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ARE DRONES TRANSFORMING TRANSPORTATION AND LOGISTICS FOR THE LAST-MILE REACH IN THE URBAN LANDSCAPE

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Abstract

The rapid growth of e-commerce, urban congestion, and rising customer expectations for faster delivery have increased pressure on last-mile logistics systems. This study examines the role of drone technology in improving urban last-mile delivery from business, operational, sustainability, and managerial perspectives. The purpose of the study is to evaluate how drone-enabled logistics can enhance delivery efficiency, accessibility, cost performance, and strategic value while identifying major barriers to large-scale adoption. A secondary research approach was adopted, using peer-reviewed literature, industry reports, government publications, and case studies of Amazon Prime Air, UPS Flight Forward, DHL Parcelcopter, and Zipline. The findings indicate that drones can improve delivery speed, reduce dependence on congested road networks, support access to hard-to-reach areas, and create value in urgent, lightweight, and healthcare-related deliveries. Adoption remains limited by payload capacity, battery life, weather dependency, infrastructure needs, regulation, safety, privacy, and public acceptance. The study concludes that drones are more effective as complementary tools within hybrid logistics networks than as complete replacements for traditional delivery systems. Managerially, firms should adopt drone logistics selectively through cost-benefit analysis, regulatory compliance, infrastructure planning, and strategic integration with existing supply chain operations.

Keywords: *Drone logistics, last-mile delivery, urban logistics, operations management, business innovation,*

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1. Introduction

The booming development of e-commerce has drastically altered the configuration and expectations of contemporary logistics systems. Last mile delivery, the last step in the supply chain where the goods are transported from a distribution centre to the end customer, is one of the most complex and expensive aspects of the supply chain. With the growth in order volumes, urban congestion and the need for quick delivery, the pressure on the operations of these companies, particularly in the urban markets with high population density, has grown. Last-mile logistics is known as a key cost and efficiency challenge for businesses as it is characterised by many distribution locations, erratic demand and high delivery standards expectations (Boysen et al., 2020). Time, cost, convenience and reliability of the service are becoming more and more important factors in the future of parcel delivery (Joerss et al., 2016).

The development of digital commerce platforms has also brought about a significant change in customer expectations. Today, consumers are demanding faster delivery, such as same-day/next-day service, delivery tracking, scheduling, and low/zero delivery costs. These expectations are putting extra strain on logistics companies to overhaul traditional delivery systems and implement technology-based solutions. Conventional vehicle-based delivery systems have been shown to have limits of efficiency in urban areas, particularly in the presence of traffic jams and complex routes (Agatz et al., 2018). Therefore, delivery by using drones has become a potential solution to enhance the efficiency of delivery routes and responsiveness (Murray & Chu, 2015). In the field of logistics and supply chain management, drone technology or Unmanned Aerial Vehicle (UAV) technology, has become more and more popular as an innovation. Drones can navigate in the low level of the airspace, bypass road congestion and provide direct customer delivery of lighter packages. Vehicle routing studies indicate that when a drone is incorporated with the existing vehicle-based logistics systems, it can increase the delivery flexibility and decrease delivery time (Dorling et al., 2016). A wide survey on civil drone applications further shows UAVs to have a great potential in transportation, delivery, monitoring and emergency applications (Otto et al., 2018).

Drone logistics matters from a business and management viewpoint since it has an impact on operational efficiency, cost structures, service quality, adoption of technology, and competitive advantage. Drones are becoming more than just a means of transport in the world of supply chain management, but are now considered a strategic asset that can transform logistics and change business models (Rejeb et al., 2023). Businesses like Amazon, UPS, DHL, and Zipline are pioneering drone delivery capabilities, including models for e-commerce, healthcare, and logistics in hard-to-reach areas, revealing the potential for drone use in the business world (Amazon, 2024). Further examples of drone delivery for healthcare demonstrate that there may be value added in industries where speed, accessibility and reliability are of utmost importance (Zipline, 2021). Drones and logistics are also related to Sustainability and Green Operations Management. For light-duty package delivery, especially if they are taking the place of fuel-powered vehicle missions, an electrically powered drone could decrease direct emissions. The research done on drone delivery emissions indicates that drones are a potential environmental benefit when operated in a suitable manner (Goodchild & Toy, 2018). Additionally, life-cycle research suggests that the sustainability performance of a drone delivery system is influenced by package weight, type of energy source, the warehouse design and the distances to be covered (Stolaroff et al., 2018).

