ABSTRACT

Le, Tho V. Ph.D., Purdue University, Dec 2018.
Dissertation title: Demand and Supply Modeling of Crowd-shipping Markets for First/Last Mile Delivery.
Major Professor: Satish V. Ukkusuri.

The rise of technologies such as smart phones and the Internet have provided opportunities to connect logistics demand and supply using the crowd. In this system, named crowd-shipping (CS), a requester doing the shipping selects a courier via a platform. In reality, the idea of CS have been explored by many firms over the last several years. However, there is a lack of fundamental understanding of the issues related to: (1) the markets that are likely to be influenced by CS; (2) the considerations that govern the success of this system; and the (3) the impacts of CS and its design.

To address these issues, there is a need of understanding CS system’s stakeholders, such as requesters’ (i.e. senders’) and potential couriers’ (i.e. driver-partners’) behaviors as well as operations and management of CS firms. This research will address these gaps by conducting a survey to understand driver-partners’ behaviors and requesters’ behaviors given the CS services availability in the logistics market. Then, pricing and compensation strategies are designed and modeled based on behavior rules of supply and demand generations as well as various CS market penetrations. As such, this research addresses the CS industry in a triad of supply, demand, and operations and management.

This research uses advanced econometrics, statistics analysis, mixed integer optimization, and data science techniques to analyze data and generate insights. The contributions of this research are to identify the contributing factors that impact the emerging logistics service. This research also reveals factors that influence the current and future shipping behaviors of requesters, as well as influencing factors of the indi-
individuals’ willingness to work as *driver-partners*. The integrated matching and routing models have been developed to examine different pricing and compensation strategies under several market penetration scenarios. ‘Individual’ price and compensation have found to provide the highest profit for CS platform providers.

This research provides meaningful knowledge for stakeholders, especially for the CS firms to develop business strategies. Several remarkable benefits that CS firms can obtain include: focusing on some specific population groups to recruit *driver-partners* (e.g. people with children, middle-aged people having lower incomes, or no car ownership); addressing certain market segments to promote CS services (e.g. tight-window delivery packages, peripheral products, or personal health and medicine items); implementing ‘individual’ or ‘flatted’ pricing and compensation strategies depending on the time of the day, the day of the week, or the market penetration; and improving platform features to incorporate requesters’ and driver-partners’ expectations.