

Dodging DAX

DATA MODELING BY EXAMPLE

DAX

Alexander Arvidsson | @arcticdba.se

MANDO



BIKES



Thank you to our Fabric February Friends!

twoday



bouvet

sopra  **steria**



DATAmasterminds



KURANT



Power BI **reports** on
operational data

Modeling concepts

Explore a **better** way of
doing Power BI **reports**





(he/him)

Alexander Arvidsson

Principal Solutions Architect @
Data Masterminds

| Data Platform MVP | MCT | Speaker |



DATAmasterminds





Bike
Production
System



Price lists

Build a data pipeline to organize and move your data

Start with a blank canvas



Pipeline activity

Automate data orchestrations using rich no-code activities.

Start with guidance



Copy data assistant

Follow guided steps to copy data into Microsoft Fabric, as well as other data stores.



Practice with sample data

Quickly build a data pipeline with a predefined template to load data into Lakehouse.



Templates

Generate a new data pipeline quickly using a predefined data scenario.

Need help? [Watch a demo](#)

Copy data

- Choose data source
Select a connector. Then enter the connection information.
- Connect to data source
- Choose data destination
- Connect to data destination
- Review + save

Home OneLake data hub Sample data **New** Azure

Search

All File Database Power Platform Azure Online services Other

Folder File	SQL Server database Database	Oracle database Database	IBM Db2 database Database
MySQL database Database	PostgreSQL database Database	SAP HANA database Database	Snowflake Database
Google BigQuery Database	Amazon Redshift Database	Dataverse Power Platform	Azure SQL database Azure
Azure Synapse Analytics (SQL ... Azure	Azure Blobs Azure	Azure Tables Azure	Azure Data Explorer (Kusto) Azure
Azure Data Lake Storage Gen2 Azure	SharePoint Online list Online services	Salesforce objects Online services	OData Other
Odbc Other	FTP File	Oracle Cloud Storage File	SFTP File
Amazon RDS for SQL Server Database	Azure Database for PostgreSQL Database	Azure SQL Managed Instance Database	MongoDB Atlas for Pipelines Database
MongoDB for Pipeline Database	Azure Cosmos DB for MongoDB Azure	Azure Cosmos DB v2 Azure BETA	Azure Database for MySQL Azure
Azure Files Azure	Amazon S3 Other	Amazon S3 Compatible Other	Dynamics 365 Other
Dynamics AX Other	Dynamics CRM Other	Google Cloud Storage Other	Http Other

- Home
- Create
- Browse
- OneLake data hub
- Apps
- Metrics
- Monitor
- Learn
- Real-Time hub
- Workspaces
- wsDodging DAX
- pipeline1

Copy data

- Choose data source
- Connect to data source**
Select, preview, and choose the data.
- Choose data destination
- Connect to data destination
- Review + save

Connect to data source

Select a table
(Connection: sqldodgingdax.databases...)

Tables
 Query

Search

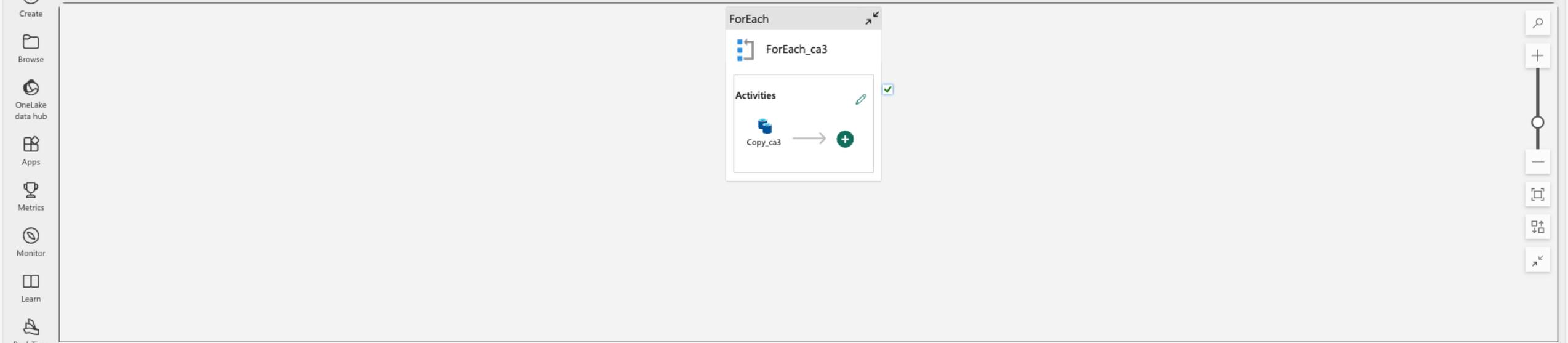
production.brands

- production.categ...
- production.produ...
- production.stocks
- sales.customers
- sales.order_items
- sales.orders
- sales.staffs
- sales.stores

Preview data: production.brands

123 brand_id	abc brand_name
1	Electra
2	Haro
3	Heller
4	Pure Cycles
5	Ritchey
6	Strider
7	Sun Bicycles
8	Surly
9	Trek

Back Next



Parameters | Variables | Settings | Output

+ New | Delete

<input type="checkbox"/>	Name	Type	Default value	
<input type="checkbox"/>	cw_items_ca3	Array	{{"source":{"schema":"produ	

wsDodging DAX | pingestBike Store

Home Transform Add column View Help

Get data Enter data Manage connections Options Manage parameters Refresh Advanced editor Add data destination Choose columns Remove columns Keep rows Remove rows Filter rows Sort Split column Group by Data type: Whole number Merge queries Append queries Map to entity Copilot Export template

New query Data sources Parameters Query Manage columns Reduce rows Transform Combine CDM Insights Share

Queries [1] Table.TransformColumnTypes("#Promoted headers", {"product_id", Int64.Type}, {"product_name", type text}, {"model_year", Int64.Type}, {"list_price", type number})

product_id	product_name	model_year	list_price
1	Trek 820 - 2016	2016	379.99
2	Ritchey Timberwolf Frameset - 2016	2016	749.99
3	Surly Wednesday Frameset - 2016	2016	999.99
4	Trek Fuel EX 8 29 - 2016	2016	2899.99
5	Heller Shagamaw Frame - 2016	2016	1320.99
6	Surly Ice Cream Truck Frameset - 2016	2016	469.99
7	Trek Slash 8 27.5 - 2016	2016	3999.99
8	Trek Remedy 29 Carbon Frameset - 2016	2016	1799.99
9	Trek Conduit+ - 2016	2016	2999.99
10	Surly Straggler - 2016	2016	1549
11	Surly Straggler 650b - 2016	2016	1680.99
12	Electra Townie Original 21D - 2016	2016	549.99
13	Electra Cruiser 1 (24-Inch) - 2016	2016	269.99
14	Electra Girl's Hawaii 1 (16-inch) - 2015/2016	2016	269.99
15	Electra Moto 1 - 2016	2016	529.99
16	Electra Townie Original 7D EQ - 2016	2016	599.99
17	Pure Cycles Vine 8-Speed - 2016	2016	429
18	Pure Cycles Western 3-Speed - Women's - 20...	2016	449
19	Pure Cycles William 3-Speed - 2016	2016	449
20	Electra Townie Original 7D EQ - Women's - 2016	2016	599.99
21	Electra Cruiser 1 (24-Inch) - 2016	2016	269.99
22	Electra Girl's Hawaii 1 (16-inch) - 2015/2016	2016	269.99
23	Electra Girl's Hawaii 1 (20-inch) - 2015/2016	2016	299.99
24	Electra Townie Original 21D - 2016	2016	549.99
25	Electra Townie Original 7D - 2015/2016	2016	499.99
26	Electra Townie Original 7D EQ - 2016	2016	599.99
27	Surly Big Dummy Frameset - 2017	2017	999.99
28	Surly Karate Monkey 27.5+ Frameset - 2017	2017	2499.99
29	Trek X-Caliber 8 - 2017	2017	999.99
30	Surly Ice Cream Truck Frameset - 2017	2017	999.99

