Integrating a White-Label Scheme Service for a Shared Micro Consolidation Center in Athens, Greece

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Abstract. Shared micro consolidation centers represent a pivotal innovation in urban logistics. They not only streamline the distribution process by centralizing deliveries, thereby reducing traffic congestion and emissions but also foster cooperative synergies between logistics service providers, leading to more efficient use of resources and enhanced service quality in last-mile delivery. This study aims to explore and analyze the integration and impact of a white-label scheme in the operation of a shared micro consolidation center in an urban setting, specifically in the center of Athens, Greece. This will be achieved by i) describing the white-label integration, i.e. how such a scheme can be effectively integrated into an existing framework of a shared micro consolidation center, highlighting the process, strategies, and technologies involved, and ii) identifying challenges and solutions with a business context that can be applied in similar logistics scenarios. Early conclusions drawn suggest that the potential of white-label schemes in transforming urban logistics is substantial, primarily due to their inherent flexibility in adapting to and supporting policies implemented by city authorities.

Keywords: Living Lab, Sustainability, City logistics, Mobile Depot, Blueprint, Sharing Economy

1 Introduction

Urban Freight Transport (UFT) systems play a crucial role in the infrastructure of cities, significantly impacting economic activities, environmental sustainability, and the quality of life in urban settings [1]. With the rapid pace of urbanization and the expansion of e-commerce, cities are increasingly grappling with challenges such as traffic congestion, pollution, and the efficient delivery of goods. Innovative solutions that integrate technology, policy, and stakeholder collaboration are essential to create more sustainable and efficient urban logistics systems.

White-label schemes in UFT, particularly within shared Micro-Consolidation Centers (MCCs), have been increasingly recognized for their potential to streamline logistics operations by allowing multiple service providers to unify under a single brand. This approach not only simplifies the logistics chain but also significantly reduces urban congestion and pollution levels by minimizing the number of delivery vehicles required [2]. For example, studies by Pufahl et al. [3] explored the implementation of

white-label solutions in urban consolidation centers, demonstrating that such schemes can enhance operational efficiencies while supporting the adoption of eco-friendly vehicles. Additionally, the research by Katsela et al. [4] highlighted that white-label services, when integrated with technologies like real-time data tracking and advanced logistics platforms, can improve service reliability and customer satisfaction. These findings are particularly relevant as cities look to innovative logistics models to address the challenges posed by increased urban density and the demand for faster, more sustainable delivery options [5]. Therefore, the role of white-label schemes in shared MCCs emerges as a crucial element in the evolution of urban freight systems, offering a balanced approach between economic efficiency and environmental responsibility.

The EU Horizon GREEN-LOG project [6] is a strategic initiative aimed at revolutionizing urban logistics across Europe through the adoption of sustainable and innovative practices. Within this comprehensive framework, the Athens Living Lab (LL) emerges as a critical component, specifically designed to transform the urban logistics landscape in Athens by fostering the development of zero-emission delivery systems. This initiative assembles a multifaceted consortium of stakeholders, including logistics service providers, IT companies, academic institutions, and local community groups. The LL model promotes a collaborative environment where these stakeholders collectively engage in the design, testing, and implementation of solutions tailored to meet the unique urban logistics challenges of Athens.

This article examines the innovative applications within the Athens GREEN-LOG LL, particularly focusing on the integration of a MCC equipped with lockers and a white-label fleet, alongside a mobile depot system. These elements represent a concerted effort to enhance the efficiency of urban freight operations while minimizing the environmental impacts of delivery activities. Additionally, the paper discusses the critical implementation phases required to assess the effectiveness of these solutions in real-world settings and provides insights into the potential scalability of the LL model to other urban contexts. By investigating the Athens LL, this study aims to explore and analyze the integration and impact of a white-label scheme in the operation of a shared micro consolidation center. This will be achieved by i) describing the white-label integration, i.e. how such a scheme can be effectively integrated into an existing framework of a shared micro consolidation center, highlighting the process, strategies, and technologies involved, and ii) identifying challenges and solutions with a business con-text that can be applied in similar logistics scenarios.

