An Adaptive Decision Support System for Last Mile Logistics in E-Commerce: A Study on Online Grocery Shopping

Mohammad K. Al-nawayseh, Jerash University, Jerash, Jordan
Mohammad M. Alnabhan, Jerash University, Jerash, Jordan
Mutaz M. Al-Debei, The University of Jordan, Amman, Jordan
Wamadeva Balachandran, Brunel University, London, UK

ABSTRACT

Last mile logistics represent one of the most important challenging issues in online grocery shopping. Online customers are expecting high logistical services, demanding convenience, high reliable and on-time delivery services. As such, online retailers have to respond to these expectations by providing convenient logistical services while keeping this process cost efficient as much as possible. This research aims to design an e-commerce logistical decision support system for online grocery shopping in Jordan as a case study from the developing countries. Online grocery retailers are supposed to use this model in order to select the most suitable delivery operating system in the future. To implement and evaluate this model, one of the available routing and scheduling online solutions (i.e. “My Route Online”) is used to identify, analyse, and compare the cost efficiencies of the available alternative delivery solutions. The system is tested using real data over three different delivery alternatives (i.e. home delivery, delivery point and pickup point) in order to evaluate and compare their cost efficiencies. The findings from the experiments show that there are significant differences amongst the three delivery alternatives on the basis of three KPIs: cost, distance and time. The findings also indicate that the time indicator has more powerful change effect on cost than distance for all delivery alternatives. According to the level of investments online grocery retailers are willing to offer, customer preferences, and the experimental results, it is concluded that pickup point solution is the best logistical strategy for online grocery retailers to start with.

Keywords: Decision Support Systems, Developing Countries, E-Commerce, Last Mile Logistics, Modelling, Online Grocery Shopping, Small-to-Medium Enterprises

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1. INTRODUCTION

In the era of globalisation, the Internet has been increasingly used to facilitate online business transactions, not only between different business entities, but also between business entities and consumers. One of the Internet business applications that received much attention in the last few years is Online Grocery Shopping (OGS) (Kurnia, 2008). Online grocery shopping refers to consumers’ ability to order groceries from home electronically (i.e., Internet) and the subsequent delivery of those ordered groceries at home or any other preferred location (Ghazali et al., 2006). OGS has many potential benefits to consumers, particularly in terms of better prices, large selection, convenience and time-savings. However, customers’ attitudes towards online grocery shopping remain skeptical, mainly because of worries about product quality, product delivery, and security and privacy issues (Ghazali et al., 2006; Scott & Scott, 2008).

On the other hand, retailers ultimately obtain significant benefits from OGS due to increased revenues and reduced costs (Akkeren & Cavaye, 1999; MacGregor & Vrazalic, 2005). Nonetheless, groceries are one of the most difficult objects to sell online; material flows are different from information flows, the number of frequent customers is large, the shopping basket may contain many items, and very critical delivery systems may be required (Kurnia & Chien, 2003). Furthermore, online grocery shopping is anchored in local contexts and environments (due to logistical factors), rather than the ‘global marketplace’ which is a tenet of e-commerce; for example, a retailer can easily sell digital products throughout the world, whereas it is very difficult to sell fresh food in the same way. Compared to electronics, books and clothing, grocery goods typically have low value-to-weight ratios, limited delivery time windows and the shelf-life limitations of perishable goods (Kurnia & Chien, 2003). As such, last mile logistics is a key operation and a major challenge in OGS.

The strategic importance of logistics and supply chain management is undoubted in academia and practice (Müller-Lankenau et al., 2004). It is therefore not surprising that also in the context of e-commerce logistics plays a key role (Yrjola, 2001). When it comes to selling non-digital products to consumers, the big challenge of “last mile logistics” arises. The last mile is the link between an online ordering process and physical product delivery (Boyer & Hult, 2006). In contrast to store-based retailing, online shops have to organize product delivery to the consumers’ homes or any other preferred location and not just to stores. Product delivery logistics or last mile logistics are considered to be one of the most challenging issues in online grocery shopping, and delivery problems have led to the failure of many online grocery pioneers (Punakivi & Saranen, 2001; Boyer et al., 2009). Indeed, time constraints, poor service quality, and lack of suitable delivery modes are influential factors that make order fulfilment as the most important, expensive, and critical operation for online grocery retailers.

While the adoption and implementation of online grocery shopping has been steady in developed countries, there is still doubt about its capabilities in developing countries. This could be explained by the differences between these countries in terms of ICT readiness levels, transportation infrastructure, social and cultural environments, political environments, business conditions and consumers’ attitudes (Al-Debei & Shannak, 2005; Kurnia, 2008; Mofleh et al., 2008; Al-Nawayseh & Balachandran, 2012). These fundamental differences between the two nations make it very complex for online retailers in developing countries to adopt and use OGS decision support systems for last mile logistics those employed in developed countries. Indeed, in this case, a great deal of customization and adaptation will be needed so as to achieve the required fit between system functionalities and the requirements of online retailers; an issue that is most likely to be infeasible in most cases. At the same time, there is a lack of cost efficient logistical modeling solutions that are useful for developing countries in the context of OGS.
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