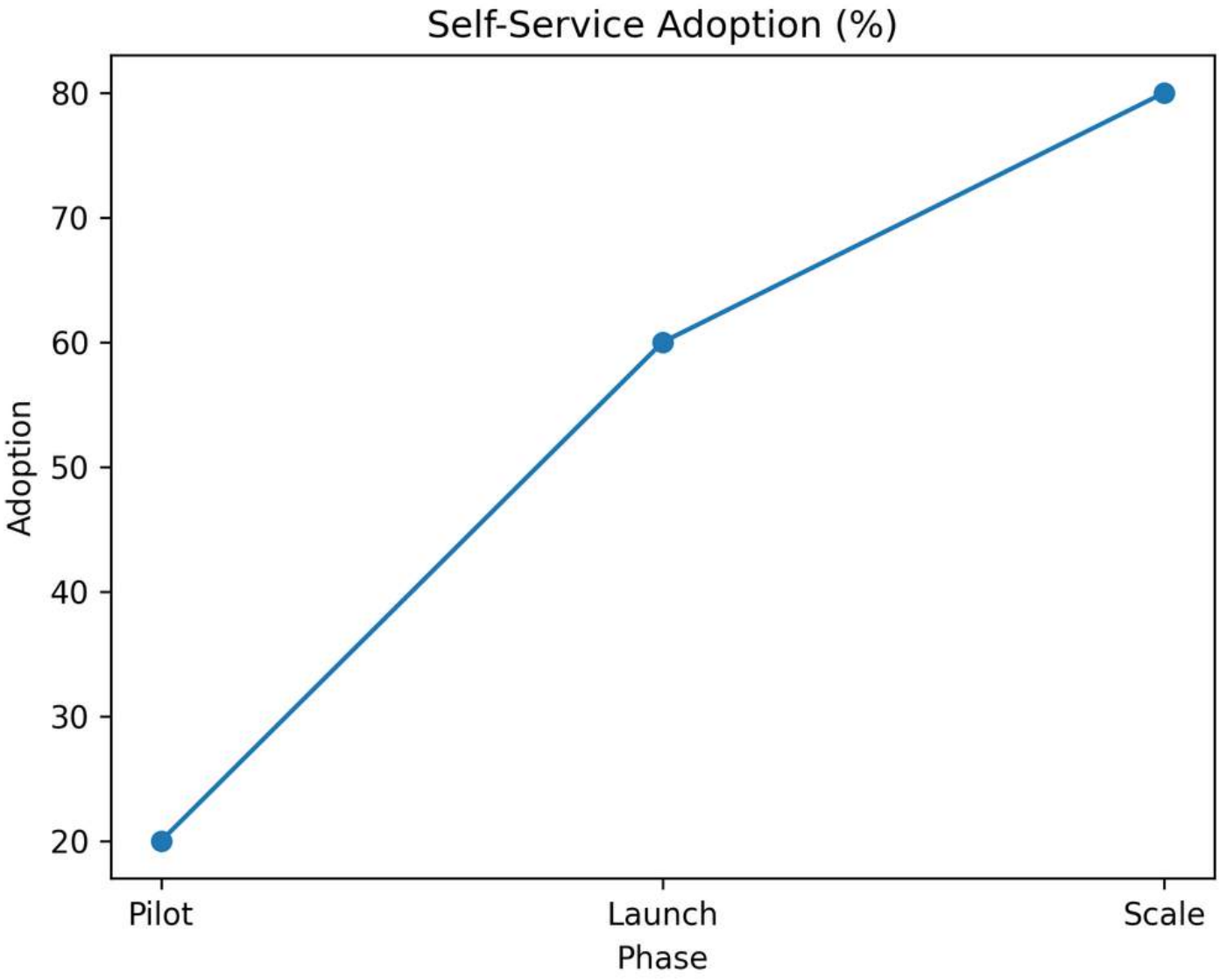


Figure 2: Self-Service Adoption Curve
Source: Nova Post

METHODOLOGY

A phased, iterative approach combined pilot testing, user feedback, and cross-functional collaboration across IT, operations, and customer experience.

The programme progressed through three stages:

• Pilot (December 2024), partial self-service to identify usability gaps
• Full redesign (June 2025), Digital Sendy with integrated light navigation
• Validation and scaling (September–December 2025)

The solution integrates four components:

• Digital Sendy terminal for identification, payment, and instructions
• Mobile app integration for seamless identification and guidance
• Light-based navigation providing real-time physical direction
• Real-time monitoring enabling staff support when required

Continuous iteration based on observed behaviour ensured robustness and high adoption.

RESULTS

The initiative delivered clear operational and behavioural impact.

Average transaction time reduced by over 50%, with many interactions completed in under 30 seconds. Branch capacity increased materially, enabling throughput of up to 150 customers per hour without additional staffing.

Adoption exceeded expectations, with more than 80% repeat usage and satisfaction above 93%, indicating the model is both efficient and preferred.

Operationally, employee workload reduced by 40% and costs by 34%, while staff shifted from routine processing to higher-value support.

As Oleksii Taranenko, Nova Post Group Business Development Director, notes, **"We expected efficiency gains, but the scale of the improvement surprised even us."**

"What started as an experiment quickly proved to be a new operating model." He adds, **"Customers actively prefer self-service because it is faster and clearer."**

This model is now being standardised for rollout across the Nova Post network, marking the next phase in the evolution of branch-based logistics.

METRIC	IMPACT
Service Time	-55%
Operational Costs	-34%
Employee Workload	-40%
Customer Satisfaction	93%+
Repeat Usage	80%+

LEARNINGS

Meaningful scalability requires system redesign rather than incremental optimisation.

Combining digital and physical guidance proved critical, reducing cognitive load and enabling intuitive navigation even for first-time users.

Adoption was driven by clarity, simplicity, and speed, not technology alone.

The transformation extends beyond customer experience, reshaping operating models, workforce roles, and cost structures. Employees transition from transaction processing to targeted support, improving both efficiency and working conditions.

The Self-Service Branch sets a new benchmark for autonomous, high-efficiency last-mile infrastructure and provides a scalable blueprint for the evolution of physical logistics networks.

TÜRKİYE

rovenma

TÜRKİYE

SUMMARY

Rovenma was selected as the product supplier for the large-scale parcel locker network initiated by The Courier Guy, South Africa's leading last-mile delivery company, starting in August 2024.

Building on its field experience in Türkiye and Romania, Rovenma enhanced its product for the demanding South African market, resulting in the battery-powered Rovlocker R7.

The system uses in-house lock systems, front service architecture, and proprietary control electronics optimised for high-risk environments.

Combined with The Courier Guy's site selection and operational capabilities, this collaboration has enabled deployment in high-risk urban areas.

South Africa is a security-sensitive market for unattended public infrastructure.

According to the Numbeo 2025 Crime Index, the country ranks among the top five globally.

SAPS 2024/25 data reports over 100,000 cases of property damage and nearly 50,000 burglaries at non-residential premises.

Since March 2025, Rovlocker R7 has been operating in the field with multiple forced entry attempts recorded, none resulting in a verified unauthorised door opening.

This demonstrates the effectiveness of Rovenma's layered security approach, combining strong mechanical design, magnetic-resistant locking, in-house electronics, and real-time vibration detection with alerts to the remote management portal.

INTRODUCTION AND BACKGROUND

The security of the installation location is a critical factor for parcel locker performance.

For this reason, placing parcel lockers in visible and active environments with existing security presence, such as petrol stations, retail stores, campuses, and other public locations, provides a significant advantage.

These locations typically benefit from higher human traffic and additional surveillance, which helps deter unauthorised activities.

In the Rovenma and The Courier Guy project, success depends not only on device durability but also on site strategy.

The Courier Guy prioritises locations that are both visible and operationally accessible, improving security, user access, and service efficiency. This approach also reduces theft incidents that may occur after parcel collection.

Field incidents are evaluated in three categories. The first includes forced entry attempts targeting the locker or its doors and represents the main test of product security. The second covers theft incidents after collection, where location visibility becomes critical.

The third includes vandalism without theft intent. In such cases, the Rovlocker R7 battery-powered system stands out with its mechanical body design that reduces impact, its component layout that limits damage, and its front service structure that enables fast field intervention.

The use of non-rechargeable alkaline batteries instead of LiFePO batteries further improves safety while also reducing weight and cost.

This framework allows accurate evaluation of R7 performance. The South African experience also provides a strong reference for markets such as Brazil, Argentina and Mexico with similar risk conditions.

Figure 1: Rovlocker R7 V1 deployed in a high-visibility petrol station location in South Africa.
Source: Rovenma

METHODOLOGY

Rovenma's development process was based on analysing real field attack types and identifying security vulnerabilities observed in parcel locker operations.

The objective was not only to strengthen the physical structure, but to reduce attack surface, door breach risk, component theft, service cost, and operational interruption within a single product architecture.

The first risk is physical force. Rovlocker R7 was developed with a reinforced body, durable door structure, and compact component layout.

