



ITOM 6265: Database Design Project

Liquor Inventory Management System

By:

Shanker Nagarajan

December 4th, 2022

Project Mentor: Dr Karthik Kannan

Southern Methodist University, Cox School of Business

PUBLISHED LINK

https://shankern.shinyapps.io/Group11_InventoryManagement/
(Would require SMU VPN to view this)

BACKGROUND

Brown Forman Corp, one of the world's largest liquor businesses, intends to optimize inventory and demand management. This will assist them in operating distribution with fewer disruptions and save costs. The project's purpose is to create an Inventory Management System, which is a real-time database of information capable of connecting many retail outlets across the country. With the use of analytics in the supply chain eco-system, the goal is to eliminate the human work of tracking and inventory maintenance.

3-A VISION (GOAL)

- Assist distribution with fewer disruptions, save costs and human work elimination
- A real-time database of information capable of connecting retail outlets across the country
- Accurately handle the product inventory and track the order and shipment status

FOCUS AREAS (SCOPE)

- Record: Creating a record-keeping structure DBMS for each product (alcohol item)
- Maintain: The product information for each item in the inventory
- Track: To keep notes of order and shipment statuses and address OOS issue
- Produce: interactive sales and stock recommendation reports
- Update: Information and reduction of product obsolescence and decay

ANTICIPATED OUTCOMES

- Save 30% time on inventory management
- Save 20% time in producing reports based on order and completion dates
- Reduce human error by 70%
- Save 35% time on tracking shipments and order statuses
- Save 50% cost on wages

APP USERS

- Inventory Managers: Receiving and recording new goods when it is delivered or shipped out by examining various suppliers, logging daily deliveries, and assessing new shipments
- Inventory Workers: Keeping track of purchases and assessing new shipments/deliveries
- Store Managers: Control Stock and Sales at the Store Level (Retailers)

CONCEPTUAL & LOGICAL ER DIAGRAM

During the early phases of conception, the following entities were the primary owners of the inventory management system: product, manufacturer, order, category, stock, stores, shipments, and location. While there is a clear link between these groups, some have shown to be more crucial than others in terms of implementation. Scoping out a specific set of functionality revealed that distinct entities for location and category were unnecessary. Phase 0 represents the idealization era of project design in the diagrams below, whereas Phase 1 represents the actualization period.

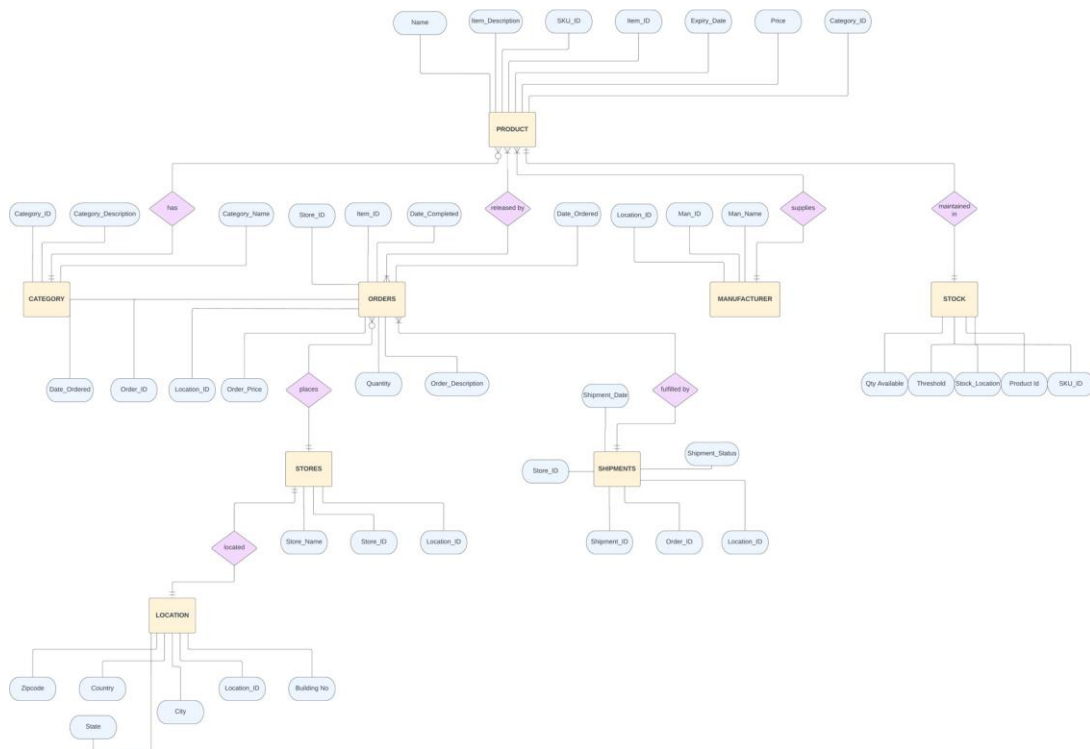


Fig A - Phase 0: ER Diagram during the idealization era (CONCEPTUAL)

