Batter Up Your Appetite

Hitting a Home Run with MLB's Culinary Strategy

MISM 6210.

Information Visuals and Dashboards for Business – Spring 2023

MSBA Cohort S – **Group 1**

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Table of Contents

Overview:

Baseball has a long and rich history, with origins dating back to the mid-19th century in the United States. Thegame has evolved over time, with numerous rule changes and innovations, but it has remained a beloved sportin America and around the world. Baseball has a leisurely pace and historical significance as "America's National Pastime" for over 150 years and has played a significant role in American culture for over a century. The sport has inspired numerous books, movies, and television shows, and many of its players have become cultural icons, such as Babe Ruth, Jackie Robinson, and Derek Jeter. Baseball is a team sport played between two teams of nine players each. It involves batting and pitching, and the goal of the offensive team is to score runs by hitting the ball and running around a series of bases. A baseball game consists of nine innings, and thefield is typically a diamond shape with strategic gameplay that requires decision making based on the situationon the field.

Problem Statement:

Major League Baseball (MLB) is a popular and reigning sport in USA, and food and sports go hand in hand. Many vendors and restaurants depend on these games and the baseball season to make annual incomes, and some of their most successful times are during these baseball seasons. Year on year, new foods are introduced[1] and the mix of food and the game is what makes the fan experience worth it.

Unfortunately, this also comes with the downside that if there are changes in the game, the restaurants also get affected in their income and food supply. Currently, the MLB has been bringing in less audience due to various reasons such as the lockout and lingering effects of the pandemic[2]. This has led to lesser revenues and downtick in the restaurant customers as well.[3,4] The negotiations between the players association and the team owners leads to postponement of the season, and this in turn leads to lesser fans who want to eat at these prime spots. Along with the lockout, the MLB is all set to make rule changes, which includes a shorter playing time to capture and bring in audiences. This has already led to financial losses in alcohol sales and will soon spill over to food and merchandise as well.[5]

Food waste is also a huge problem in sporting events, from NFL to MLB. The EPA's 2018 Food Waste report estimated that sports venues waste more than 38,000 tons of food per year.[6] This food waste goes in landfills and creates harmful methane which hurts our planet. Although multiple teams[7] have tried putting out initiatives to save wasted food and stadiums and restaurants are also taking steps, there is a harmful effect to both the environment and society when so much food is wasted daily at these sporting events. A report from the Natural Resources Defense Council (NRDC) that estimates that MLB stadiums generate more than 40,000 tons of food waste each year.[8]

Therefore, the creation of a dashboard which can help show inventory levels, connect game events and the foods most sold during these events to the level of inventory, and show voting preferences of the audience related to food and beverages to ensure that those in demand are stocked up, while those not in demand are sold out with managerial decisions taken by restaurant owners, can help maximize the profit that restaurant owners will make given the change in rules, and ensure that less food is wasted by optimizing inventory.

Why Baseball?

Baseball and food are closely linked, with traditional food items like hot dogs and peanuts becoming a staple of the sport's culture. Food also plays an important role in convenience, socialization, sponsorship, and revenue. Fans can grab a quick bite or drink from concession stands and vendors, while sharing food and drinks can help create a sense of community and camaraderie. Food and beverage companies often sponsor baseball teams and stadiums, which can lead to the creation of unique food items tied to the team or stadium. Additionally, food and beverage sales are a significant source of revenue for baseball teams and stadiums.

Creating food-based incentives to draw crowds back in can help baseball through its low attendance. Food is an essential part of the sport experience, and baseball is no different. By focusing on the food experience and providing a range of engaging and entertaining options, concessionaires can help enhance the fan experience and add to the overall enjoyment of the sport. Baseball also has multiple events which can allow for flash sales and the psychology of the highs and lows of where a team is playing and how they are playing can allow for an exciting fan experience.