Comparative environmental studies also point to the fact that the use of drone delivery might be more advantageous in one delivery scenario than others (Park et al., 2018). In spite of these opportunities, there are some managerial, regulatory, social and technological barriers to the adoption of drones. Public acceptance is still a significant challenge as drones are perceived as issues that involve safety, privacy, noise, surveillance and trust (Aydin 2019). Finally, a commercial drone's impact on society should not be overlooked, as its prevalence could impact the life of the city, public space and regulatory governance (Rao et al., 2016). Governments have been working to find a balance between innovation and safety, compliance

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and airspace management, as evidenced by the recent Drone Rules in India (Ministry of Civil Aviation, 2021). Unmanned aviation systems (UAS) are also a central topic in international policy debates, focusing on the need for safe and sustainable solutions (European Union Aviation Safety Agency, 2024).

In India, the name drone logistics has been associated with the provision of healthcare, modernisation of logistics and the newfound concept of smart cities (NITI Aayog, 2026; World Bank, 2023). The "Medicine from the Sky" project demonstrates the potential of drone technology in health care delivery to provide health services in areas where traditional transportation is difficult or inefficient (World Economic Forum, 2022). The larger logistics development agenda of India also incorporates the adoption of technology to enhance efficiencies in the supply chain and make the nation competitive (Ministry of Commerce and Industry, 2025). But previous research tends to focus on drone logistics in isolation, either from a technical, environmental or regulatory viewpoint. A need for further research on operational, economic, sustainability and strategic management, all combined under one business umbrella, still exists. While there have been studies on drone delivery from various angles (technological, environmental, optimisation, or regulatory), few studies have combined the different aspects in a holistic business and management framework.

Much of what has been written on drone logistics has been limited to the drone layer alone in the absence of an integrated approach to management and strategic value creation, organisational decision-making and business feasibility. The originality of the present research is the integration of various approaches and perspectives from operational, economic, sustainability, regulatory and strategic management. The study aims to provide an integrated business-oriented perspective on the last-mile logistics enabled by drones by integrating the evidence from academic articles with up-to-date industry use cases. Such a strategy would not only be beneficial for the operational potential of a drone delivery system but also for the organisational and strategic conditions for the successful implementation of such a delivery system.

The objectives of this study are:

1. To examine how drone technology can improve efficiency, speed, and accessibility in urban last-mile delivery systems.
2. To analyse the economic, operational, sustainability, and managerial implications of drone-based logistics.
3. To identify key challenges affecting large-scale drone adoption, including regulation, infrastructure, safety, public acceptance, and business feasibility.

2. Methodology

This study is a structured secondary research which aims to understand the significance of last-mile logistics in business and management using drones. A broad spectrum of relevant academic and industrial sources is analysed to obtain a wholesome understanding of the current developments, challenges and opportunities in drone-based delivery systems. The relevant literature was found by conducting targeted searches in key academic databases like Scopus, Web of Science, Google Scholar, and ScienceDirect on the keywords such as "drone logistics," "last-mile delivery," "urban logistics", "unmanned aerial vehicles", "supply chain management", and "drone delivery sustainability". The criterion for the selection of the sources was based on the relevance of the sources to the business, logistics and management aspects of the use of drone technology.

The sources covered in the study are those from the last five years (2015-2025), authored in English and directly dealing with commercial, healthcare or urban logistics use cases of drones. To guarantee both academic rigour and field relevance, a mixture of peer-reviewed journal articles, industry reports, government publications and organisational case studies was consulted. Sources that were purely technical engineering design and/or purely military in applications, with no obvious implications for logistics or management, were excluded. The literature collected was analysed and categorised in some of the most important thematic

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areas, such as operational efficiency, economic implications, sustainability performance, regulatory challenges, public acceptance, and strategic management considerations (Tranfield et al., 2003).

A comparative analysis of current case studies was carried out based on four drone logistics projects, namely Amazon Prime Air, UPS Flight Forward, DHL Parcelcopter and Zipline, in order to highlight the application in the real world and to discover patterns, opportunities and problems in the use of drone-based delivery systems

Table 1 presents the Summary of Research Methodology.

