

O.R. Applications

# Operations research practice on logistics management in Taiwan: An academic view

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## Abstract

The opinions of logistics educators in Taiwan on OR practices in the domestic logistics industry are explored in this research. In this study, questionnaires were given to 42 pre-screened educators at 10 logistics departments and graduate institutes. According to the 37 valid returned questionnaires, 70% of the responding educators believe the major source of OR techniques in Taiwan's logistics industry originates from individual employee training, while 92% believe OR is not widely used primarily because companies are unfamiliar with OR techniques. OR techniques were considered helpful in solving problems by 73%. Generally speaking, familiarity with OR techniques is not associated with implementation of OR techniques by educators. Additionally, logistics educators express concern about insufficient training for logistics students in Taiwan. However, they are optimistic about the logistics industry's willingness to more actively adopt OR techniques in Taiwan in the next two years.

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## 1. Introduction

Despite being mainly associated with IT-related industries, the logistics industry in Taiwan began in the 1980s with less specific industrial characteristics and mainly provided warehousing and material handling services, lagging far behind its Western counterparts. Not until the late 1990s did related

industry policies begin to develop, due to increasing pressure from Western customers for global logistics capabilities, while service industries exhibited the trend of tailor-made logistics and large-variety-and-small-quantity home delivery. Logistics industry operations were moving toward the goals of process integration and value-added, innovative services (Hsieh, 2003).

As the form of services has changed, so there have been different hardware requirements. Racks, forklifts and pallet trucks were replaced with modern wireless hand-held terminals, electronic tags, WMS systems, and high-speed selectors. Software

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requirements were more closely connected with information systems through communications enabled by software languages such as ASP and XML. Application technologies, such as the Global Positioning System (GPS) and Enterprise Resource Planning (ERP), were developed.

It is not uncommon for scholars to conduct studies on logistics problems using operations research (OR) technologies. However, while logistics providers are busy upgrading their hardware facilities, few adopt OR to increase their competitiveness. Kao et al. (1997) conducted a questionnaire survey on the operations of 1000 top enterprises in both the manufacturing and service industries in Taiwan. The questionnaire attempted to find the status of OR department within enterprises, frequently used OR techniques, frequency of OR use in different occupations, difficulties encountered in OR practice, and supporting factors for successful OR applications. The survey found that 37.4% of enterprises interviewed did not establish any OR-related departments and the frequency of OR use was below average. Among reasons given for using OR, most interviewed enterprises chose the ability of “solving problems efficiently.” Their study indicated OR is still not widely applied in enterprise operations, even though it is believed by many to be useful.

Though helpful in theory and practice, current OR applications in the Taiwan logistics industry remain unknown, while it is difficult to tell if departments and graduate institutes offer sufficient OR-related courses or if the courses meet the logistics industry requirements. By collecting teacher opinions of OR-related courses at logistics institutes, this research can help to better understand opinions about OR education and current OR use in the domestic logistics industry to determine if there is any gap between education and actual industrial needs.

## 2. Literature review

Most OR studies cover issues such as linear programming, transportation problems, assignment problems, network analysis, dynamic programming, game theory, integer programming, queuing models, and decision theory (Hiller and Lieberman, 1996). However, according to members from both academia and industry of the Committee on the Next Decade in Operation Research (CONDOR, 1988), the focus of OR development in the future

lies in optimization (including linear programming, non-linear programming, and multi-criteria analysis), stochastic processes, and artificial intelligence. It is also believed that the most significant OR impact on the logistics industry lies with delivery. For example, the latest information technology can allow real-time information transmission to the carrying devices and keep track of the transportation through satellite tracking. Meanwhile, the current trend is to incorporate OR techniques in professional subjects. Ólafsson (2004) for example, at the University of Iceland, integrated OR techniques into five courses in a new MBA program, including Analysis and Policy-Making, Operation Management I, Operation Management II, Marketing Engineering, and Performance Evaluation. Because he thought OR courses in the UK were softer, with a case study focus, while those in the US were more difficult, focusing on methodology and techniques, he recommended combining both British and American characteristics into OR courses.

The logistics system operation can be divided into network design, information, transportation, inventory, warehousing, material handling, and packaging (Bowersox and Closs, 1996). Slats et al. (1995) provided a table listing further connections between logistics activities and OR techniques in the supply chain, such as forecasting demand—simulation model, customer orders—DLP model, location of warehouses—transportation model, location of production facilities—assignment/allocation, warehouse lay-out—dynamics model, stock policies—network model, and choice of equipment/facilities—multi-criteria analysis.

Examples of OR practices abroad are numerous. For instance, in the UK, OR groups held a series of training, education, and activities (Ranyard, 1995). Several scholars from Mainland China also produced papers on OR applications in economic, service, manufacturing, and transportation activities (Li et al., 2000). German OR institutions were also active in related education, research, and application activities (Feischmann, 1995) while industrial applications of OR in the United Arab Emirates were found to be rapidly developing (Kemp and Yousef, 1995). The Center for Quantitative Methods (CQM), a Netherlands-based consultancy firm, conducted research on industrial applications during 1981–1988 and 1988–1996, and found that the numbers of medium OR projects (from 1 to 3 months), strategic projects, and

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