Simulating Crowd-Sourced Logistics for the Last Mile Challenge

Over the past twenty years, the rapid growth of ecommerce has led to an evolution in supply chain management strategy and practice. Today's omni-channel mindset of filling demand from any location at anytime has resulted in a need for supporting distribution and inventory management strategies. Combined with strict customer requirements, the need for retailers to efficiently and effectively deliver an order in the same day directly to the customer is crucial. Amazon has provided a futuristic glimpse into how it may perform same-day delivery service with its proposed fleet of drones (Amazon 2015). DHL has evaluated the use of bicycle couriers in large European cities (DHL 2014). Others have sought to adapt innovations from the so-called "sharing economy" where customers are connected with independent service providers via a common platform.

New types of companies have emerged, such as Über, Lyft, and Sidecar that facilitate ridesharing services, where a customer requests a ride via a mobile application and an independent driver agrees to perform the service. Classified as Transportation Network Companies (TNC) by some jurisdictions (Anderson 2014), these companies are now amending their services to facilitate the pickup and delivery of goods, but they face significant challenges. For example, drivers are independent contractors who are free to manage their own schedule. This creates uncertainty for shippers in the size and availability of the fleet of drivers. Thus, crowd-sourcing delivery drivers may be less reliable than a courier company owning a dedicated fleet of vehicles. However, the growth of Über and the rapid emergence of new logistics providers also using this model suggests otherwise. The efficacy of Crowd-Sourced Logistics (CSL) as a distribution management strategy is not yet understood and is the underlying motivation for this research effort.

We seek to understand how using CSL as a same-day delivery strategy compares to using an owned fleet of vehicles in terms of efficiency, effectiveness, and cost in different cities. In doing so, we also examine how a TNC manages its contracted drivers to match the supply of available drivers to customer demand. We employ a discrete event simulation to investigate two research questions. *What is the effect on logistics performance of using a crowd-sourced fleet of vehicles for same day delivery service under varying market conditions? Under what market conditions should a TNC employ a supply management strategy to meet demand or vice-versa?*

Due to the inherent uncertainty of complex logistics problems and stochastic nature of supply chains, simulations are well equipped for supply chain management research (Bowersox and Closs, 1989; Goldsby, Griffis, and Roath, 2006). We draw upon previous research on variants of the vehicle routing problem (Dantzig and Ramser, 1959) that simulate courier services (Gendreau et al 2006, Van Hentenryck and Bent 2006) and same-day delivery services (Boyer et al 2009, Campbell and Savelsbergh, 2005) to introduce a variable vehicle supply to study the effects of CSL upon logistics performance. The simulation parameters are based on secondary data and are validated with key informant interviews from courier providers in major American cities.

These are questions of critical and timely importance as the prevalence of the "sharing economy" continues to rise. Über has proven to be a disruptive force to the taxi industry, inciting protests and consternation from taxi drivers all over the world. Logistics service providers similarly have a significant incentive to understand how "Über for logistics" will affect last-mile operations.