ERDBEERENBURG: A SUPPLY CHAIN ANALYSIS

K. KHAMMUANG & H. S. GAN

(*Company's Background Sheet*)

NOTE: *students will given a Company's Background Sheet, a Task Sheet, a Report Outline Sheet and a Data Sheet each.*

Part 1. Introduction

Having migrated to Australia in 1969, Mr. and Mrs. Heesen brought their secret strawberry jam recipe with them and established *Erdbeerenburg* in the early 1970s. To date, *Erdbeerenburg* has provided its customers with quality strawberry jams for more than three decades. Despite having high annual sales, *Erdbeerenburg*'s profit does not seemed to be impressive at all. Hence, Mr. Heesen has sought our assistance to unravel ways of reducing jam-making costs, to propel *Erdbeerenburg*'s profit to a higher level.

As part of a preliminary investigation, we will examine each of the "partners" in *Erdbeerenburg*'s supply chain. *Erdbeerenburg*'s supply chain can be summarised in the flowchart shown in Figure 1.

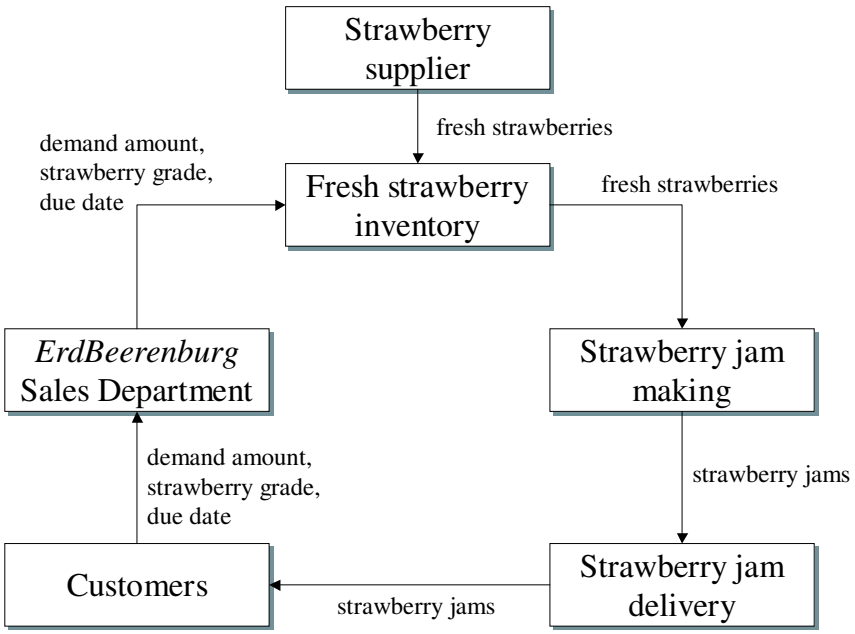

FIGURE 1. *Erdbeerenburg*'s Supply Chain

The three major supply chain "partners" to be examined and optimised are *the fresh strawberry inventory* (Inventory Control problem), *the strawberry jam making* (Machine

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Scheduling problem) and *the strawberry jam delivery* (Vehicle Routing problem)[1]. Each of these "partners" are briefly described in the following parts of this handout. Further elaborations will be made during the meetings.

Part 2. Ordering of Raw Materials (Strawberries)

The raw material inventory "partner" will receive information (demand amount, strawberry grade and due date) from the sales department. The demand amount can be "transformed" to the amount of raw materials required and the customer specified due date can be used to estimate when should the fresh strawberries be in store. Hence, using this information we can plot a demand-time graph, indicating the trend of the demand. The two major decisional questions in this area are,

(1) *When should we place an order?*
(2) *How much fresh strawberries, of each grade, should be ordered each time an order is placed?*

The costs involved, that may influence the decisions above, are the *inventory holding cost*, *order cost* and the *unit purchasing cost*. Note that there will be a delivery lead-time[2] involved in the order of raw-materials.

Part 3. Production Scheduling

The jam-making "partner" will receive information from the inventory "partner" (arrival date of raw materials, since this date is the earliest possible date one could start the production for that particular demand) and the sales department. The jobs are the customers' orders, the duration of a job is proportional to the amount ordered, the arrival date is the arrival of the raw material and the due date is the "adjusted" due date from the customer-specified due date. The jobs are *preempt-resumable*[3].

Part 4. Product Delivery

We assume that only one truck is available and has "infinite" capacity, that is unlimited wagons can be attached to the truck. The truck also travels at a fairly constant speed. The decisional questions to this problem are stated as follows:

(1) *When should the truck do a pick-up?*
(2) *What sequence of locations should the truck visit?*

[1]Note that optimising these "partners" independently may only produce sub-optimal solutions.

[2]Delivery lead-time is the duration by which we will receive our ordered products from the time we place our order.

[3]When a job in process is allowed to be terminated and continued later from where it was last terminated, this job is preempt-resumable.

The truck will always start its journey at the Loading Bay. This problem can be represented with a network diagram, as shown in Figure 2. The customers are represented by the nodes and the arcs connecting each pair of nodes represent the shortest possible distance between the two locations.

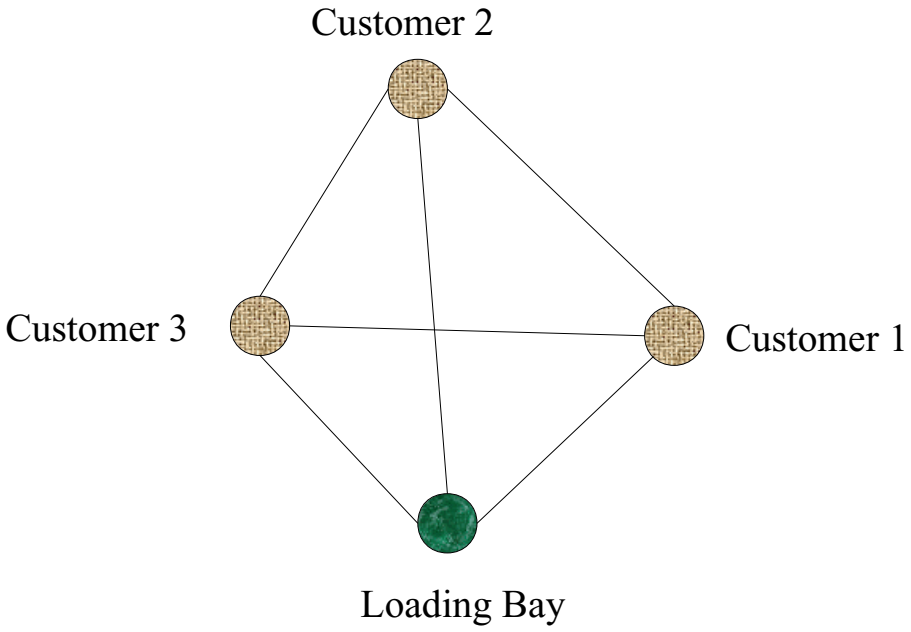

FIGURE 2. An example of a vehicle routing network

Part 5. **Perturbations**

The supply chain "partners" will be subjected to perturbations such as change in demand amounts, rush orders, cancellation of orders, new customer demands, machine breakdowns, late arrival of raw materials, late departure of truck, late arrival of truck and so on. We will investigate the effects of these perturbations on a well-planned supply chain in weeks to come. Re-active methods to cope with these perturbations will also be explored.

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING, THE UNIVERSITY OF MELBOURNE, VIC 3010, AUSTRALIA

E-mail address: kpopk,hsgan@mame.mu.oz.au