Table 1. Summary of Research Methodology

Method Element	Description
Research design	Secondary research approach
Data sources	Journals, industry reports, government publications, and company case studies
Time frame	Mainly 2015-2025
Analysis method	Thematic analysis and comparative case evaluation
Selected cases	Amazon Prime Air, UPS Flight Forward, DHL Parcelcopter, and Zipline
Key focus areas	Efficiency, cost, sustainability, regulation, public acceptance, and strategy

Multiple source categories were used in order to triangulate evidence to increase the analytical rigour. Theoretical and empirical insights were provided from academic literature, and practical and policy insights were offered by industry and government reports. The triangulation of this enhanced the reliability of the findings and lessened reliance on one source of evidence.

3. Results

The results show that a drone-based last-mile logistics system can enhance the delivery speed, delivery accessibility, and operational flexibility in the appropriate delivery situation. Based on the case analysis, it has been found that drones are ideally suited for the transport of light loads, where urgency and high value are involved and where the area is difficult to access and not for bulk transport. Drone logistics holds strategic potential for businesses and management as it can facilitate faster service delivery, supply chains with greater responsiveness, and enable companies to reimagine specific last-mile operations. Their results also indicate that the value of a drone is situational and must fit with the cost feasibility, compliance with regulations, readiness of infrastructure and customer-service goals.

3.1 Case Study Findings

The cases presented illustrate various uses of drone logistics in various sectors and scenarios. The following are just some examples of the uses of the drone delivery business model tested and deployed in the e-commerce, health-care, remote-area supply and social-impact supply chains. They also emphasise that drone adoption does not occur in all sectors equally and that the effectiveness of the drones depends on the urgency of the delivery, the type of product, the geographic conditions and the capability of the organisation. The case findings offer real-world examples of how companies can leverage the drone as a complementary logistics device to enhance the performance, reliability of services and strategic competitiveness of companies.

3.1.1 Amazon Prime Air

Amazon Prime Air is a concept of using drones to deliver e-commerce orders with faster speed, better convenience and hence a better customer experience. The programme is oriented to the delivery of light packages mainly for small consumer goods, by means of autonomous delivery systems that are based on aerial platforms. One of the goals of Amazon's Prime Air is to deliver orders within about 30 minutes to meet the needs of faster order fulfilment in

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competitive e-commerce markets. The model helps to decrease dependence on road-based delivery for certain parcels and facilitates the more rapid delivery in congested urban settings. Amazon Prime Air demonstrates the potential of drone logistics to enhance customer satisfaction, increase last-mile agility, and drive service innovation via automation and technology, a competitive advantage for businesses. These innovations, in general, relate to the national logistics transformation agenda, which focuses on logistics efficiency, digitalisation, and infrastructure transformation (Ministry of Commerce and Industry, 2025).
The 2024 Annual Report by Amazon suggests that reduced delivery times are of crucial importance in e-commerce logistics for a business. The increase in Amazon's total revenue from $575 billion in 2023 to $638 billion in 2024 represents a growth rate of 11%, whereas the operating income rose 86% from $36.9 billion to $68.6 billion (Amazon, 2024). The company also said for the second year in a row, it was shipping out to Prime members at record speed. Amazon says that Prime Air drones will deliver items to customers within an hour in "select markets" commercially around the world, and attributes this to faster delivery promises (which lead to purchase completion and shopping frequency).

3.1.2 UPS Flight Forward

UPS Flight Forward is an example of how drones are being used in the healthcare sector, where time, reliability and accuracy are essential. It has been used for moving medical samples, laboratory specimens, medicines and other health care supplies from hospital to hospital, clinic to clinic and medical facilities. In such environments, small delivery-time cuts can enhance performance and help to facilitate better patient-care outcomes. Drones can help to overcome the road traffic-induced delays in traditional courier transportation within healthcare networks, enhancing timely deliveries and the reliability of logistics. In this scenario, the drone serves as an extension of the supply chain, but it is not confined to commercial delivery of packages. The drone is not just for commercial parcel delivery in this case, but also for specialised supply chains where urgency, safety and reliability are key (UPS Flight Forward, 2024). Drones can also be used to deliver healthcare services to remote areas, as demonstrated in India, where primary healthcare services have been enhanced in such areas through the use of drones (World Economic Forum, 2022).