The structure of the remainder of this paper is organized as follows: Section 2 provides a detailed description of the Athens LL, including its structure and the workshops that have been conducted. Section 3 explores the use cases implemented by the LL, presenting a detailed service blueprint for each scenario, which includes the shared MCC with lockers and white label fleet, and the delivery model using a mobile depot. Section 4 analyses the sustainable business model of the Athens LL, discussing the Business Model Canvas, assessing barriers and opportunities, examining market trends, and detailing cooperation agreements and arbitration models. Finally, Section 5 synthesizes the findings from the study, discussing the conclusions and suggesting future directions for research and practical implementation based on the insights obtained throughout the study.

2 Athens Living Lab

LLs are collaborative spaces where diverse stakeholders, including businesses, researchers, and local communities, join forces to co-create and co-design solutions aimed at tackling complex urban challenges [7]. In the realm of city logistics, LLs function as platforms where these stakeholders collaborate to pilot and refine innovative approaches designed to enhance the efficiency, sustainability, and resilience of UFT systems. These labs facilitate a neutral ground for exchanging knowledge, ideas, and resources, enabling stakeholders to learn from each other effectively while overcoming potential conflicts of interest and differing agendas [8].

2.1 Living Lab Structure

The GREEN-LOG Athens LL focuses on the creation of a zero-emission delivery scheme within the historic center of Athens, Greece. This scheme is characterized by its collaborative structure, which is pivotal to its success in implementing sustainable logistics solutions. At the heart of the LL structure is the Core Team, comprising prominent logistics service providers ACS and FedEx, alongside DAEM, the IT company of the Municipality of Athens. The involvement layer expands to include the University of the Aegean (UAEGEAN), the Athens University of Economics and Business (AUEB), Frontier Innovation – an IT solutions SME – and other partners who are developing modules directly relevant to the use cases. This collaborative effort ensures that the LL benefits from a wide range of expertise, from technological innovation to academic insights. Furthermore, the LL structure extends to keeping citizens, businesses, and recipients informed about its activities and progress.

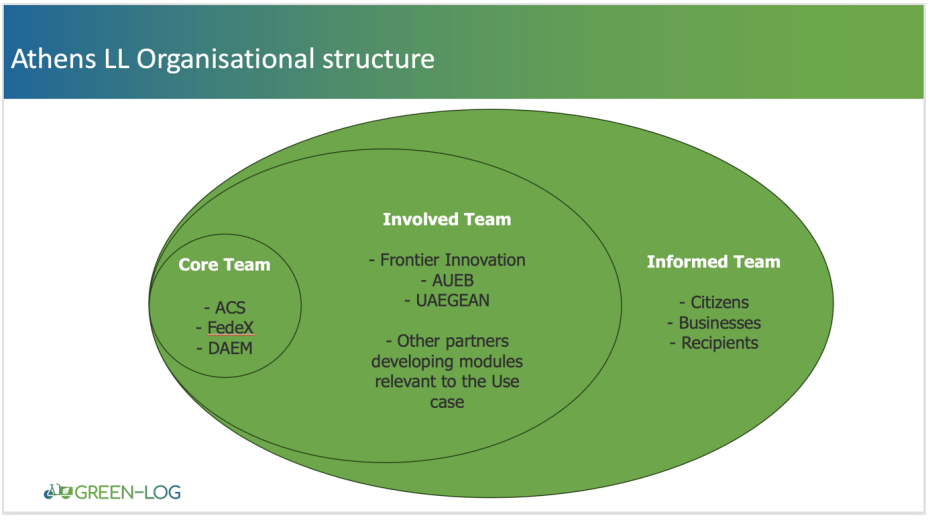

Fig. 1. Athens LL structure

2.2 Workshop

In addition to the regular monthly meetings that are integral to the Athens LL, where stakeholders engage in continuous updates and feedback, a specialized co-creation workshop was organized on the 16th of February, 2024. The GREEN-LOG workshop in Athens, convened stakeholders to deliberate on enhancing parcel distribution within the city with sustainable and efficient methods. The workshop started with an ice-breaker, which set the stage for an in-depth discussion on the challenges of online purchasing, such as reliability issues, inconvenient delivery points, and the lack of late-night delivery options. The dialogue extended to the specifics of Athens' pilot site under the Sustainable Urban Mobility Plan, exploring the integration of GREEN-LOG strategies with the city's goals for establishing low-emission zones. Stakeholders considered available logistical options including the use of vans, mobile depots, and bicycles, while also assessing safety and infrastructure challenges that might necessitate alternative solutions such as lockers. Challenges with courier companies and regulatory permissions for moving parcels to lockers were also debated, with white-labelling for vans proposed as a solution. The workshop concluded with a consensus on the two use cases that are to be tested and demonstrated, focusing on advancing Athens' sustainable parcel distribution initiatives (section 3). The highlights of the workshop are summarized and presented as in Table 1:

Table 1. Workshop highlights.

