

ABSTRACT

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Dissertation title: Demand and Supply Modeling of Crowd-shipping Markets for First/Last Mile Delivery.

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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-

viduals' 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.