## ISYS90086 Data Warehousing

## Fantastic Fireworks Case Study

### *Introduction*

Fantastic Fireworks was established in 1991 in a single store in Darwin in the Northern Territory by Nancy Lightening. The business has expanded to three other locations (Brisbane, Queensland – 1994; Sydney, New South Wales – 2000; and Melbourne, Victoria – 2003). Each of the stores has a shop front in the capital city. Fantastic Fireworks sells fireworks and related paraphernalia (i.e. things related to fireworks). Each of the products is ordered and purchased centrally and distributed to the required location by various suppliers. Due to fireworks licensing regulations, all customers must become a member before they can purchase (NOTE: in Australia, fireworks can only be sold to licensed providers, for the sake of this case study we are deliberately ignoring this rule and everyone over 18 can buy them if they have their details recorded). Customers must purchase items in person within their nominated store. The stores are each opened from 8am until 9pm Monday through Saturday but only the original store opens on Sunday, from 9am until 6pm. Each of the 4 stores has a number of employees who advise customers on their choices and around safety. These employees receive a negotiated commission on all of their sales.

Fantastic Fireworks has been very successful in recent years and is a highly profitable business. Nancy would like to expand the business further, by possibly adding a further one or two stores, expanding the floor space in the existing stores, optimizing store opening times (even considering opening on Sundays at all locations) and locating the most profitable products in prominent places in the stores. However, to make these decisions she needs a better understanding of the sales, products and customers. She has heard from vendors that data warehousing and business analytics will provide the capability to make more informed decisions. You have been hired as a consultant to propose a data warehousing solution to Nancy.

Two separate information systems are used within Fantastic Fireworks to support operations: the inventory system and the sales system. The inventory system is used to manage product inventory and order products from suppliers. Inventory management is the responsibility of Kim (Firery) Ng who has worked with Fantastic Fireworks for many years. Most reordering decisions are made automatically when stock levels reach predefined minimum levels, but Firery also frequently uses intuition to make changes to these orders.

The sales system is used to support sales and customer interactions. The sales system is deployed in all 4 locations, so each store has a separate customer table, and shares the other tables (they are duplicated across the stores). The group accountant, Digger (Sparky) Lightfinger, monitors sales figures. Sparky has worked on a contract basis for Fantastic Fireworks for many years. He has a strong intuitive understanding of which products are the most profitable. Information from these systems is difficult to integrate and aggregate as they have different data formats and use different database management systems.

### The Insights Needed for Decision-Making

Decisions about expanding the business are made by Nancy, with input from Firery and Sparky. Although both Firey and Sparky have great experience and a strong "gut feel" about the business, Nancy wants evidence based on data to inform her decision-making. In particular, she needs insights about products, customers, store location and opening times.

1. *Who are the key customers?*

The data warehouse should provide information about unit sales, dollar sales and margin for customers for various time periods (including year, month and quarter). It should also provide information about the suburbs (postcodes) in which the most profitable customers live. Note that customers move house occasionally and it is important to know the suburb in which they lived at the time of any particular sale. It should be possible to aggregate customer reports into age groups – 30 years and under, 31-50, and over 50.

[Cost = cost of the product on the most recent order before the sale]

[Margin = Dollar sales – Cost]

2. *Which products are the most profitable?*

The data warehouse should provide information about unit sales, dollar sales and margin for products for various time periods (including year, season and month).

3. *Which store location is the most profitable?*

The data warehouse should provide information about unit sales, dollar sales and margin for each store location for each month of the previous year.

4. *Which time periods are the most profitable?*

The data warehouse should provide information about the unit sales, dollar sales and margin for various time periods including Monthly, Quarterly, Yearly and Sundays.

5. *Who are the Key employees?*

The data warehouse should be able to provide information about employee sales, including the amount of commission they earn for various time periods.

## The Current Information Systems

Data for the data warehouse will be sourced from two of the existing operational systems, the inventory system and the sales system.

1. The *Inventory System*

The inventory system is a package based on an Access database and runs of a windows-based computer. A variable length product code is used to identify products. The system also supports product cost history. Examples of data in relevant Access tables are shown below.