Data visualization can provide valuable insights and solutions for food-related business problems in baseball games. Vendors make a lot of revenue through their sales and tips and giving them a dashboard to increase sales can lead to overall success for their business. By analyzing sales data, concessionaires can identify popular food and beverage items, optimize their menu offerings, and allocate resources effectively. These efforts can help concessionaires enhance the fan experience, increase revenue, and better understand customer preferences and needs. Overall, data visualization can be an effective tool for solving food-related business problems in baseball games, improving the fan experience, and driving success for businesses.

Data Gathering and Analysis:

The data for the dashboard elements we have created are as follows:

1. **Game Events:** The "Game Events" dataset is a good representation of the correlation between Baseball game events and the popular food items sold during those specific events. It contains information about how rare each of the events are to help us identify if there is a pattern in food discounts provided based on the rarity of the event happening. The information to generate the data was collected using commonly identified patterns from articles about food trends during a Baseball game and general information about the types of events at a game. For example, an article from The Food Network gives us insight into the most popular food trends over the years (https://www.foodnetwork.com/fn-dish/restaurants/2016/04/ballpark-bites-favorite-food-finds-at-the-baseball-game). The article lists various food items that are popular at Baseball games, including hot dogs, peanuts, cracker jacks, nachos, and pretzels. It also features some less traditional options such as sushi and lobster rolls. We can find information about the specific game events on the Major League Baseball glossary website (https://www.mlb.com/glossary) where there is a detailed description of the various game stats. By combining the knowledge from such resources along with ChatGPT's assistance, we have created a consolidated dataset from which the visualizations can be made.

2. **Geolocation & Weather:** This data provides information about weather conditions in various cities where baseball games are played. We can use weather applications such as the National Centers for Environmental Information (https://www.ncei.noaa.gov/) to get up-to-date weather information and the Major League Baseball page for team locations (https://www.mlb.com/team) to get information about team names and stadium locations. We have taken the example of cloudy weather in Seattle to assess the food items available and the votes given to those items. This data can be applied dynamically to each city and its changing weather conditions. This data is closely used alongside the spectator voting data mentioned below, to showcase trends across cities in the United States.

3. **Spectator Voting:** At the start of the game, spectators will scan a QR code provided by their seats to fill out a survey for voting for their desired food and beverage. These two datasets i.e., "Food_Voting" and "Beverage_Voting" will allow the vendor to stock up their inventory before and during the game and provide promotional offers and discounts effectively. The list of food items and beverages the spectators prefer to have has been created according to multiple articles such as https://www.mlb.com/mariners/ballpark/top-eats and https://www.foodnetwork.com/fn-dish/restaurants/2016/04/ballpark-bites-favorite-food-finds-at-the-baseball-game.

4. **Inventory:** The "Inventory" dataset provides details about the items in stock such as unit price, quantity, quantity sold, quantity left, etc. This data will help the vendor track and maintain their stock of most sold and most voted food and beverage items. For example, Rolling Roof is one of the vendors at the T-Mobile Park in Seattle whose inventory is being monitored: https://www.mlb.com/mariners/ballpark/top-eats. It will also be used to monitor the revenue generated during the event to reach their end goal. The revenue will be calculated by summing up the product of unit price and quantity sold of each item in the dataset.

Unit of Analysis and Metrics:

"Game Events" data:

- **Unit of analysis**: Game Event that is happening.
- **Metrics**: Event Food (the food items and beverages being sold), Event Rarity (Rare, Common, or Uncommon), Avg Qty Sold, Discount % (percentage of discount offered).

