National University
School of Engineering and Computing

Team Name: Pasta Autentica
Team Members: Ryan Paw, Arun Kumar Mallikarjuna
Week 4 Project, Portfolio, Integrated Parts 1,2,3
ANA 655
Instructor: Barbara Lauridsen

**Introduction**

Pasta Autentica is a chain of Italian restaurants, located in San Francisco, CA, known for their handmade, fresh pasta. Over the years, the restaurant business has become more competitive and the demand to innovate has become imperative for survival. Excellent food and service on the front-end of the business has always kept them alive for 15 years. Now, they would like to focus on the back-end of the business to build a stronger foundation. The Pasta Autentica Data Team would like to propose two centralized operational databases and a data mart to be used by the entire Pasta Autentica restaurant chain, instead of each providing it own variation on a small computer in the back office. The first database would be to manage food inventory, and the second database would be to manage employee scheduling. The food inventory and the employee scheduling databases will be eventually consolidated into a shared, centralized data mart that will allow users, partners, and owners to quickly access critical business insights about each location, and generalized for all.

**Problem**

For 15 years, Pasta Autentica's data has been spread out in a jumbled mess across various existing platforms. It's difficult to make sense of it and create any actionable insights. Managers collect and receive stacks of manual reports to help identify trends, but the colossal mess makes it painfully overwhelming. COVID-19 has hit the restaurant industry hard, but it was challenging to measure the impact on restaurant sales and operations. For example, customers have been shifting away from dine-in service to ordering take-out food, and the company lacked any understanding how it could impact the business until they were facing the consequences of not having a design solution that saved time and presents reliable information.

One of the fundamental rules in business is: Know your audience. The Pasta Autentica Data Team would like to build two centralized operational databases and a data mart to improve the company's understanding of their business and customers. This will aid with proper inventory control, ensure each of their restaurants are properly staffed, and meet customer demand. By owning and growing our own database, Pasta Autentica can improve data management and streamline data analysis efforts.

**Operational Database Application Scenario**

*Appendix 1* is a proposed food inventory database model for Pasta Autentica that establishes the entities, their attributes, and relationships. The key processes includes:

- Incoming food orders are linked with food items on the menu.
- Menu items are composed of different food ingredients.
- Ingredients are supplied from food suppliers.
- Ingredient types categorize the kinds of food, such as vegetables, meats, grains, etc.
- Additional ingredients can be ordered by the business.
- Item stock levels are linked with each ingredient.

*Appendix 2* is a proposed employee scheduling database model for Pasta Autentica that establishes the entities, their attributes, and relationships. The key processes includes:

- Employees are assigned a role by the business
- Employees register by creating an online account
- Employees may see their scheduled start/end work time

**Challenges**

- Designing two centralized operational databases which will be shared across all the applications running at each Pasta Autentica location.
- Design a process or application to bulk import historical operational data that was previously captured in Microsoft excel sheets. This needs to be transformed and integrated with SQL Server databases.
- Integrating data from various sources from different locations is a big challenge as the existing operational data does not use a standard for data collection.
- Expecting inconsistencies and missing data because each location has previously used different formats and designs to collect the data. This data needs to be transformed so it can be usable in a data mart for decision making.
- Ensuring all stakeholders from different restaurant locations are informed about the guidelines and standards to be followed.
- Keeping data up-to-date for analysis reports to be used for decision making.

**Resources Needed**

- Visio or Draw.io to create the star schema dimensional model.
- Microsoft SQL Server will be used to develop and design the operational databases. Microsoft SQL Server will also be used to store the data after being imported from Excel worksheets.
- Data staging will be done using SSIS package for ETL.

- Power BI will be used for cleaning/trimming the imports of data, linking data into a model, and to generate the end user reporting and dashboard needs.