Figure 2: Rovlocker R7 V1 deployed in an outdoor public environment. Source: Rovenma

This provides strong resistance against impact and forced entry attempts while maintaining a simple and robust system design.

The second risk is lock manipulation. Some electronic lock systems can be triggered externally using magnets or similar methods. Rovenma addressed this risk at the design stage by developing its lock system, control board, and software in-house, creating a structure resistant to magnetic interference.

The third risk is delayed detection of vandalism, especially in locations with limited surveillance. Rovlocker R7 integrates vibration detection with the remote management portal. When abnormal physical activity is detected, the system generates real-time alerts to the operator, enabling rapid response.

The fourth risk is component theft. Parts with material value, such as metal roofs or external cameras, may be targeted. Rovlocker R7 reduces this risk with a patented composite roof and an embedded camera system.

The composite structure lowers theft motivation and replacement cost, while the embedded camera design makes tampering more difficult and increases deterrence.

RESULTS

The South African deployment represents a real-world application where Rovlocker R7 has been tested under uncontrolled public space conditions rather than laboratory environments.

The system has been active in the field for more than a year. During this period, multiple forced entry attempts were recorded, yet none resulted in a verified door breach.

This outcome provides a clear and measurable indication of product security performance.

Despite repeated physical interference, no unauthorised door opening, parcel security breach, or systematic vulnerability was observed.

Figure 3: Rovlocker R7 V2 parcel locker system showing modular structure and user interface.
Source: Rovenma

This result reflects the integrated design approach of Rovlocker, where the mechanical structure, lock system, control electronics, and software architecture are developed as a unified system.

The Courier Guy's site strategy also contributed directly to these results.

The selection of visible, accessible, and operationally manageable locations improved not only security but also user access and service response capability.

The outcome is therefore not solely a result of product engineering, but of a deployment model built with a strong local partner.

Overall, the field performance of Rovlocker R7 demonstrates that high security and operational durability can be achieved within the same system architecture.

The absence of unauthorised door openings despite multiple forced entry attempts stands as the most direct field validation of Rovenma's layered security approach.

LEARNINGS

The key learning from this project is that security in parcel lockers operating in public spaces cannot be achieved through a single feature.

Real field durability depends on the combined performance of mechanical design, locking system, control electronics, software, vibration detection, remote monitoring, and service architecture.

A second learning is the value of in-house development. Rovenma's control over the lock, electronics, and mechanical design enables faster response to field feedback and reduces dependency on external suppliers, making the development process more reliable and controlled.

The third learning is the importance of local field knowledge. The Courier Guy's site selection and operational experience, combined with Rovenma's product architecture, improve both technical security and operational performance.

Another key insight is the direct link between vandalism resistance and maintenance cost. In the early phase of the project, metal roofs were used, which led to limited theft incidents.

Although this occurred only twice, it triggered a redesign process. Leveraging its long-term expertise in plastics, Rovenma developed a fully plastic roof through a challenging research and development effort.

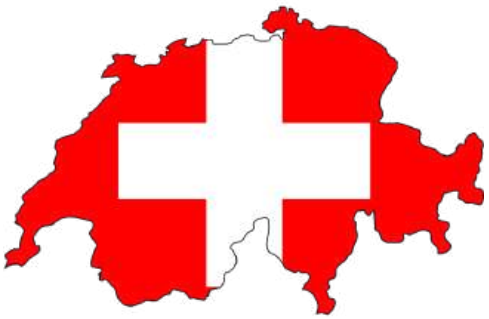
This solution reduced theft motivation, improved production efficiency, and simplified installation while maintaining durability.

Finally, the value of Rovlocker R7 comes from its integrated architecture rather than a single feature.

It combines a vandalism-resistant body, a metal and plastic hybrid structure, magnetic-resistant locking, in-house electronics, and low energy consumption.

SCANDIT

SWITZERLAND



SUMMARY

La Poste, France's largest mail provider, delivers 23 billion items a year through 90,000+ mail and parcel carriers.

Each carrier runs an employee app on a low-end Android smartphone for proof of delivery, search-and-find at the door, and track-and-trace.

The original scanning component was open source, and the resulting scan errors were costly enough to drive misdelivered mail.

La Poste replaced it with the Scandit Barcode Scanner SDK and now records over 1 million scans a month at speeds 55% faster than the open source baseline, with zero incorrect scans across the trial.

The Scandit-powered app is live on 90,000+ smartphones.

The same Scandit Smart Data Capture platform powers comparable shifts elsewhere in the European last mile. Swiss Post integrated Scandit MatrixScan AR into its Nemo app to find the right parcel in delivery vehicles handling 200 million parcels and 1.7 billion letters a year.

CTT in Portugal reads fluorescent UPU mail codes on consumer smartphones for the first time, lifting compliance audit sample size from 500 items per month to 80,000.

Yodel runs a 7,000-strong BYOD courier community on 300+ smartphone models via the Scandit SDK.

The same Scandit Smart Data Capture software extends beyond these use cases to PUDO workflows with streamlined operations via the use of AR instructions, plus the ability to check IDs to validate deliveries to the right person.

INTRODUCTION AND BACKGROUND

Postal and parcel operators across Europe are pushing data capture beyond dedicated scanning hardware and into smartphone software. La Poste is among the largest deployments to date.

La Poste's 90,000+ mail and parcel carriers had been running low-end Android smartphones with an open source barcode scanner inside their employee app, scanning at proof of delivery, on doorstep search-and-find, and across track-and-trace events.

Scan errors translated directly into misdelivered mail, with downstream costs in handling, customer trust, and SLA exposure.

With 23 billion items moving through the network annually, every saved second per scan compounds into real route time.

The starting hypothesis: the Scandit Barcode Scanner SDK could outperform the open source library across every Samsung and Huawei Android model already in field use, including under low light, glare, awkward angles, and on damaged barcodes.

These are the conditions where field scanning actually breaks down.

Equivalent hypotheses applied at Swiss Post (drivers losing time finding parcels in the van), CTT (fluorescent UPU codes unreadable on field devices), and Yodel (ageing hand-held terminals and a need for cross-device BYOD scanning).

Figure 1: Envelope Scanner
Source: Scandit

Concrete targets agreed with each customer:

- La Poste: zero scan errors against the open source baseline, faster per-document scan times across all Android models in use, in-house integration in 3 to 6 months, no disruption to existing capture.
- Swiss Post: AR-guided parcel location inside the van.
- CTT: fluorescent UPU scans under one second, read rate above 98% on consumer phones.
- Yodel: a single SDK across iOS, Android, and 20,000+ smartphone models.

METHODOLOGY

Each deployment followed a similar pattern.

- **Head-to-head trial.** La Poste mail carriers timed batches of 50 documents on the Scandit-enabled and the open source versions of the employee app, across the Samsung and Huawei Android models already in use, including in low light, glare, awkward angles, and on damaged barcodes. Scandit outperformed the open source library on every device tested. The same benchmarking principle ran at Swiss Post, CTT, and Yodel.

- **Use case prioritisation.** La Poste: scan errors driving misdelivery costs. Swiss Post: finding the right parcel in the back of the van. CTT: capturing fluorescent UPU codes that field devices had never been able to read. Yodel: phasing out ageing hand-held terminals in favour of BYOD smartphone scanning during the pandemic.

- **Integration into existing apps.** The Scandit Barcode Scanner SDK went into La Poste's employee app, Swiss Post's Nemo, CTT's MOBI, and Yodel's iOS and Android delivery app. La Poste's developers ran the integration in-house in 3 to 6 months, bundled into a wider app update. The Scandit SDK runs concurrently with La Poste's existing data capture, so rollout was incremental with minimum disruption.

- **Co-development of net-new capability.** CTT's fluorescent UPU scanning on smartphones was a first-of-its-kind capability, scoped in the summer and live by September of the same year. Swiss Post added Scandit MatrixScan AR for parcel location. Yodel's roadmap now adds MatrixScan and AR for service centres.

- **Frontline testing.** La Poste trial participants were asked not to revert to the old version once the trial ended. Swiss Post's training and AR guidance were shaped by employee feedback.

