Taku’s Hornshop Database Specification

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INTRODUCTION

Company Description

Taku decided to open his own musical instrument store, Taku's Horn Shop, that exclusively sells his machine-made saxophones. The shop has three types of saxophones and each type comes in different sizes. For example, the Growling Sax has both Alto and Tenor versions of it. Each version requires the same raw material, but in different quantities. Also, as an additional service, the shop provides free repair and maintenance service to customer that have bought more than three products, excluding the plastic saxophone.

Taku asked to create an operational that tracks his business's day to day transaction and operational data, as well as an analytical database that can be utilized as an archive data repository that can in analytical purposes. The remainder of this document specifies the database requirements, visualized ER and Logical diagram followed by tables populated with sample data of the operational database, and requirements, star schema, as well as tables populated with sample data of the analytical databse.

OPERATIONAL DATABASE

Database Requirements

List of Entities

In order to adequately track day to day transaction, the operational databse must have the following six entities.

- "Product" will keep track of unique product id, product name, product price, and production time.
- "Raw Material" will keep track of unique raw material id and raw material name .
- "Orders" will keep track of unique order id, order date, and revenue from each order,
- "Customer" will keep track of unique customer id, customer name composed of first name and last name, customer phone number, customer email adress, and customer residential adress.
- "Machine" will keep track of unique macine id, machine name, as well as maintainance cycle of each machine.
- "Vendor" will keep track of unique vendor id, vendor name, one or more phone numbers for each vendor, and one or more email adress for each vendor.

Relationships

In order to establish proper connection between each entities, following six relationships between entities must be present.

- Customer can be associated with multiple orders. But an instance of order can only be and must be associated with one customer.

- A product is made of at least 3 or more raw materials, and raw material can make one or more product. Quantity of raw materials used in each product is also recorded here.
- Product is made by only one machine. Machine can make only one product.
- Product is associated with zero to many orders. Orders have to be associated with one to many products. Quantity of same product in a single order is also recorded here.
- Raw Materials can only be made by one vendor. Vendor can only make one raw material.

Operational ER Diagram

Figure 1 is the conceptual visual representation of the database requirements listed above. Figure 1 presents six entities explained above and their attributes, as well as relationships between them. Attributes that are underlined represents a primary key (unique identifier) of each of the entities.

