1. INTRODUCTION

1.1 Background

The well-developed worldwide transportation and growing international economics stimulated many overnight carriers to develop new and innovative ways to move freight. The most dramatic success stories are Federal Express (FedEx), United Parcel Service (UPS) and DHL. For example, FedEx connects areas that generate 90 percent of the world's gross domestic product in 24 to 48 hours and deal with more than 3.2 million items each working day. Each of them has his own fleet of airplanes and vehicles, and also thousands of customer convenience locations all around the world. The business volume of parcel service market per year is near 70 million dollars and growing continuously. It will be more and more competitive in the future, especially in mainland China.

Enterprises today are always looking for more stable orders. Therefore, for the profit concern, exploiting new and stable demands is one of the most important issues for overnight carriers. Large enterprises usually have much more international documents, mails or packages for delivery. These demands are large and almost arise everyday. Hence, it is very helpful to construct good relationships and even form alliances with these significant customers. In addition, the carriers also keep information of the other customers who request often but not everyday in the database and give them some discounts to strengthen their loyalties.

On the other hand, to keep great competitive advantage in this logistics industry, the carriers also provide more and more high-quality services by new communication and transportation technologies. The improvement in real-time pickup service is one of the most representative examples. Customers can request for service via Internet, phone or fax immediately and the next-day on-time deliveries are guaranteed. It is not an easy mission for carriers to provide these real-time services, especially the requests

occurred at the end of the route without increasing cost sharply while the service quality is maintained.

Traveling Salesman Problems (TSP) and Vehicle Routing Problems (VRP) are components of logistics problems. Under some basic restrictions like capacity of vehicles or volume of depots, the decisions obtained from these two problems are picking up goods from or delivering goods to the customers at valid time while keeping operating cost rational. These problems draw a lot of attentions in the past few decades, especially the stochastic and dynamic versions. But many decision makers still cope with routing and scheduling issues by experience or intuition. With the huge and continuous improvements on tracking and communicating technologies like GPS, GIS and GPRS, the developments in TSP and VRP will make more significant contributions to operating efficiency of logistics.

1.2 Motivation

In the business world today, many companies have frequent request of mails, documents or parcel services. The carrier may sign contracts with these customers and label them as regular customers. Because the request of each regular customer may not occur every day, Jaillet [14] mentioned that the service route derived from the conventional TSP model is not the most efficient in the view of expected length. For the sake of reducing the expected traveling cost without increasing the difficulties of operation, we expect to establish an *a priori* route with robustness and skip the customers without real request. To attain the goal above, the idea of Probabilistic Traveling Salesman Problem (PTSP) is introduced in this thesis.

On the other hand, to cope with the real-time call-ins is also an important problem. Because of the uncertainties of these requests, the carriers cannot predict where and when they will occur. An additional immediate request may make the traveling cost

and customer dissatisfaction increase sharply. Therefore, to well insert these customers into the rest route with low total cost is the common goal of overnight carriers. It is not only a dynamic routing but also scheduling problem.

In the literature, many researchers have presented the topics of PTSP and Dynamic Vehicle Routing and Scheduling Problem (DVRSP). In the past twenty years, both problems are extensively studied and well-developed respectively. However, the problem with the characteristics of both PTSP and DVRSP has not been investigated. The goal of this thesis is to propose a PTSP model with time restrictions, which objective is minimizing total operating costs and satisfying the needs of customers as possible, to deal with the logistics problem with probabilistic and real-time demands.

1.3 Research Framework

This thesis focuses on the local pickup and delivery system of the parcel service provider. The rest of this thesis is organized as follows. In the next chapter, the previous work including Probability Traveling Salesman Problems (PTSP) and dynamic routing issues are reviewed. In Chapter 3, the problem statement and the conceptual model are presented. A two-stage heuristic will be proposed in Chapter 4. We will perform the experiments and provide the computational results in Chapter 5. Finally, Chapter 6 gives the concluding remarks. The framework of this thesis is shown in Fig. 1.1.

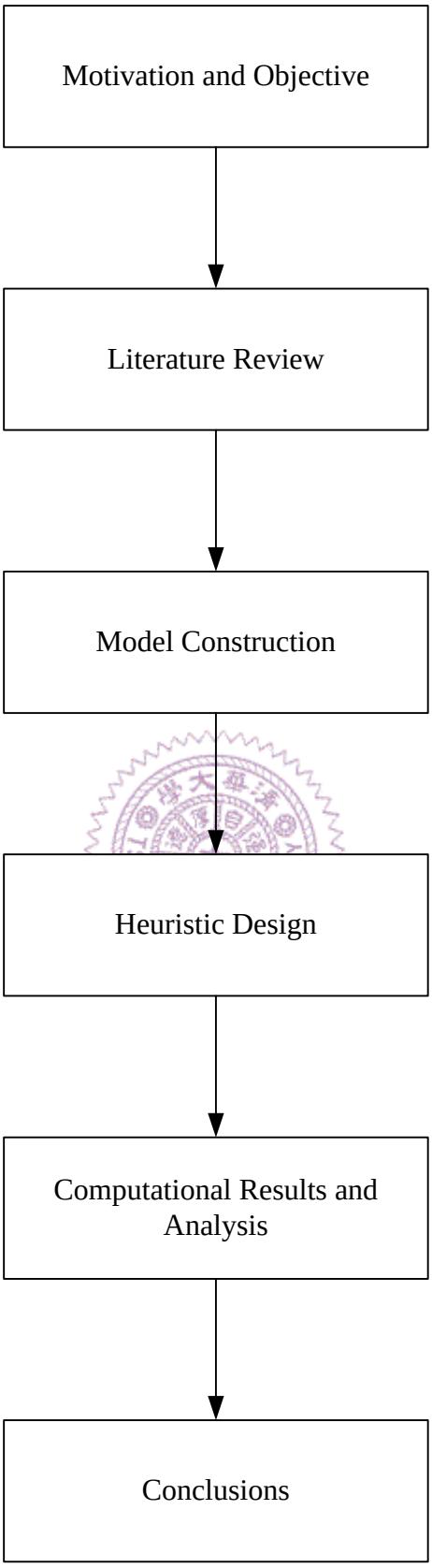

Fig. 1.1 Framework of this study