Figure 2: Loading van via Matrix Scan
Source: Scandit

RESULTS

La Poste

- 55%+ faster scan times per document versus the open source baseline, across the Samsung and Huawei Android models in field use
- Zero incorrect scans recorded across the trial
- Reads damaged barcodes, low-light scans, and awkward-angle scans that the open source library could not
- Deployed on 90,000+ smartphones
- Over 1 million scans per month
- Lower misdelivery costs through higher first-time accuracy
- Scandit SDK runs concurrently with the existing capture, so rollout was incremental with minimum disruption

Swiss Post

- Scandit MatrixScan AR shortens the time drivers spend locating the right parcel in vehicles handling 200 million parcels and 1.7 billion letters a year
- AR-based in-app guidance shortens onboarding for new staff
- The 25+ functions in the Nemo app, including route advice, scan-and-track, and proof of delivery, now run on Scandit

CTT

- Fluorescent UPU barcode scans in under 1 second on consumer smartphones, read rate above 98%
- Compliance audit sample size grew from 500 items per month to 80,000 (160x), on real mail rather than dummy items
- 0% false positives and 99.99% scan rate on standard manifest scanning
- Lower exposure to penalties tied to Universal Service Obligations

Yodel

- BYOD courier community scaled 10x to ~7,000 daily users
- Delivery app is live on 300+ smartphone models, with the Scandit SDK supporting 20,000+ device types
- Tenth release of the Scandit-powered app shipped, with real-time proof of delivery on couriers' own devices

Figure 3: Scanning damaged label
Source: Scandit

LEARNINGS

- Scanner replacement is now a software decision, and field conditions are where the gap shows up. La Poste's like-for-like trial found the Scandit Barcode Scanner SDK beat both dedicated hardware and open source libraries across every Samsung and Huawei device tested, including under low light, glare, awkward angles, and on damaged barcodes. The 55% speed gain came from those real-world conditions, the ones that defeat lower-tier libraries.

- AR and multi-scan are where the between-scan time savings come from. Swiss Post's MatrixScan AR for "find the right parcel in the van" attacks the seconds drivers waste between scans, where route time compounds. Although high-performance single barcode scanning is essential to efficient operations, the addition of AR and multi-scanning unlocks the significant benefits.

- AI-based context scanning opens net-new use cases. CTT's fluorescent UPU code reading on a smartphone was a hardware-only capability before this project. With Scandit, the audit sample size jumped 160x, and the regulatory penalty risk fell. OCR can be used to scan unreadable barcodes, while unintentional scans are automatically identified to avoid incorrect or duplicate items, which can occur in back-of-the-van scenarios with multiple packages.

- BYOD is a cost lever. Yodel's 10x community growth on 300+ device types was enabled by BYOD, but the underlying win was removing the cost and lead time of putting a device in the hands of self-employed couriers. The KPIs that matter are time-to-first-delivery and cost-to-onboard, with TCO dramatically reduced.

- Drivers vote with their feet. La Poste trial participants were asked not to revert to the old version of the app once the trial ended. That same signal showed up at every customer.

Sources:

- La Poste case study
- Swiss Post case study
- CTT case study
- Yodel case study

Figure 4: Proof of delivery scan
Source: Scandit

Software Mind

KUCHNIA VIKINGA

POLAND

SUMMARY

Kuchnia Vikinga, one of Poland's fastest-growing B2C operators running a fully owned last-mile fleet, faced a critical scalability ceiling as rapid growth overwhelmed its legacy infrastructure.

To eliminate frequent system crashes and manual bottlenecks, the company transitioned to a modular, AI-ready Transport Management System (TMS) built on a hybrid architecture.

This transformation replaced a rigid, monolithic framework with a flexible digital backbone, allowing for seamless overnight deliveries at massive scale.

The project's defining achievement was its speed of execution: the team moved from initial analysis to production go-live in just 6 months – a stark contrast to the industry-standard 18–36 months for systems of similar complexity.

By leveraging pre-built modules for standard logistics and bespoke engineering for unique operational logic, the project provided unmatched reliability, reducing routing time by 50% and manual steps by 70%.

The resulting solution is not a static tool but an evolving infrastructure designed to triple current capacity and adapt to future market volatility.

INTRODUCTION AND BACKGROUND

Kuchnia Vikinga operates in the high-pressure subscription-based ready-to-eat (RTE) meal industry, where success hinges on a complex operation defined by uncompromising time windows and temperature-sensitive inventory.

Every night, the company must coordinate the delivery of 300,000 fresh meal sets directly to customers' doors across Poland – before dawn.

Kuchnia Vikinga, a major player in this space in Poland, faced a paradox of success: their rapid expansion was outstripping the structural capacity of their technology.

Relying on a monolithic legacy framework, the operation struggled with data fragmentation and a lack of real-time visibility, leading to system instability during critical overnight delivery cycles.

As volume surged season after season, the risk of a total operational blackout became a tangible threat.

The initial assumption was that a standard, off-the-shelf TMS would be insufficient for the client's unique business model, yet a full bespoke build would take too long to deploy.

Operating in a landscape that demands extreme reliability, the company transitioned to a modular, hybrid architecture.

The expected outcome was a resilient, future-proof platform that would eliminate manual intervention in routing and geocoding.

Beyond mere stability, by moving toward a component-based infrastructure, our client aimed to secure a digital backbone that could support unlimited growth, providing the agility to introduce new services and handle future volume spikes without the risk of system-wide failure. Last-mile operational challenges are sector-agnostic.

The same system architecture serves both CEP operators and fast-scaling B2C players running their own fleets. The deployment model is identical – the business model is different.

METHODOLOGY

The project bypassed the traditional "build vs buy" dilemma by adopting a hybrid development strategy – combining off-the-shelf and custom solutions.

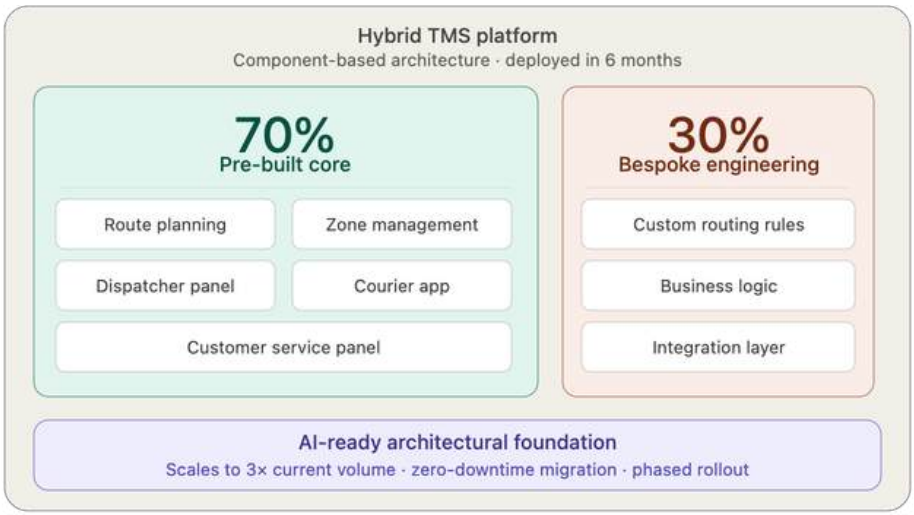
This approach utilised a 70/30 rule: up to 70% of the software was rapidly constructed with the use of components accumulated across multiple last-mile logistics projects – a core of pre-built, production-proven modules that handle the common challenges of courier and delivery operations: geocoding, route optimisation, real-time tracking, shipment lifecycle management, driver interfaces – while the remaining 30% involved bespoke engineering to address the client's unique business logic.

This ensured a high-speed deployment without sacrificing the customisation required for complex overnight operations.

A phased migration was employed to mitigate the risks associated with replacing mission-critical legacy software. Instead of a high-risk "big bang" cutover, the system was modernised incrementally, ensuring zero downtime.

Furthermore, the methodology prioritised a continuous feedback loop; stakeholders engaged with a clickable, functional system from the earliest stages. This iterative process ensured that the final digital backbone was perfectly tuned to handle extreme peaks in demand while providing the flexibility for rapid future service expansion.

The delivered system is not a collection of features but an integrated platform designed around the specific operational reality of the client's last-mile model, where every module exists to solve a real problem identified during the diagnostic phase.



A component-based Transport Management System combining 70% pre-built logistics modules with 30% bespoke engineering, deployed on an AI-ready foundation to enable rapid scaling and zero-downtime migration.

Figure 1: Hybrid TMS platform
Source: Software Mind

RESULTS

The transition to a hybrid architecture delivered immediate and measurable improvements across Kuchnia Vikinga's entire operational value chain.

The primary outcome of the transformation was the migration of the Transport Management System from a point of vulnerability to a competitive advantage.

By establishing a high-availability digital backbone, the operation successfully neutralised the technical debt that had previously capped its growth. Most critically, system reliability reached 100%, with zero recorded crashes since the go-live date, even as daily volumes peaked during seasonal surges.

Operational efficiency saw a significant transformation. By automating complex processes, the time required for route generation was reduced by 50%.

Furthermore, the digitisation of shipment lifecycles and driver workflows led to a 70% decrease in manual administrative steps, allowing the logistics team to allocate resources to strategic oversight rather than crisis management.

From a strategic perspective, the most substantial result is the newfound business agility. The modular architecture has granted the organisation an unprecedented advantage, reducing the lead time for deploying new service features from months to mere days.

Growing at 30% annually and with an infrastructure now capable of supporting triple current volumes without further structural changes, the company has secured the technical headroom necessary to dominate the subscription-based ready-to-eat meal market for years to come.

This was achieved through an outcome-based engagement: by tying fees to operational KPIs, the project moved beyond a standard technical delivery into a different kind of vendor relationship – one in which the software partner has genuine skin in the game.