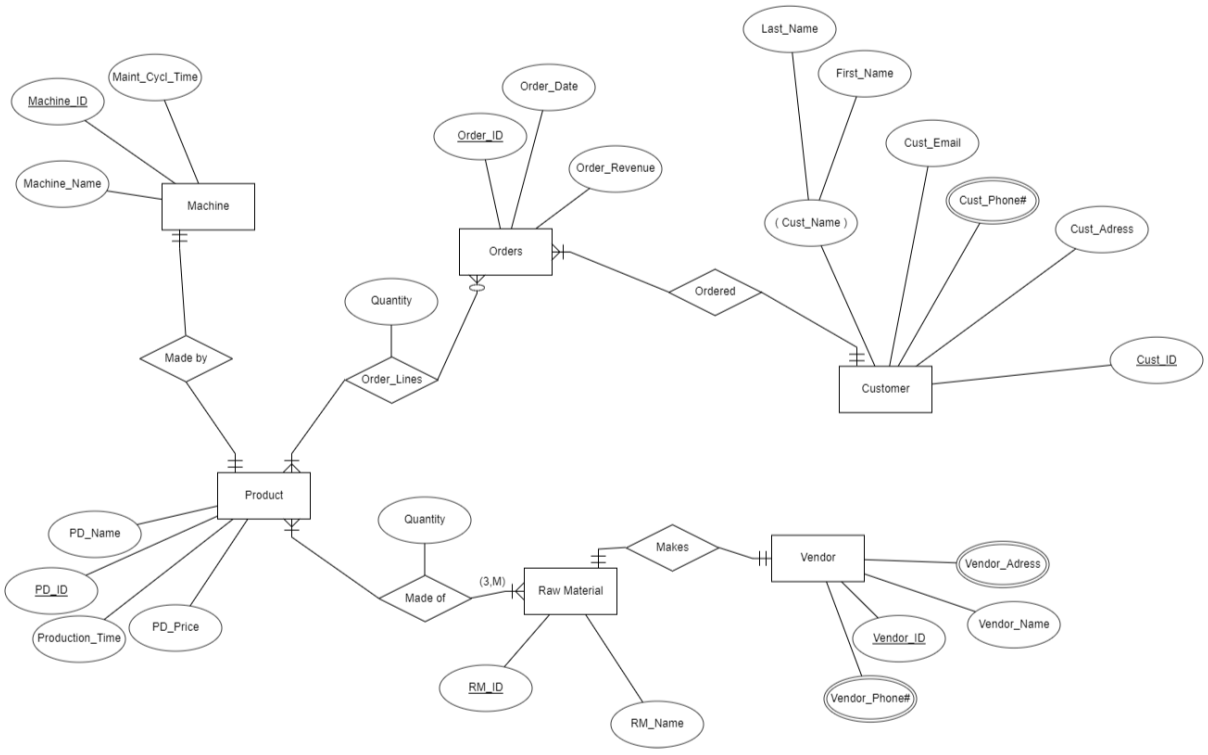

Figure 1: ER Diagram

Logical Diagram

Figure 2 represents a logical diagram of the operational database. Figure 2 specifies each entities and attributes including primary and foreign keys, as well as foreign key connections between each adjacent tables.

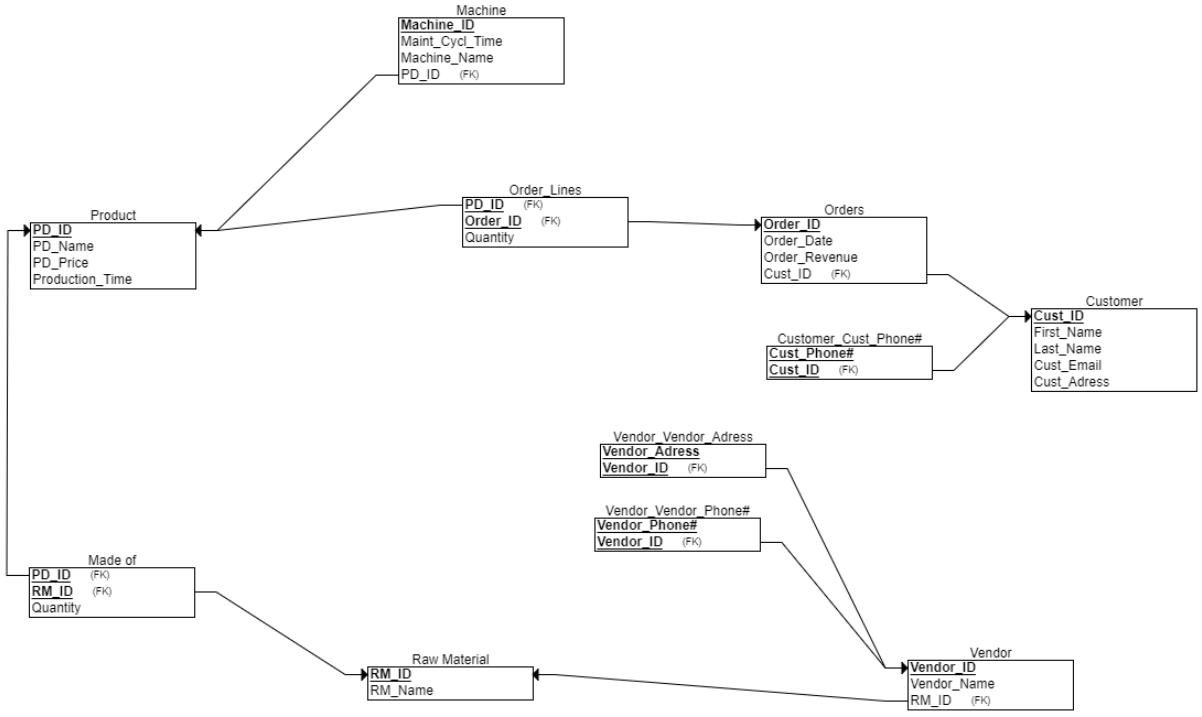

Figure 2: Logical Diagram

Sample Table / Data

Based on the logical diagram of the database included above, tables are depicted below. The tables are also pupolated with sample data.

