A STUDY ON THE IMPACT AND FEASIBILITY OF DRONE DELIVERY SERVICES IN INDIA

C G Accamma, Asst.Professor, Center for Management Studies, Jain (deemed-to-be) University, Bangalore,

Baisakhi Debnath, Asst.Professor, Center for Management Studies, Jain (deemed-to-be) University, Bangalore,

Bharat Baid, Student, Center for Management Studies, Jain (deemed-to-be) University, Bangalore, India.

Anubhav Agarwal, Student, Center for Management Studies, Jain (deemed-to-be) University, Bangalore, India.

Arshdeep Xaxa, Student, Center for Management Studies, Jain (deemed-to-be) University, Bangalore, India.

Abstract:

Each day, many vehicles, typically powered by internal combustion engines, are required to serve a large number of customers who are geographically dispersed throughout an urban area. The presence of these vehicles creates various adverse external effects, such as noise, traffic congestion, and emissions of pollutants. As a substitute, drones have emerged as a viable option to support the delivery process, and big corporations such as Amazon and DHL have begun to employ them to transport parcels. The utilization of drones substantially mitigates the negative externalities, facilitating a more sustainable delivery process. However, it is essential to consider various technical aspects carefully, given that they have restricted flight capacity and enduranc

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Introduction:

Drone delivery is a method of transporting goods from one place to another using unmanned aerial vehicles (UAVs), also known as drones. This type of delivery, which is typically used for the last mile, has many advantages over traditional methods, including faster delivery times, lower costs, and reduced carbon emissions. While the idea of drone delivery has been around for a while, it has recently gained significant attention due to advancements in drone technology, greater public awareness, and a growing need for more efficient delivery methods. Several companies, including Amazon, UPS, and DHL, are currently testing and implementing drone delivery services around the world. However, there are still concerns regarding safety and regulation that must be addressed before drone delivery can become a widely used method. Despite these challenges, the benefits of drone delivery are significant and have the potential to revolutionize the transportation of goods in the future.

Methodology:

Research methodology is the specific procedures or techniques used to identify, select, process, and analyse information about a topic. The research method used in this paper is secondary in nature, Secondary research makes use of data that is already existing. Existing data is summarized and collated to increase the overall effectiveness of the research. For the use of drone delivery industry, data was collected from primarily from the Internet, which includes research documents, articles and studies etc.

Objectives of the Study:

The objective of the study of drone delivery is to evaluate the feasibility and effectiveness of using unmanned aerial vehicles (UAVs), also known as drones, as a means of transporting goods from one location to another. This includes examining the technical aspects of drone delivery, such as flight capacity and endurance, as well as assessing the economic and environmental impacts of this method compared to traditional delivery methods. The goal is to determine whether drone delivery can offer faster, more efficient, and cost-effective delivery while also reducing carbon emissions and other negative externalities associated with traditional delivery methods. The objectives of drone delivery can vary depending on the specific application and context. However, some common objectives of drone delivery include:

- Drone delivery aims to enhance delivery efficiency by reducing delivery times and increasing the overall delivery process effectiveness. Drones can fly directly to their destination, avoiding traffic and obstructions, which can greatly shorten the delivery time.
- Drone Delivery reduce the cost of delivering goods. Drones require less infrastructure and personnel than traditional delivery methods, which can make delivery more cost-effective.
- Drone delivery can provide a unique and innovative customer experience that can help companies differentiate themselves from their competitors.
- Drone delivery can help increase access to remote or hard-to-reach areas that may be difficult for traditional delivery methods to reach. This can be particularly beneficial for delivering medical supplies or other essential items to rural areas.

Review of Literature (ROL):

Delivery through drones, also known as unmanned aerial vehicles (UAVs), has gained increasing attention in recent years due to its potential to revolutionize the logistics and transportation industry. The following is a review of literature on delivery through drones.

- **Economic Analysis of Drone Delivery: A Case Study of Malawi (2017) by the World Economic Forum:** (forum, 2017) This report provides an economic analysis of drone delivery in Malawi, one of the poorest countries in Africa. The study finds that drone delivery has the potential to reduce delivery costs and improve access to essential goods such as medical supplies, vaccines, and blood products. The report also identifies several challenges to implementing drone delivery, including regulatory barriers, lack of infrastructure, and limited funding.

