

MIT Mobility Forum 4/21/23

Matthias Winkenbach “Last Mile Logistics on Steroids”

Annotated by James Shaw

#### Part 1- Literature:

Aurambout, JP., Gkoumas, K. & Ciuffo, B. Last mile delivery by drones: an estimation of viable market potential and access to citizens across European cities. *Eur. Transp. Res. Rev.* 11, 30 (2019).  
<https://doi.org/10.1186/s12544-019-0368-2>

Mohammad Moshref-Javadi, Ahmad Hemmati, Matthias Winkenbach,  
A truck and drones model for last-mile delivery: A mathematical model and heuristic approach, *Applied Mathematical Modelling*, Vol. 80, 290-318 (2020) <https://doi.org/10.1016/j.apm.2019.11.020>

Carolynne Lord, Oliver Bates, Adrian Friday, Fraser McLeod, Tom Cherrett, Antonio Martinez-Sykora & Andy Oakey (2023) The sustainability of the gig economy food delivery system (Deliveroo, UberEATS and Just-Eat): Histories and futures of rebound, lock-in and path dependency, *International Journal of Sustainable Transportation*, 17:5, 490-502, <https://doi.org/10.1080/15568318.2022.2066583>

Sorooshian S, Khademi Sharifabad S, Parsaee M, Afshari AR. Toward a Modern Last-Mile Delivery: Consequences and Obstacles of Intelligent Technology. *Applied System Innovation*. 2022; 5(4):82.  
<https://doi.org/10.3390/asi5040082>

André Snoeck, Daniel Merchán, Matthias Winkenbach, Revenue management in last-mile delivery: state-of-the-art and future research directions, *Transportation Research Procedia*, Volume 46, 2020, Pages 109-116, <https://doi.org/10.1016/j.trpro.2020.03.170>

#### Part 2- News Articles:

Frey, S., Am, J. B., Doshi, V., Malik, A., & Noble, S. (2023, February 6). *Do consumers care about sustainability & ESG claims?* McKinsey. Retrieved May 8, 2023, from <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/consumers-care-about-sustainability-and-back-it-up-with-their-wallets#/>

Glasscock, J. (2022, August 31). *Leveraging technology to build reliability and same-day delivery at scale*. FreightWaves. Retrieved May 8, 2023, from <https://www.freightwaves.com/news/leveraging-technology-to-build-reliability-and-same-day-delivery-at-scale>

Meyersohn, N. (2023, May 5). *Big Apple's latest traffic jam: On-demand, ultra-fast delivery services are hobbling the city*. WRAL TechWire. Retrieved May 8, 2023, from <https://wraltechwire.com/2023/05/05/big-apples-latest-traffic-jam-on-demand-ultra-fast-delivery-services-are-hobbling-the-city/>

Ryan, T. (2022, October 7). *Can retailers sustain their current delivery practices?* RetailWire. Retrieved May 8, 2023, from <https://retailwire.com/discussion/can-retailers-sustain-their-current-delivery-practices/>

Tarasov, K. (2022, November 11). *A first look at Amazon's new delivery drone, slated to start deliveries this year*. CNBC. Retrieved May 8, 2023, from <https://www.cnbc.com/2022/11/11/a-first-look-at-amazons-new-delivery-drone.html>

#### Part 3- Q&A Between John Moavenzadeh and Matthias Winkenbach:

Q: Do you see potential pricing of instant gratification (i.e. can/will retailers charge consumers more if they order in a less efficient manner)? And if so, are consumers still willing to pay for that instant gratification?

A: Yes- the question is if individuals/retailers want to price it; even if consumers are willing to pay extra (which they may not as consumers are used to rapid delivery), companies probably won't charge extra because the ability to provide such quick delivery is what sets companies apart and differentiates Amazon/Walmart from others who aren't able to do rapid delivery as cost-effectively w/ as much volume. However, making consumers aware of the negative environmental impact of such rapid, inefficient delivery can dissuade/influence consumers' behaviors.

Q: If you were speaking to mayors, developers, etc., what would you tell them about the fabric of the city from an urban design perspective moving forward (from a logistics/delivery lens)?

A: It is important to think about the land use in cities with regard to what spaces generate the least amount of revenue per sq. ft. These spaces are most likely to be the ones replaced by logistics activities/micro-fulfillment centers. These spaces might be parking garages, former retail spaces, or even apartments; we should think about which spaces are the most likely to be replaced, and if we want that from a societal/political point of view.

#### Part 4- Q&A (From Chat by Bhuvan Atluri):

Q: If companies are not willing to price in the cost of inefficient ordering, is there a role for policy/regulation (how else do we get sustainability)?

