

Researchers explore how retail drone delivery may change logistics networks

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Credit: University of Texas at Dallas

Researchers at the University of Texas at Dallas say drone technology has the potential to be a genuine game changer in the retail industry, with its promise to enable retailers to offer unheard-of delivery lead times

and near-perfect delivery-time customization adaptability.

In a new study, recently published online in *Production and Operations Management*, three faculty members from the Naveen Jindal School of Management explored how [drone delivery](#) could change retail logistics networks. The paper focuses on the use of customer-facing [delivery](#) centers, also known as last-mile warehouses.

Dr. Milind Dawande, professor of [operations management](#) and one of the paper's co-authors, said last-mile retail delivery via drones is being viewed as a truly disruptive technology. Retailers worldwide are pursuing approaches to enable faster delivery, and drones arguably represent the most encouraging technological innovation toward this goal, he said.

The study found that both the number of last-mile warehouses and the delivery speed of the drones will increase as technology matures. In other words, last-mile delivery networks will become more decentralized, with drones operating at increasingly faster speeds.

The analysis also showed that while perfect customization of delivery-time guarantees is more profitable, retailers can capture a sizeable portion of the profit by partitioning their market into a few zones and offering the best-possible delivery-time guarantee for each zone.

"If a retailer promises each customer a different delivery time based on the customer's location, that would be perfect customization," Dawande said. "For example, a retailer could give any customer who is one mile away a delivery-time guarantee of five minutes and a customer 1.5 miles away a delivery-time guarantee of seven minutes. While perfect customization is theoretically best for the retailer, it is impractical. Instead, the retailer might offer all customers less than five miles away a guaranteed delivery time of 15 minutes.

"In other words, limited customization is good enough."

Faster delivery times are more profitable because it implies more demand, Dawande said. Customers' needs are time-sensitive. For example, if a retailer promises delivery of a book in 15 minutes, the demand is likely to go up, as compared to a three-day delivery promise.

The researchers note that increasing delivery speed of drones can help improve profitability only if it is accompanied by an increase in the number of last-mile warehouses. Therefore, in congested markets, where the number of warehouses cannot be increased, the retailer may find it best to offer a delivery speed that is lower than the highest-possible speed.

Before [drone](#) technology can become widely adopted, however, privacy and safety issues need to be solved, Dawande said, as well as regulations coordinating drone travel and the public perception of fleets of drones flying overhead. The paper points to pilot programs testing the technology.

"It would be reasonable to assume that drone technology is maturing quickly, and we should see a commercial rollout on a larger scale in the not-too-distant future. The COVID-19 pandemic will perhaps hasten this process," said Dawande, who is also the Mike Redeker Distinguished Professor in Management.

Drones might be particularly appealing to customers concerned about both delivery safety and delivery speed, he said. Hands-free delivery to one's doorstep will be an advantage drones can offer in the post-COVID-19 era.

The analysis is also applicable to other dedicated delivery vehicles, such as delivery robots and electric bikes, which many retailers are testing.

The researchers noted that further research is needed into how last-mile delivery capacity might be allocated between drones and traditional approaches such as delivery trucks. On the one hand, drone delivery can enable fast delivery times and minimize the cost of human labor by using dedicated aerial vehicles that fly directly from a delivery center to the customer's location. On the other hand, delivery trucks have the capability of making multiple stops during a trip. The researchers predict that retailers will use both in order to benefit from their respective strengths.

More information: Sandun Perera et al. Retail Deliveries by Drones: How Will Logistics Networks Change?, *Production and Operations Management* (2020). [DOI: 10.1111/poms.13217](https://doi.org/10.1111/poms.13217)

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