Product

PD_ID	PD_Name	PD_Price ($)	Production_Time (Hrs)
1	Growling Sax (Alto)	30000	4
2	Growling Sax (Tenor)	40000	5
3	Platinum Sax (Soprano)	100000	4
4	Platinum Sax (Alto)	150000	4.5
5	Happy Kids Sax (Soprano)	80	2
6	Happy Kids Sax (Tenor)	80	2.5

Raw Material

RM_ID	RM_Name
1	Brass
2	Gold
3	Stainless Steel
4	Marble Stone
5	Cork
6	Platinum
7	Plastic
8	Normal Stone

Made Of

PD_ID	RM_ID	Quantity
1	1	1500
1	2	100
1	3	100
1	4	50
1	5	10
2	1	2000

Orders

Order_ID	Order_Date	Order_Revenue ($)	Cust_ID
1	2020-07-28	30000	2
2	2020-08-01	480	3
3	2020-08-10	150000	1
4	2020-08-19	70000	4

Order_Lines

PD_ID	Order_ID	Quantity
1	1	3
5	2	2
6	2	5
6	2	1
6	2	30
4	3	1
1	4	1
2	4	2

Customer

Cust_ID	First_Name	Last_Name	Cust_Email	Cust_Adress
1	John	Coltrane	jcoltrane223myjazzrock@gmail.com	354 Contrane Avenue, New York City, NY, USA
2	Kamasi	Washington	kwashington80listen2myalbum@gmail.com	2 Green Dolphin Street, Los Angeles, LA, USA
3	Terrace	Martin	tmartin712funkymelody@gmail.com	58 ilovejazz, Los Angeles, LA, USA
4	Uyama	Hiroto	Uhiroto9097sofresh@gmail.com	2-5-11, Onngakudouri, Bunkyo-ku, Tokyo, Japan

Cust Phone#

Cust_ID	Cust_Phone#
1	(+1)210-345-2353
2	(+1)310-463-6245
3	(+1)932-384-8284
4	(+81)080-1435-3453

Machine

Machine_ID	Machine_Name	Maint_Cycl_Time (Weeks)	PD_ID
1	Alto Growl Maker	4	1
2	Tenor Growl Maker	4	2
3	Soprano Platinum Maker	3.5	3
4	Alto Platinum Maker	3.5	4
5	Soprano Happy Maker	10	5
6	Tenor Happy Maker	10	6

Vendor

Vendor_ID	Vendor_Name	RM_ID
1	Real Brassy Corporation	1
2	WeGetGolden	2
3	Trusty Steel Company	3
4	Marble Sprinkle	4
5	TheCorkFactory	5
6	PlatiNation	6
7	Plastica	7
8	MineStone	8

Vender Phone#

Vendor_ID	Vendor_Phone#
1	(+1) 210-234-3452
2	(+1) 234-242-1234
2	(+1) 234-873-8234
3	(+1) 452-254-2434
4	(+1) 984-738-8374
5	(+1) 648-674-8490
6	(+1) 284-240-0082
6	(+1) 284-848-7482
7	(+1) 210-008-0073
8	(+1) 234-849-7400

Vender Adress

Vendor_ID	Vendor_Email
1	customerservice@rbrassy.com
1	customerservice2@rbrassy.com
2	custserve@wegetgolden.com
3	cservice@trustysteel.com
4	customer@marblesprinkle.com
5	customerserviceses@corkfactory.com
6	cust@platination.com
7	customer@plastica.com
8	customerservice@minestone.com

ANALYTICAL DATABASE

Database Requirements

The analytical database will be built as a data repository for analysis on sales data. Based on this fact, following are the dimensions and fact table that are going to be implemented.

CALENDER Dimension

Calender dimension provides a useful information related to the date of transaction. This informaiton is extracted from the Orders table from the operational database. Columns include surrogate key for the dimension, full date of when the transaction occurred, day of the week when transaction occurred, month of when transaction occurred, , day of the month when transaction occurred, business quarter corresponding to the each transaction date, and year of when transaction occurred.