LEARNINGS

A central insight from this project is that the "build vs buy" debate is a fallacy for high-volume logistics.

The hybrid model demonstrated that long-term scalability is best achieved by combining the reliability of battle-tested components for foundational tasks with the flexibility of bespoke engineering for unique business logic.

This approach allows a company to modernise mission-critical infrastructure without the prohibitive timelines of total bespoke development.

The necessity of an "AI-first" architectural foundation emerged as another critical lesson.

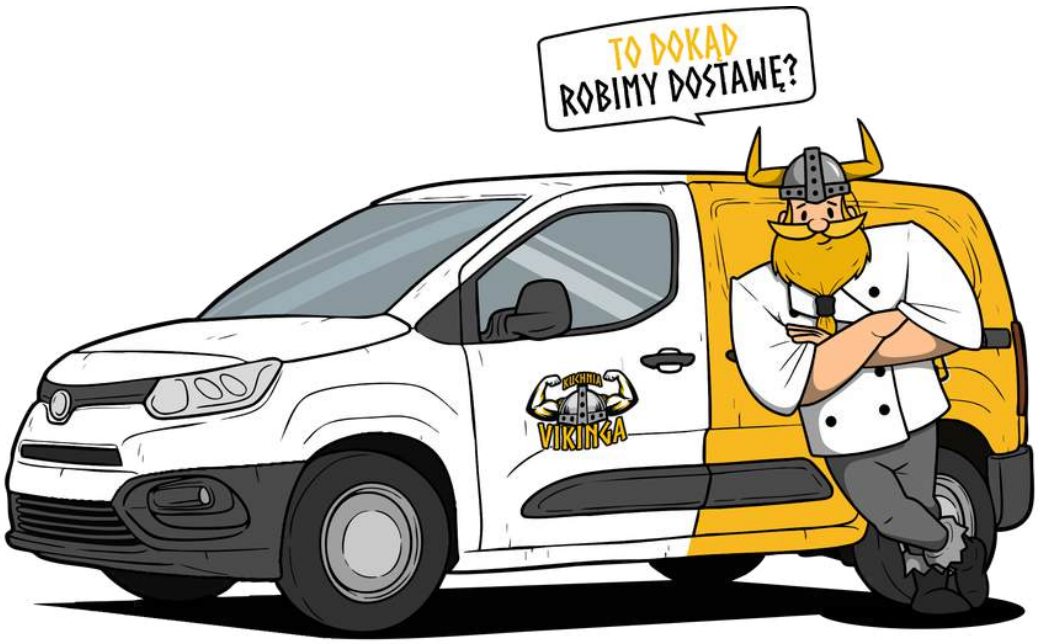
Rather than treating automation or advanced routing as secondary additions, building these capabilities into the core digital backbone from the start ensured the system could handle extreme volatility.

Ultimately, this project proves that a hybrid, component-based approach can deliver the robustness and precision of an enterprise bespoke solution with the rapid deployment speed typically associated with off-the-shelf software.

The project also highlighted the value of a phased migration over a "big bang" implementation.

Maintaining a functional system throughout development fostered stakeholder trust and allowed for real-world validation in a live-data environment.

For a business operating in a market as unique as Kuchnia Vikinga is, the transition strategy is just as vital as the code itself, ensuring that technical evolution never comes at the cost of operational continuity.



POLAND

SUMMARY

izizwrot (izireturn) is a new logistics service for e-commerce developed by izidrop, a courier company established within Żabka Group.

Żabka is the largest convenience retail chain in Poland with over 12,500 locations around the country and growing by more than one thousand locations yearly, making Żabka stores a very dense network of locations used also as PUDO points in OOH logistics.

Izizwrot is a service built specifically with the purpose of lowering the cost of e-commerce returns for both merchants and customers. The service is based on dual-use and dual-flow principles in logistics.

It uses existing infrastructure and existing processes originally developed for the needs of delivering products to Żabka stores. Delivery vans, which are used for store operations, are returning to logistics hubs with excess cargo capacity.

With the introduction of izizwrot, this cargo capacity is used to transport returns dropped off by customers at Żabka stores back to the merchants. The pre-existing routes cover over 90% of izizwrot's itinerary.

Figure 1: Żabka Store
Source: Żabka Group

INTRODUCTION AND BACKGROUND

Żabka stores, for years, have been operating as PUDO points for various international and local courier companies.

With the rapid growth of OOH deliveries in Poland and the expansion of locker networks in the country, Żabka was looking to differentiate its offer and deliver even more value to its customers.

To do so, Żabka, together with local entrepreneurs and logistics experts, created a Joint Venture company, Izidrop – an e-commerce courier startup within Żabka Group.

Izidrop's main goal is to develop new and often innovative e-commerce logistics services based on Żabka's extensive store network that deliver value to Żabka's customers and business partners.

Izidrop's team analysed existing logistics processes within Żabka Group and assessed those that can be of use for the e-commerce sector.

The process of delivery vans returning with available cargo capacity from stores to warehouses, terminals, and logistics hubs proved to be one of the most promising in terms of creating a valuable solution for e-commerce.

The expected outcome was the creation of a return service for e-commerce, characterised by a low price point and still meeting SLA delivery levels acceptable for both customers and merchants: over 90% of packages delivered in D+4 standard and 100% in D+5.

Figure 2: Żabka delivery truck
Source: Żabka Group

METHODOLOGY

Izizwrot's implementation took nearly a year from the initial business analysis to the first packages returned by customers to merchants.

After e-commerce returns were determined as the best choice for the first logistics service based on Żabka's internal infrastructure, the missing elements had to be created, and smooth cooperation with the existing ones had to be ensured.

Two main types of missing steps in the process were defined as:

1. Physical processes, e.g., transportation of packages from terminals to the central hub, including delivery trucks, bulk containers, and sorting tables
2. IT infrastructure, e.g., Central Warehouse System built from scratch, API connection with updates within Żabka's TMS systems

While the above were purchased and developed, we initiated discussions with potential partners.

Commercial strategy included approaching key players in the e-commerce fashion and apparel segments, which are usually known for having high return volumes.

A large part of the project involved close cooperation with Żabka's teams responsible for PUDO operations to ensure a good understanding of the process at the store level and proper implementation of procedures.

Testing helped refine some minor issues before launching the service in the entire network and build confidence about the SLA.

During the first days and weeks of operations, several hypercare measures were implemented, including extensive communication with store franchisees and automated alerts.

Figure 3: Żabka warehouse
Source: Żabka Group

RESULTS

Izidrop created and successfully launched the first logistics service based on dual-use principles – using the same vans for delivery of products to stores and for package collection.

After approximately one year of preparation and testing, izizwrot was launched at the beginning of May 2026.

It offers competitive pricing and SLA with most packages expected to be delivered to the merchant's warehouses within 3 working days from the drop off by the customer.

At the moment of the publication of the report, izizwrot operations have just begun; larger-scale business results of izizwrot can be expected within several months.

Figure 4: Izidrop label
Source: Żabka Group

LEARNINGS

Multiple logistics services currently operating have the potential for dual use and dual flow, hence increasing their overall efficiency.

In every case, careful consideration of existing infrastructure and processes, as well as potentially matching market needs, is crucial. The expected scale of operations must justify the required investments.

End-to-end ownership of the operations by a single entity is helpful, but not an absolute must.

When it's not feasible, the testing phase might take longer than initially planned due to various improvements that become apparent only in real-life rather than laboratory scenarios.

The sheer number of people who have to follow the designed processes poses a challenge in itself.

While educational materials play a role, systems guiding users at every step towards the expected result seem to be the only way to ensure smooth operations at scale.

Figure 5: Żabka store footprint
Source: Żabka Group

Prepared with the support of:

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

Contribution by **Marta Cudziło**
Deputy Director of Modern Mobility Center, Head of Logistics Research Group at the **Łukasiewicz Research Network – Poznań Institute of Technology.**

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MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

For many years, logistics has not only supported but also driven the growth of e-commerce. Customers shopping online have very specific requirements not only regarding products, but also – and sometimes even primarily – regarding delivery conditions.

Speed and punctuality of deliveries remain the cornerstone of customer satisfaction, yet their expectations are increasingly focused on aspects such as convenience, flexibility, transparency, and the environmental sustainability of deliveries. This last factor is gaining in importance in the eyes of customers and is increasingly having a real impact on their purchasing decisions. Global reports show that around 57% of customers consider it important to know the environmental impact of delivery.

In Poland, this percentage is slightly lower, yet 39% of Poles surveyed still state that the environmental impact of delivery matters to them, and environmentally friendly delivery is a motivating factor for online shopping for half of the respondents in Poland.

The 'Odpowiedzialny e-commerce 2025' report shows that as many as 60% of e-commerce customers in Poland take the carbon footprint into account when choosing an online shop, and as many as 83% of e-consumers are prepared to wait longer if it means an eco-friendly delivery (sending all ordered products in a one delivery)

The changing preferences of online shoppers are raising the standards for logistics operators responsible for deliveries from online shops.