3.1.3 DHL Parcelcopter

DHL Parcelcopter is a significant case study for the transportations in remote areas and difficult terrains using a drone. The project was designed to assess the viability of remote delivery via drone in geographies that present a challenge for traditional delivery methods and/or where delivery costs are prohibitive. The tests helped DHL to prove that drones can be an aid for delivery services in mountainous, rural and remote areas, making travel times shorter and extending service areas. The case also illustrates the need for supporting infrastructure such as landing stations, routing systems and operational control systems. DHL Parcelcopter demonstrates that drones can be effectively utilised in logistics management, not just for their speed but also for their ability to reach inaccessible areas and maintain a continuous service (DHL, 2023). Applications like these are also backed by regulatory frameworks, such as the Drone Rules, 2021, in India, which facilitate regulated and safe operations with drones (Ministry of Civil Aviation, 2021; Ministry of Civil Aviation, 2022).
DHL's UAV perspective helps highlight the logistics relevance of drone delivery, which is that none of these three factors is more important than the other, but rather, the interaction of all three is what is important in enabling adoption. The report highlights that UAVs can be employed in missions which are “dull, dirty and dangerous”, such as logistics missions in difficult locations (DHL, 2023). DHL considers urban deliveries (first and last mile), rural deliveries, infrastructure surveillance and intralogistics to be important logistics uses. It also identifies electric multicopters as suitable for denser urban areas, as they are relatively silent, easier to launch and are suitable for light parcels in the controlled delivery network and for commercial scalability planning. The Drone Rules, 2021 is a significant regulation that lays

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the groundwork for drone logistics in India. As per the rules, anyone in India who owns, leases, operates, transfers or maintains unmanned aircraft systems (drones) or drones registered or operated in Indian airspace is subject to the rules (Ministry of Civil Aviation, 2021). They categorise compliance for drone operators based on the maximum takeoff weight of the drone, including nano drones (up to 250 g), micro drones (over 250 g up to 2 kg), small drones (over 2 kg up to 25 kg), medium drones (over 25 kg up to 150 kg) and large drones (over 150 kg).

3.1.4 Zipline

One of the best examples of social-impact (drone-powered) logistics is Zipline, which is focused on healthcare supply chains. Employing autonomous drones for the transportation and delivery of much-needed medical supplies like blood, vaccines, medicines and emergency supplies to remote and underserved areas. In a number of cases, delivery of medical supplies can take just a few minutes as opposed to hours, particularly during emergencies. Zipline's model provides a prime example of how drone logistics can fill the voids, enhance health access and aid public health. Zipline is not just a purely commercial delivery system; it is a value creation system with social value and operational efficiency. This case demonstrates how drones can create a business and humanitarian value in the form of better and easier access to essential goods and services (Zipline, 2021). Drones could revolutionise healthcare access and improve public health systems in India, as seen in other countries worldwide (World Economic Forum, 2020; World Economic Forum, 2024a).

Zipline is a good example of the way drone delivery can be used for commercial and public-sector delivery requirements. Zipline enables a fast and reliable delivery, which allows businesses to grow their delivery territory, access more customers, minimise traffic delays and enhance customer satisfaction. The business model applies to retail, food, pharmacy and fast delivery, where fast delivery and reliability are key. Zipline claims that its system can reach more areas, deliver orders faster, and help with more efficient order fulfilment by using drone stations and delivery drop-off infrastructure (Zipline, 2025a). Zipline is a public infrastructure example of drone logistics for governments. It has a network that is used for healthcare, nutrition, agriculture, animal health, food and retail, postal and commercial delivery. The company points out that it's able to reach rural or hard-to-reach areas, provide cold-chain storage, provide package tracking and better access to necessary supplies. Zipline says it has flown over 130 million miles and that its delivery system is as much as 90% faster than delivery on the ground. This adds to the evidence that drone logistics can have an impact on social, economic, and public-health issues when it's deployed as part of a country or region's delivery system (Zipline, 2025b).

Table 2 summarises the four selected drone logistics cases by comparing their main application, key operational findings, and business relevance for last-mile delivery systems.