Topic	Description
Opening Discussion	- The workshop began with an interactive discussion led by the project's coordinator, focusing on the common issues customers face with online purchases, such as reliability and the convenience of delivery points.
Project Goals and Linkages	- The primary objectives of the project were reiterated, emphasizing the alignment with European sustainability goals. The potential for creating a model for zero-emission urban zones was particularly highlighted, along with the strategic use of low emission zones inspired by Athens' Sustainable Urban Mobility Plan (SUMP).
Pilot Discussion	- Detailed discussions on the Athens pilot included the roles of various delivery models, such as the use of electric vehicles and cargo bikes, and the logistical setups involving shared municipal spaces and MCCs. Concerns about safety, infrastructure, and operational logistics were critically evaluated.
Stakeholder Input	- Representatives from various sectors provided their insights, stressing the importance of safety, the feasibility of using different types of vehicles, and the configuration of parcel distribution hubs and lockers. The need for a clear and practical implementation strategy was a recurring theme.
Technical Challenges and Solutions	- Technical and practical challenges were thoroughly discussed, particularly regarding the suitability of different vehicles and the

Topic	Description
Future Directions	architectural design of logistics hubs. Proposals for phase one of the pilot demonstration focused on using existing facilities and assessing their effectiveness before broader implementation. - The discussions concluded with an agreement on the need for detailed planning and coordination among all stakeholders, including legal and operational aspects. The workshop also identified two specific use cases to be tested and demonstrated, emphasizing the necessity of a collaborative approach to effectively tackle the complexities of urban logistics in a densely populated city like Athens.

3 Use Cases and Service Blueprint

Two primary use cases are explored; a) the integration of a shared MCC with lockers and a white label fleet, and b) the innovative concept of a delivery service using a mobile depot. Each use case is accompanied by a detailed service blueprint, outlining the specific processes and interactions involved. These blueprints serve as strategic guides to implement and scale the logistics solutions aimed at enhancing efficiency, sustainability, and community service in urban environments.

3.1 UC1: Shared Micro-consolidation Center, Lockers and White Label Fleet

The first use case has at its core the Klauthmonos parking facility, operated by DAEM, which has been repurposed into a shared MCC. Here, at noon each day, two prevailing logistics companies ACS and FedEx converge to deposit their parcels, totaling between 60 to 80 packages destined for the historic area of Athens city center. The MCC serves as the heart of the operation, where the parcels are temporarily housed before being entrusted to a white-label electric vehicle. This vehicle, a symbol of the initiative's commitment to zero emissions, navigates the streets of Athens with the specific objective of delivering parcels to their recipients in the most sustainable manner achievable. A key component of this seamless operation is the integration of GREEN-LOG's BYOD (Bring Your Own Device) component, which equips the white label scheme with the necessary equipment. This technology ensures real-time tracking and management of deliveries, enhancing the reliability and efficiency of the service.