**Background - Food Inventory Management and Employee Scheduling Databases**

The Pasta Autentica Data Team would like to propose two centralized operational databases and a data mart to be used by the entire Pasta Autentica restaurant chain, instead of each location providing their own variation in small computers in the back office. The food inventory and the employee scheduling databases will be eventually consolidated into a shared centralized data mart that will allow users, partners, and owners to quickly access critical business insights about each location and generalized for all. The first centralized operational database is a food inventory database to aid in the daily process of maintaining food inventory information and restocking food inventory. Minimizing food waste to help save money and to protect the environment is important to Pasta Autentica. *Appendix 1* is the proposed entity relationship diagram (ERD) for the Food Inventory Database.

The second centralized operational database is an employee scheduling database to schedule, track time, track attendance, and manage daily employee schedules. This will help increase workforce efficiency and control labor costs for the business. *Appendix 2* is the proposed entity relationship diagram for the Employee Scheduling Database.

**Proposed Food Inventory Database ERD (***see Appendix 1)*

<u>Assumptions</u>

- Food inventory database is linked with Pasta Autentica's separate, existing Ordering database
- As soon as orders are processed, the food inventory database triggers a menu item that is ordered
- Menu items are linked with ingredients in the kitchen. As orders are processed, item stock levels decrease.
- New or restock ingredients can be ordered, re-ordered, and received from suppliers to increase supply

<u>Business Rules</u>

- Minimum of 1 order needs to be processed before food inventory database can be initiated
- Menu items are changed monthly. Pasta Autentica's signature entrees, such as the Garlic Parmesan Linguine, stay on the menu, but all other menu items rotate in/out.
- When item stock levels are low, end users are responsible for communicating this with the manager and ordering it to increase supply.

- End users are responsible for maintaining all inventory items for their assigned Pasta Autentica location.
- You can't improve what you can't measure. Metrics are essential to drive change. End users must use inventory data to identify trends and to measure inventory health.

**Food Inventory Database Relationship**

| Entity | Relationship | Mandatory/Optional | Strong/Weak | Entity |
|---|---|---|---|---|
| Orders | 1:M | Mandatory | Strong | Orders-MenuItems |
| MenuItems | 1:M | Mandatory | Strong | Orders-MenuItems |
| MenuItems | 1:M | Mandatory | Weak | Menus |
| MenuItems | 1:M | Mandatory | Strong | MenuItems-Ingredients |
| Ingredients-Order | 1:M | Mandatory | Weak | Ingredients |
| Ingredients-Receive | 1:M | Mandatory | Weak | Ingredients |
| Ingredients | 1:M | Optional | Weak | Item_Stock_Levels |
| Ingredients-Order | 1:M | Mandatory | Weak | FoodSuppliers |
| Ingredients-Receive | 1:M | Mandatory | Weak | FoodSuppliers |

- Orders has a 1:M mandatory, strong relationship with Orders-MenuItems. Orders-MenuItems is a composite entity that bridges primary keys with the Orders and MenuItems entities.
- MenuItems has a 1:M mandatory, strong relationship with Orders-MenuItems. Orders can consist of many menu items, and menu items can be part of many orders.
- MenuItems has a 1:M mandatory, weak relationship with Menus. Menu items are part of many menus, and menus relate to each menu item. Menus are changed monthly. The parent entity is MenuItems.
- MenuItems has a 1:M mandatory, strong relationship with MenuItems-Ingredients. MenuItems-Ingredients is a composite entity that bridges primary keys with MenuItems and Ingredients.
- Ingredients has a 1:M mandatory, strong relationship with MenuItems-Ingredients. Menu items are composed of different food ingredients. Menu items can have many ingredients, and ingredients can be part of many menu items.
- Ingredients-Order has a 1:M mandatory, weak relationship with Ingredients. Ingredient orders can consist of many ingredients, and ingredients is associated with one ingredient order. The parent entity is Ingredients.