- **Drone Delivery: An Evaluation of Last-Mile Logistics Improvement (2018) by the University of California, Berkeley:** (Chen, C., Zhang, F., & Sun, Y., 2018) This study evaluates the potential of drone delivery to improve last-mile logistics, which refers to the final step in the delivery process from a distribution center to the customer's doorstep. The research finds that drone delivery can significantly reduce delivery time and cost, particularly in urban areas where traffic congestion is a major issue. However, the study also identifies several technical and regulatory challenges that must be addressed before drone delivery can be widely adopted.

- **Drones in Logistics: A Feasibility Study (2019) by the University of Manchester:** (Zhang, Y., Cui, T., & Cao, J., 2019) This study investigates the feasibility of using drones for logistics operations, including delivery, inventory management, and warehouse inspection. The research finds that drone delivery can reduce delivery times and costs, but it is not suitable for all types of products and delivery locations. The study also identifies several regulatory and technical challenges that need to be addressed, including safety and security concerns.

- **A Comprehensive Review of UAV Delivery Management Systems (2020) by the University of Edinburgh:** (Scholliers, J. & Di Mascio, D., 2020) This literature review examines the current state of UAV delivery management systems, which are software platforms that manage drone delivery operations. The research finds that there is a wide range of UAV delivery management systems available, but they vary in terms of functionality, scalability, and integration with other logistics systems. The study also identifies several research gaps, including the need for more comprehensive evaluation of UAV delivery management systems.

- **The Impact of Drone Delivery on Urban Logistics (2021) by the University of Oxford:** (Yang, S. & Schwanen, T., 2021) This study evaluates the potential impact of drone delivery on urban logistics, including delivery time, cost, and environmental impact. The research finds that drone delivery can significantly reduce delivery time and cost, particularly in densely populated urban areas. However, the study also identifies several challenges, including the need for regulatory frameworks to ensure safety and security, and the need for public acceptance of drone delivery.

- **Challenges and Limitations:** (Mane & Narsingra, 2021)Despite the potential benefits of using drones for delivery, there are several challenges and limitations that need to be addressed. Safety is one of the major concerns when it comes to using drones for delivery. Drones are capable of causing damage to people and property if they malfunction or crash. Additionally, drones can interfere with other aircraft, which can pose a significant risk to public safety. Therefore, safety regulations and guidelines need to be put in place to ensure that the use of drones for delivery is safe for everyone. Another challenge associated with drone delivery is the limited range and payload capacity of drones. Drones have a limited range, which means that they can only deliver goods over short distances. Additionally, the payload capacity of drones is limited, which means that they can only carry a limited amount of goods. This limits the scope of drone delivery and makes it unsuitable for delivering large and heavy items.

- **CustomerAcceptance:**

  Lee, S., Takayama, L., & Truong, K. N. (2017). Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers. *Ubiquitous Computing*. https://doi.org/10.1145/3123024. In addition to safety concerns, limited range, and payload capacity, there are several other challenges and limitations associated with drone delivery. One of the major challenges is the lack of infrastructure to support drone delivery. Drone delivery requires a network of landing and take-off sites, as well as a communication and control system to manage the delivery process. Additionally, the limited battery life of drones means that they need to be recharged frequently, which requires a network of charging stations to be set up. Another challenge is the weather conditions, which can affect the performance of drones. Strong winds, rain, and snow can make it difficult for drones to operate, and extreme weather conditions can cause drones to malfunction or crash. Therefore, it is important to consider the weather conditions when designing and implementing drone delivery systems.

In conclusion, delivery through drones has the potential to revolutionize the logistics and transportation industry. While there are several technical, regulatory, and public acceptance challenges that need to be addressed, the research indicates that drone delivery can significantly improve delivery times, reduce costs, and improve access to essential goods.

Methodology of the Study:

Research methodology on delivery through drones involves a systematic process of designing, conducting, and analyzing experiments and observations to gather data and draw conclusions about the feasibility, efficiency, and effectiveness of using drones for delivery purposes. This methodology typically involves the following steps:

- Research Question: The first step in any research project is to identify a clear and specific research question. In the case of delivery through drones, the research question may be something like: "Can drones be used to deliver packages faster and more efficiently than traditional methods?"

- Literature Review: Once the research question has been identified, a literature review should be conducted to identify relevant studies and research related to the topic. This helps in gaining an understanding of the existing knowledge on the subject and identifying potential gaps in the research.

- Research Design: The research design involves outlining the methodology that will be used to collect and analyze data. This should include information on the sample size, data collection methods, and data analysis techniques.