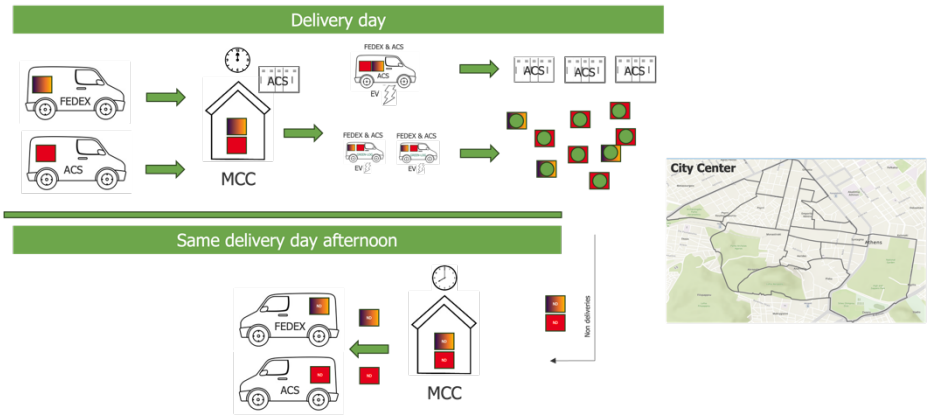

Fig. 2. Athens GREEN-LOG use case 1

In the afternoon, the electric vehicle returns to the MCC, carrying any undelivered parcels, which are then picked-up by ACS and FedEx. This ensures that no parcel is left overnight, maintaining the integrity of the delivery process and preparing for the next day's cycle.

In parallel to the aforementioned system is the integration of smart lockers, a strategic initiative by ACS. Located within the premises of the shared MCC at Klauthmonos parking lot, but also at Varvakeios parking lot, the smart lockers represent a pivotal enhancement to the delivery process, offering recipients unparalleled flexibility in parcel collection. The convenience of picking up parcels at one's leisure addresses the dynamic needs of Athens' residents and visitors, ensuring that the rhythm of city life is uninterrupted by the logistics of parcel delivery. For ACS, the same vehicle that facilitates daily parcel deliveries to the MCC also serves a dual function by distributing parcels to the smart locker system. This efficient use of resources underscores the initiative's commitment to sustainability, reducing the need for multiple delivery attempts and thereby minimizing the carbon footprint. After stocking the smart locker, the vehicle resumes its route, delivering parcels to additional smart lockers in the vicinity.

3.2 UC2: Delivery with Mobile Depot

The essence of this use case lies in the transformation of the delivery process through the introduction of a white label electric vehicle, not just as a transporter of parcels, but as a mobile depot itself. This vehicle, powered by the commitment to zero emissions, embarks on a daily journey through the city, making strategic stops at locations previously identified and provided by DAEM, while also considering the daily demand. These stops are not random but are carefully selected to maximize accessibility and convenience for the residents and businesses of Athens.

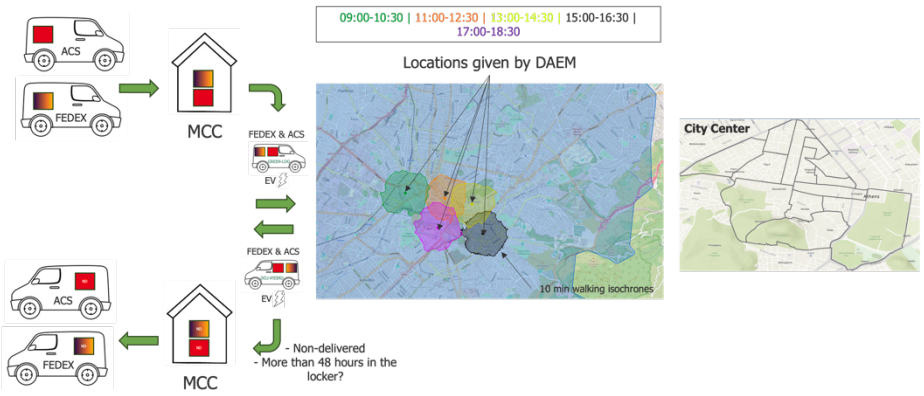

Fig. 3. Athens GREEN-LOG use case 2

Upon reaching these designated locations, the mobile depot parks for a duration of 60 to 90 minutes, creating a temporary hub of activity. This window of time allows recipients to collect their parcels directly from the vehicle, thereby eliminating the need for a fixed smart locker infrastructure. After the allotted time, the vehicle then proceeds to the next location, repeating this cycle throughout the day. This innovative approach ensures a broader reach of the delivery service, catering to more people across different parts of the city.

The "Delivery with Mobile Depot" use case is a testament to the flexibility and adaptability of urban logistics solutions. It addresses several challenges associated with urban deliveries, such as traffic congestion, limited parking spaces, and the environmental impact of traditional delivery methods. Moreover, it represents a significant step forward in the quest for a more inclusive delivery system. By moving away from fixed delivery points and embracing a mobile solution, the service becomes more accessible to individuals who may not have been adequately served by traditional or static models. This approach democratizes access to parcel delivery services, ensuring that more residents can benefit from the convenience it offers.