## PRODUCT (sample data, incomplete)

| PartNumber | Description | Price | ValidFrom |
|---|---|---|---|
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 0.48 | 1/01/2015 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 65.91 | 1/01/2015 |
| yf8assT2 | 8" assortment YungFeng T2 (fancy), 1 ea of 4 w/2 fuses | 59.14 | 1/01/2015 |
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 0.53 | 1/01/2016 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 69.38 | 1/01/2016 |
| hq25p01 | 2.5" mine multicolor stars | 5.52 | 1/01/2016 |
| yf25e05 | 2.5" mine nishiki kamuro niagra falls | 5.91 | 1/01/2016 |

## PRODUCT ORDER (sample data, incomplete)

| ID | Description | Quantity | Cost per item $ | Date |
|---|---|---|---|---|
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 38 | 0.34 | 2/01/2015 |
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 379 | 0.4 | 4/04/2015 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 133 | 56.02 | 2/01/2015 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 496 | 34.93 | 4/04/2015 |
| yf8assT2 | 8" assortment YungFeng T2 (fancy), 1 ea of 4 w/2 fuses | 359 | 46.72 | 5/01/2015 |
| yf8assT2 | 8" assortment YungFeng T2 (fancy), 1 ea of 4 w/2 fuses | 125 | 49.09 | 8/04/2015 |
| 30cb04m | cndl 30mm caballer 8-shot green mine (28s) | 450 | 27.92 | 21/12/2015 |
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 467 | 0.33 | 27/12/2015 |
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 133 | 0.36 | 9/05/2016 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 117 | 46.48 | 10/05/2016 |
| yf8assT2 | 8" assortment YungFeng T2 (fancy), 1 ea of 4 w/2 fuses | 129 | 47.06 | 1/01/2016 |

2. The *Sales System*

The sales system is a package based on an MYSQL database also running on a windows-based PC. The customer identifier includes both a customer number and a store. Sales order, Product and Customer data are included in the system. Examples of data in relevant SQL-Server tables are shown below.

## CUSTOMER (sample data, incomplete)

| Customer ID | Name | Date of Birth | Postcode | Valid until date |
|---|---|---|---|---|
| C3330Bris | Amul Chen | 28/11/1966 | 4039 | 8/01/2017 |
| C3330Bris | Amul Chen | 28/11/1966 | 4006 | |
| C5040Darw | Vonny Yan | 17/04/1961 | 0812 | |
| C5041Sydn | Anisha Jain | 4/08/1994 | 2195 | |
| C5043Melb | Vaishnavi Katherine | 5/11/1985 | 3005 | |

## PRODUCT PRICE LIST (sample data, incomplete)

| Product ID | Description | Unit Price ($) | Valid from Date |
|---|---|---|---|
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 0.48 | 1/01/2015 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 65.91 | 1/01/2015 |
| yf8assT2 | 8" assortment YungFeng T2 (fancy), 1 ea of 4 w/2 fuses | 59.14 | 1/01/2015 |
| em-2m | ematch 2-meter wire length, orange wire, 50/box | 0.53 | 1/01/2016 |
| rack-175-hdpe | mortar rack, 1.75" w/14 black hdpe tubes, 4 ft wide | 69.38 | 1/01/2016 |

## SALES (sample data, incomplete)

| Order ID | CutomerID | Date | Store | Salesperson |
|---|---|---|---|---|
| 1 | C4233Bris | 1/01/2015 | Brisbane | B1 |
| 2 | C3547Bris | 1/01/2015 | Brisbane | B1 |
| 3 | C1551Darw | 1/01/2015 | Darwin | D4 |
| 308 | C1910Darw | 10/01/2015 | Darwin | D4 |

## SALES ITEM (sample data, incomplete)

| OrderID | Line | Product | Quantity | SalePrice |
|---|---|---|---|---|
| 3 | 1 | yf8assT1 | 14 | 54.28 |
| 3 | 2 | ls4501 | 3 | 7.24 |
| 3 | 3 | yf6e05 | 7 | 29.19 |
| 308 | 1 | yf10m01 | 90 | 73.53 |
| 308 | 2 | yf6k114 | 20 | 29.2 |
| 308 | 3 | yf5p40 | 10 | 20.92 |
| 308 | 4 | 30cb03c | 9 | 44.65 |
| 308 | 5 | em-2m | 4 | 0.43 |
| 308 | 6 | yf5k30 | 32 | 18.35 |
| 308 | 7 | ht246-yel | 51 | 4.51 |
| 308 | 8 | htnck01 | 12 | 32 |

## SALES PERSON (sample data, incomplete)

| ID | Name | Commission rate |
|---|---|---|
| D1 | Hi Min Chow | 19% |
| M1 | Alice McPherson | 9% |
| M2 | Pjan Ling | 3% |

## STORE (sample data, incomplete)

| StoreID | Description | Address |
|---|---|---|
| 1 | DARWIN | 19 Finniss St, Darwin, NT 0800 |
| 2 | BRISBANE | 23 Wellington St, Brisbane, QLD 4000 |