CUSTOMER Dimension

Customer dimension will be able to provide useful information for analysis related to information in each customers. Information in this dimension is extracted from Customer table in an operational database. Columns consist of surrogate key for this dimension, customer id, customer first name, last name, and customer address.

PRODUCT Dimension

Product dimenstion is a result of joining the Product table, Made of table, Raw Material table, and Vendor table from the orerational database. In this dimension, columns will consist of surroate key, product id, product name, product price.

Sales Fact Table

Using surrogate keys from each dimensional table, Sales fact table will be able to provide with analytical information about each sales. Columns consist of surrogate keys from each dimensions. In order to enable analysis such as market basket analysis, TID (Transaction ID) will be added refering to the Order_ID from the Orders table from the operational database as an additional column . Additionally, dollar amount of transaction, and unit amount sold in transaction will be added as columns in order to enable monetary analysis.

Analytical ER Diagram

Figure 3 is a conceptual diagram of the analytical database. Figure 3 was made based on the requirements stated above, and consists of three dimensional table and one fact table, as well as all attributes that will be included in each table. It also visualizes how each dimension will be connected to single fact table.

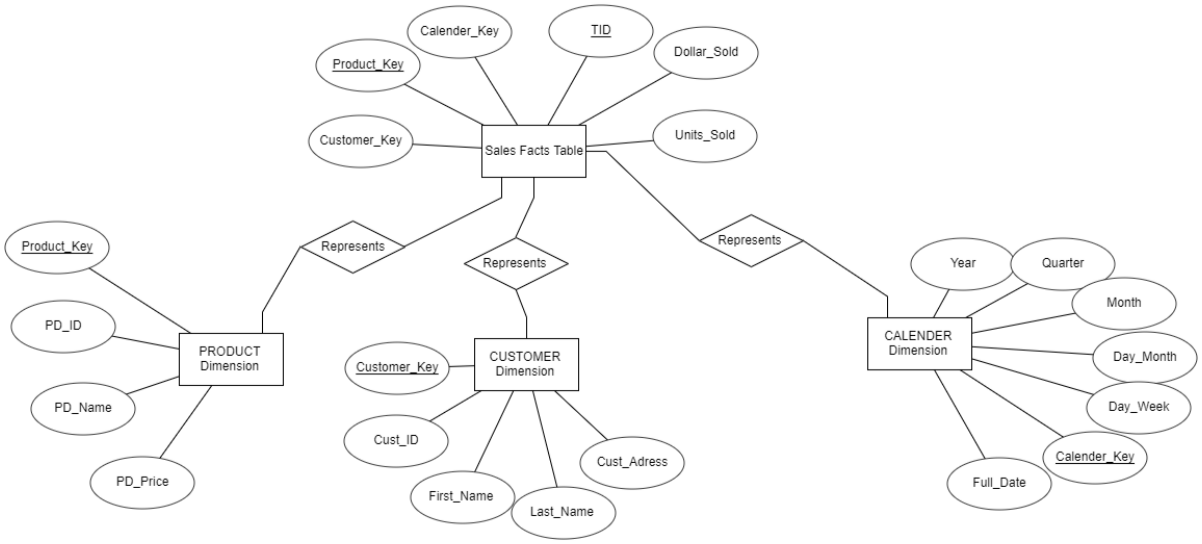

Figure 3: Analytical ER Diagram

Star Schema

Figure 4 is a subject oriented star schema of the analytical database that is based on the requirements and ER diagram. Figure 4 includes three dimensions including information on products, customer, and dates of transactions. Figure 3 also contains a sales fact table which contains keys from each dimensions, a transaction identifier, and some other sales information such as units and dollars sold.