- Ingredients-Order has a 1:M mandatory, weak relationship with FoodSuppliers. Ingredient orders can be sourced from many food suppliers, and food suppliers are linked with one ingredient order. The parent entity is Ingredients-Order.
- Ingredients-Receive has a 1:M mandatory, weak relationship with FoodSuppliers. Received ingredients can come from many food suppliers, and food suppliers are linked with one received shipment. The parent entity is Ingredients-Receive.
- Ingredients-Receive has a 1:M mandatory, weak relationship with Ingredients. Received ingredients can consist of many ingredients, and ingredients are linked with one received shipment. The parent entity is Ingredients.
- Ingredients has a 1:M optional, weak relationship with Item_Stock_Levels. Ingredients can have 0 or many stock levels, and stock levels are associated with each ingredient. The parent entity is Ingredients.

**Proposed Employee Scheduling Database ERD** *(see Appendix 2)*

Assumptions

- All Pasta Autentica employees have a designated role in the business.
- Employees register by creating an online account.
- Employees can have many schedules throughout the week.

Business Rules

- Employees may see their scheduled start/end work time and have 24/7 access
- Employees log their start/end time
- Employees must communicate with their manager regarding any schedule changes

**Employee Scheduling Database Relationship**

| Entity | Relationship | Mandatory/Optional | Strong/Weak | Entity |
|---|---|---|---|---|
| Employee_Role | 1:M | Mandatory | Weak | Employee |
| Employee | 1:M | Mandatory | Strong | Employee-Schedules |
| Schedules | 1:M | Mandatory | Strong | Employee-Schedules |

- Employee_Role has a 1:M mandatory, weak relationship with Employee. Employee roles are associated with many employees, and each employee has one designated role. The parent entity is Employee.
- Employee has a 1:M mandatory, strong relationship with Employee-Schedules. Employee-Schedules is a composite entity that bridges primary keys with the Employee and Schedules entities.

- Schedules has a 1:M mandatory, strong relationship with Employee-Schedules. Employees can have many different schedules, and schedules are associated with many employees.

**Background - Data Mart**

The Pasta Autentica Data Team would like to propose a shared, centralized data mart for the two centralized operational databases: inventory management and employee scheduling. A data mart is a subset of a data warehouse that is subject-oriented and focuses on a specific group of users. This helps users quickly access relevant information that aligns with their department. By having a smaller, more focused design this will help users, partners, and owners gain critical insights for Pasta Autentica chain restaurant locations.

A galaxy schema will be used to model the data mart. This helps the data from the inventory management and employee scheduling databases more distinct, compared to a traditional star schema. The multidimensional qualities help both fact tables have a deeper, shared dimension level. The galaxy schema in *Appendix 3* contains two fact tables (Fact_Scheduling) and Fact_Employee) and their associated dimensions.

**Data Mart - Galaxy Schema Model**

*Appendix 3* illustrates the proposed data mart as a galaxy schema model.

**Fact_Scheduling** is the fact table for employee scheduling. It utilizes four dimensions tables imported from source operational databases: EmployeeID, EmployeeRoleID, ScheduleID, OrderID. It contains the following attributes: TotalWorkingHours. This fact table enforces consistent and accurate query results. For example, if two dimensions are used in a SQL query, such as the Employee and Scheduling dimensions, only one join path, intersecting the fact table, exists between the two tables.

**Dim_Employee** is the dimension table for employees of the Pasta Autentica chain restaurant. It contains the following attributes: EmployeeID (Primary Key), Employee_FirstName, Employee_LastName, Employee_StartDate, Employee_EndDate, Employee_PhoneNumber, Employee_Email. This dimension helps gain demographic information on employees for scheduling.

**Dim_EmployeeRole** is the dimension table for employee roles. It contains the following attributes: EmployeeRoleID (Primary Key), EmployeeRole_Description, EmployeeRole_Training, RestaurantLocation. This table allows the data team to analyze employee responsibilities and their corresponding training.