Query settings

Properties

Name: sheet1

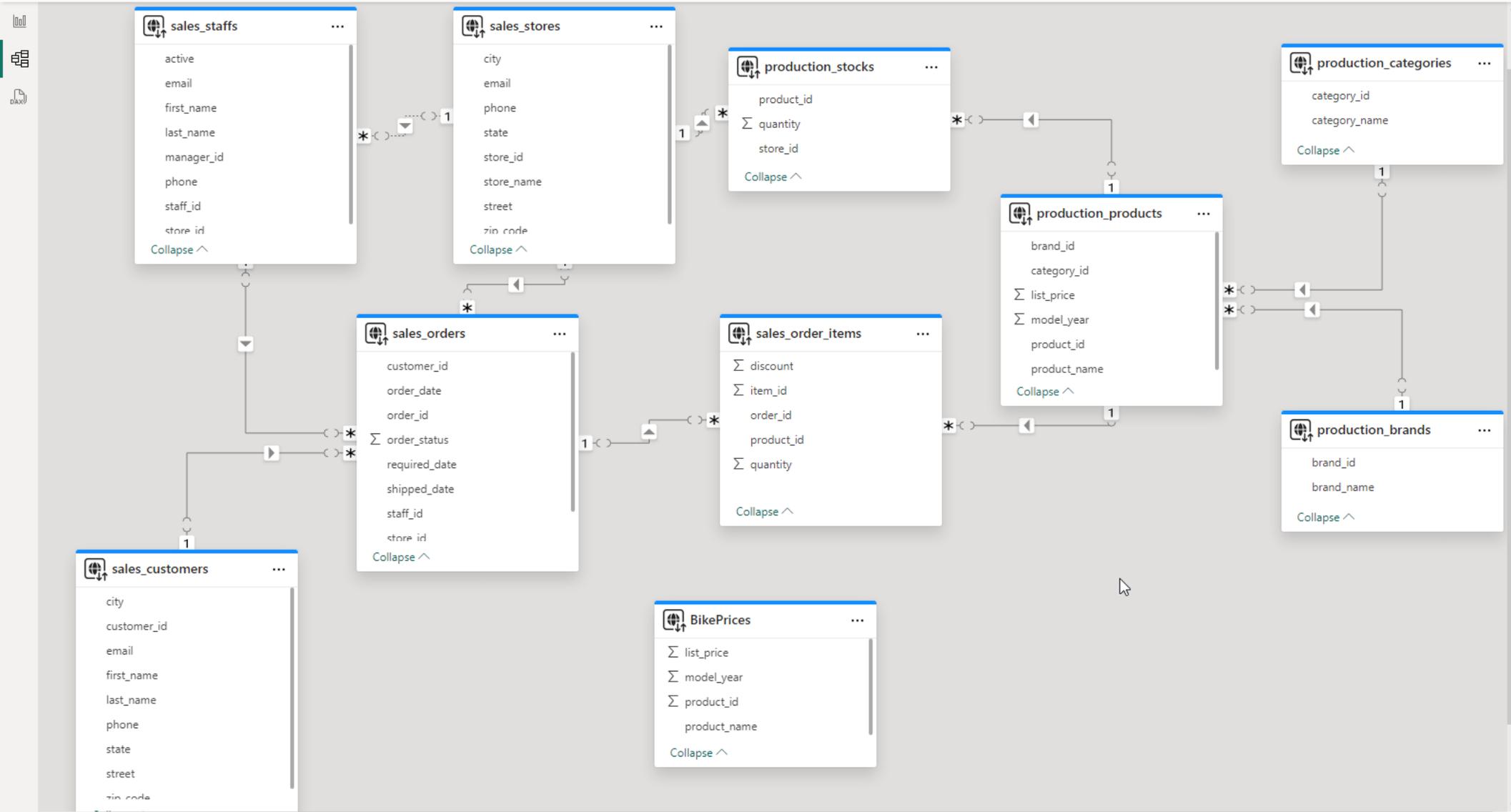
Entity type: Custom

Applied steps

- Source
- Navigation 1
- Promoted ...
- Changed c...

Data destination

Lakehouse



Data

Tables Model

Search

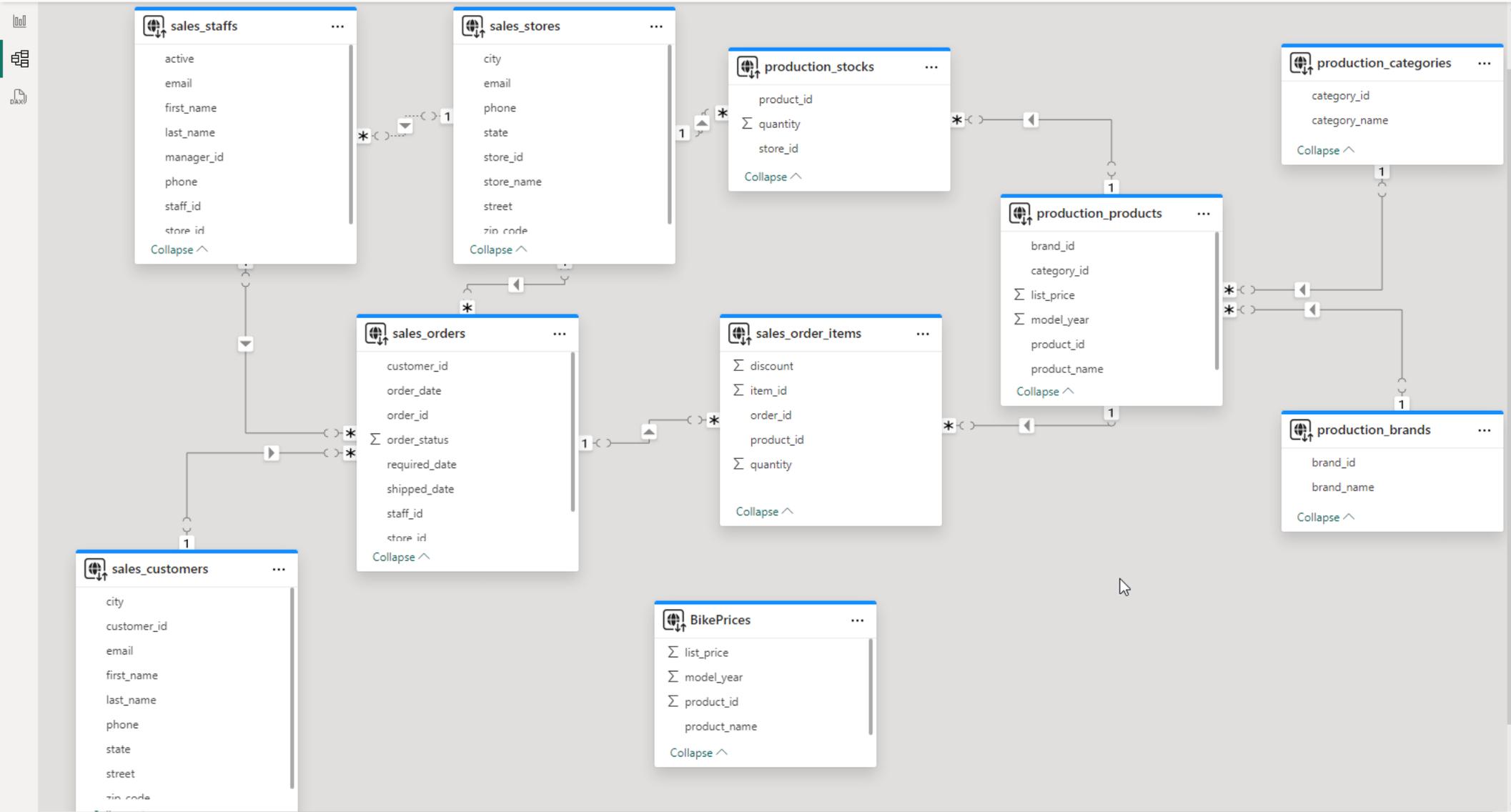
- BikePrices
- production_brands
- production_categories
- production_products
- production_stocks
- sales_customers
- sales_order_items
- sales_orders
- sales_stuffs
- sales_stores

Report **requirements:**

Total Sales Revenue

Rolling 3-month Average Sale

Net Sales per Quarter



Data

Tables Model

Search

- BikePrices
- production_brands
- production_categories
- production_products
- production_stocks
- sales_customers
- sales_order_items
- sales_orders
- sales_stuffs
- sales_stores

Properties

Making these reports
won't be **fun**.