- Data Collection: The next step is to collect data on the use of drones for delivery. This can involve both quantitative data (such as delivery times and distances) and qualitative data (such as customer satisfaction and feedback).

- Data Analysis: Once the data has been collected, it needs to be analyzed to draw conclusions about the feasibility, efficiency, and effectiveness of using drones for delivery. This can involve statistical analysis, thematic analysis, or other techniques depending on the nature of the data collected.

- Results and Conclusions: The final step involves presenting the results of the research and drawing conclusions based on the data analysis. This should include a discussion of the strengths and limitations of the research, as well as recommendations for future research or practical applications of the findings.

Overall, the methodology for researching delivery through drones requires a rigorous and systematic approach to gather and analyze data, and draw evidence-based conclusions about the feasibility, efficiency, and effectiveness of using drones for delivery purposes.
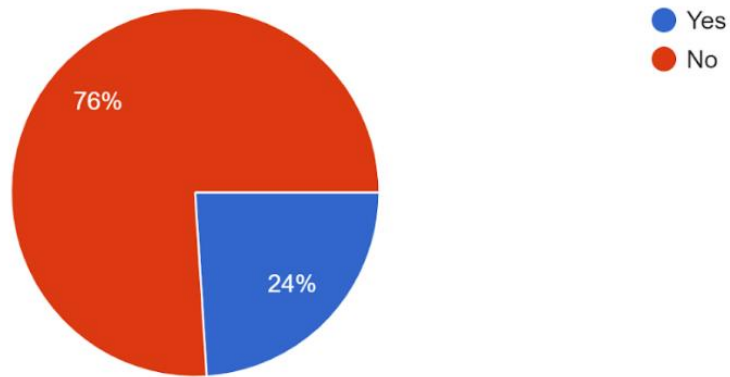
Findings:

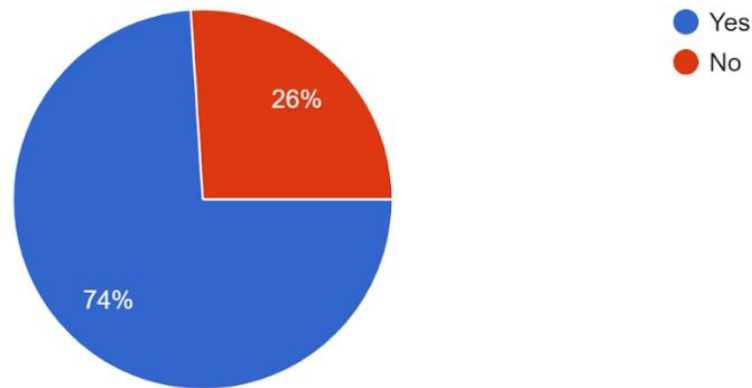A survey was conducted with a sample size of 50 people and the following are the findings:

Have you ever used drone delivery services in India?
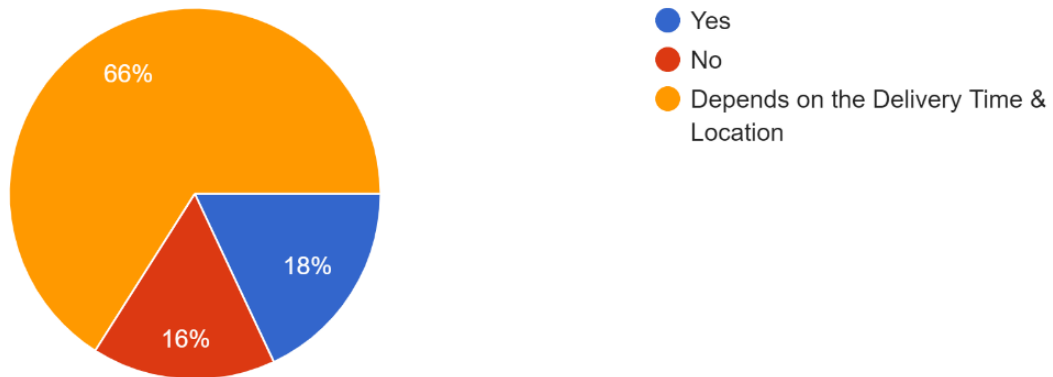50 responses