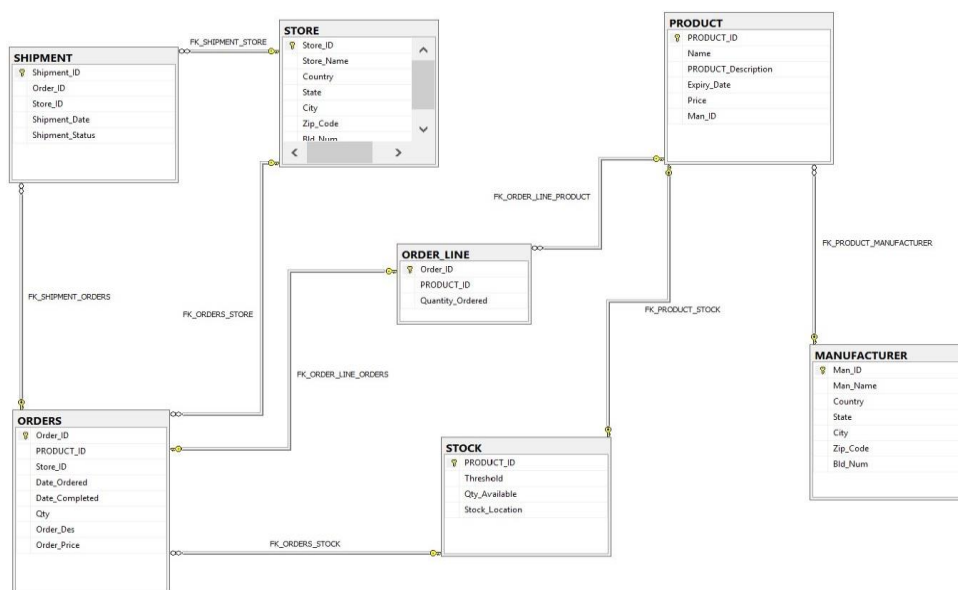


Fig B - Phase 1: ER Diagram during the actualization era (LOGICAL - NORMALIZED)

SHINY WORKFLOW

For user ease and enhanced accessibility, the shiny app had the following tabs and functions associated: (See Appendix C. for detailed step-by-step flow)

PRODUCT	To Add, Search, Update or Delete a particular product from the central Database
STATUS	To glance at the shipment situation by searching using order_id or order status
REPORT	To search by Date Type and Range
STORE MAP	To search stores and retailers by geolocation on interactive maps
ANALYTICS	Produce monthly sales reports for each category and stock status

FUTURE SCOPE

- Reports on product-by-product sales can also be created in the future. This will provide users with a better understanding of which items are selling well and which are not
- For optimal processes, functionality that monitors the supply chain from the manufacturer to the corporate warehouse can also be implemented
- The app may be created with global retails in mind for scalability

APPENDIX

A. ENTITY RELATIONSHIPS – BUSINESS RULES

- Each **manufacturer** supplies one to many **products**
- Each **product** is supplied by one **manufacturer**
- Every **order** contains one **product**
- One **product** is released by one **order**
- Each **order** is shipped to one **store**
- Each **store** places zero to many **orders**
- Each **shipment** contains one to many **orders**
- Each **order** is fulfilled by one **shipment**
- Each **product** is maintained in one **stock**
- One **stock** maintains one to many **products**

B. DATA DICTIONARY

The entity table below shows the various groups and basic definitions for user understanding.

Manufacturer	Another company that may provide items to the Brown Forman Corp warehouse <i>Examples: Rolfson, Crown Royal, Titos Handmade etc.</i>
Store	A retailer that has ordered or might order products <i>Examples: Hamil Howe, Hickle – Konopelski, Bailey Inc., etc.</i>
Order	The transaction is associated with the sale of one or more products to a store and is identified by an order_id from sales or accounting. Examples: 4001, 4011, 4026
Shipment	The transaction is associated with the sale of one or more orders from the warehouse outward and is identified by a shipment_id by accounting. Examples: 10006, 100011
Product	A type of liquor or wine or beer in the warehouse that may be ordered by stores or supplied by suppliers. It has a product_id associated with it too. <i>Example: Coors Light Beer (200101)</i>
Stock	Record different products and their location and threshold in the warehouse.