In fact, it **won't** even
be **possible** with this
data model.

It's actually a
really bad idea.

Seriously.

Why is this going to
be **difficult**?

The operational data
model is **not suitable**
for **reporting**.



[Visible confusion]

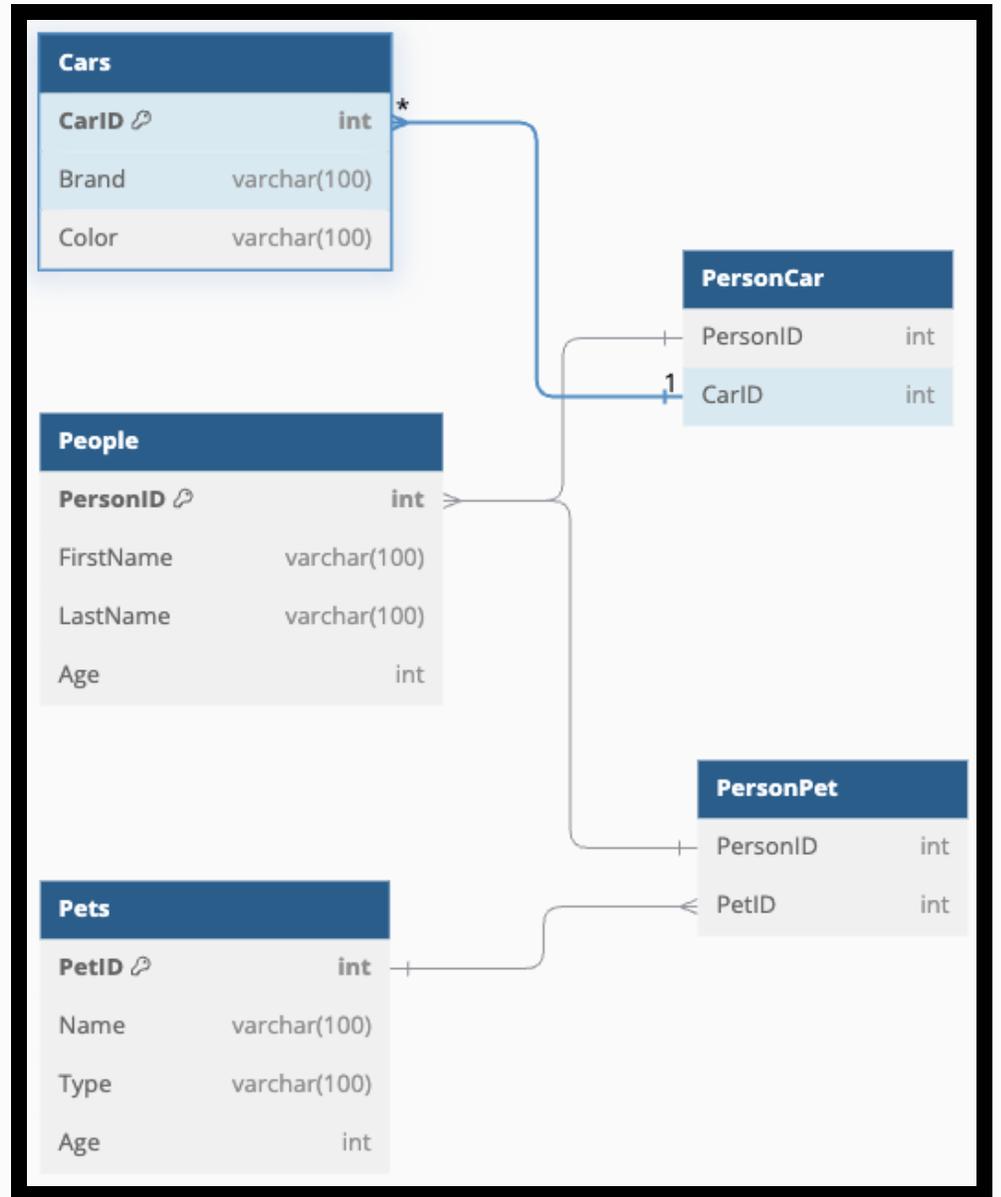
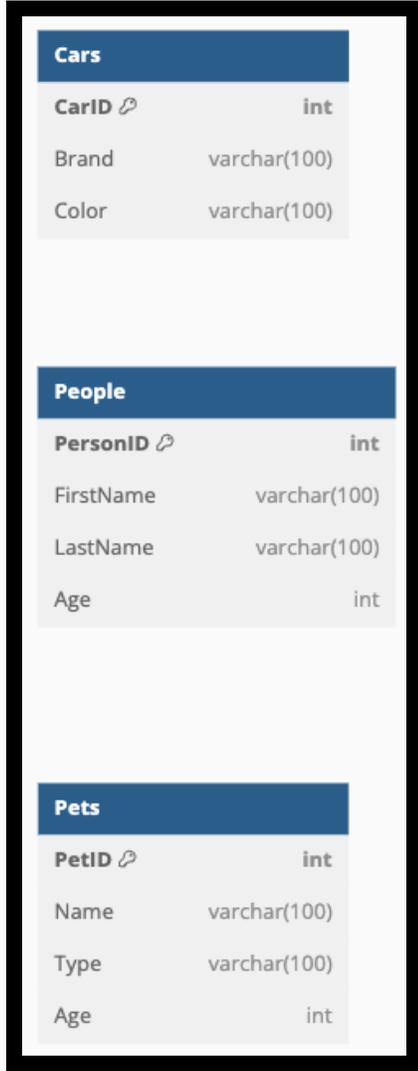
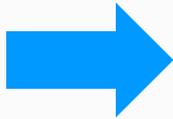
Several
reasons for **that.**

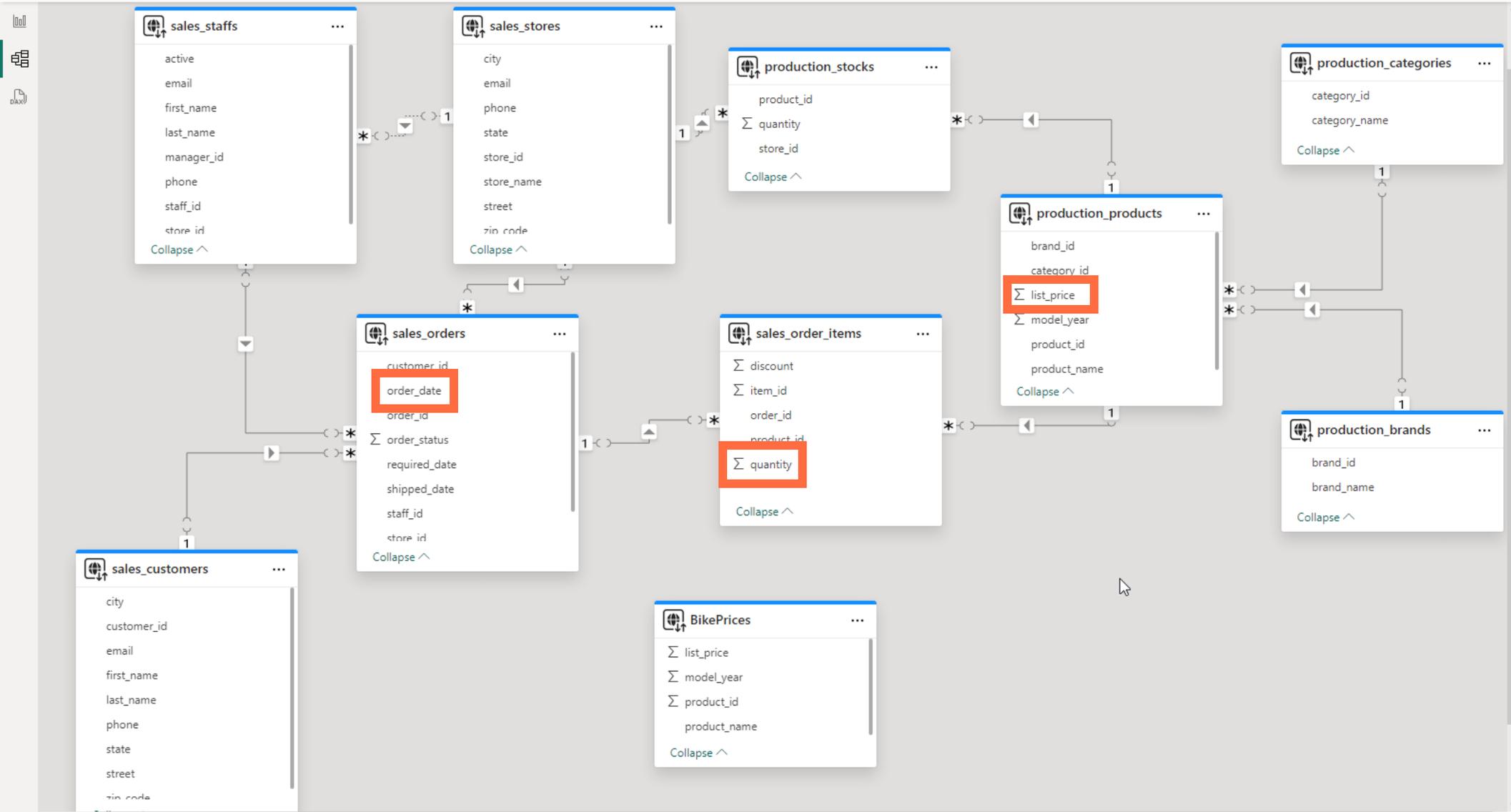
The data model is
normalized.