**Dim_Schedules** is the dimension table for employee schedules. It contains the following attributes: ScheduleID (Primary Key), StartTime, StartDate, EndTime, EndDate, PlannedHours, ActualHours, ScheduleComments. The Schedules dimension table is essential to create time-based metrics regarding employee hours. For example, creating a visualization comparing PlannedHours and ActualHours helps the data team understand if full-time employees are actually clocking in their planned, 40 hours/week.

**Dim_Orders** is the dimension table for incoming customer orders. It contains the following attributes: OrderID (Primary Key), OrderDate, OrderDetails, OrderComments, RestaurantLocation. OrdersID is linked with both Scheduling and Inventory fact tables. This is because the amount of orders dictate how many employees are needed for a restaurant location and how much inventory will be used. As orders increase, the demand for employees increases and inventory supply decreases.

**Fact_Inventory** is the fact table for food inventory. It utilizes four dimension tables imported from source operational databases: OrderID, MenuItemID, IngredientID, SupplierID. It contains the following attributes: InventoryQuantity, InventoryQuantityUsed, InventoryTotalValue, InventoryValuePerItem. This fact table could be used for inventory analysis and can be customized at each dimension level. For example, a GROUP BY command in SQL could be used to group the current value of stocked ingredients by ingredient type.

**Dim_MenuItems** is the dimension table for menu items. It contains the following attributes: MenuItemID (Primary Key), MenuID (Foreign Key), MenuItem_Description, MenuItem_Price, MenuItem_Quantity. This allows the data team to analyze menu items that are ordered by customers. Attributes, such as MenuItem_Price and MenuItem_Quantity, help the data team quantify which menu items are ordered more/less, and the quantity of which they are ordered.

**Dim_Menus** is the dimension table for menus. It contains the following attributes: MenuID (Primary Key), MenuStartDate, MenuEndDate, MenuName, MenuDescription, MenuComments, RestaurantLocation. Pasta Autentica have multiple menus that rotate in/out. The attributes in this dimension table support time-based metrics, such as using MenuStartDate and MenuEndDate. For example, the data team can analyze how well different menus performed from the past year.

**Dim_FoodSuppliers** is the dimension table for food suppliers. It contains the following attributes: SupplierID (Primary Key), SupplierName, SupplierPhone, SupplierAddress, SupplierCity, SupplierZIP, SupplierEmail, SupplierDescription, SupplierComments. This dimension table contains helpful demographic information on Pasta Autentica's suppliers. SupplierAddress could provide location data to understand the travel patterns of different food ingredients.

**Dim_Ingredients** is the dimension table for food ingredients. It contains the following attributes: IngredientID (Primary Key), IngredientOrderID (Foreign Key), IngredientReceiveID (Foreign Key), IngredientName, IngredientType, IngredientDescription, IngredientComments, IngredientExpiration, RestaurantLocation. The Ingredients dimension table is vital for creating insights on how well inventory is doing at restaurant locations. IngredientExpiration and IngredientName could be used to query what ingredients are currently in stock and what ingredients that need to be used soon before they expire.

**Dim_Ingredients-Order** is the dimension table for ordering/re-ordering new or existing ingredients. It contains the following attributes: IngredientOrderID (Primary Key), OrderQuantity, OrderDate, OrderPrice, OrderFrequency, OrderComments, RestaurantLocation. Ingredients constantly need to be ordered/re-ordered as ingredients are used up. A pattern of ingredient orders may be examined to improve the ordering process. This could help food ingredients to be consistently stocked, even during peak seasons.

**Dim_Ingredients-Receive** is the dimension table for received ingredients shipped to a Pasta Autentica restaurant location. It contains the following attributes: DateReceived, IngredientDescription, IngredientComments, RestaurantLocation. As ingredient orders increase, it's important to track the many received orders at restaurant locations. This can help track if all ingredient orders have been received by all restaurant locations.