A: Regulation usually does not fix the problem, and unfortunately can make it worse; the question is rather: how do we accept human imperfection/behavior. The question is how to improve the flexibility of delivery systems. Amazon & others attempt to predict individuals' erratic behavior to improve sustainability. Cities, likewise, can think about providing better infrastructure for more sustainable delivery. Can we create spaces for safe and unattended deliveries (this can allow for consolidated shipments/routes)?

Q: Where can the consolidation of food delivery happen? Double parking, high level of inefficiency, etc, has created lots of problems that are getting worse.

A: Looking at food delivery in an Indian context (more unsafe, congested), again, difficult to change consumer behavior. As you can't change demand size, the question is how to keep up with demand but require fewer resources. For example, how to connect orders, connect restaurants, and consolidate routes; too many examples of 1-order vehicles. Other investments can help with sustainability such as improving bikability and removing motor vehicles.

### Part 5- Summary of Memos:

McKenzie wonders if more publicly beneficial delivery initiatives (i.e. supplying medicine to rural areas, delivering basic supplies to areas affected by natural disasters) are being prioritized by Winkenbach's research. McKenzie would also have liked to see some of the negative influences of on-demand delivery (i.e. double parking, congestion) and how companies are addressing sustainability issues addressed.

Soichi discusses the increasing complexity of the supply chain and how companies will need to optimize/change their supply chains more frequently with a higher level of flexibility. Soichi also points out that some business/delivery models, such as those in India, are simply not sustainable in the long run due to the current low cost of labor that won't last as economies develop.

Nineveh, similarly to McKenzie, would have liked to see more justification provided for on-demand delivery as a beneficial social good. Nineveh also would have liked to see Winkenbach's work discussed more intersectionality with the implications of his work, especially with regard to urban planning.

Yen-Chu wonders how drones and autonomous tech. will be realized in the real world, especially given the enormous regulatory, economic, and environmental hurdles Winkenbach discusses.

Jason is interested in the AI side of Winkenbach's research and highlights that it may prove to be the biggest game-changer in innovation for logistics. Jason also doesn't necessarily believe that a researcher must be involved with the applied side of their research for it to be useful, and that some of Winkenbach's work on the supply-chain volatility side might become less useful as we move away from the COVID shock.

Yunhan wonders about the social acceptance of drone deliveries; many people may be concerned about the safety and privacy implications of drone delivery. In general, Yunhan believes that we must take a very careful approach to implementing new drone technology due to social and environmental concerns.

Michael is interested in the interplay between (1) the possibility of that on-demand deliveries may never be able to compete with the current status quo, and (2) the possibility that deliveries may become efficient and consolidated enough to remove the need for many personal vehicles.

Spencer highlights the view of Winkenbach that drones will likely not be used for direct business/distributor-to-customer delivery, but serve as midday resupplies for traditional ground delivery due to the high cost and complex regulatory framework associated with operating drones.

Samuel reflected on the use of instant-gratification by Amazon and other delivery services as something that should be better managed; while the instant-gratification provided by rapid delivery is a draw for many customers, companies must make sure to move forward in a sustainable manner, especially as new technologies/methods such as drones emerge.

Ao was impressed by Winkenbach's bringing together of visual design, deep learning, and operations research. Ao also reflected on the importance of Winkenbach's discussion of the role of AI in augmenting

human workers rather than replacing them; the relationship between humans and machines is rapidly evolving.

### My Reflection

In general, I would say that I can identify with some of the pessimistic / let down themes that some individuals expressed regarding Winkenbach's presentation. With a subject such as last-mile delivery, I think it's easy to approach any discussion with an anti-vehicle, anti-rapid-delivery bias simply due to our understanding of how unsustainable the system is as it exists today. Add on top of that bias a meager emphasis on theoretical sustainability (and a bad image of the industry today), and it seems clear why more justification was needed as to why, as a society, we should care/invest/allow for instant-gratification delivery to begin with. Similarly, I felt as though justification was needed for Winkenbach's broad statement that regulation (such as something in an attempt to promote more sustainable delivery practices) does not usually work or makes things worse.

With regard to Winkenbach's discussion of AI and drones, I am somewhat conflicted. On the one hand, I do feel as though Winkenbach promoted more realistic ideas about AI and drone implementation than full autonomy or drone-to-door delivery, however, I have grown biased over time regarding what seems to be an overemphasis on innovation/new tech in the transport/delivery fields; in other words, the drones Winkenbach mentions seem to be a delivery-gadgetbahn with little likelihood of soon, beneficial implementation.