Urbanisation also plays a significant role in the development of e-commerce logistics. City dwellers make up the majority of Polish e-commerce customers, accounting for approximately 65% of online shoppers in Poland. Taking into account the place of residence of online customers, nearly 74% of people made e-purchases in cities in 2025.

High population density in cities increases the number of online orders and parcels to be delivered within the city, whilst at the same time making delivery significantly more difficult due to heavy traffic, congestion and a limited number of parking spaces, particularly for delivery vans.

Added to this are EU regulations adopted by Polish cities concerning clean transport zones, i.e., zones in city centres where combustion-engine vehicles are banned.

All these factors – ranging from the growing eco-awareness of e-recipients, through their concentration in cities and increasing difficulties in urban traffic, to EU regulations adopted in Poland – are driving changes in last-mile logistics and fuelling the development of smart city solutions. These solutions are designed to optimise deliveries, not only in economic terms but also in environmental and social terms. One such solution is the use of micro-hubs and cargo bikes for last-mile deliveries.

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

What Functions Does a Micro-Hub Perform?

Micro-hubs are designated points within a city dedicated to transferring parcels from larger delivery vans to more environmentally friendly modes of transport, such as cargo bikes.

The aim of introducing this solution is to streamline last-mile deliveries and improve their social and environmental efficiency, without negatively impacting economic aspects or delivery times.

The introduction of microhubs allows larger delivery vehicles operating in city centres to be replaced by smaller vehicles such as cargo bikes.

Bicycles are low-emission, quiet vehicles that do not contribute to traffic congestion in the city; they can travel on streets closed to motor traffic or one-way streets, and thus have the flexibility to reach any location and park easily.

The effective use of cargo bikes for last-mile urban deliveries requires the provision of spaces in city centres where the bikes can be stored, where their batteries can be charged and regular maintenance carried out, and where parcels can be efficiently loaded onto them.

These functions are performed by **transhipment microhubs**. Thus, microhubs and cargo bikes constitute an integrated solution, enabling the optimisation of last-mile deliveries.

Although this solution appears simple at first glance, it can in fact take many forms, and its practical implementation requires the cooperation of numerous stakeholders.

Examples of micro-hubs in Poland
In Poland, the use of microhubs and cargo bikes is growing in popularity.

The most advanced initiatives are the microhubs in Poznań and Wrocław. The microhub in Poznań is a freestanding structure.

It is a dedicated, purpose-built, small building with an area of approx 36m^2, located on Pułaskiego Street (right in the city centre), enabling parcels to be transferred from a delivery van to bicycles.

The hub was established as part of the GRETA project implemented by Łukasiewicz-PIT and the City of Poznań in cooperation with GLS Poland.

For six months (December 2024 – May 2025), the microhub was used in practice as part of the delivery of online orders by cargo bikes in the Poznań districts of Stare Miasto and Jeżyce.

The second of these initiatives is a microhub in Wrocław utilising the existing infrastructure of the underground car park beneath the National Forum of Music on Plac Wolności.

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

Figure 1: Microhub in Poznan
Source: Lukasiewicz-PIT own study

A designated area (approx. 500 m^2) has been set aside in the car park, divided into several bays intended for independent operators (including InPost, DPS, GLS and Allegro), where it is possible to store bicycles and transfer parcels from delivery vans to bicycles.

The microhub in Wrocław began operating in June 2025 and serves the areas of the very centre of Wrocław (the Old Town).

It is worth noting that the examples mentioned are not, in fact, the only ones when it comes to the use of cargo bikes for last-mile deliveries in Poland. They are also successfully used by DPD, which has the largest fleet of cargo bikes in Poland.

The difference is that DPD does not use either free-standing, dedicated microhubs or specially adapted spaces, but instead uses rented premises in cities (urban depots), which often combine logistics functions (transferring parcels onto bikes) with a customer service point (e.g., parcel collection and drop-off points for recipients).

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

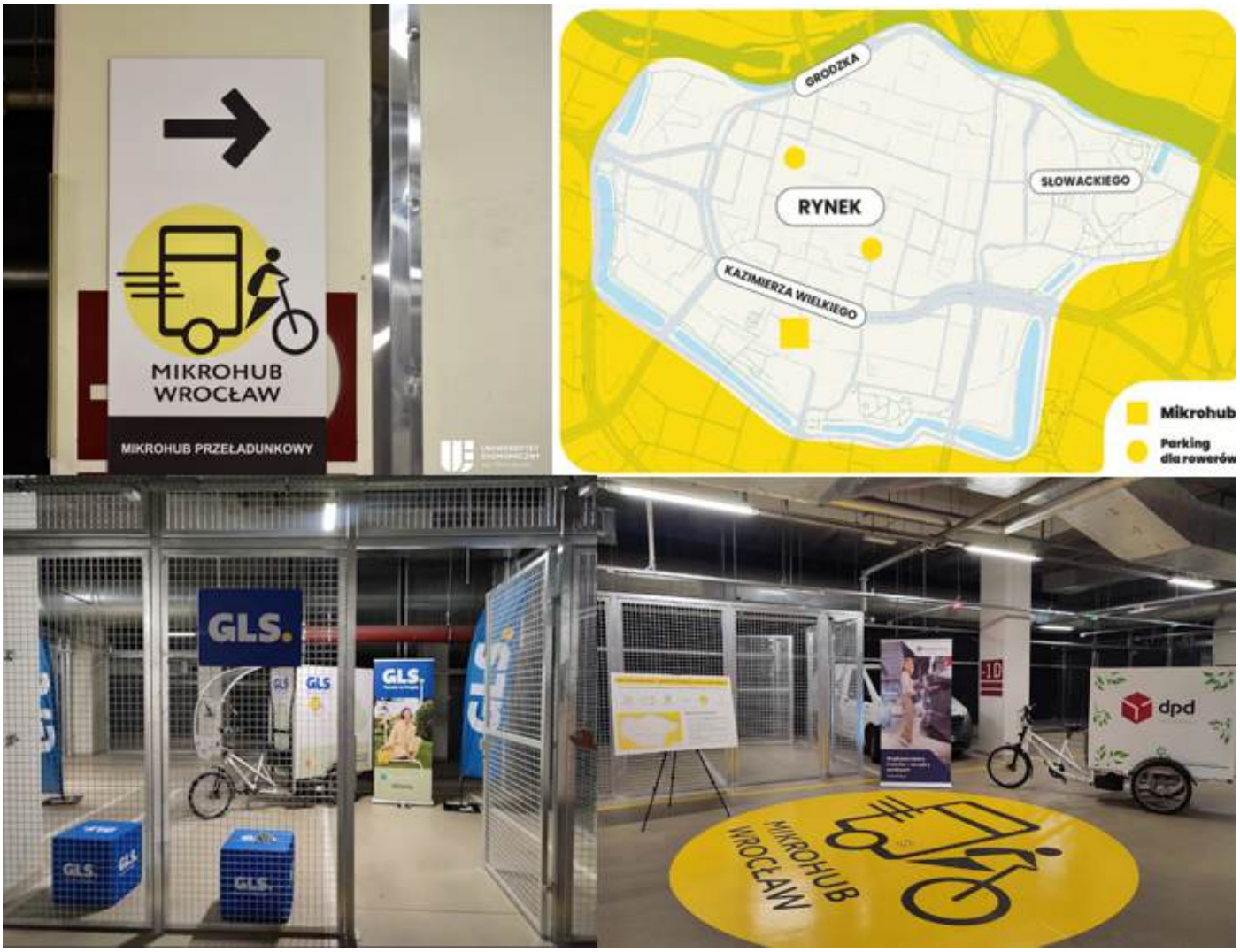

Figure 2: Microhub in Wrocław
Source: Wrocław University of Economics Press Materials

What Conditions Should a Microhub Meet?

What determines the effectiveness of urban microhubs, and can any location that allows parcels to be transferred to bicycles be called a microhub? Definitely not. Several very important conditions must be met.

Let's start with **the location** – a microhub should be situated close to the city's main transport routes and large clusters of recipients, but at the same time in a way that allows access for delivery vans.

Cargo bikes delivering parcels have limited capacity and range, so the hub must be situated in such a way that the bike can reach recipients in the city centre without 'wasting' unnecessary kilometres travelling to these areas.

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

Choosing the optimal location for a micro-hub is crucial and, at the same time, very difficult, because both land and buildings in city centres are in huge demand, particularly from residential and office developers.

There is, therefore, competition for access to these spaces. In this context, cities have a vital role to play; acting in accordance with Sustainable Urban Mobility Plans (SUMPs), they should actively support the development of micro-hubs, guided by the aim of promoting low-carbon delivery methods within the city that help reduce car traffic in the city centre.

Another factor is the form of the micro-hub – this can vary. Both freestanding facilities and the use of existing urban infrastructure can be effective, but meeting **accessibility requirements** is key.