C. SHINY USER INTERFACE

The following write-up shows in full the step-by-step process of the shiny app that was designed to ensure the success of this project.

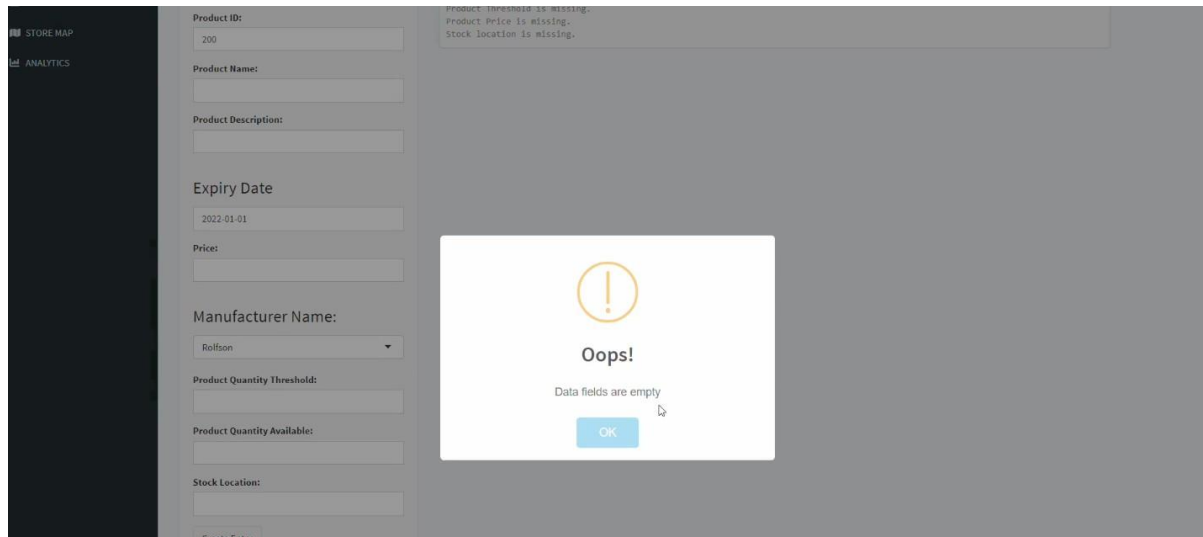
When the app is started, it displays a landing page with information about the analysts who created it, the goal of the project, and the firm to which it applies "Brown Forman Corporation."



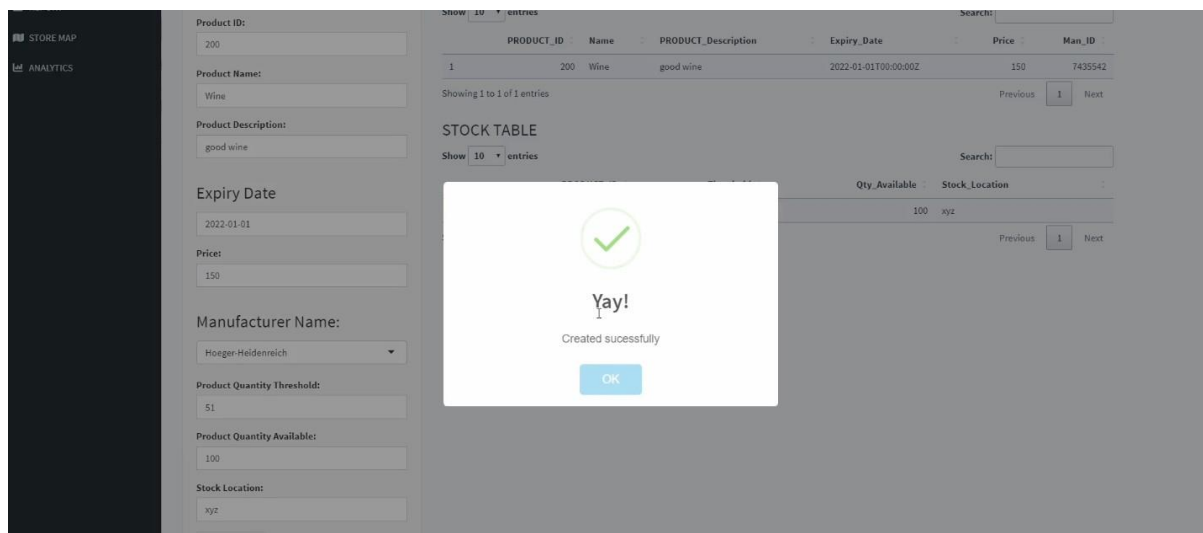
The first item on the left pane, "PRODUCT", has four capabilities, the first of which allows any user to **CREATE** a product entry into the database. An entry may be made by inputting basic information such as the product ID, product name, product information, expiry date, price per unit, manufacturer name, threshold, quantity available, and stock location.