Table 2. Case Study Findings of Selected Drone Logistics Models

Organization	Main Application	Key Finding	Business Relevance
Amazon Prime Air	E-commerce parcel delivery	Targets eligible lightweight package delivery within approximately 30 minutes through autonomous aerial systems	Enhances customer satisfaction, last-mile responsiveness, and competitive advantage in online retail
UPS Flight Forward	Healthcare logistics	Supports time-sensitive movement of medical samples, laboratory specimens, medicines, and healthcare supplies	Improves reliability, accuracy, and operational efficiency in healthcare supply chains
DHL	Remote-area	Demonstrates drone	Improves service reach,

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Parcelcopter	and difficult-terrain logistics	delivery feasibility in mountainous, rural, and infrastructure-limited regions	accessibility, and infrastructure learning for specialised logistics networks
Zipline	Medical supply and social-impact delivery	Delivers blood, vaccines, medicines, and emergency supplies to remote and underserved areas	Creates economic and social value by improving healthcare access and emergency response

3.2 Comparative Insights

Delivering speed is the top benefit for drones when compared with other methods. Drones can take a straight path and circumvent traffic congestion in the air, which is unlike road vehicles. This enhances responsiveness in crowded cities and in areas where the ground transport is not so fast. Another way that drone delivery has been demonstrated to be cost-effective is that it could lower the amount of fuel consumed, reliance on drivers, and the number of short-haul vehicle trips. But, cost savings are dependent on size, capacity, charging infrastructure, maintenance and compliance. The scalability is still a huge constraint. Most drone delivery systems continue to be more apt for small packages than commercial deliveries. The extent to which they can be used is limited by payload and battery capacity, weather and required landing space. The level of regulatory exposure is also very high, as the operation of a drone involves obtaining permissions for a number of regulations that involve airspace safety, flying beyond the line of sight, privacy and risk management. Hence, drone logistics adds strategic value to the business, and this is only possible if companies implement carefully integrated drone logistics with the present ground-based logistics.

Table 3 summarises the comparative performance of the four cases across major logistics dimensions.

Table 3. Comparative Insights from Drone Logistics Cases

Evaluation Factor	**Amazon Prime Air**	**UPS Flight Forward**	**DHL Parcelcopter**	**Zipline**
Delivery speed	High	High	Moderate to high	High
Cost efficiency potential	Moderate	Moderate	Moderate	High in critical medical delivery
Scalability	Developing	Specialized	Limited by geography	Strong in healthcare networks
Regulatory exposure	High	High	Moderate	High
Strategic business value	Customer experience	Healthcare reliability	Remote access	Social and healthcare impact

The results indicate three significant results. For one, logistic drones can make deliveries faster by minimising reliance on road networks. This is particularly helpful for same-day delivery, emergency delivery, and lightweight parcels. Second, a drone makes access to hard-to-reach places easier, including places with high density or medically underserved areas, disaster areas or remote areas. Third, drone systems can aid in the operational optimisation of selected trips, provide route flexibility and enable companies to create hybrid delivery networks.

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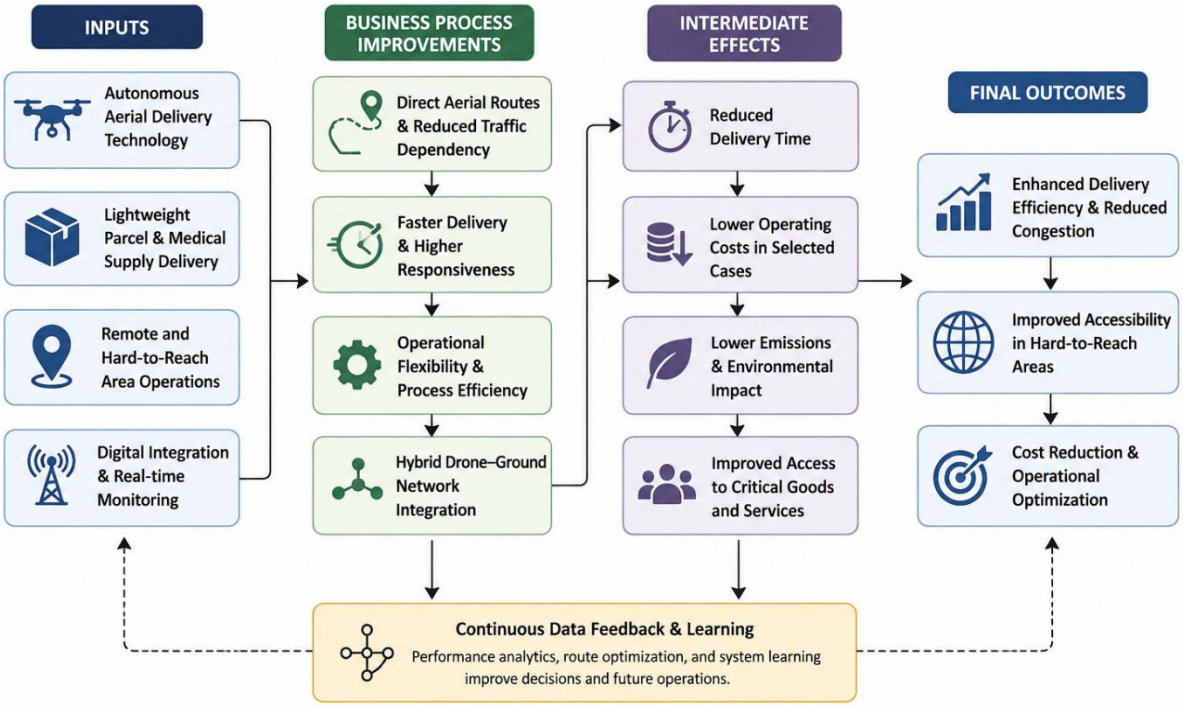