"Geolocation & Weather" data:

- **Unit of Analysis**: City name where baseball stadium is located.
- **Metrics**: Weather conditions like cloudy, sunny, rainy, windy

“Spectator Voting" data:

- Food Voting data:
  - **Unit of Analysis**: Food
  - **Metrics:** Number of votes for the food items

- Beverage Voting Data:
  - **Unit of Analysis**: Beverage
  - **Metrics:** Number of votes for the beverages

"Inventory" data:

- **Unit of analysis**: Items (food or beverage)
- **Metrics**: Unit Price, Qty, sold (how much is sold), Left (how much is remaining in the inventory), Sales (of each item), Items Discounted, Discount Perc, Discounted Unit Price, Sales Post Discount

Dashboard:

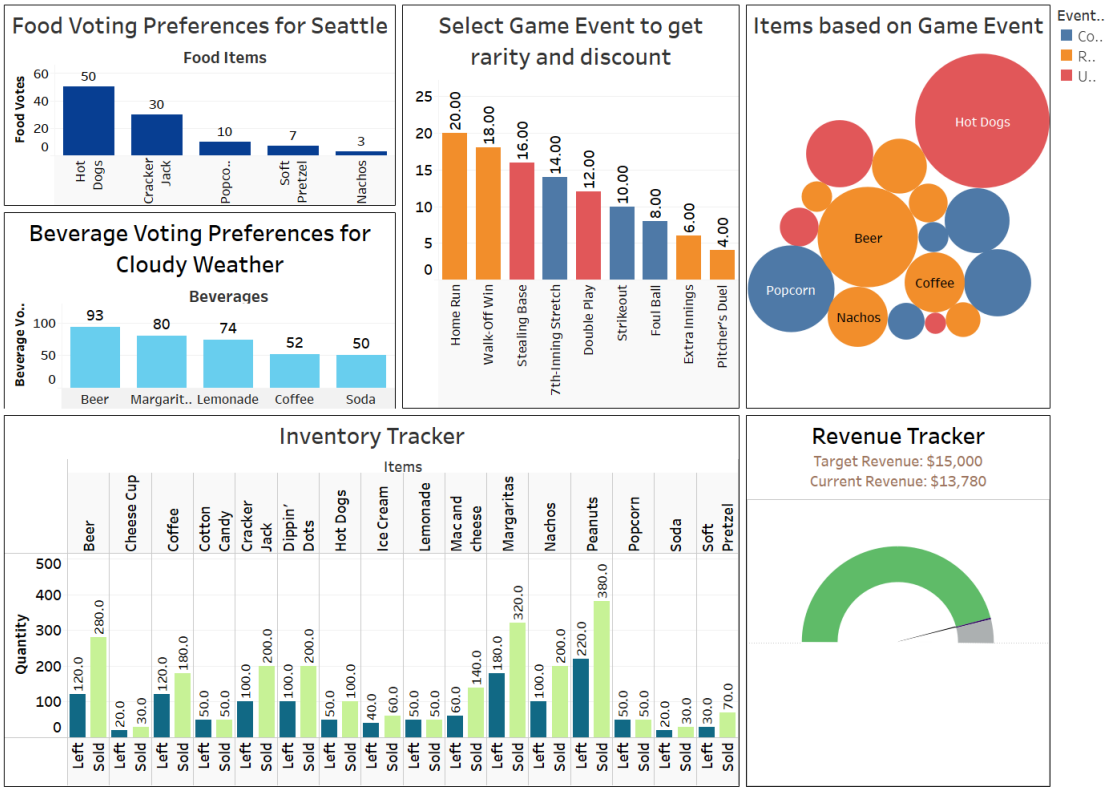

Figure 1. Vendor Dashboard

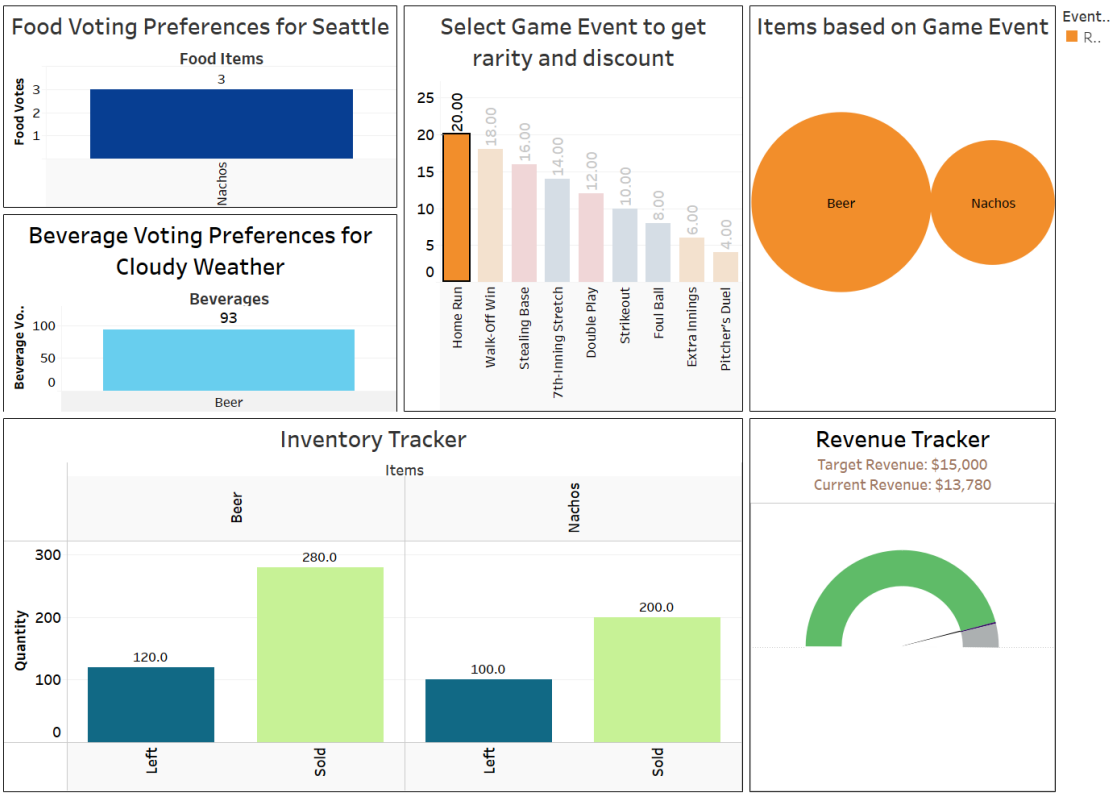

Figure 2. Vendor Dashboard during a Home Run game event

Tableau Dashboard Components:

The Tableau dashboard consists of several components that provide valuable insights to the vendor regarding the food and beverage preferences of the audience, inventory management, and revenue tracking.

The “Food Voting Preferences” component allows the audience to vote on their preferred food item based on the location where the game is played (which in our case is the T-Mobile Park, Seattle, Washington) providing the vendor with information on what food items to stock up on. Similarly, the “Beverage Voting Preferences” component allows the audience to vote on their preferred beverage for a specific weather condition (which in our case is cloudy), giving the vendor an idea of what beverages to stock up on.

The “Game Event Rarity and Discount” visualization provides information on the frequency of a specific game event and the discount that could be offered on popular food and beverage items during that event. This information can help the vendor to plan their inventory and pricing strategies accordingly.

The “Select the Game Event based Item” component allows the vendor to select a specific-colored bubble that matches the game event to identify what food and beverage items are associated with that game event. This visualization is based on historical data and can be used by the vendor to predict their sales for a specific food item/beverage based on the game event that has occurred.

The “Inventory Data” component provides the vendor with information on the quantity of food/beverage items sold and left at a specific instance during the game, helping them manage their inventory more effectively.

Finally, the “Revenue tracker” component uses a calculated field to track the total revenue made by the vendor since the start of the game and provides a gauge chart to compare the vendor’s current revenue with their target revenue. This visualization can help the vendor to keep track of their overall sales and plan effectively to reach their target sales by the end of the game.

Overall, the Tableau dashboard integrates with each vendor system, providing them with a comprehensive view of their sales data, which enables informed decisions about inventory management, pricing strategies, and revenue tracking. This integration ensures that vendors won't hesitate to adopt the product.