Above all, a microhub should allow for easy access and parking of delivery vehicles (without unnecessary manoeuvring, blocking pavements, cycle paths, exit routes, etc.) and **the efficient transfer** of parcels from vehicles to bicycles.

The efficiency of the transfer should rely on the ability of a vehicle to drive freely up to the bicycle parking area, followed by the efficient unloading of parcels from the van onto the bikes, so that these operations take place quickly, without unnecessary manoeuvring and without being adversely affected by weather conditions (rain, heat, etc.), and so that the loaded bikes can easily and safely join the traffic and set off on their routes.

It is also important that the micro-hub meets the **technical requirements** for the effective storage of bicycles, charging of their batteries, and carrying out minor maintenance work on the bicycle fleet.

Cargo bikes are a very important element of this form of delivery, and the hub should support their efficient operation. It is therefore important to arrange the space inside the hub appropriately, with designated areas for bicycle parking and loading zones, to provide efficient chargers and access to electricity, as well as adequate fire safety measures.

Furthermore, the microhub should not interfere with existing urban infrastructure or disturb local residents. If we are talking about a free-standing building, it should be a structure that blends into the urban environment, is **aesthetically pleasing,** and meets the required spatial planning standards.

Ideally, it should be an **energy-efficient** building (with solar panels, etc.), featuring a subdued colour scheme, attractive lighting, and constructed from recyclable materials. It is also essential to ensure adequate noise protection (all logistics operations should comply with applicable noise standards).

This approach constitutes a comprehensive implementation of sustainable urban delivery strategies.

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

Furthermore, the hub should also ensure adequate safety for staff (including the operator's staff, bicycle couriers, etc.), as well as for stored bicycles and parcels being handled.

It is advisable to use access control systems, appropriate outdoor lighting, and monitoring of the facility and its surroundings.

In terms of the social functions a micro-hub should fulfil, in addition to the aforementioned issues of not disturbing the peace of residents in the vicinity of the hub and ensuring staff safety, the micro-hub should also provide suitable social facilities for those using it, primarily for bicycle couriers.

The work of a bicycle courier is not easy; it requires strength and the ability to steer and manoeuvre a bicycle effectively. It is therefore worth ensuring that the hub includes a designated 'social area', which will allow staff to rest, change clothes, store their belongings or have a meal.

Ensuring that all these conditions are met simultaneously is no easy task, which means that establishing effectively functioning urban micro-hubs is a significant challenge and should be undertaken in collaboration with city authorities, logistics operators, independent entities capable of providing efficient hub facilities, and local residents.

The Direction of Urban Micro-Hub Development

The operation of urban microhubs has a positive impact on the sustainable development of last-mile deliveries in cities.

Both Polish and European cities should strive to increase the scale of this solution's implementation, whilst ensuring that the urban microhubs created meet the operational conditions described above.

The comprehensive logistical effectiveness of this solution also requires its implementation on an appropriate scale.

The installations created should constitute **unified and scalable** solutions, i.e., meet specific functional, technical, and visual requirements agreed upon by all stakeholders, and allow for their replication on a wider scale in individual cities, under the supervision of an independent operator, such as the city itself or an entity employed by it.

This will prevent the emergence of 'random installations' in cities, located in ill-considered places, spoiling the surroundings or disrupting residents' daily lives. **Cooperation and sharing** are also of paramount importance in the development of micro-hub-based initiatives.

MICROHUBS IN POLAND AND THE CONDITIONS FOR THEIR EFFECTIVE OPERATION

If every logistics operator were to set up their own transhipment microhubs in cities, we would quickly end up with a phenomenon of 'hubomatosis', analogous to the "parcel-machine mania" popular in Poland, where logistics operators compete to install more and more parcel machines, resulting in locations where several different machines stand side by side.

It is important that microhub spaces are shared by independent operators, created on the basis of consistent standards guaranteeing both operational functionality and compliance with social and aesthetic norms.

A development path for such initiatives defined in this way requires not only openness on the part of logistics operators and their willingness to cooperate, but also **administrative support.**

City authorities and public administration bodies should simplify procedures, for example regarding the provision of land for micro-hubs, or offer grants to smaller logistics firms for the purchase of low-emission fleets (e.g. cargo bikes).

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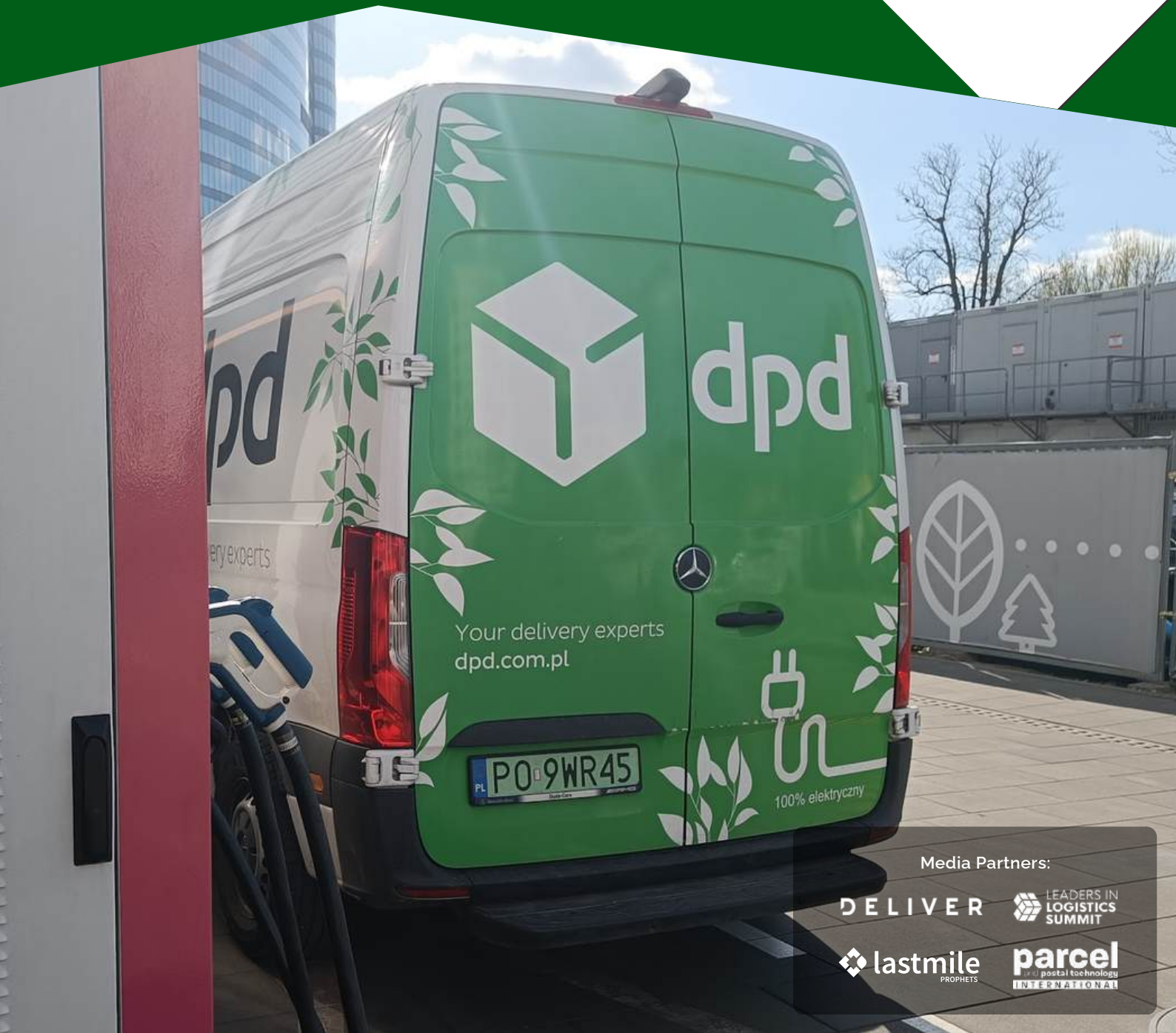
THE ENVIRONMENTAL IMPACT OF THE LAST MILE



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THE ENVIRONMENTAL IMPACT OF THE LAST MILE

Running away from the worst last-mile scenario

Decarbonisation of last-mile deliveries requires a rapid shift from traditional delivery methods to cleaner ways of bringing convenience to online shoppers. We evaluated the impacts of various scenarios, combining different degrees of adoption of out-of-home (OOH) delivery and electric vehicles (EVs) (Table 2).

The goal is to quantify the benefits from avoiding the worst-case scenario, that is, the one without the adoption of OOH delivery and EVs. Our base-case scenario assesses the impacts of an intermediate level of adoption of OOH and EVs.

This scenario is closer to what could be expected for 2032 today. However, these efforts might turn out to be insufficient should global warming be limited to an increase of 1.5°C. Thanks to OOH and EVs, greater climate ambitions could be pursued.