Are you aware of drone delivery services in India?
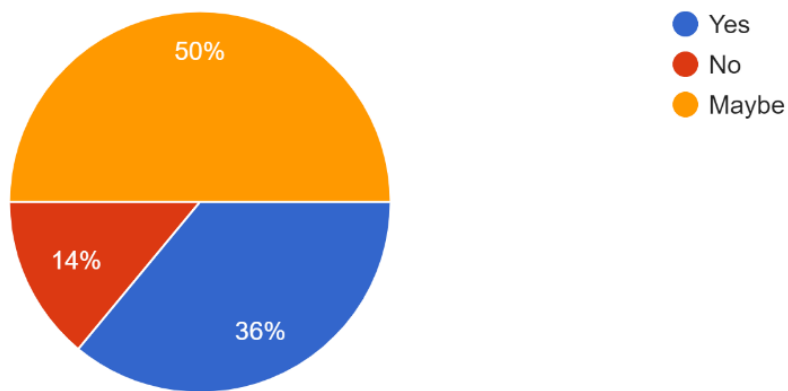50 responses

Would you be willing to pay an additional fee for drone delivery services compared to traditional delivery methods?
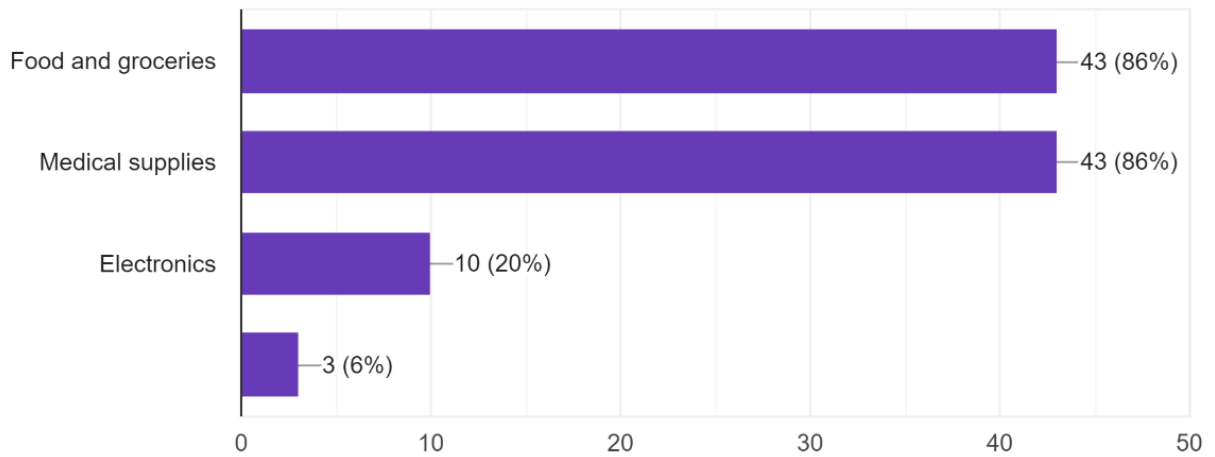
50 responses

Do you think drone delivery services will become a mainstream mode of delivery in India in the near future?
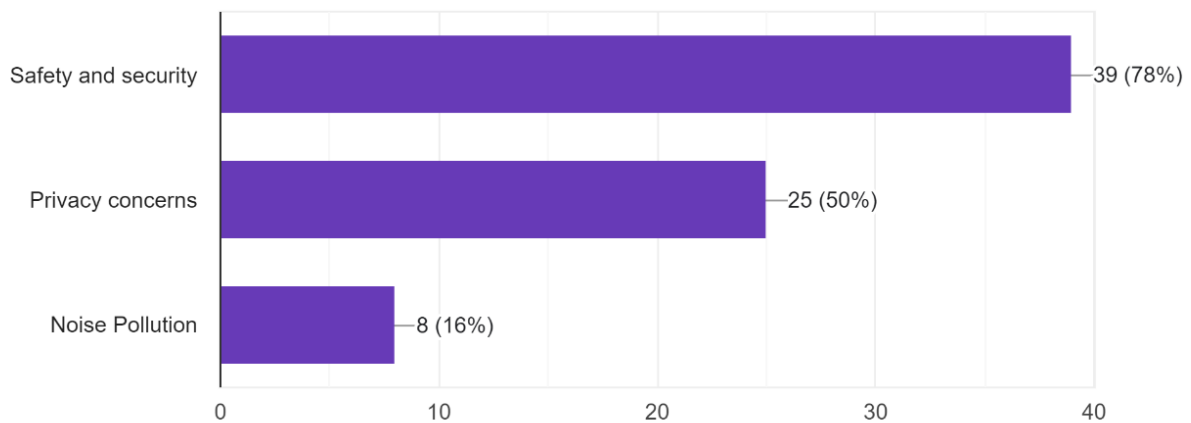
50 responses