**Dashboard**

The Pasta Autentica Data Team was able to create a dashboard (*Appendix 4*) from aggregated test data to simulate critical insights. "Previous Inventory Stock Levels (2020)" shows inventory stock levels previously in 2020. Based on the monthly trend, peak inventory levels are in Quarter 4 and Quarter 2. This could indicate that the company is struggling to manage its inventory and make proper sales during this period. Inventory is one of the main sources of revenue, so it's important to balance supply with demand. "Previous Inventory Stock Expired (2020)" shows the amount of outstanding days inventory has expired in 2020. Inventory waste could be a potential factor causing profits and revenue go down. This chart shows that most inventory waste was meat related last year. It could be used in parallel with the "Previous Inventory Stock Levels (2020)" because when inventory stock levels are high, it is more likely that ingredients will expire. Ingredients are not being effectively used. Therefore, it is recommended to run promotions/deals during high inventory months (May, October, November, December) ensure ingredients, especially meats, are used before they expire.

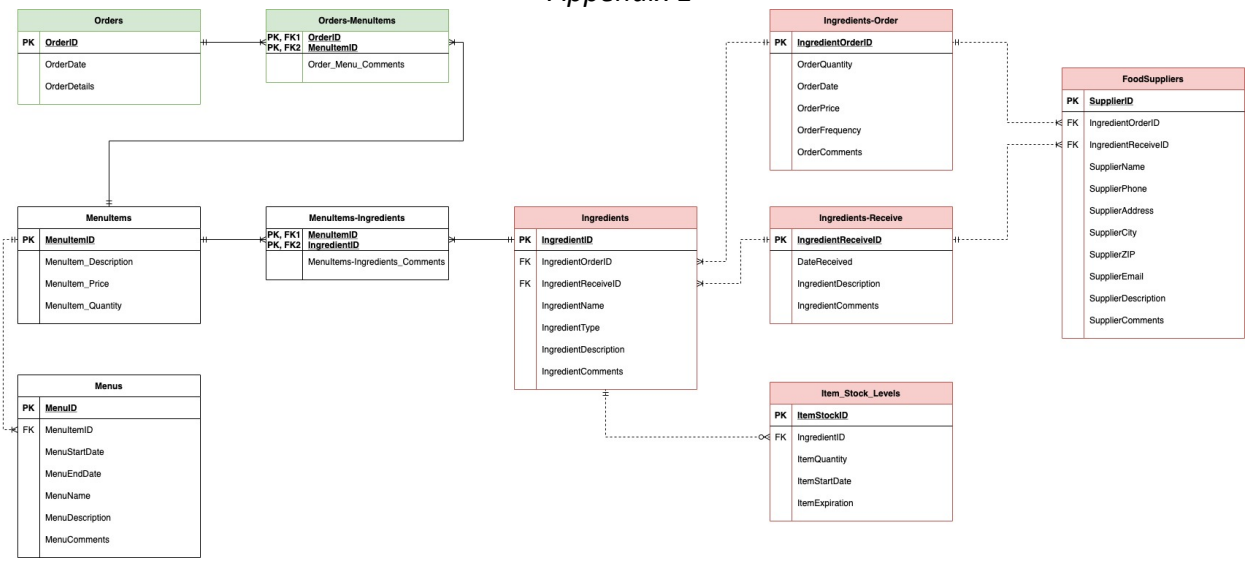
"Current Stock Levels by Ingredient Types" is set up to display current stock levels. This enables managers to order inventory based on the current usage, instead of waiting for the next periodic shipment from food suppliers. "Previous Employee Actual Hours by Month (2020) shows the total actual hours employees are clocking in each month in 2020. Employee actual hours in the months of November and December are higher compared to other months. It is

recommended to hire more part-time, or temporary, employees during these months to improve employees' schedules.