Tableau Dashboard Working:

Let’s consider the following example:

When there is a strikeout in the game, the vendor needs to check the color of the strikeout in the “Game Event Rarity and Discount” component of the dashboard, which in this case is pink. This color represents the occurrence of a common game event, and based on this information, the vendor decides whether to offer a recommended discount of 10% on the most popularly ordered food or beverage item during that game event.

To get more insights into the most ordered food or beverage item during that game event, the vendor can use the “Select the Game Event based Item” component of the dashboard, where they can select the corresponding pink bubble to get the corresponding vote count and inventory details in the “Food/Beverage Voting Preferences” and “Inventory Data” components respectively. This information can help the vendor in managing their inventory and making decisions on offering discounts or promotions to boost sales during the game event.

Overall, the dashboard provides the vendor with useful insights into the sales data and helps them make informed decisions on offering discounts and managing inventory during specific game events.

Datasets used to create the Dashboard:

- The "Region” dataset was filtered to get the “Food_Voting” dataset used in the “Food Voting preferences for Seattle” component of the dashboard.

- The "Weather” dataset was filtered to get the “Beverage_Voting” dataset used in the “Beverage Voting preferences for Cloudy Weather” component of the dashboard.

- The “Game Events” dataset was used for the “Game Event Rarity and Discount” and the “Select Game Event based Item” components of the dashboard.

- The “Inventory” dataset was used to build the “Inventory Data” and the “Revenue Tracker” components of the dashboard.

- The required data-wrangling steps were performed for most of the above-mentioned datasets. The details of these are mentioned in the Data wrangling section (below).

Data Wrangling Steps:

1. **Cleaning for Inventory Dataset:**
    - Checked datatypes and ensured they are correct for future use.
    - Checked for NULL or MISSING values.
    - Renamed required columns for standardization.
    - Replaced dollar sign with an empty string in specific columns.

2. **Cleaning for Voting Dataset:**
    - Filtered region sheet based on game location.
    - Extracted food items into a new data frame.
    - Appended a new column with votes assumed from the app.

3. **Cleaning for Beverage Voting:**
    - Filtered region sheet based on game location.
    - Extracted food items into a new data frame.
    - Appended a new column with votes assumed from the app.

Game events and Corresponding Food choices:

1. **Home Runs and Nachos:** When a player hits a home run, fans often celebrate with a nacho platter. This could be since home runs are a big event in the game and nachos are a shareable, celebratory food.
2. **Double Plays and Hot Dogs**: When a team executes a double play, fans often celebrate with a hot dog. This could be because hot dogs are a classic baseball food and double plays are an impressive defensive feat that deserves a classic celebration.
3. **Strikeouts and Popcorn**: When a pitcher strikes out a batter, fans often celebrate with popcorn. This could be because popcorn is a light and easy snack to munch on during the game, and strikeouts are a common event in baseball games.
4. **Seventh Inning Stretch and Cracker Jack**: During the seventh inning stretch, fans often enjoy a bag of Cracker Jack, a popular snack at baseball games. This could be due to the fact that the seventh inning stretch is a tradition in baseball, and Cracker Jack has been a part of baseball culture for over a century.
5. **Walk-Off Wins and Ice Cream**: When a team wins on a walk-off hit, fans often celebrate with ice cream. This could be because walk-off wins are an exciting event in the game, and ice cream is a sweet and satisfying treat to enjoy after a victory.

Event	Food Consumed
Home Run	Nachos
Strikeout	Popcorn
Seventh-Inning Stretch	Cracker Jack / beer
Stealing Base	Soft Pretzel
Grand Slam	BBQ
Double Play	Hot Dog
Foul Ball	Dippin' Dots
Extra Innings	Coffee
Pitcher's Duel	Sunflower Seeds
Walk-Off Win	Ice Cream
Opening Day	Ballpark Food

Project Scope:

The project aims to develop a comprehensive dashboard for food vendors in MLB (Major League Baseball) stadiums to help them manage their inventory effectively, minimize waste, and maximize profits. The dashboard will feature six key charts that will provide insights into food and beverage preferences, inventory data, revenue tracking, and game event-specific food item selection.