No.

Normalized**ED**.

Stuff	
Name	varchar(200)
Car	varchar(200)
Car color	varchar(20)
Pet name	varchar(30)





Properties

Data

Tables Model

Search

- BikePrices
- production_brands
- production_categories
- production_products
- production_stocks
- sales_customers
- sales_order_items
- sales_orders
- sales_stuffs
- sales_stores

A **normalized**
data model is
not intuitive.

A **normalized**
data model has
many **uses.**

...but **reporting** is
not one of them.

The **data model** has
a **date issue**.








Mark as date table Manage relationships New measure Quick measure New column New table

Calendars Relationships Calculations

order_status	order_date	required_date	shipped_date	store_id	staff_id	OrderDateYear
4	Friday, 1 January 2016	Monday, 4 January 2016	Sunday, 3 January 2016	2	6	2016
4	Sunday, 3 January 2016	Wednesday, 6 January 2016	Wednesday, 6 January 2016	2	6	2016
4	Monday, 4 January 2016	Thursday, 7 January 2016	Tuesday, 5 January 2016	2	6	2016
4	Monday, 4 January 2016	Thursday, 7 January 2016	Tuesday, 5 January 2016	2	6	2016
4	Tuesday, 5 January 2016	Wednesday, 6 January 2016	Wednesday, 6 January 2016	2	6	2016
4	Friday, 8 January 2016	Monday, 11 January 2016	Monday, 11 January 2016	2	6	2016
4	Friday, 15 January 2016	Saturday, 16 January 2016	Monday, 18 January 2016	2	6	2016
4	Monday, 18 January 2016	Thursday, 21 January 2016	Thursday, 21 January 2016	2	6	2016
4	Tuesday, 19 January 2016	Wednesday, 20 January 2016	Thursday, 21 January 2016	2	6	2016
4	Wednesday, 20 January 2016	Friday, 22 January 2016	Thursday, 21 January 2016	2	6	2016
4	Wednesday, 20 January 2016	Thursday, 21 January 2016	Thursday, 21 January 2016	2	6	2016
4	Thursday, 21 January 2016	Friday, 22 January 2016	Friday, 22 January 2016	2	6	2016
4	Friday, 22 January 2016	Monday, 25 January 2016	Saturday, 23 January 2016	2	6	2016
4	Saturday, 23 January 2016	Sunday, 24 January 2016	Sunday, 24 January 2016	2	6	2016
4	Monday, 25 January 2016	Thursday, 28 January 2016	Tuesday, 26 January 2016	2	6	2016
4	Wednesday, 27 January 2016	Saturday, 30 January 2016	Friday, 29 January 2016	2	6	2016
4	Sunday, 31 January 2016	Monday, 1 February 2016	Tuesday, 2 February 2016	2	6	2016
4	Wednesday, 3 February 2016	Thursday, 4 February 2016	Friday, 5 February 2016	2	6	2016
4	Thursday, 4 February 2016	Friday, 5 February 2016	Saturday, 6 February 2016	2	6	2016

The numbers will
seem absolutely **fine**

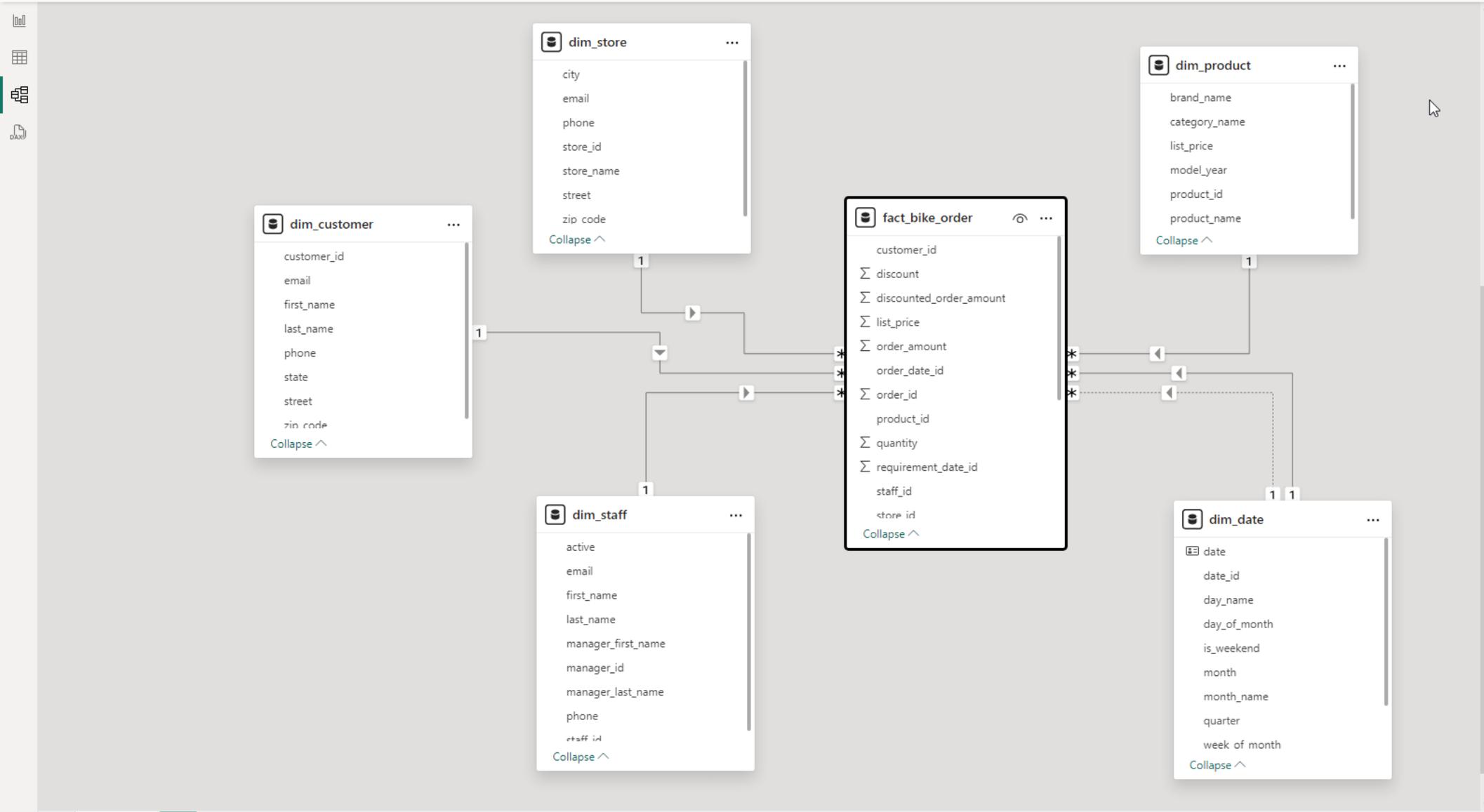
...when, **in fact,**
they're **not.**

The report will be
unbearably slow –
especially as the
dataset grows.