3.3 Service Blueprint

In Use Case 1, which involves a shared MCC, lockers, and a white label fleet, the process starts with recipients accessing smart lockers at their convenience to collect parcels. The operation is supported by the white label drivers who are responsible for assigning and loading the parcels for distribution. Additionally, drivers from ACS and FedEx play a crucial role by depositing parcels at the MCC and feeding the lockers. These actions are supported by backstage employee activities such as using scanning equipment to inform the delivery system upon successful delivery and navigating the delivery routes to final recipients. The support systems include the planning and scheduling of routes and the use of equipment for scanning and tracking deliveries. The physical evidence of this use case includes the white label electric vehicle, transformed into

a mobile depot serving the MCC, and two lockers installed within the MCC and Varvakeios parking areas.

Use Case 2, involves recipients retrieving parcels from the mobile depot during scheduled stops. Onstage, white-label mobile depot drivers drive to designated parking locations and oversee the parcel distribution. They park at these locations and assist in parcel distribution, a critical aspect of the backstage employee actions that also include using software for planning stop locations and routing. Support systems enhance this setup by sending notifications 30 minutes before the mobile depot arrives at a location and using software for routing and managing the distribution process. The physical evidence, in this case, is the white label vehicles used as mobile depots at designated stops.

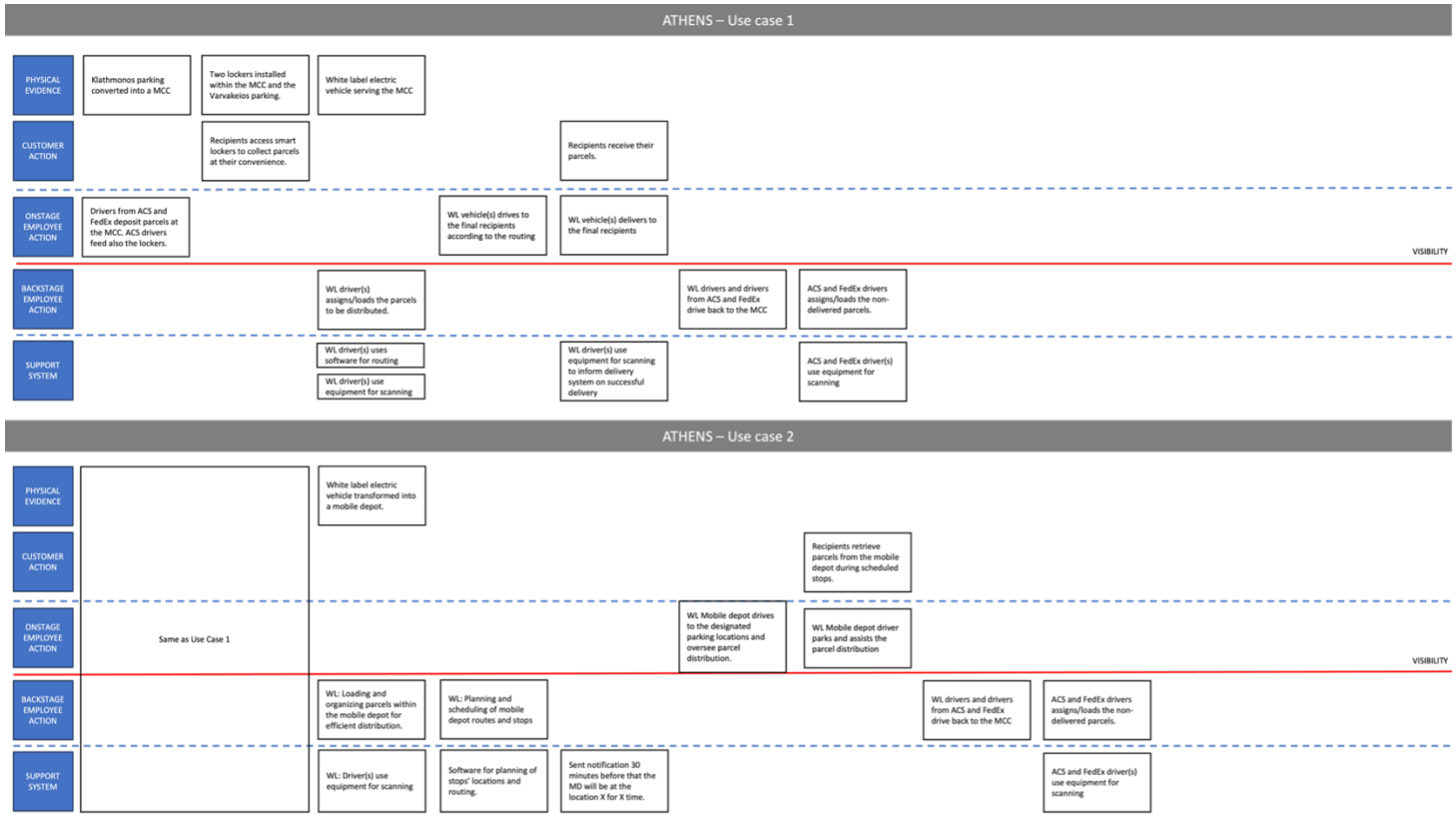

Fig. 4. Athens service blueprint

4 Athens Sustainable Business Model Analysis

Transport organizations are compelled to develop sustainable business models to remain competitive in the current market landscape. A business model precisely delineates the rationale, supported by data and other evidence, that underpins a value proposition to customers, along with a viable revenue and cost structure for the enterprise delivering that value [9]. It encapsulates the benefits an enterprise promises to deliver to its customers, the organizational structure required to deliver these benefits, and the strategy for capturing a portion of the value that it creates. With a clearly articulated business model, organizations can accurately identify customer needs and desires, and strategically align their operations to fulfill these requirements while securing appropriate compensation.

4.1 Business Model Canvas (BMC)

The Business Model Canvas is a strategic tool employed to delineate an organization's business framework, presenting it as a qualitative snapshot at a specific point in time and isolating key components into distinct blocks [10]. GREEN-LOG has customized Osterwalder's Business Model Canvas (BMC), integrating the Sustainability Canvas to highlight how the LL use cases create and deliver value in last-mile deliveries. This adaptation is designed to generate a comprehensive value proposition that encompasses financial returns as well as societal and environmental impacts, thereby offering a holistic view of the value creation process.