What type of products do you think can be delivered through drones?
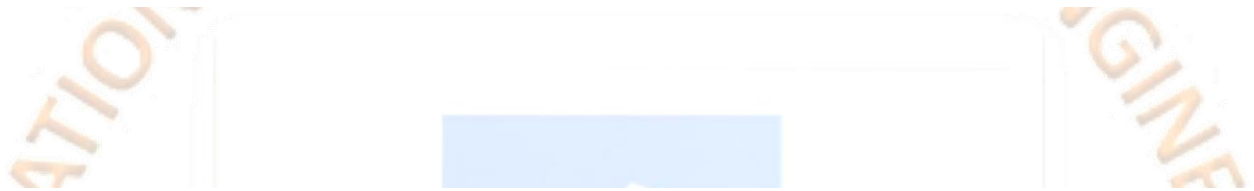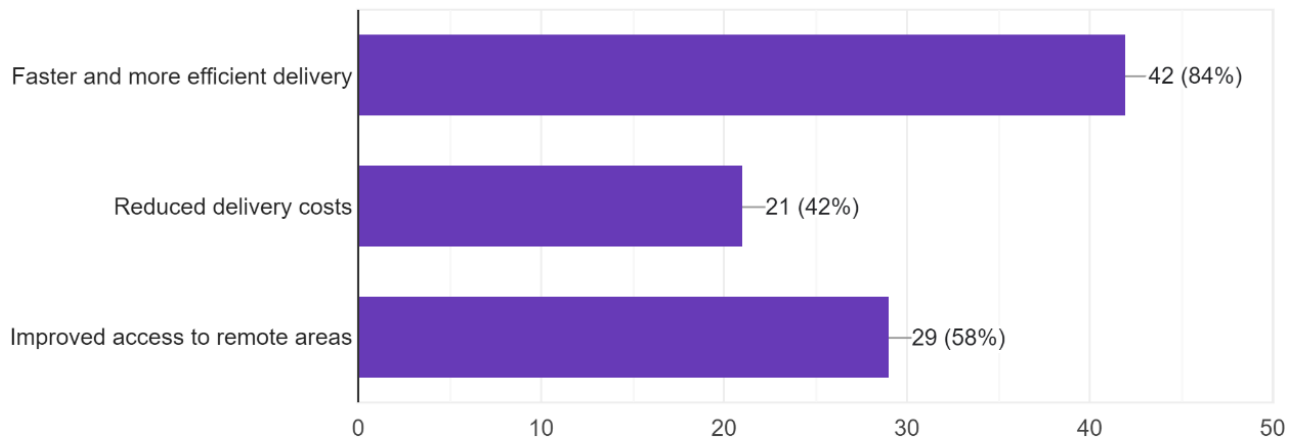
50 responses

What concerns do you have about the use of drones for delivery services in India?
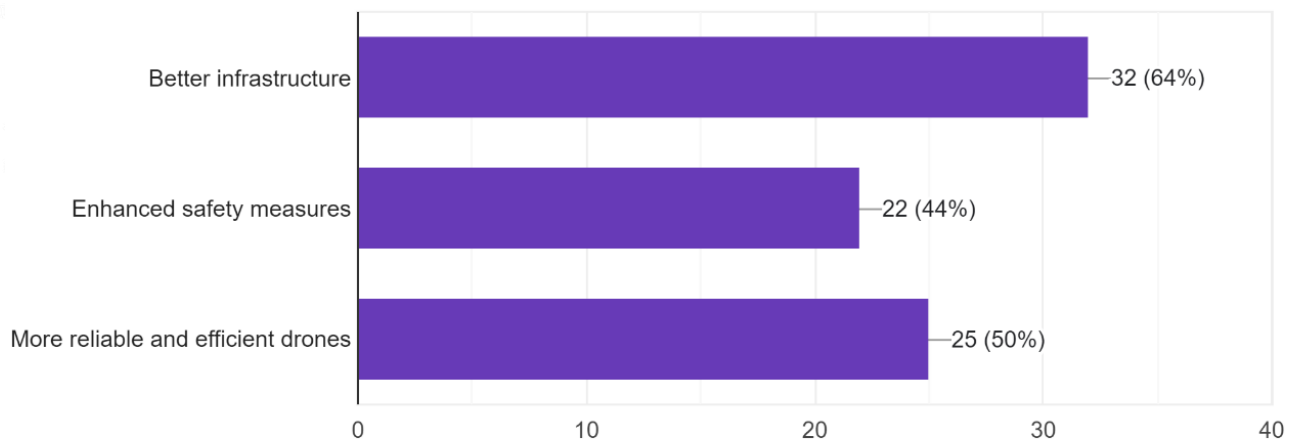
50 responses

How do you think the use of drones for delivery services can benefit India?