Figure 1. Outcome Pathway of Drone-Based Last-Mile Logistics

Drone logistics is an enabler of business performance, transforming tech-capability to operations as shown in Figure 1. The key route starts with the autonomous aerial delivery, thus minimising dependence on traffic and ensuring faster delivery. If applied to light-weight and urgent deliveries, they can also help to cut out vehicle deliveries and contribute to cost efficiency. The end outcome is a more flexible logistics system, which can supplement the normal logistics system instead of completely replacing it.

4. Discussion

4.1 Operational and Economic Implications

The impact of drone-powered last-mile delivery is significant as it can cut down on the need for roads, lessen response time and shorten routes. Optimisation studies indicate that drones can be used in parallel to vehicles for the delivery to certain customers or in hybrid delivery routes with vehicles (Agatz et al., 2018). This model is suitable for small parcels, urgent consignment and places where the movement on the road is slow. What is interesting is the flexible network design, with fulfilment hubs and drone stations providing better coverage, in order to make the drones more useful. According to industry analysis, the future last-mile delivery will rely on technologies such as automation, localised delivery, and cost control (McKinsey & Company, 2023). Drones could save on fuel, driver time and unnecessary trips from an economic perspective. There are capital investment, maintenance, battery replacement, insurance, personnel, and traffic management systems considerations that must be taken into account to determine the feasibility. Reported drone-powered logistics cases show that the market needs to be scaled up, regulated, and integrated with supply chain assets (PwC, 2023). So, drones must be viewed as an investment and not as an answer to all logistics problems, but rather as a selective solution.

4.2 Sustainability Considerations

For lightweight deliveries over a distance, drone logistics can be used to help to support sustainability. Flight times of electric drones are free from any tailpipe emissions, which makes them appealing for a cleaner delivery option. Drone delivery is more environmentally friendly, in certain cases, when compared to vehicle delivery, based on environmental

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research (Goodchild & Toy, 2018). Based on these factors, energy source, package weight, density of warehouses and distance of delivery, energy analysis using life cycle assessment (LCA) reveals that drones are not always the optimal choice from an environmental perspective compared with traditional vehicles (Stolaroff et al., 2018). Benefits for sustainability are not guaranteed. Drones may lose their green edge if they need to be charged often, if vehicles have to carry them as a backup or if small warehouses must be implemented. Previous studies have proposed that, according to various density, distance and energy demand scenarios, drone delivery has different performance in the urban context than in the rural context (Park et al., 2018). When considering healthcare, sustainability can encompass social aspects, as drones may help to enhance access to medicines and services (World Economic Forum, 2024b).