Typically, BMC is structured around nine fundamental building blocks: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. However, GREEN-LOG has introduced two additional components, ie. Eco-Social Benefits and Eco-Social Costs, to more effectively capture the sustainability footprint and externalities associated with the proposed solutions. These extensions enrich the traditional model, ensuring that it not only addresses economic dimensions but also reflects the broader ecological and social contexts impacting and emanating from the business operations.

Table 2. Eleven building blocks of the sustainable business model canvas.

Building Blocks	Definitions
1) Key partnerships	This building block describes the network of suppliers and partners that make the business model work.
2) Key activities	This building block describes the most important things a company must do to make its business model work.
3) Key resources	This building block describes the most important assets required to make a business model work.
4) Value Propositions	This building block describes the bundle of products and services that create value for a specific Customer Segment.

5) Customer relationships	This building block describes the types of relationships a company establishes with specific customer segments.
6) Channels	This building block describes how a company communicates with and reaches its customer segments to deliver a value proposition.
7) Customer Segments	This building block defines the different groups of people or organisations the enterprise aims to reach and serve.
8) Cost Structure	This building block describes all costs incurred to operate a business model.
9) Revenue streams	This building block represents the cash a company generates from each customer segment (costs must be subtracted from revenues to create earnings).
10) Eco-Social Costs	This building block describes all the costs incurred for operating the business on an environmental and societal level.
11) Eco-Social Benefits	This building block describes all the benefits accumulated for operating the business on an environmental and societal level.

In the following section the eleven blocks are analysed with respect to Athens use cases.

Key Partners. The Sustainable Business Model Canvas for the Athens LL identifies key partners including logistics providers ACS and FedEx, the city municipality DAEM, University of the Aegean as LL moderators, and the Athens University of Economics and Business (AUEB) and Frontier Innovation as technology providers and modules' developers.

Key Activities. Key activities include organizing the LL, identifying and establishing a shared MCC in Athens' historic city center, testing the deployment of a mobile depot, both coupled with smart lockers installation.

Value Propositions. The value propositions of the Athens LL focus on offering green and reliable deliveries through a joint delivery system involving multiple Logistics Service Providers (LSPs), utilizing routing software, and significantly reducing costs for LSPs. It also aims at minimizing externalities such as congestion, environmental emissions, and noise.