The base case is compared with three other scenarios: the case of full adoption of OOH but no adoption of EVs, namely the OOH-only scenario; the case of full adoption of EVs but no adoption of OOH, namely the EV-only scenario; and finally, the best-case scenario combining both a full use of OOH and EV.

EV adoption / OOH adoption	No adoption *parcels delivered by EVs in 2032: 0%*	Intermediate adoption *parcels delivered by EVs in 2032: 50%*	High adoption *parcels delivered by EVs in 2032: 100%*
No adoption *parcels delivered in lockers or PUDOs in 2032: 0%*	Worst-case scenario		EV-only scenario
Intermediate adoption *parcels delivered in lockers or PUDOs in 2032: 50%*		Base-case scenario	
High adoption *parcels delivered in lockers or PUDOs in 2032: 100%*	OOH-only scenario		Best-case scenario

Table 1: Carbon footprint of last mile delivery in the EU+UK+CH+NO in 2032: estimating the impacts according to different levels of OOH & EV delivery adoption
Source: UPIDO

THE ENVIRONMENTAL IMPACT OF THE LAST MILE

Coping with 40 billion deliveries in the last mile

We forecast 40 billion B2C parcel deliveries in the European Union, the United Kingdom, Switzerland, and Norway in 2032 (with a margin of error of two years).

As shown in Table 3, this would result, on average, in CO2 emissions ranging from 13 to 139 g of CO2 per parcel across the different scenarios and European countries under analysis.

Following the base-case scenario route would only lead to 55 g of CO2 per parcel in 2032.

Policies focusing on a single way to reduce emissions cannot bring the most desirable outcome alone (compare, in Table 3, the 32 g CO2 per parcel through electric vehicles only or the 36 g CO2 through out-of-home delivery only to the 13 g CO2 with high adoption of OOH and EVs).

Only a strong combination of last-mile instruments fighting climate change, as illustrated here by the carbon outcomes for relatively high levels of adoption of OOH delivery and EVs, can lead to the lowest emissions per parcel in European countries (as highlighted in darker green colours in Table 3).

EV adoption / OOH adoption	No adoption *parcels delivered by EVs in 2032: 0%*	Intermediate adoption *parcels delivered by EVs in 2032: 50%*	High adoption *parcels delivered by EVs in 2032: 100%*
No adoption *parcels delivered in lockers or PUDOs in 2032: 0%*	139 g CO_2	86 g CO_2	32 g CO_2
Intermediate adoption *parcels delivered in lockers or PUDOs in 2032: 50%*	87 g CO_2	55 g CO_2	23 g CO_2
High adoption *parcels delivered in lockers or PUDOs in 2032: 100%*	36 g CO_2	24 g CO_2	13 g CO_2

Table 2: Carbon footprint of last-mile delivery in the EU+UK+CH+NO in 2032: CO_2 emissions per parcel for different levels of OOH and EV delivery adoption
Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.

THE ENVIRONMENTAL IMPACT OF THE LAST MILE

Dividing European last mile emissions by eleven

By 2032, the total amount of European CO2 emissions generated by last-mile deliveries could be reduced from 5,568,000 metric tons of CO2, if B2C parcels are delivered without any support from OOH and EVs, to 510,400 metric tons of CO2, if all deliveries are made with electric vehicles to parcel lockers or pick-up and drop-off points (Table 4).

The complete elimination of CO2 is not possible as long as last-mile deliveries impact the movements of individual non-electric vehicles on the road, such as personal cars with internal combustion engines.

Achieving these new emission milestones would require a much more intensive use of the OOH infrastructure than today, since the growth of parcel lockers and PUDOs could be physically limited in space for various reasons.

It is critical that parcel lockers and PUDOs can be used several times a day to their full capacity, which also means that the average parcel collection time of one day or more must be dramatically reduced (through better IDM, for instance). From an EV perspective, EU regulations have been adopted to ensure minimum procurement levels of EVs by parcel companies.

EV adoption / OOH adoption	No adoption *parcels delivered by EVs in 2032: 0%*	Intermediate adoption *parcels delivered by EVs in 2032: 50%*	High adoption *parcels delivered by EVs in 2032: 100%*
No adoption *parcels delivered in lockers or PUDOs in 2032: 0%*	5,568,000 metric tons CO_2	3,429,888 metric tons CO_2	1,291,776 metric tons CO_2
Intermediate adoption *parcels delivered in lockers or PUDOs in 2032: 50%*	3,497,400 metric tons CO_2	2,199,244 metric tons CO_2	901,088 metric tons CO_2
High adoption *parcels delivered in lockers or PUDOs in 2032: 100%*	1,426,800 metric tons CO_2	968,600 metric tons CO_2	510,400 metric tons CO_2

Table 3: Carbon footprint of last-mile delivery in the EU+UK+CH+NO in 2032: total European CO_2 emissions for different levels of OOH and EV delivery adoption
Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.

THE ENVIRONMENTAL IMPACT OF THE LAST MILE

Towards ambitious emissions reduction targets?

Our base-case scenario with an intermediate level of adoption of OOH delivery and EVs would correspond to a 61% reduction in European last-mile delivery emissions. In Table 5, only three out of nine scenarios would be compatible with CO2 emissions reduction targets higher than 80% by 2032 (see dark green colours).

New generations of consumers are expected to become very demanding in terms of carbon footprint requirements related to their online purchases.

Customer loyalty and sales growth, which are key drivers of customer lifetime value creation, are more and more likely to depend on ambitious targets of CO2 emission reductions.

On top of contributing to the fight against climate change, there is a real business opportunity in targeting the greatest CO2 emission reductions.

Given that last-mile delivery is at the heart of the customer experience, the acceleration of the transition towards an ever cleaner last mile should be prioritised by postal and parcel companies in the new post-pandemic normal.

EV adoption / OOH adoption	No adoption *parcels delivered by EVs in 2032: 0%*	Intermediate adoption *parcels delivered by EVs in 2032: 50%*	High adoption *parcels delivered by EVs in 2032: 100%*
No adoption *parcels delivered in lockers or PUDOs in 2032: 0%*	5,568,000 metric tons CO_2	3,429,888 metric tons CO_2	1,291,776 metric tons CO_2
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High adoption *parcels delivered in lockers or PUDOs in 2032: 100%*	1,426,800 metric tons CO_2	968,600 metric tons CO_2	510,400 metric tons CO_2

Table 4 :Carbon footprint of last-mile delivery in the EU+UK+CH+NO in 2032: percentage reduction in total CO_2 emissions for different levels OOH & EV scenarios
Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost

THE ENVIRONMENTAL IMPACT OF THE LAST MILE

The benefits of a greener European last mile

The impact of OOH and EV delivery on CO2 emissions in 2032 can also be measured in terms of preserved forested land. Table 6 shows the number of trees that could be planted for the different scenarios under consideration, thanks to last mile carbon footprint reduction instruments.

The most ambitious scenarios allow for planting the equivalent of all trees, or more, of the Black Forest every year. Indeed, a greener last mile does matter for a greener Europe.

EV adoption / OOH adoption	No adoption *parcels delivered by EVs in 2032: 0%*	Intermediate adoption *parcels delivered by EVs in 2032: 50%*	High adoption *parcels delivered by EVs in 2032: 100%*
No adoption *parcels delivered in lockers or PUDOs in 2032: 0%*	**0.00 x Black Forest**	**0.47 x Black Forest**	**0.94 x Black Forest**
Intermediate adoption *parcels delivered in lockers or PUDOs in 2032: 50%*	**0.45 x Black Forest**	**0.74 x Black Forest**	**1.02 x Black Forest**
High adoption *parcels delivered in lockers or PUDOs in 2032: 100%*	**0.91 x Black Forest**	**1.01 x Black Forest**	**1.11 x Black Forest**

Table 5: Impact of OOH and EV delivery on forested land in the EU+UK+CH+NO in 2032: how many "Black Forests" could be planted with OOH and EV delivery every year?
Source: UPIDO estimates, and calculations based on previous studies commissioned by InPost.

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CONCLUSIONS AND THE FUTURE

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CONCLUSIONS AND THE FUTURE

The 2026 Last Mile Innovation Report shows that last mile innovation has entered a more practical and more demanding phase.

The sector is moving beyond general sustainability claims, beyond isolated pilots and beyond the idea that one technology can solve the structural pressures facing parcel delivery.

The message from this year's submissions is that innovation now sits at the intersection of cost, capacity, service quality, customer experience and environmental impact.

The best projects are not necessarily the most futuristic, but they are the ones that improve daily execution, reduce waste in the network, and can be scaled without creating a new layer of operational complexity.

In a market where B2C, C2C, online retail, and re-commerce volumes continue to reshape parcel flows, this is critical; these volumes are typically more fragmented, less predictable, and more expensive to serve than traditional B2B flows.

Indeed, this makes innovation less of a strategic choice and more of an operating necessity.