This screenshot shows the "ENTER PRODUCT DETAILS" form within the "PRODUCT" section of the application. The form is titled "ENTER PRODUCT DETAILS" and includes several input fields: "Product ID:" with the value "4001", "Product Name:" with "Beer Magnum", "Product Description:" with "Lather beer rich in taste and flavour", "Expiry Date:" with "2022-01-01", "Price:" with "3.4", "Manufacturer Name:" with a dropdown menu showing "Rolfson", "Product Quantity Threshold:" with "120", "Product Quantity Available:" with "40", and "Stock Location:" with "WR Zone 1 North". A "Create Entry" button is located at the bottom of the form. The top of the form area has a green header with the text "STOCK MANIPULATION" and a sub-header with "CREATE", "READ", "UPDATE", and "DELETE" options.

Failing to enter all required data fields will result in throwing an error pop-up on the screen. The image below is a small example of what is explained:



Once all data fields are essentially entered. A success message pops up on the screen.



The second capability on the same screen, "PRODUCT," allows the user to **READ** the default data of all stock or data on any specific product or category (beer/wine/whiskey, for example) by entering key search terms.

ITOM6265-Final Project

HOME

PRODUCT

STATUS

REPORT

STORE MAP

ANALYTICS

STOCK MANIPULATION

CREATE

READ

UPDATE

DELETE

ENTER PRODUCT ID OR PRODUCT NAME

Beer

Get Data

PRODUCT TABLE

Show 10 entries

Search:

PRODUCT_ID	Name	PRODUCT_Description	Expiry_Date	Price	Man_ID
1	200101	Budweiser Magnum Beer	Budweiser is a medium-bodied, flavorful, crisp American-style lager. It is brewed with the best barley malt and a blend of premium hop varieties. It contains less than 8% alcohol.	2025-02-11T00:00:00Z	2.35 5004512
2	200102	Coors Light Beer	Coors Light Beer is an American style light lager. This light beer has a 4.2% ABV. Full of Rocky Mountain refreshment has a light body with clean malt notes and low bitterness.	2023-11-24T00:00:00Z	2.67 7435542
3	200103	Corona Extra Beer	Corona Extra Mexican Lager Beer is an even-keeled imported beer. Brewed in Mexico since 1925, this canned beer's flavor is refreshing, crisp, and well-balanced between hops and malt.	2023-06-13T00:00:00Z	2.99 8797451
4	200104	Dos Equis Beer	Dos Equis Especial Lager is made with roasted malts, choice hops, a unique strain of yeast and purified water for a distinctively delicious taste. Sight: Warm, deep golden color.	2023-03-19T00:00:00Z	2.7 6006723

Showing 1 to 4 of 4 entries

Previous 1 Next

STOCK TABLE

Show 10 entries

Search:

PRODUCT_ID	Threshold	Qty_Available	Stock_Location
1	200101	115	20 WR Block A-1 North
2	200102	108	99 WR Block A-2 South
3	200103	151	402 WR Block A-3 East
4	200104	170	190 WR Block A-4 West

Showing 1 to 4 of 4 entries

Previous 1 Next

The next capability on the same tab allows the user to **UPDATE** stock threshold information by raising or reducing the amount or critical item restriction. This use case aids in the monitoring of supply chain efficiency, particularly during high and low sales seasons.