Customer Relationships. The Athens LL emphasizes co-creation with all stakeholders, and establishing licensing agreements. These relationships are designed to integrate seamlessly with the rest of the business model, enhancing the engagement and participation of all involved parties.

Customer Segments. The customer segments include the Last Mile delivery providers, the shop owners and local businesses, the final recipients- citizens and the citizens of other municipalities and regions in Greece.

Channels. The outreach to customer segments is managed through various channels, including social media, websites, newsletters, and physical advertisements like bulletin boards and billboards. These channels are evaluated based on their effectiveness, cost-efficiency, and integration with customer routines.

Key Resources. The key resources involve physical assets like the fleet owned by LSPs and the shared MCC facility, intellectual resources including data on routing and parcels, and financial resources sourced from EU funding and contributions from LSPs.

Cost Structure. The cost structure includes significant investments in IT for platform maintenance and upgrades, acquisition and maintenance of fleet and lockers, future space leasing or purchases, storage, cloud services for the platform, personnel, insurance, training, and marketing.

Revenue Streams. Revenue streams are generated through various means such as subscriptions, asset sales, licensing, and consultancy for similar projects. Additional revenues come from advertisements on the fleet, selling data, and a percentage of income generated from deliveries.

Eco-Social Costs. The ecological and social costs associated include safety concerns, administrative complexities, and operational challenges under extreme weather conditions. These aspects are assessed using tools like Life-Cycle Assessment and the Common Good Balance Sheet.

Eco-Social Benefits. The project delivers substantial eco-social benefits such as reduced noise, congestion, travel time, and pollution. It addresses climate change issues, reduces accidents, and requires less public space, thereby improving the credibility of the operations and aligning with Athens' Sustainable Urban Mobility Plan (SUMP) and contributions to Low Emission Zones. These benefits are documented and potentially transformed into additional value propositions.

4.2 Identified Barriers, Opportunities and Market Trends

Barriers. In the context of the Athens LL, several barriers challenge the implementation of innovative last-mile delivery solutions. User reluctance toward new delivery methods persists, with many customers favoring traditional delivery approaches, thus dampening interest in more sustainable options. Operational challenges also arise for logistical service providers (LSPs) who may find it difficult to adapt due to established

organizational structures or processes. Financial constraints could deter stakeholders from investing in new technologies or infrastructure essential for modernizing delivery systems. Additionally, legal hurdles and the need for more coherent regulatory frameworks further complicate the system deployment. Collaborative challenges, such as conflicting interests among stakeholders and technological incompatibilities, pose significant obstacles to integrating sophisticated logistics solutions within the existing urban framework.

Opportunities. The Athens LL aims at capitalizing on the opportunities presented by the exponential growth in e-commerce and the resulting demand for efficient delivery solutions [11]. This collaborative platform facilitates innovation by bringing together public authorities, supply chain service providers, and the community to trial and implement sustainable delivery models, including shared MCCs and zero-emission fleets. By engaging a diverse group of stakeholders, the lab not only fosters the co-creation of solutions but also maximizes the potential impact and efficacy of these initiatives, aligning them closely with the city's sustainability goals and the evolving needs of urban populations.

Market Trends. Technological advancements and the shifting landscape of e-commerce are driving significant market trends in city logistics [12]. The COVID-19 pandemic has accelerated changes in consumer behavior, increasing demand for home delivery services and pushing the logistics sector toward more agile and responsive delivery methods. This has highlighted the importance of developing services like same-day deliveries, enhanced tracking, and innovative out-of-home delivery options to improve user experience and trust. Furthermore, as urbanization intensifies, particularly in densely populated areas like Athens, there is an increasing need for sustainable solutions that address urban challenges such as traffic congestion, emissions, and the efficient use of space. These trends illustrate the urgency for deploying green delivery options and the critical role of supportive regulatory environments to enable the widespread adoption of such innovations in urban logistics.