4.3 Adoption Challenges

Regulatory, safety, technical and social acceptance issues limit the large-scale adoption. One of the key issues is airspace management as drones need to be able to fly safely close to buildings, people, traffic and planes. The Federal Aviation Administration (2024) highlights integration planning as a key element of UAS, which includes safety, certification and traffic coordination. The Drone Rules in India outline a process for the registration, certification, and permissions of drones, as well as requirements for their compliance (Ministry of Civil Aviation, 2021). Adoption is impacted by concerns of safety and privacy. Civil uses of drones have the potential to create concerns about privacy and surveillance, data collection, cybersecurity, noise, and public trust (Finn & Wright, 2012). Public acceptance studies indicate that the acceptance of a solution depends on usefulness, risk, safety and knowledge of the technology in the case of drones (Aydin, 2019). Considerations on deployment include payload capacity, battery life, weather susceptibility, landing-zone availability and maintenance requirements. The market outlook reports indicate that autonomy, batteries, infrastructure and regulatory maturity are the four elements for growth (Morgan Stanley Research, 2024).

4.4 Strategic and Managerial Implications

Managers should assess the use of drones in terms of cost-benefit analysis, relevance of the service, operational risk and customer value. Drones are best suited for urgent deliveries of lightweight, high-value, or hard-to-reach products and not for routine bulk deliveries. The manager should determine lines of flight that can be used to achieve a measurable benefit over ground systems. A hybrid system will work, where drones are used for select routes and trucks, and vans are used for heavier deliveries. Implementation will additionally need training, partnerships, data systems, security and communication. Drone logistics needs to be a strategic asset in firms for their customer experience and resiliency.

4.5 Policy and Governance Considerations

Policy and Governance are key enablers of Responsible Drone Logistics. Before deployment, the rules of airspace, safety standards, pilot certification, permission and liability rules need to be clear. Data privacy should be taken into account as drones could take photos and other data, including location and operational information, during delivery. Drone corridors, drone landing areas, charging stations, and emergency plans must be taken into account by urban planning authorities. Drone logistics has an impact on businesses, regulators, communities and infrastructure providers, hence the need for public-private collaboration. With good governance, safety, privacy and public trust can be safeguarded.

The evidence gleaned from the industry and regulatory review further indicates that the adoption of drone logistics is dependent on technological feasibility, as well as on governance, market readiness and integration. DHL points out that the three factors are interdependent, and technological capability, regulatory pressure, and public acceptance are all important factors in the deployment of UAVs. Likewise, the Drone Rules, 2021 for India have laid down

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the proper guidelines regarding drone classification, registration, certification, safety features, and operational areas. The report further reveals that speed continues to be a priority for Amazon's business, and Prime Air is expected to play a role in fulfilling its future speedy delivery needs. Based on these insights, it seems that balanced drone logistics should be adopted, in which innovation, compliance, infrastructure planning and customer value creation play a role.

5. Conclusion

The findings of this study lead to the conclusion that drone technology can play an important role in improving the last-mile logistics in urban areas and make the delivery more flexible, time-efficient and accessible. Especially for certain delivery tasks in cities with traffic jams, booming volumes of e-commerce and customers with higher expectations, drones are an innovative delivery solution. They are particularly beneficial in situations where packages need to be delivered quickly, reliably, and safely, such as those with a high value, urgency, and/or difficulty of access. But, drones aren't necessarily replacements for traditional delivery trucks. They can't be used for large-scale or heavy volume logistics due to payload capacity, battery life, weather, landing facilities, operational safety and regulatory approval. It's more realistic to incorporate the drone as a complementary means of transport in hybrid logistics networks. In such systems, drones might be used for special routes or special deliveries, and trucks and vans will still be used for bulk and routine deliveries. The regulatory support, safe air space management, certification systems, and operating compliance will be essential to the successful implementation of these. Other infrastructure readiness will also be crucial, such as charging stations, landing points, a digital monitoring system, and/or integration with a warehouse or a fulfilment centre. The public needs to be informed and to feel good about it, and issues of safety, noise, privacy, and trust could be factors impacting adoption. From a managerial point of view, the aspects of drone logistics are to be carefully planned and assessed in terms of investment, risks, and business strategy. Drones should be a business choice where they can be seen to have an impact on operational or customer-service activities. This study offers a novel understanding of drones' technology capabilities and their relationship to operational performance, sustainability and strategic business value, which adds to business and management literature. Research in the future should focus on empirical field studies, cost-benefit analysis, consumer acceptance and environmental impact, as well as comparisons between different countries, in order to facilitate the development of drone logistics on a global scale.

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