ITOM6265-Final Project

HOME

PRODUCT

STATUS

REPORT

STORE MAP

ANALYTICS

STOCK MANIPULATION

CREATE

READ

UPDATE

DELETE

ENTER PRODUCT ID

Change

☒ Increase

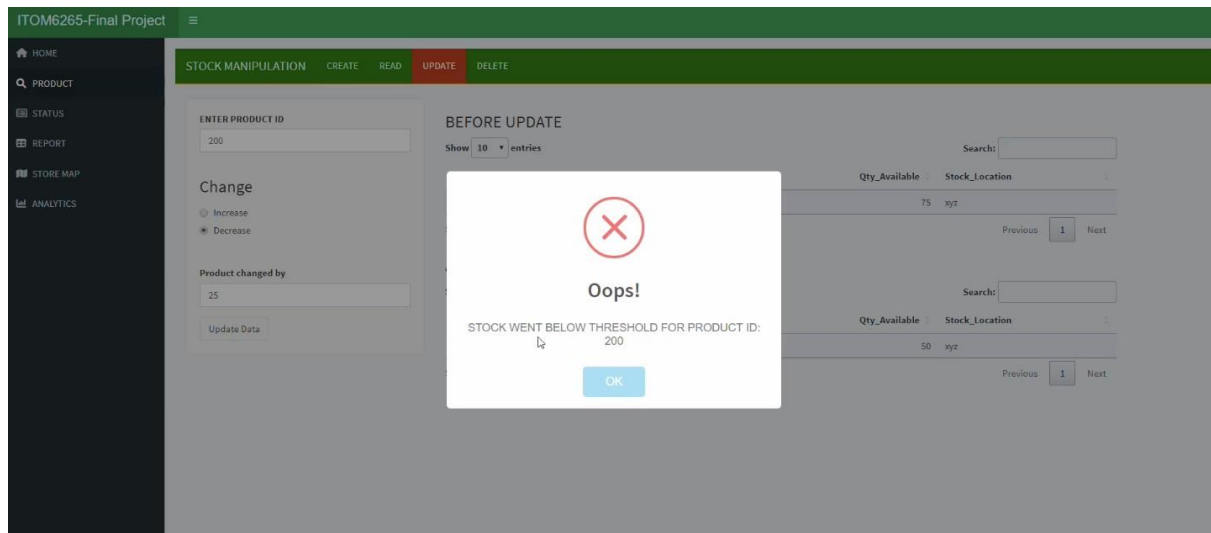
☐ Decrease

Product changed by

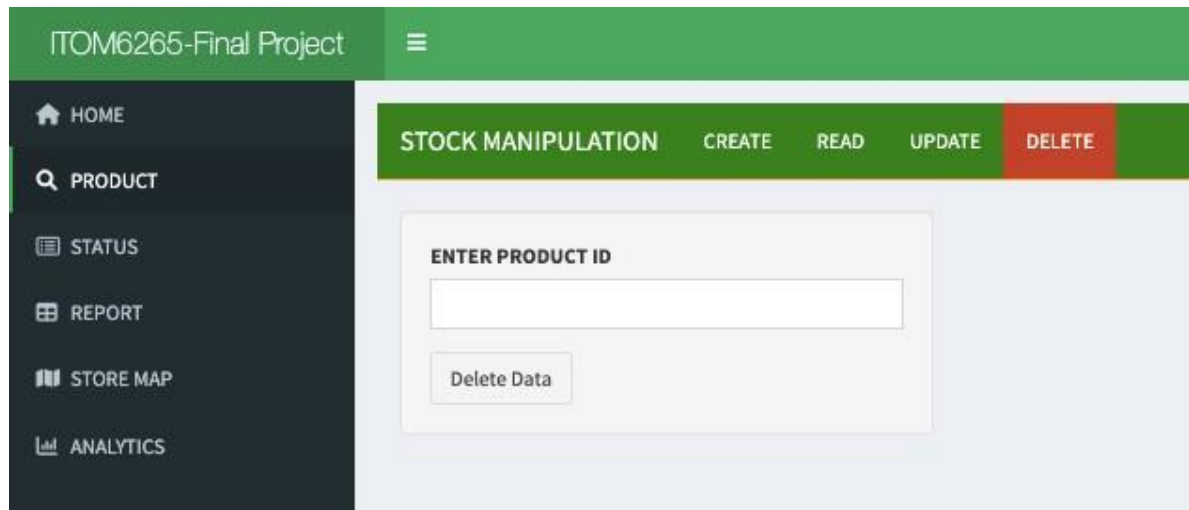
0

Update Data

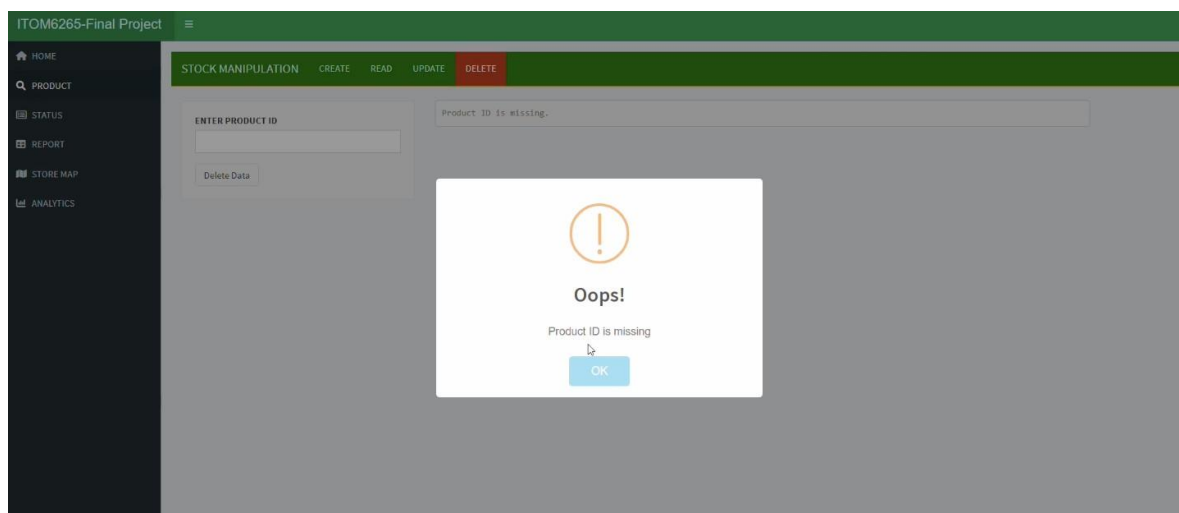
Having changed the available quantity to a number which is below the threshold a warning message would display on the screen to alert the app user.