I **told** you it was
a **bad** idea.



We can make the
data model
much more **intuitive**.



Data

Tables Model

Search

- dim_customer
- dim_date
- dim_product
- dim_staff
- dim_store
- fact_bike_order

Properties

Activate Windows
Go to Settings to activate Windows.

This is the **same**
information in a
dimensional structure.

Also **known** as a
"star schema"

Two **parts** to
a **dimensional**
data model:

Facts

phone
store_id
store_name
street
zip code

Collapse ^

fact_bike_order
customer_id
Σ discount
Σ discounted_order_amount
Σ list_price
Σ order_amount
order_date_id
Σ order_id
product_id
Σ quantity
Σ requirement_date_id
staff_id
store id

Collapse ^

category_name
list_price
model_year
product_id
product_name

Collapse ^

dim_staff
active
email
first_name
last_name

dim_date
date
date_id
day_name
day_of_month

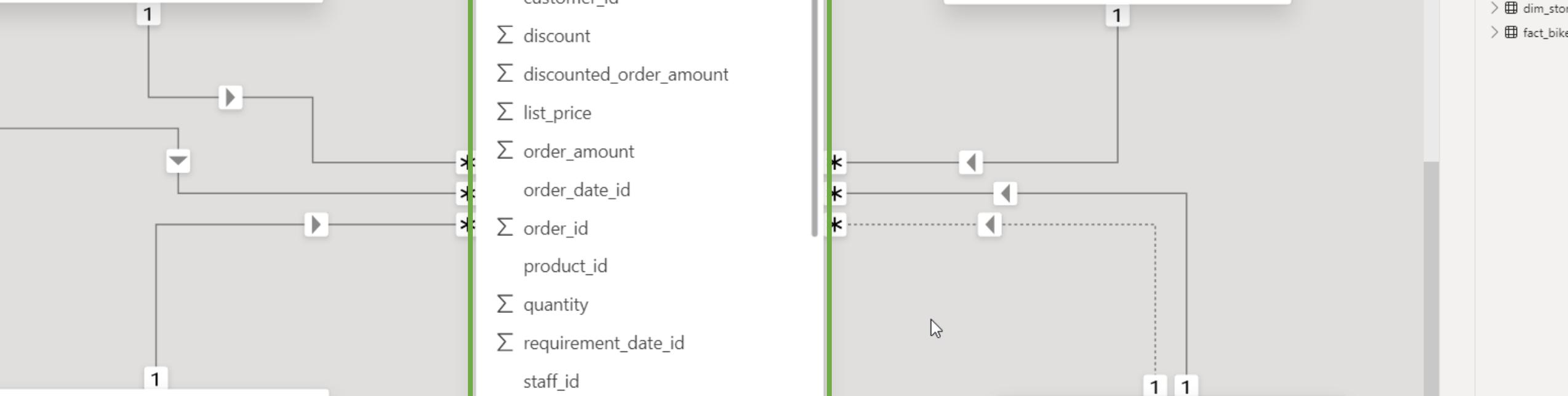
Properties

Data

Tables

Search

- dim_cus
- dim_dat
- dim_pro
- dim_staf
- dim_stor
- fact_bike



Dimensions

dim_customer	
customer_id	
email	
first_name	
last_name	
phone	
state	
street	
zip code	
Collapse ^	

dim_store	
city	
email	
phone	
store_id	
store_name	
street	
zip code	
Collapse ^	

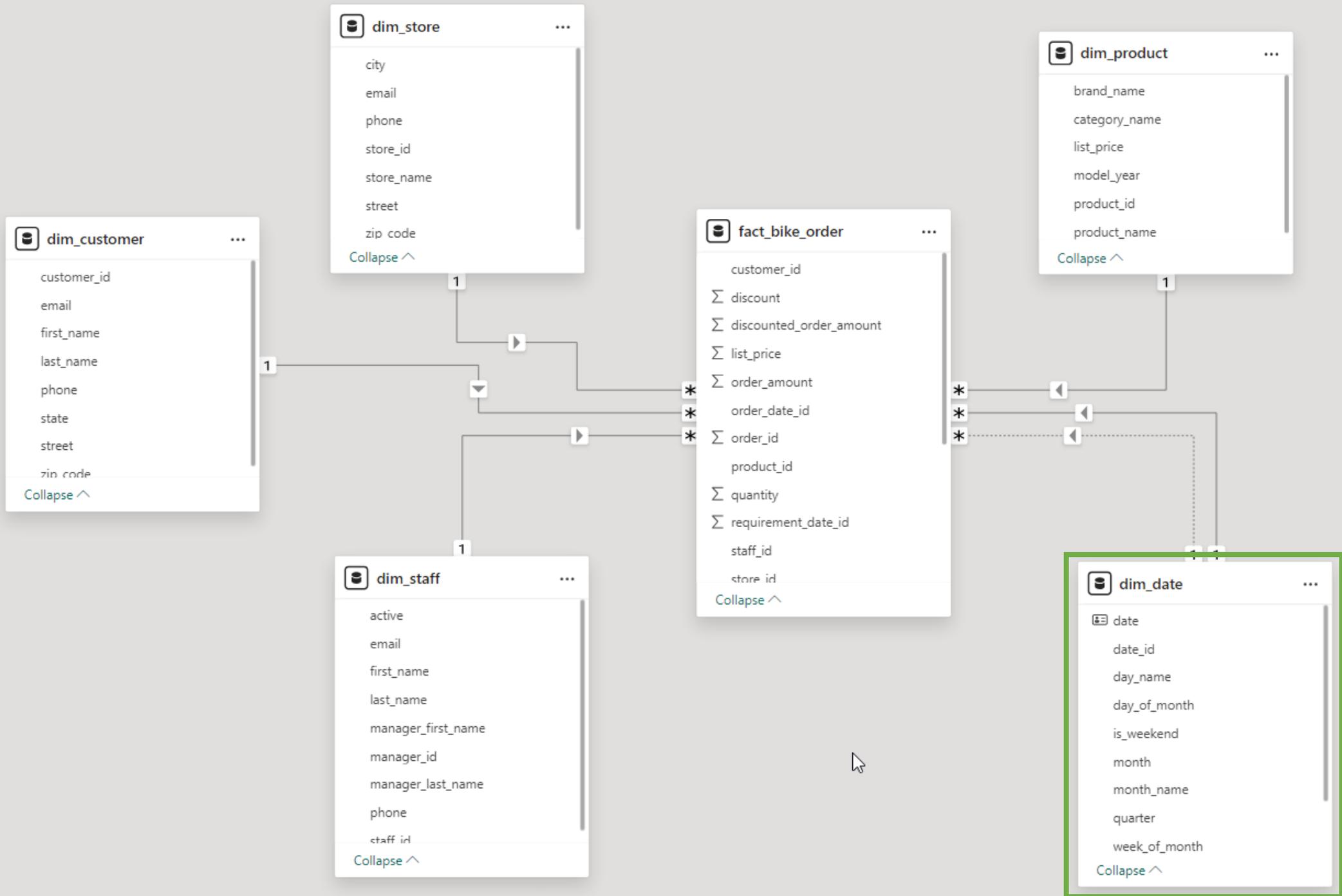
dim_staff	
active	
email	
first_name	
last_name	
manager_first_name	
manager_id	
manager_last_name	
phone	
staff_id	
Collapse ^	

fact_bike_order	
customer_id	
Σ discount	
Σ discounted_order_amount	
Σ list_price	
Σ order_amount	
order_date_id	*
order_id	*
product_id	*
quantity	
Σ requirement_date_id	
staff_id	
store_id	
Collapse ^	

dim_product	
brand_name	
category_name	
list_price	
model_year	
product_id	
product_name	
Collapse ^	

dim_date	
date	
date_id	
day_name	
day_of_month	
is_weekend	
month	
month_name	
quarter	
week_of_month	
Collapse ^	

Remember the
date issue?

