OPER20525A.A2019 - LOGISTICS
Warehousing at Avril Supermarché
Practical exercises

Context:

"Avril Supermarché Santé is an independent Quebecer health food store chain. Just like a garden, Avril is a promise of freshness and abundance, bringing its customers closer to a healthier way of life. Avril stores are designed to be energy efficient and to provide its customers with a unique, satisfying shopping experience.

In Avril stores you will find:

- Natural and organic foods
- Organic vegetables and fruits, certified by Ecocert Canada
- Supplements and vitamins
- Natural cosmetics
- Organic meat products
- Gluten-free products
- Local products
- Fair-trade products
- Ecological products
- Herbal medicine, homeopathy and aromatherapy products
- Esthetics cabin care
- Bistro-type restaurant
- Qualified staff: naturopaths, homeopaths, herborists, cosmeticians
- Private consultations"[1]

Avril has stores in Brossard, Granby, and Longueuil and a distribution center (DC) located a few miles away from the Granby store. Figure 1 shows Avril's network.

Avril does not accept any direct store delivery (DSD), meaning that every single product goes through the DC on its path between the manufacturers and the stores. Avril recently opened a store in Laval. They now want to move the DC closer to Montréal (but still in the south bank), to better serve the new Laval store. The DC manager wants your help to decide the type of pallet racking, the ideal picking system, and the best picking strategy for the new facility. To help you achieve this goal, the manager has provided you with a data base (file D.AVRIL_SUPER-MARCHE.XLS) holding information on products, transfers between the DC and the stores, and inventory levels for each product during a year.

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[1] Taken from: https://www.avril.ca/en/about-us/. Last access: September 28, 2019.
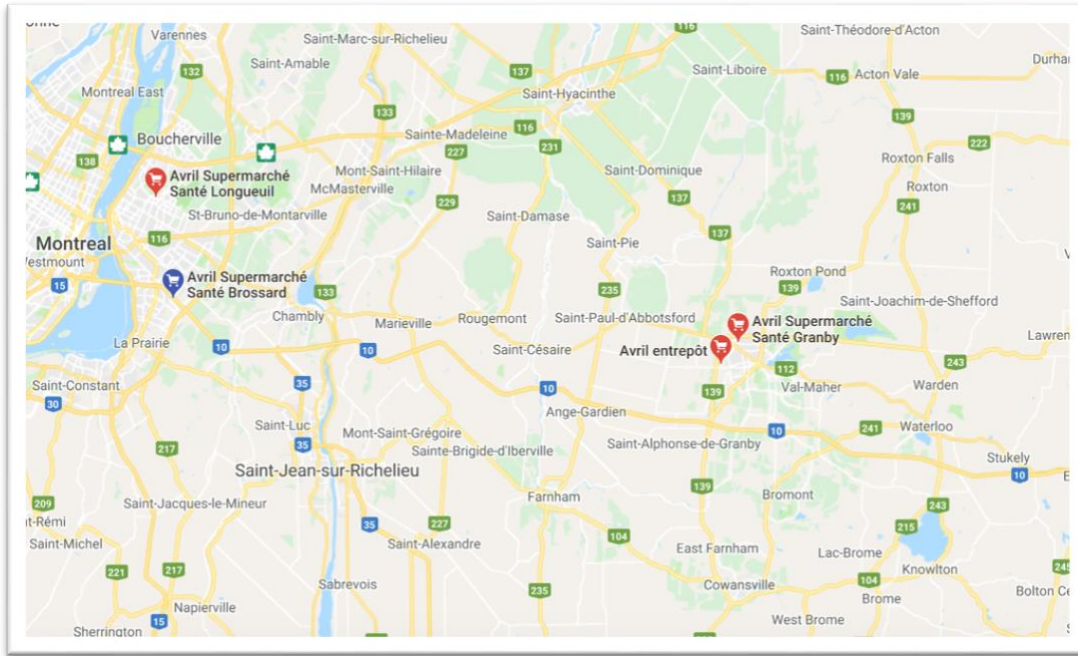
Figure 1: Avril's distribution network

The database:

The database is made up of three data sheets: product, transfer, and inventory. As the name suggests, the product sheet contains information about the products. Figure 2 describes the fields in the product table. The transfers sheet contains the details on the orders placed by the three stores to the DC between January and July 2019. Each row on the table corresponds to a *line* in an order. In the warehousing jargon, a line is simply a Stock Keeping Unit (SKU) included in an order. For instance, order 1 is made up of 21 lines (rows 3 to 22), meaning that the order includes 21 different SKUs. Figure 3 describes the fields in the transfers table. Finally, the inventory sheet holds "screen shots" of the inventory held at the DC the first day of each month between July 2018 and July 2019. Each row in this table shows the inventory (in units, cases, and pallets) held for a given SKU during the year. Figure 4 describes the fields in the inventory table.