The last feature on the "PRODUCT" page simply allows the user to **DELETE** a specific product from the database due to obsolescence.



If by any chance the app user forgets to enter the product ID, an error message pops up on the screen as shown below.



When you click on the next tab, "STATUS," you may get a quick report on the shipping status of the order from the database by either entering the exact order id or categorizing the search to look at all orders that are either out for delivery, in transit, delivered, an order placed, failed delivery attempt or all together.

ITOM6265-Final Project

HOME

PRODUCT

STATUS

REPORT

STORE MAP

ANALYTICS

ENTER ORDER ID

Select status

All

Out For Delivery

In Transit

Order Placed

Failed Delivery Attempt

Delivered

The following image is an extension of what may be seen on the screen after doing a certain search. In this example, you are viewing all orders that are out for delivery.

ITOM6265-Final Project

HOME

PRODUCT

STATUS

REPORT

STORE MAP

ANALYTICS

ENTER ORDER ID

Select status

Out For Delivery

Get Status

SHIPMENT TABLE

Show 10 entries

	Shipment_ID	Order_ID	Store_ID	Shipment_Date	Shipment_Status
1	10001	4001	750101	2022-11-14T10:40:00Z	Out For Delivery
2	10006	4006	750109	2022-11-09T10:41:00Z	Out For Delivery
3	10011	4011	750119	2022-11-09T10:45:00Z	Out For Delivery
4	10016	4016	750129	2022-11-02T10:46:00Z	Out For Delivery
5	10021	4021	750144	2022-11-08T10:48:00Z	Out For Delivery
6	10026	4026	750127	2022-11-06T10:49:00Z	Out For Delivery

Showing 1 to 6 of 6 entries

Previous 1 Next

ORDER TABLE

Show 10 entries

	Order_ID	PRODUCT_ID	Store_ID	Date_Ordered	Date_Completed	Order_Des	Order_Price	Qty
1	4001	200402	750101	2022-11-07T00:00:00Z		Order Placed for 33 bottles of Rose Pink Sparkling Wine by retailer Hamill-Howe which is based out of El Paso, Texas for amount \$247.5 on date 11/07/22	247.5	33
2	4006	200702	750102	2022-11-11T00:00:00Z		Order Placed for 68 bottles of Kurosawa Junmai Kimoto Kurosawa Brewery Sake by retailer Runte, Schiller and Deckow which is based out of Newport News, Virginia for amount \$5711.32 on date 11/11/22	5711.32	68
3	4011	200802	750106	2022-10-26T00:00:00Z		Order Placed for 32 bottles of Bombay Sapphire Gin by retailer Hickie-Konopelski which is based out of Fort Wayne, Indiana for amount \$479.68 on date 10/26/22	479.68	32

The next tab on the App is "REPORT," which is a simplified version of the "STATUS" tab. It simply retrieves information on all orders that were either ordered or fulfilled within a date period specified by the user.

ITOM6265-Final Project

HOME

PRODUCT

STATUS

REPORT

STORE MAP

ANALYTICS

Data range type

☒ Date Ordered

☐ Date Completed

Date range

2022-11-01 to 2022-12-22

Get Report

The graphic and sample below show all orders placed between the dates of November 1st, 2022, and December 12th, 2022. If necessary, a little search box on the top right can be used to extract a certain order from the list.