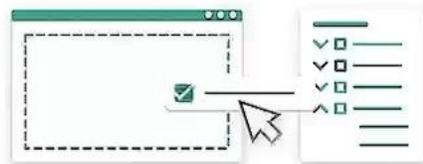


This is the way.

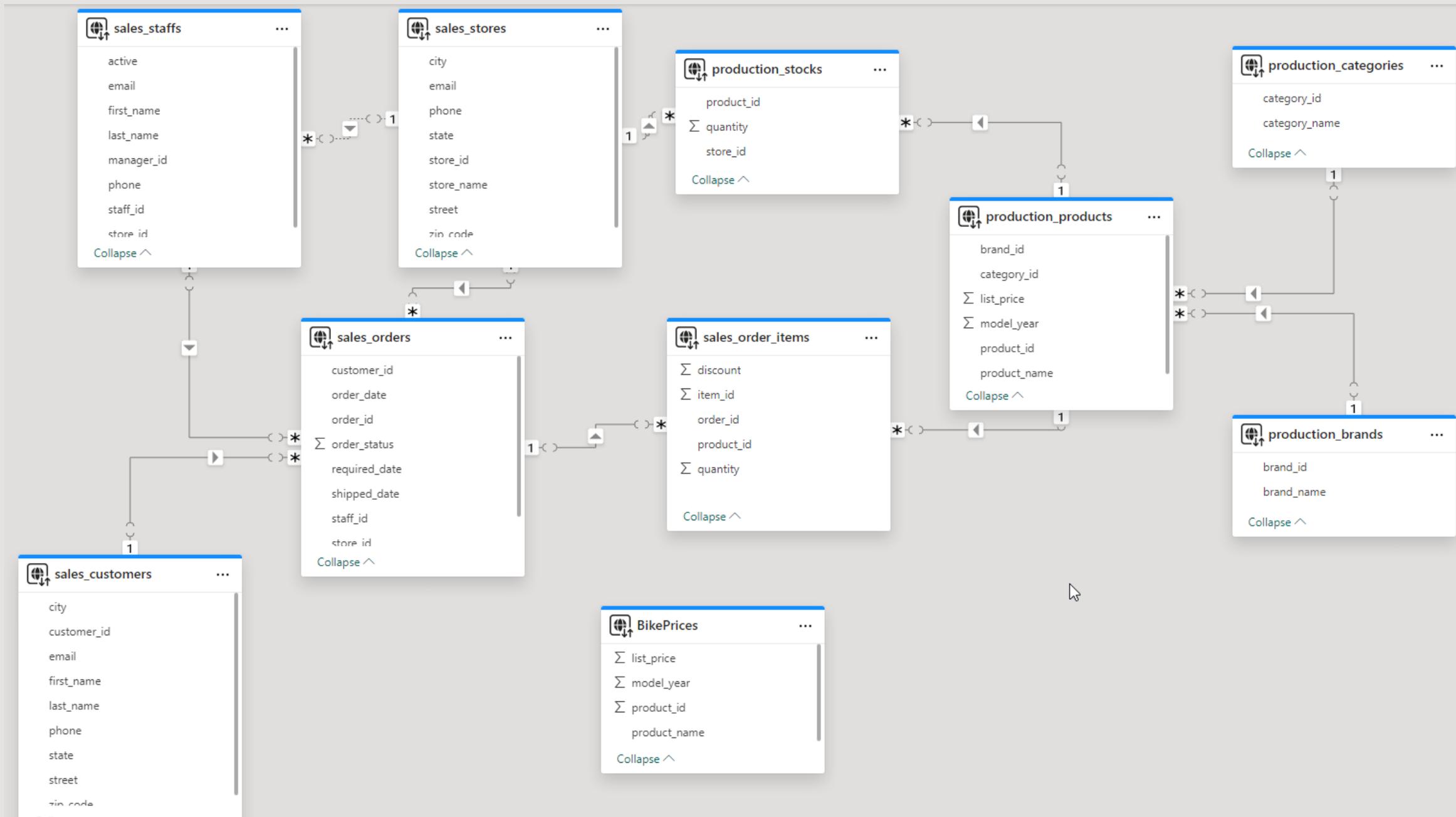
A **dimensional**
data model is much
more **intuitive**.

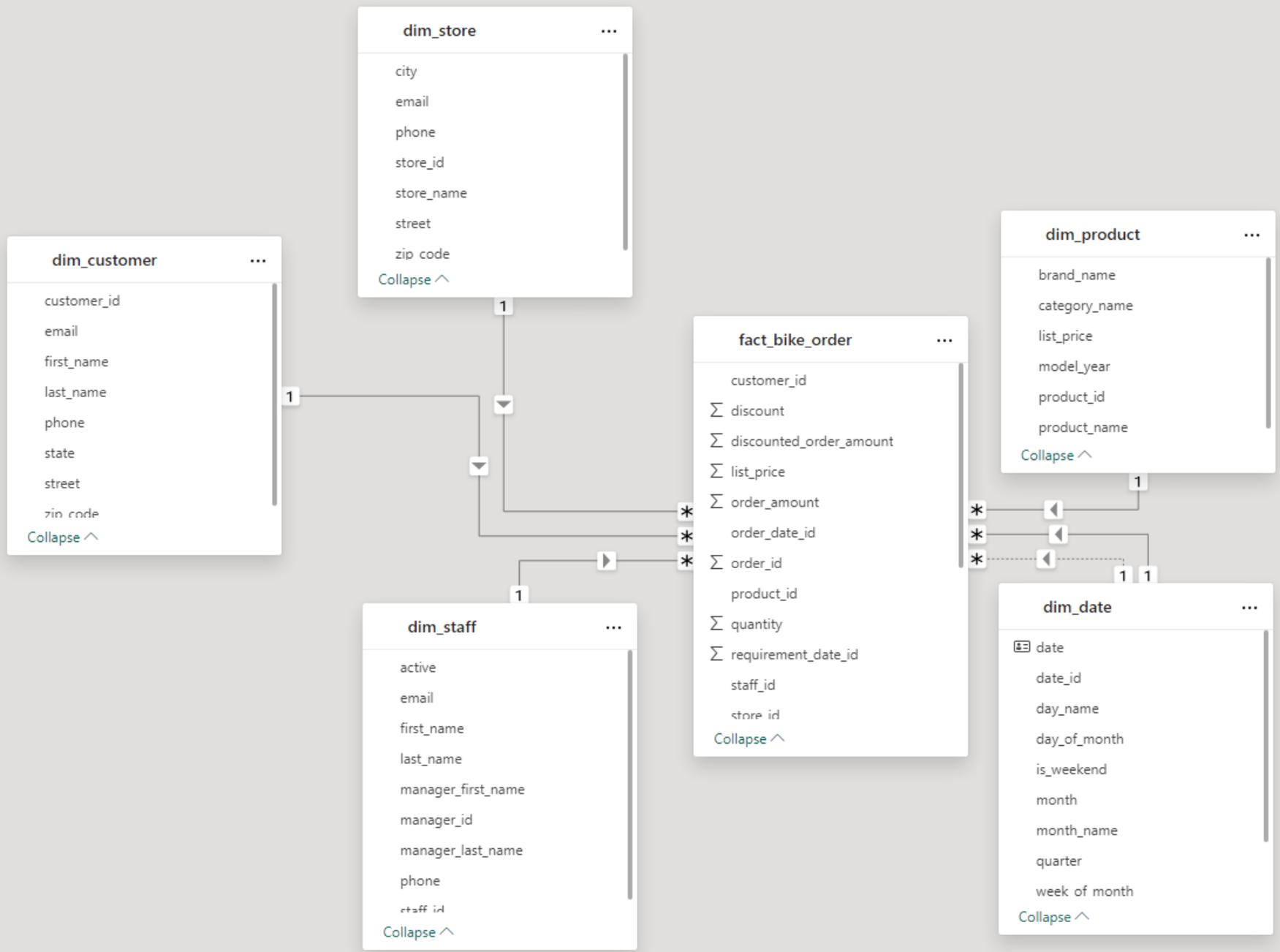
Build visuals with your data

Select or drag fields from the Data pane onto the report canvas.