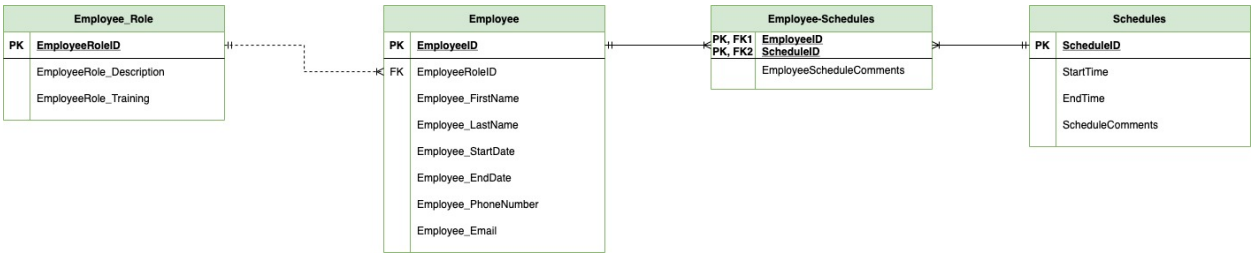
**Next Steps**

The next step forward for Pasta Autentica would be to incorporate a front-end application for current inventory levels with GIS capabilities to keep track of what stocks are going to expire and stock availability at nearby locations. The goal of Pasta Autentica is to have fully automated inventory management tool that can rotate inventory, if needed, to nearby Pasta Autentica locations. Thus, we expect to see a 20% increase in revenue due to these improvements, and have a more efficient process for inventory management and employee scheduling.