ITOM6265-Final Project

HOME

PRODUCT

STATUS

REPORT

STORE MAP

ANALYTICS

Data range type

☒ Date Ordered

☐ Date Completed

Date range

2022-11-01 to 2022-12-22

Get Report

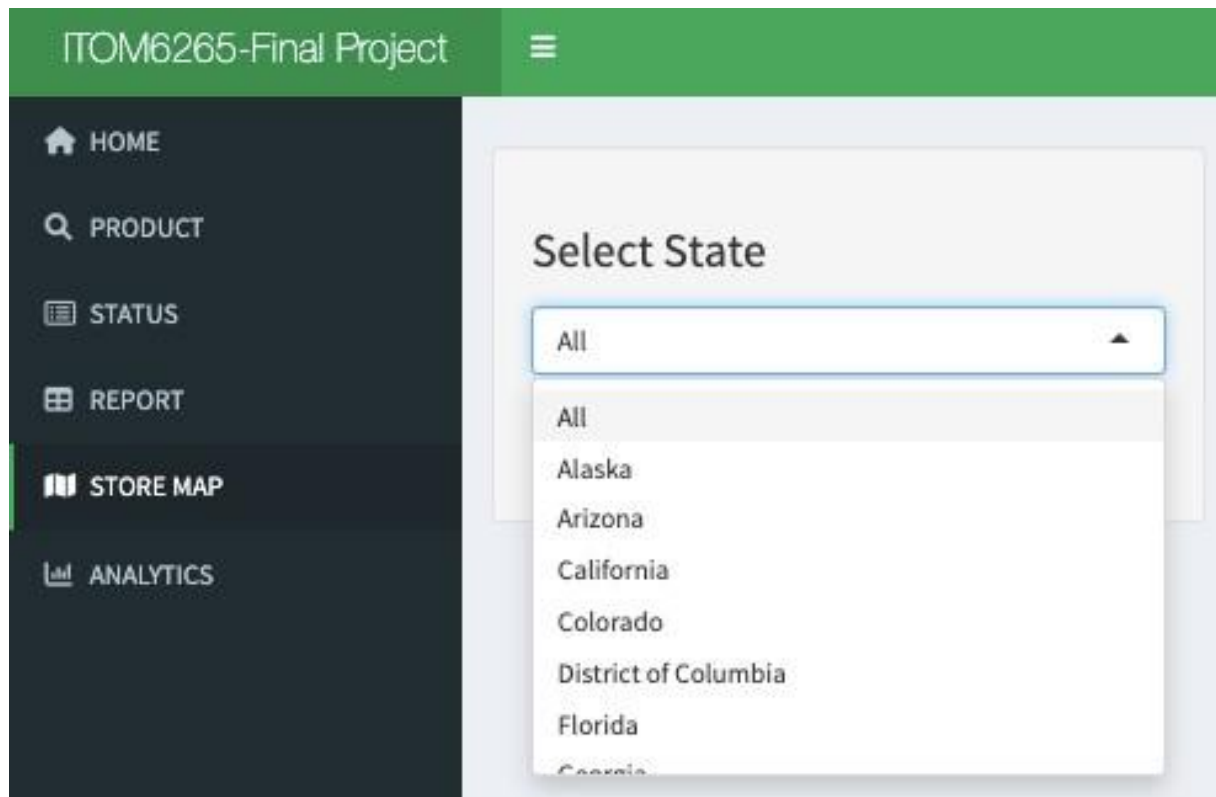
REPORT

Show 10 entries

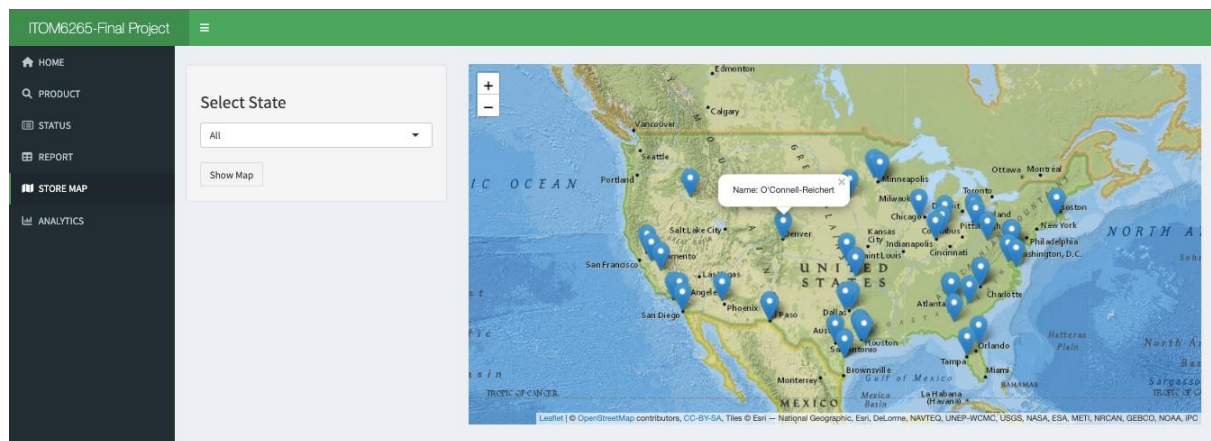
Search:

Order_ID	PRODUCT_ID	Store_ID	Date_Ordered	Date_Completed	Order_Des	Order_Price	Qty
1	4001	200402	2022-11-07T00:00:00Z		Order Placed for 33 bottles of Rose Pink Sparkling Wine by retailer Hamill-Howe which is based out of El Paso, Texas for amount \$247.5 on date 11/07/22	247.5	33
2	4002	200604	2022-11-07T00:00:00Z		Order Placed for 48 bottles of Truly Hard Seltzer by retailer Hamill-Howe which is based out of El Paso, Texas for amount \$143.52 on date 11/07/22	143.52	48
3	4003	200502	2022-11-09T00:00:00Z		Order Placed for 33 bottles of Ocho Tequila by retailer Runte, Schiller and Deckow which is based out of Newport News, Virginia for amount \$1517.67 on date 11/09/22	1517.67	33
4	4004	200501	2022-11-10T00:00:00Z		Order Placed for 92 bottles of Don Julio Tequila by retailer Runte, Schiller and Deckow which is based out of Newport News, Virginia for amount \$5335.08 on date 11/10/22	5335.08	92
5	4005	200202	2022-11-14T00:00:00Z		Order Placed for 18 bottles of Ballentine's Finest Whiskey by retailer Runte, Schiller and Deckow which is based out of Newport News, Virginia for amount \$341.82 on date 11/14/22	341.82	18
6	4006	200702	2022-11-11T00:00:00Z		Order Placed for 68 bottles of Kurosawa Junmai Kimoto Kurosawa Brewery Sake by retailer Runte, Schiller and Deckow which is based out of Newport News, Virginia for amount \$5711.32 on date 11/11/22	5711.32	68
7	4014	200304	2022-11-03T00:00:00Z	2022-11-17T00:00:00Z	Order Placed for 55 bottles of Platinum 7X Vodka by retailer Stracke Group which is based out of Charlotte, North Carolina for amount \$549.45 on date	549.45	55

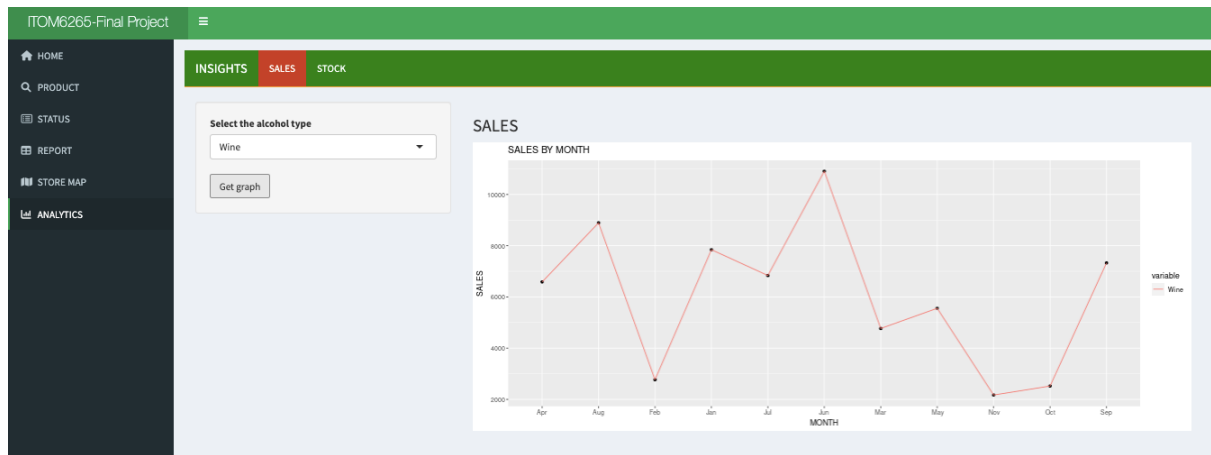
It is vital to have a visual representation of all merchants with which Brown Forman Corporation deals. The "STORE MAP" option right here offers the user a fast overview of all the stores around the country.



The search can also be done by the state. When the cursor hovers over a certain teardrop, the retail store name appears for accessibility.



Our app's final tab is "ANALYTICS," which has two functions. The first stage is to provide a sales trend report of sales by category (wine/beer/gin/whiskey, etc.) to determine which products are performing well and which are not.



Next feature aids in the monitoring of stock and threshold levels at the product and category levels. This information is crucial in preventing hoarding and missed sales. Red signifies emergency restocking requirements, yellow serves as a warning, while green shows adequate supply.