But - creating a
dimensional data
model requires **effort**.





Let's put it **all together**.

Report requirements:

Total Sales Revenue
Rolling 3-month Average Sale
Net Sales per Quarter



Year	Revenue
2016	\$2,709,484.47
2017	\$3,845,515.02
2018	\$2,023,989.39
2024	\$1,559.99
Total	\$8,580,548.87

Data

Search

- month
- month_name
- quarter
- week_of_month
- week_of_year
- year
- > dim_product
- > dim_staff
- > dim_store
 - city
 - email
 - phone
 - store_id
 - store_name
 - street
 - zip_code
- > fact_bike_order
 - customer_id
 - Σ discount
 - Σ discounted_or...
 - Σ list_price
 - Σ order_amount
 - order_date_id
 - Σ order_id
 - product_id
 - Σ quantity
 - Σ requirement_...
 - Rolling3Mont...
 - staff_id
 - store_id
 - Total Revenue ...
 - YoY Revenue ...
 - YTD Sales by ...
 - YTD Total Rev...

Report requirements:

Total Sales Revenue

Rolling 3-month Average Sale

Net Sales per Quarter

```

Rolling3MonthAvgSales =
VAR CurrentDate = MAX(dim_date[date])
VAR ThreeMonthsAgo = EDATE(CurrentDate, -2)
RETURN
CALCULATE(
    AVERAGEX(
        VALUES(dim_date[date]),
        CALCULATE(SUM(fact_bike_order[discounted_order_amount]))
    ),
    dim_date[date] >= ThreeMonthsAgo && dim_date[date] <= CurrentDate
)

```

Date for analysis ▼

Friday, August 05, 2016 ▼

Store Name	Rolling 3-month average sales
Baldwin Bikes	7,351.55
Rowlett Bikes	5,011.69
Santa Cruz Bikes	6,729.99
Total	9,052.87

Data

Visualizations

Filters

- month
- month_name
- quarter
- week_of_month
- week_of_year
- year
- dim_product
- dim_staff
- dim_store
 - city
 - email
 - phone
 - store_id
 - store_name
 - street
 - zip_code
- fact_bike_order
 - customer_id
 - discount
 - discounted_or...
 - list_price
 - order_amount
 - order_date_id
 - order_id
 - product_id
 - quantity
 - requirement_...
 - Rolling3Mont...
 - staff_id
 - store_id
 - Total Revenue
 - YoY Revenue ...
 - YTD Sales by ...
 - YTD Total Rev...

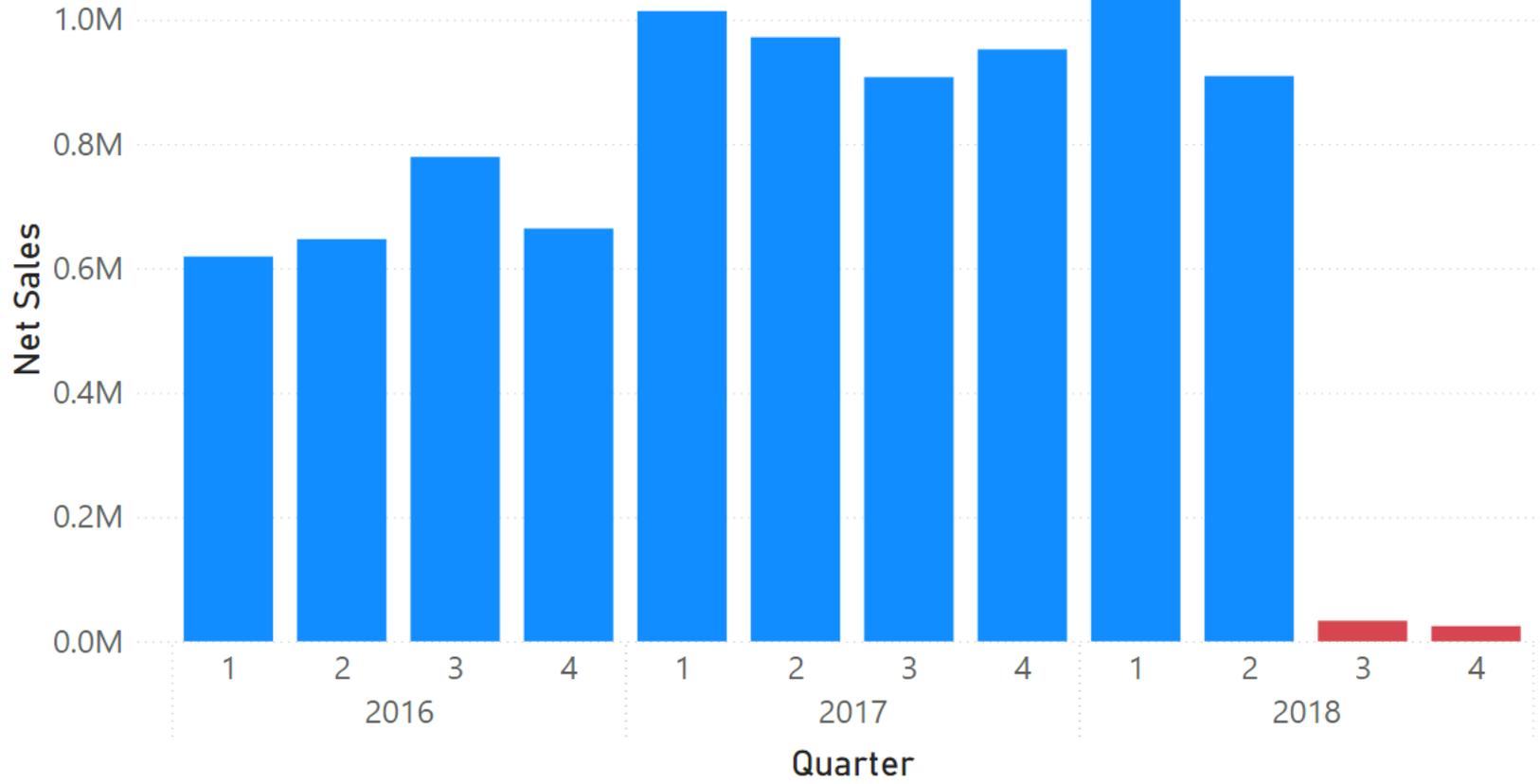
Report requirements:

Total Sales Revenue

Rolling 3-month Average Sale

Net Sales per Quarter

Net Sales by Year and Quarter



Add a text box to your report.

Data

Visualizations

Filters

- month
- month_name
- quarter
- week_of_month
- week_of_year
- year
- dim_product
- dim_staff
- dim_store
 - city
 - email
 - phone
 - store_id
 - store_name
 - street
 - zip_code
- fact_bike_order
 - customer_id
 - discount
 - discounted_or...
 - list_price
 - order_amount
 - order_date_id
 - order_id
 - product_id
 - quantity
 - requirement_...
 - Rolling3Mont...
 - staff_id
 - store_id
 - Total Revenue
 - YoY Revenue ...
 - YTD Sales by ...
 - YTD Total Rev...

Measures?

Maybe. Maybe not.

“The **best** DAX is
the DAX you did
not have to write.”

- Marco Russo



“I’m not lazy,
I’m **efficient.**”

-Patrick LeBlanc



Better **Performance?**

Yes.

Bonus:

Better **Security?**

%#@\$! YES.

Just because you **can**, **doesn't**
mean you **should**.

Data modeling is a
complicated activity.

Even **more** important with
Microsoft Fabric.

