

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 Firey 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 on 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)

<i>Product ID</i>	<i>Description</i>	<i>Unit Price (\$)</i>	<i>Valid from Date</i>
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 Finnis St, Darwin, NT 0800
2	BRISBANE	23 Wellington St, Brisbane, QLD 4000