Field	Description
SKU ID	Unique identifier of the SKU on Avril's ERP system.
Brand	Brand of the product.
Description	Name of the product associated to the SKU. Note that the same product can be sold as different SKUs (e.g., bottles of 500ml and bottles of 1L).
Size	Size of the product unit. For instance, if Size = 500ml, one unit of the SKU contains 500ml of the product (e.g., a bottle of 500ml). Similarly, if Size = 125gr, then one unit of the SKU contains of 125gr of the product (e.g., 1 package of 125gr). On the other hand, if Size = 4x125gr, then each unit of the SKU contains 4 units of 125gr of the product (e.g., 1 package of 4 units, each of 125gr).
Supplier	The name of the supplier of the product.

Category	Category of the product in the Avril classification. There are 9 categories: Canned; Honey, syrup and jam; Inedible; Juices and beverages; Oils, vinegar and seasonings; Pasta, bread and cereals; Snacks and sweets; Soups and broths; and Teas.
Class	The class of the product according to Avril's ABC classification.
Nb units / case	Number of units of the SKU in a case.
Nb case / pallet	Number of cases of the SKU in a pallet.
Nb units / pallet	Number of units of the SKU in a pallet.
Weight	Weight classification: heavy, average, light.
Picking unit	The minimum aggregation unit in which the SKU may appear in an order.
Width (in)	Width of a case in inches.
Length (in)	Length of a case in inches.
Height (in)	Height of a case in inches.
Volume case (ft^3)	Volume of a case in cubic feet.
Volume case (in^3)	Volume of a case in cubic inches.

Figure 2: description of the fields in the product table

Field	Description
Order ID	Unique identifier of the order.
Line ID	Unique identifier of the line.
Customer	The store placing the order: BRD for Brossard, GBY for Granby, and LGL for Longueuil.
Date of TRF	Date of the transfer.
Day TRF	The day of the week corresponding to Date of TRF.
Month TRF	The month of the year corresponding to Date of TRF.
SKU ID	ID of the SKU in the line.
Description	Name of the product associated to the SKU (see Figure 2 for more details).
Qty (units)	Units of SKU shipped.
Qty (case)	Number of cases shipped.
Qty (pallet)	Number of pallets shipped.

Figure 3: description of the fields in the transfers table

Field	Description
SKU ID	ID of the SKU held in inventory.
Description	Name of the product associated to the SKU (see Figure 2 for more details).
Inventory in units	Snapshot of the inventory in units of the SKU the first day of every month between Jul-2018 and Jul-2019. The last two columns contain the average number of units held in inventory during the year and the maximum number of units held in inventory (considering only the values captured by the snapshot).
Inventory in cases	The same information presented in "Inventory in units" but in cases.
Inventory in pallets	The same information presented in "Inventory in units" but in pallets.

Figure 4: description of the fields in the inventory table

Exercises 1 to 6: basic database queries

1) How many SKUs does Avril handle through the DC?

2) How many products?

3) How many suppliers deliver products to Avril's DC?

4) What is the name of the supplier who provides the largest number of SKUs?

5) What is the number of A, B, and C class SKUs?

6) How many class-A SKUs are supplied by SATAU?

Exercises 7 to 11: Selecting a picking system

7) What is the most common picking unit in Avril's DC?

8) What is the average size of a case (in ft_3)?

9) What is the average and maximum number of orders in one month?

10) What is the most frequently ordered SKU?

11) Based on your answers to questions 7, 8, 9, and 10, what picking system (goods-to man, man-to-goods, or automated system) would you recommend to the DC manager? Why?

Exercise 12: Selecting a picking strategy

12) According to the data in sheet "Transfers", what picking strategy (cluster, batch, discrete) would you recommend to the manager?

Exercises 13a to 13d: Selecting racking systems

13) According to the data in sheet "Inventory", what racking systems would you recommend for the following products?

   a) 67178550100 – Eska (ES EAU NATURELLE)
   b) 6366751100 – Boisson Soya non sucrée
   c) 3619212784 – Limonade à la mangue
   d) 62123490560 – Cubes bouillon de Poulet