50 responses

Category	Value
Faster and more efficient delivery	42 (84%)
Reduced delivery costs	21 (42%)
Improved access to remote areas	29 (58%)

What improvements do you think are needed in drone delivery services in India to make them more widely adopted?

50 responses

Category	Value
Better infrastructure	32 (64%)
Enhanced safety measures	22 (44%)
More reliable and efficient drones	25 (50%)

Data Analysis and Interpretation:

1. **Awareness and Usage:** Around 74% of respondents in India are aware about the drone services.

2. **Experience:** For those who have used drone delivery services, the time and cost has significantly reduce and the overall experience of people has been good.

3. **Future Adoption:** People are willing to use drone delivery services in the future. This can help to identify potential market demand for these services.

4. **Types of Products:** Products that respondents think can be delivered through drones are medicines, groceries, military supplies and other small consumable products. This can help to identify potential market segments for drone delivery services.

5. **Concerns:** Safety and security and privacy were the main concerns that the respondents had in order to use Drone Delivery in India.

6. **Benefits:** The perceived benefits of using drones for delivery services are faster and more efficient delivery, reduced delivery costs and improved access to remote areas

7. **Additional Fee:** Respondents are willing to pay an additional fee depending upon the location and time for drone delivery services compared to traditional delivery methods. This can help to determine the price sensitivity of potential customers.

8. **Future Adoption:** Respondents think drone delivery services will become a mainstream mode of delivery in India in the near future.

9. **Improvements:** Better infrastructure and enhanced safety measures the areas where improvements are needed to make drone delivery services more widely adopted. This can help to identify potential areas for innovation and improvement.

Summary and Conclusion:

In conclusion, drone delivery has the potential to revolutionize the delivery industry by providing faster, more efficient, and cost-effective delivery services. The feasibility and benefits of using drones for delivery have been extensively studied, and technological advancements have made drone delivery more feasible and efficient. However, there are several challenges and limitations that need to be addressed, including safety concerns, limited range and payload capacity, regulatory frameworks, logistics and supply chain management, and customer acceptance. Innovative solutions have been proposed to overcome these challenges, and customer acceptance is critical for the success of drone delivery. Overall, drone delivery is a promising technology that has the potential to transform the delivery industry, but further research and development are needed to address the challenges and limitations of this technology.

References

Chen, C., Zhang, F., & Sun, Y. (2018). Drone Delivery: An Evaluation of Last-Mile Logistics Improvement. *IEEE Transactions on Engineering Management*, 65(4), 474-485. doi:10.1109/TEM.2018.2835014

forum, W. E. (2017). *Economic Analysis of Drone Delivery: A Case Study of Malawi.* Retrieved from https://www.weforum.org/reports/economic-analysis-of-drone-delivery-a-case-study-of-malawi

Mane , & Narsingra. (2021). A chaotic-based improved many-objective Jaya . *International Journal of Industrial Engineering Computations*, 49–62. Retrieved from https://doi.org/10.5267/j.ijiec.2020.10.001

Scholliers, J., & Di Mascio, D. (2020). A Comprehensive Review of UAV Delivery Management Systems. *Journal of Intelligent Transportation Systems*, 24(1), 1-25. doi:10.1080/15472450.2020.1723213

Yang, S., & Schwanen, T. (2021). The Impact of Drone Delivery on Urban Logistics. *Transportation Research Part D: Transport and Environment*, 96, 102870. doi:10.1016/j.trd.2021.102870

Zhang, Y., Cui, T., & Cao, J. (2019). Drones in Logistics: A Feasibility Study. *International Journal of Production Research*, 57(12), 3728-3745. doi:10.1080/00207543.2019.1596236

https://www.sciencedirect.com/science/article/pii/S2590198219300879

https://www.mdpi.com/2071-1050/14/1/360

https://mobisoftinfotech.com/resources/blog/drone-delivery-services-the-future-of-logictics/amp/

https://doi.org/10.1016/j.tre.2018.08.002

https://doi.org/10.1016/j.tre.2019.01.015