The "food visiting preferences for Boston" chart will display the most popular food items based on customer preferences for Boston-based MLB games, while the "beverage voting preferences for cloudy" chart will show the preferred beverages for customers attending games in cloudy weather conditions. The "inventory data" chart will provide real-time updates on inventory levels, enabling vendors to make informed decisions on restocking and avoiding overstocking. The "revenue tracker" chart will allow vendors to track their sales and revenue over time, enabling them to make strategic pricing and marketing decisions. The "select food items based on game events" chart will provide vendors with recommendations on which food items to the stock based on the specific game event being held like a home run, double play, foul play, etc. Based on that, the "Game Event Rarity and Discount" chart will help vendors to understand discounts on the food items available. By using this dashboard, vendors can optimize their inventory management, reduce waste, and increase profitability.

Timeline: The project was structured into three key milestones. The first milestone involved identifying the sport and relevant datasets that could be used to culminate the connection between sports and culinary. Our research revealed that many food vendors in baseball stadiums face challenges with inventory management, waste reduction and lacking clarity regarding food preferences. Therefore, we focused on exploring the relationship between weather, location, and food to find relevant articles and datasets that could provide insight into these challenges. The outcome of this milestone was a clear understanding of the datasets required for the project's success.

The second milestone focused on data wrangling and merging to prepare the datasets for visualization in Tableau. We cleaned, transformed, and integrated data from different sources to ensure consistency and accuracy. The final dataset was then tested for integrity and completeness to ensure that it could be used for further analysis.
The third and final milestone was the development of the interactive dashboard in Tableau. We used the final dataset to create a range of charts and visuals that connected relevant data points according to food items. The dashboard was designed to enable vendors to make informed decisions on inventory management, pricing, and marketing. The result of this milestone was a comprehensive dashboard that provided vendors updates on inventory levels, sales, and revenue, as well as insights into food and beverage preferences, game event-specific food item selection, and inventory optimization.

Limitations:

During the project development, we encountered several limitations that had the potential to impact the project:

- The first limitation we faced was finding a concrete connection and business problem between sports and food. This proved challenging as food preferences are subjective and can vary greatly depending on individual taste and cultural background. However, we mitigated this limitation by conducting extensive research on customer food preferences and patterns in different baseball stadiums along with weather.

- The second limitation we faced was the reluctance of some vendors to share their data and participate in the dashboard idea. This posed a significant challenge in terms of acquiring relevant data and ensuring that the dashboard would accurately reflect the experiences of all vendors.

- Finally, the location-specific nature of the dashboard posed a limitation as it would only work in big cities with franchise vendors. This could potentially limit the reach and scalability of the dashboard, as not all baseball stadiums would have franchise vendors present. To address this limitation, we plan to expand the dashboard to include all small vendors in baseball stadiums across the United States.

Challenges:

- The first major challenge we encountered was finding relevant data in connection with food and sports stadiums. Ultimately, we encountered this challenge by generating and wrangling our own datasets from the guidance of various articles and blogs.

- Another significant challenge we faced was visualizing the data in Tableau. Since all the data were mostly about food and qualitative in nature, it was challenging to represent it visually.

- Integrating votes, weather, and location for food preferences, and deciding on discounts based on events was another challenging part of the project. This required extensive research and analysis of customer preferences, weather patterns, and game events to develop data-driven insights into food and beverage preferences, inventory management, and sales optimization.

- Building the revenue tracker using a doughnut chart was another challenging aspect of the project. We got help from various online resources.

- Additionally, conducting research to identify the core problems faced by vendors in baseball stadiums was challenging.

- Finally, putting the color in sync across the different charts and visuals proved challenging. We overcame this challenge by leveraging the Gestalt principle and ensuring that the color schemes were consistent across all charts and visuals.

Supporting Documentation

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