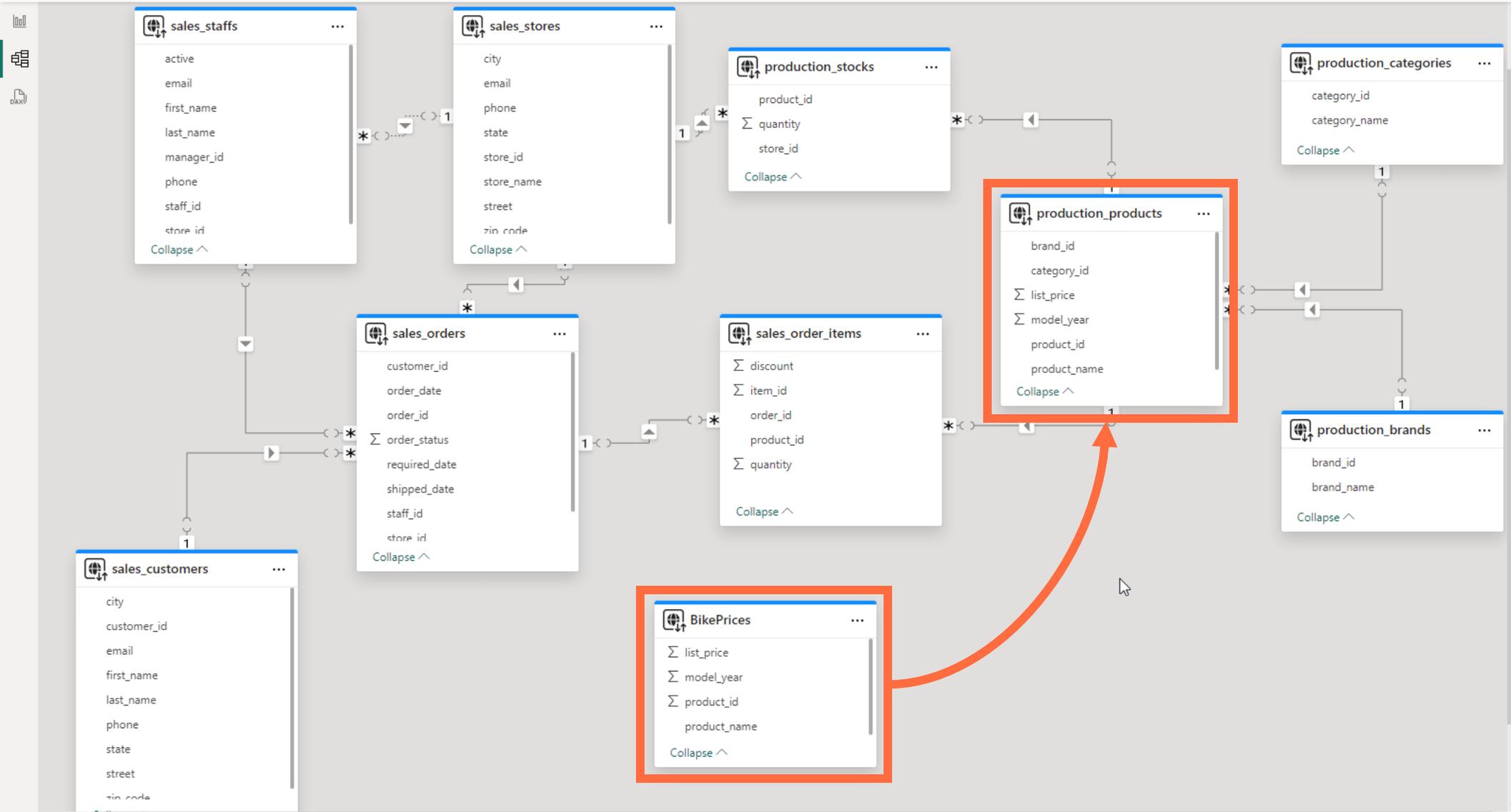
STAR SCHEMA



ALL THE THINGS

Dirty secret:

None of these sales
numbers are actually
correct.

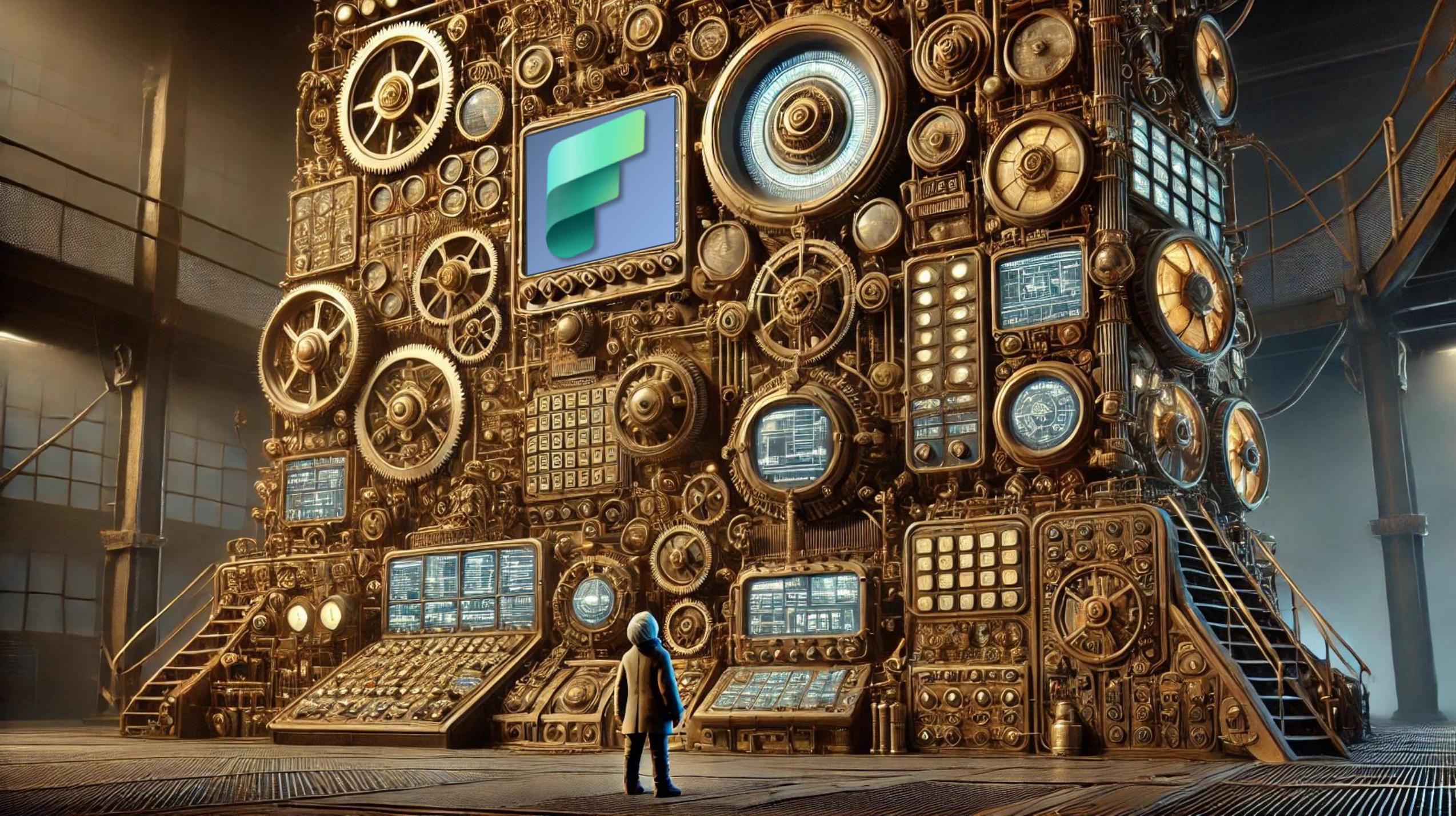


Data

Tables Model

Search

- > BikePrices
- > production_brands
- > production_categories
- > production_products
- > production_stocks
- > sales_customers
- > sales_orders
- > sales_order_items
- > sales_stuffs
- > sales_stores





Thank you!

@arcticdba.se

alexanderarvidsson@masterminds.io