*Appendix 1*

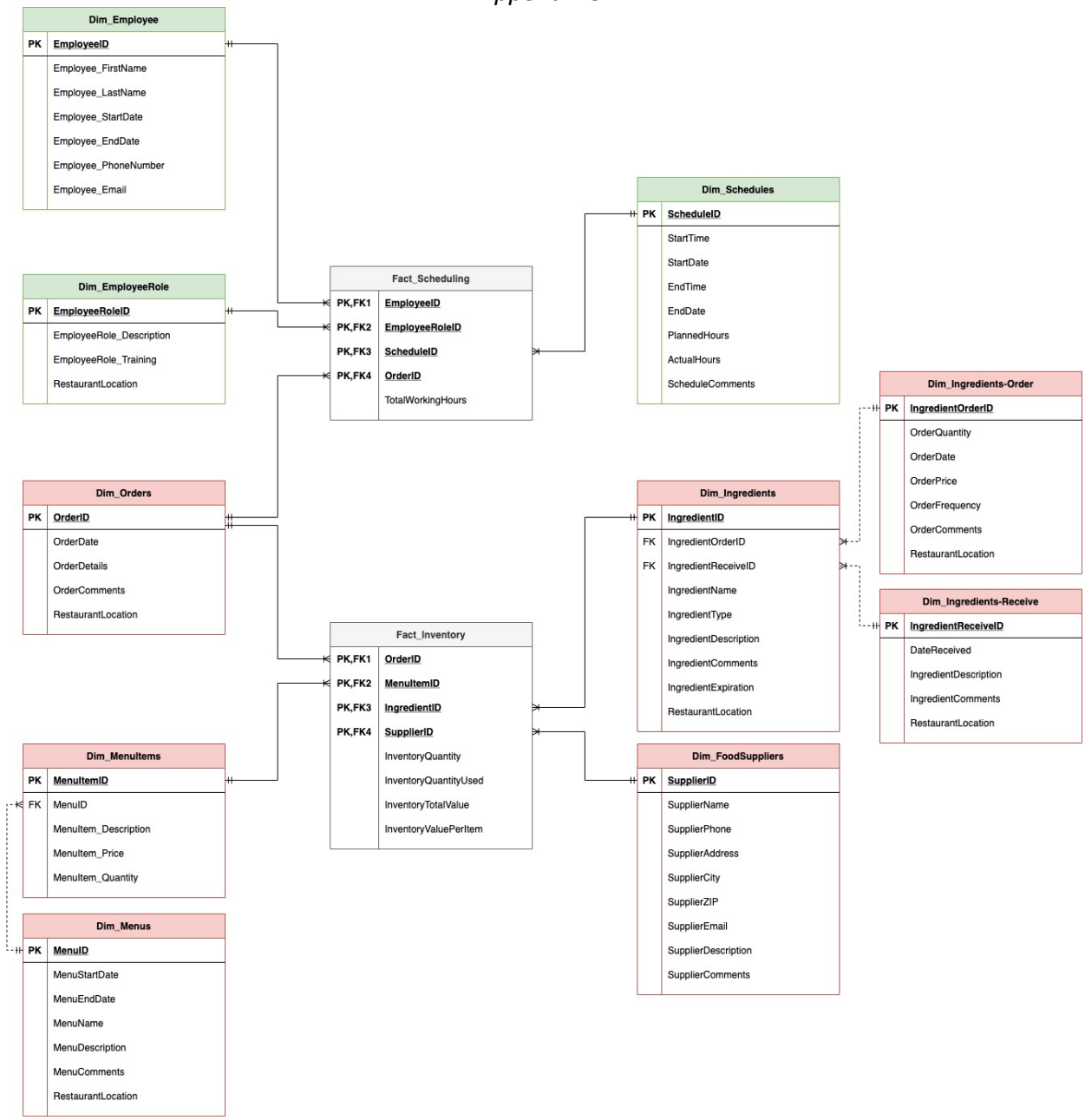



*Appendix 2*



National University
School of Engineering and Computing

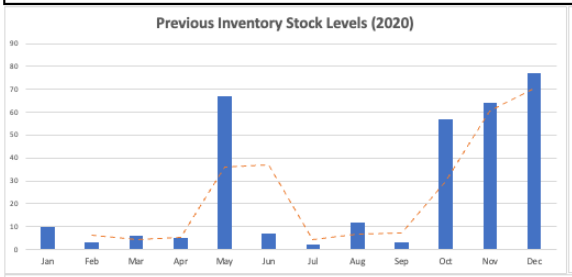
*Appendix 3*

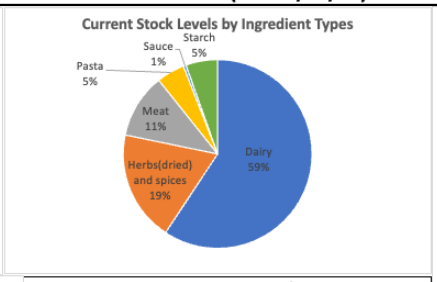


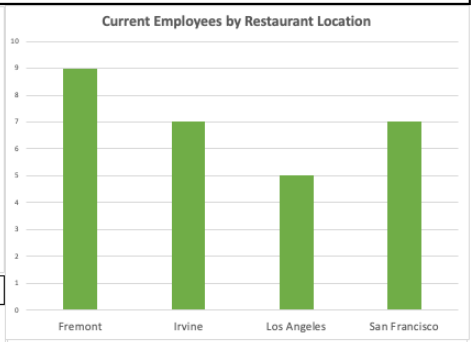
National University
School of Engineering and Computing

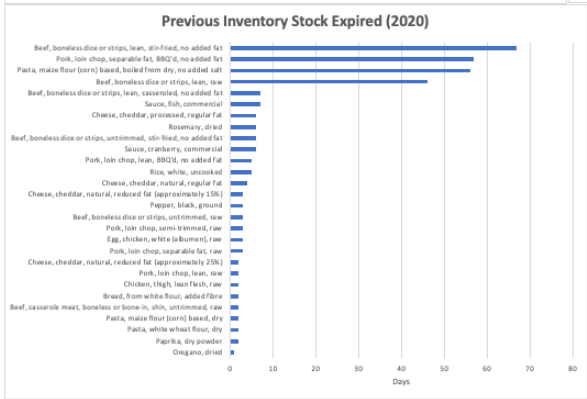
*Appendix 4*

**Pasta Autentica Dashboard (as of 3/13/21)**




Inventory Total Value: **$60,128**