4.3 Cooperation Agreements and Arbitration Models

Cooperation agreements is a legal instrument that formalizes the relationships developed within a partnership [13]. The collaboration between corporations and research institutions is a crucial step in the progress of innovation and technology [14]. The significance of cooperation between LSPs has been analyzed, revealing significant benefits for the quality of services and the profitability of partners [15,16]. Every collaboration and partnership are built to satisfy specific goals and objectivities. A successful collaborative agreement is based on clear definition of objectivities [17], that enables clear segmentation of partners' responsibilities, along with shared objectives and targets [14]. Researchers have shown an indirect influence of clear definition of objectives on success through trust for research organizations, and through commitment and conflict for firms. At the same time, a clear and direct relationship has been observed

between clear definition of objectives and global satisfaction of firms. Furthermore, partners' reputation is considered a significant factor towards successful cooperative agreements[17,18]. Reputation is characterized as the history of partners' behavior prior the collaboration which indicates its trustworthiness [19]. The greater the reputation the higher the possibilities for a continuing reliable collaboration.

Some of the most important conflicts that may arise are related to the operational aspect of the pilot. Differences in operational procedures and protocols between ACS and FedEx could create disputes in handling and management of parcels within MCC. Furthermore, privacy issues regarding clients' data may arise. Additionally, conflicts regarding the ownership of the data collected during parcel delivery operations, are of high importance. The key partners in this pilot may have divergent opinions on who should own the collected data, how this data should be used, and how someone could access the data. Such incidents could lead to significant disagreements over data ownership and each partner's responsibilities. Moreover, in case one party believes that the other is not following properly the legal requirements, disputes could arise due to potential legal and reputational consequences. The selection, approval, and preparation of the location for the creation of MCC could become an important potential conflict. Different stakeholders may have different opinion regarding the ideal location for the MCC. In addition, the governance model and the operational conditions of the MCC could create divergent opinions between the partners. Each partner may have different expectations regarding the equipment of the MCC and the entity that should assume the financial responsibility. Another important area for possible conflicts during the Athens LL is resource allocation. Possible disagreements between the two operators over the allocation of vehicles, manpower, and infrastructure could increase competition and lead to the failure of the synergy. Finally, the branding of the venture could result in significant conflicts.

To address the above conflicts, white label cooperative agreements will be signed between the key partners of the Athens LL. Generally, a white label involves one party providing goods or services to another party, which then resells them under its own brand. In the case of Athens LL this will be slightly modified. ACS and FedEx are the logistics providers that will cooperate with the city of Athens to introduce the concept of MCC in the city. The two operators will employ an external subcontractor as a white label service provider. The agreement will clearly state the role of each partner, who will be responsible to make sure the fleet is safe and properly maintained and whose responsibility is the creation of the MCC. Additionally, before the agreement is signed, all the partners will participate in meetings and workshops to establish what equipment the MCC should have, and the decision will be described in detail in the cooperative agreement. Furthermore, the cooperative agreement will outline the procedures and protocols to be followed, and data ownership will be clarified.

5 Conclusions and future directions

The Athens LL has effectively demonstrated a sustainable, collaborative approach to addressing urban logistics challenges through the development of a zero-emission

delivery scheme. By integrating stakeholders from various sectors – logistics providers, IT specialists, academic institutions, and community members – it has fostered a dynamic environment for innovation in UFT systems. This setup has facilitated the co-design of tailored solutions that address the specific logistical needs and urban dynamics of Athens.

The operational structure of the LL, including its core and involved teams, has been pivotal in enabling continuous innovation and adaptation of strategies. The workshops and stakeholder meetings have been instrumental in refining these strategies and ensuring all participants are aligned with the lab's goals. The outcomes from these collaborative efforts, particularly the two strategic use cases developed—the MCC with lockers and the mobile depot—highlight the lab's ability to create practical, scalable solutions that significantly enhance the efficiency and sustainability of urban deliveries.

Looking ahead, the implementation phase scheduled for September 2024 will be critical in testing the viability and effectiveness of these solutions in a real-world setting. This phase is expected to uncover the operational strengths and potential weaknesses of the current models, providing valuable insights into aspects of the operations that may have been overlooked. Furthermore, it will serve as a preparatory stage for the more extensive second implementation phase, running from September 2025 to January 2026. This subsequent phase will not only test a refined version of the initial demonstrations based on insights gathered but will also expand the scope and scale of the deployment. The iterative nature of these phases ensures continuous improvement, optimizing the delivery solutions to better meet the needs of Athens' urban environment and its inhabitants.

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