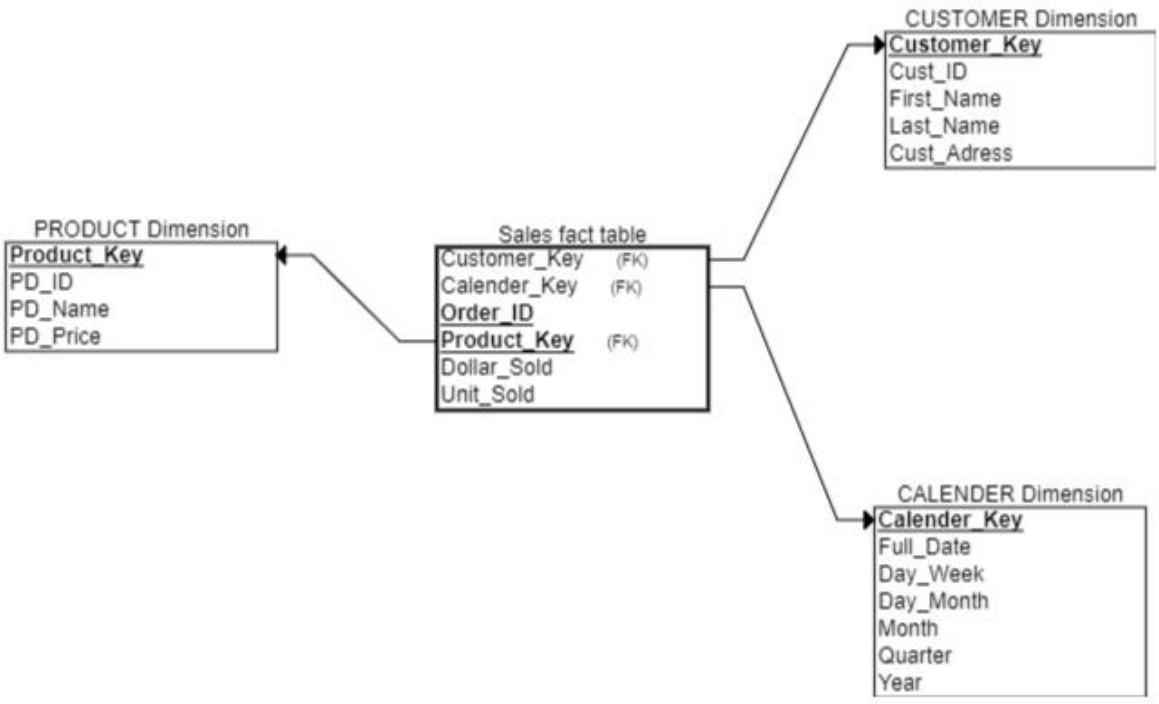

Figure 4: Analytical Database Star Schema

Sample Table / Data

Based on the starschema above, tables were created for three dimensions and fact table stated and vosualized in above sections. Each tables below also contains sample data.

PRODUCT Dimension

Product_Key	PD_ID	PD_Name	PD_Price
1	1	Growling Sax (Alto)	3000
2	2	Growling Sax (Tenor)	40000
3	3	Platinum Sax (Soprano)	100000
4	4	Platinum Sax (Alto)	150000
5	5	Happy Kids Sax (Soprano)	80
6	6	Happy Kids Sax (Tenor)	80

CUSTOMER Dimension

Customer_Key	Cust_ID	First_Name	Last_Name	Cust_Adress
1	John	Coltrane	jcoltrane223myjazzrock@gmail.com	354 Contrane Avenue, New York City, NY, USA
2	Kamasi	Washington	kwashington80listen2myalbum@gmail.com	2 Green Dolphin Street, Los Angeles, LA, USA
3	Terrace	Martin	tmartin712funkymelody@gmail.com	58 ilovejazz, Los Angeles, LA, USA
4	Uyama	Hiroto	Uhiroto9097sofresh@gmail.com	2-5-11, Onngakudouri, Bunkyo-ku, Tokyo, Japan

CALENDER Dimension

Calender_Key	Full_Date	Day_Week	Day_Month	Month	Quarter	Year
1	2020-07-28	Tue	28	07	Q2	2020
2	2020-08-01	Sat	01	08	Q2	2020
3	2020-08-10	Mon	10	08	Q2	2020
4	2020-08-19	Wed	19	08	Q2	2020

Sales Facts Table

Calender_Key	Customer_Key	Product_Key	TID	Dollar_Sold	Unit_Sold
1	2	1	1	30000	3
2	3	5	2	160	2
2	3	6	2	400	5
2	3	6	2	80	1
2	3	6	2	2400	30
3	1	4	3	150000	1
4	4	1	4	30000	1
4	4	2	4	80000	2