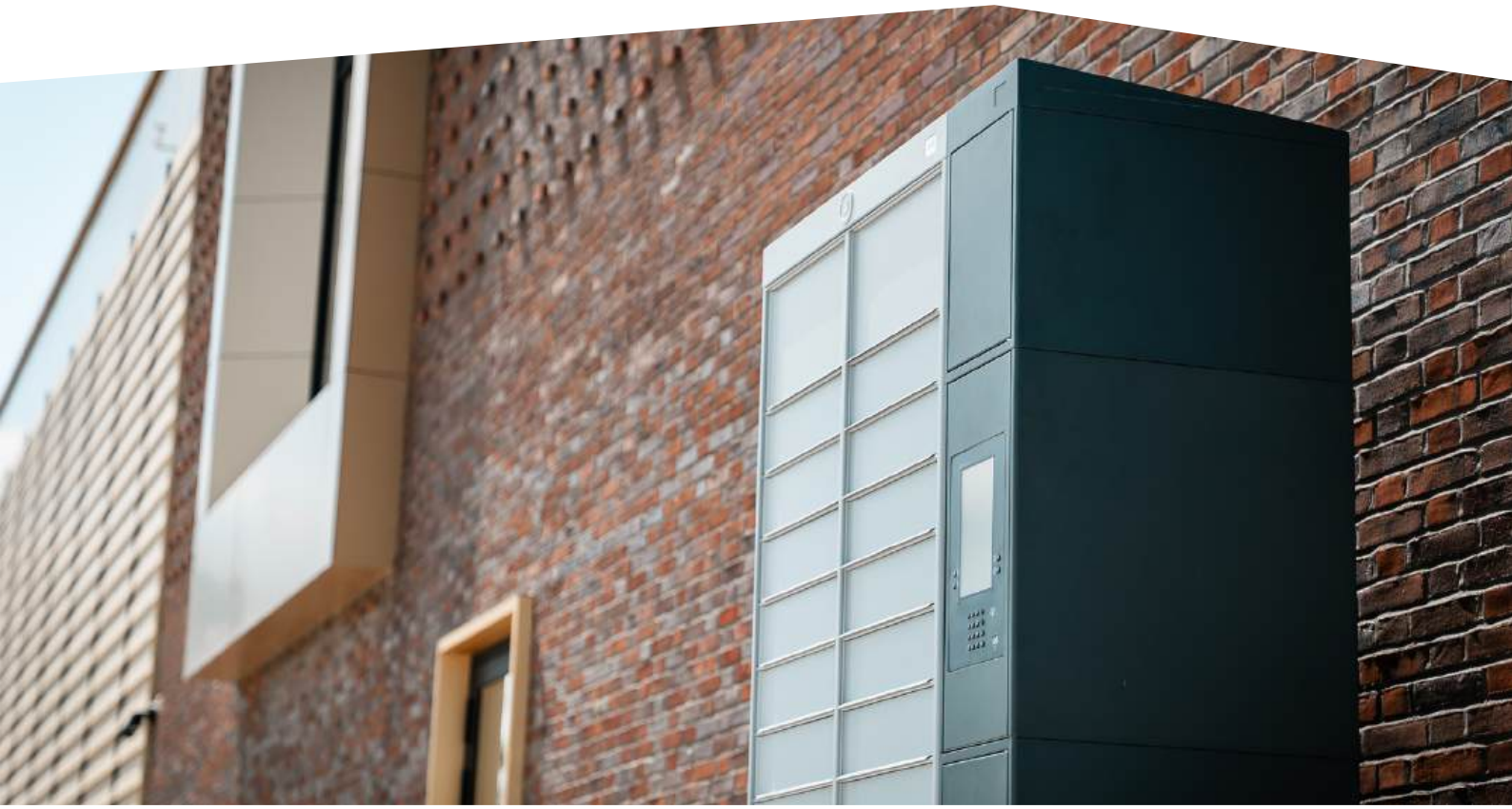

Figure 1:SwipBox Infinity Locker
Source: SwipBox

CONCLUSIONS AND THE FUTURE

Innovation is Moving from Promise to Proof

A clear theme in this report is the shift from innovation as a communication tool to innovation as measurable operational improvement.

For several years, the last mile has been full of attractive ideas: robots, drones, electric fleets, artificial intelligence, lockers, microhubs and new delivery apps.

Today, some of these ideas are beginning to mature, while others still require more evidence, better economics or more favourable operating conditions.

The projects included in this year's report show a more disciplined direction. Allegro's Packaging Standard addresses packaging efficiency and regulatory readiness.

ElifTech applies AI to locker utilisation and anomaly detection. Scandit improves operational execution through smartphone-based scanning and computer vision.

Elitec AI focuses on locker placement, usage and behavioural data. MaddWill AI's Tarviq platform moves freight audit upstream, before billing errors and service failures become hidden costs. These are not abstract concepts. They are examples of innovation being used to solve specific, recurring problems.

This is where the sector now needs to go; innovation should be judged less by the novelty of the idea and more by whether it reduces failed delivery, improves utilisation, cuts avoidable kilometres, increases delivery density, lowers emissions or removes friction for customers and couriers.

Out-of-Home Delivery is a Critical Infrastructure, not a Side Channel

Out-of-home delivery remains one of the strongest themes of the report. Parcel lockers, PUDO points, self service branches can no longer be seen as peripheral delivery options.

In many markets, they are already becoming core infrastructure for managing growth, labour pressure, congestion, and emissions.

However, this year's report also makes clear that out-of-home delivery is not automatically efficient or automatically green; its impact depends on density, location quality, customer behaviour, courier routing, and the degree to which it genuinely consolidates deliveries.

A "slipper distance" locker used by many customers can reduce delivery stops and vehicle kilometres. Conversely, a poorly located locker (or PUDO) that generates dedicated car trips may simply move the environmental burden elsewhere.

CONCLUSIONS AND THE FUTURE

This is why the "slipper distance" principle remains important.; "out of home" works best when it becomes part of the consumer's natural daily movement, not a separate journey.

This means that the strategic challenge is therefore not simply to build more lockers or sign up more PUDO points, but to build the right network, in the right places, with enough density and with software that enables high utilisation.

Sustainability is Becoming an Operating Model

The environmental message of this year's report is more mature than a simple call for greener delivery.

Sustainability isn't just about replacing diesel vans with electric vehicles, although fleet electrification remains important, but about designing delivery systems that need fewer kilometres, fewer failed attempts, better parcel consolidation, smarter routing, better packaging, and more efficient returns.

The key conclusion is that credible sustainability now requires operational detail and that it is not enough to announce a green ambition.

Operators and merchants need to show how the model actually reduces emissions, how these reductions are measured, and whether the customer behaviour required to deliver those reductions is realistic.

Software is Becoming the Nervous System of the Last Mile

This year's report places much greater emphasis on software, data, and artificial intelligence….and we believe that is appropriate, because the complexity of the modern last mile can no longer be managed effectively through static planning, fragmented systems, and manual intervention.

AI will be important, but it should not be treated as a magic wand; its value will depend on data quality, process discipline, and the clarity of the operational problem being solved.

Used well, AI can support a variety of tasks, including forecasting, sectorisation, locker utilisation, billing validation, failed delivery prevention, and customer communication. Used poorly, AI risks becoming just another layer of technology without meaningful impact.

Customer Experience is Part of the Logistics Product

A further conclusion from this year's report is that customer experience cannot be treated as a separate marketing layer; delivery experience has become part of the product itself. Consumers judge merchants and carriers by convenience, transparency, control, reliability, and the ease with which exceptions are handled.

CONCLUSIONS AND THE FUTURE

Microhubs and City Logistics Need the Right Conditions

The section on microhubs in Poland adds an important practical note to the report; they can play a valuable role in reducing emissions and supporting cargo bike delivery, especially in dense city centres. However, they are not automatically viable.

Their success depends on location, volume density, access to suitable space, operational integration, municipal support, and a realistic economic model.

The Next Phase Will Require Collaboration

No single stakeholder can deliver the next phase of last-mile innovation alone!

Carriers control networks and execution. Merchants influence checkout choices, packaging and returns behaviour. Technology providers enable smarter planning and automation.

Local authorities shape access, infrastructure, and regulation….and consumers ultimately determine whether many new models are adopted in practice.

The industry, therefore, needs fewer isolated initiatives and more system-level thinking.

The "new last mile" will not be built by hardware, software, vehicles, lockers, or regulation alone, but by combining them all intelligently.

A Final Word

The last mile isn't about the final movement of a parcel anymore.

It is the point at which online retail economics, customer experience, labour availability, urban mobility, and environmental responsibility meet….and it is this that makes it one of the most important areas of transformation in the CEP sector.

This year's report suggests that the sector is becoming more serious about innovation and that the emphasis is shifting from what looks impressive to what actually works.

The strongest projects are practical, measurable, and connected to the real pressures facing operators, merchants, cities, and consumers.

For this reason, it will be critical to keep observing how these developments evolve in the years ahead.

We hope that next year's report will show not only continued ambition, but also more projects delivering measurable benefits for the sector, consumers, and the environment.

Prepared with the support of:

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Warsaw, June 2026

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