ITCS495 Special Topics in Database & Intelligent Systems

Project 1 – ThinkNest

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Prepared by

6588070 Nakarin Phoorahong

6588071 Thareerat Phothitham

6588087 Yaowapa Sabkasedkid

6588096 Panipak Sittiprasert

6588183 Achiraya Mankham

Presented To

Assoc. Prof. Dr. Srisupa Palakvangsa na ayudhya

Faculty of Information and Communication Technology, Mahidol University

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Introduction

This project presents a data-driven analysis of the cinema industry, using historical sales data to uncover actionable business insights. In a market increasingly challenged by digital streaming, this analysis demonstrates how data can be leveraged to optimize operations, understand customer behavior, and enhance profitability. The final output will be an interactive dashboard designed to support strategic decision-making for cinema management.

Background of the Project

The modern cinema industry faces a significant challenge from on-demand streaming services, which have fundamentally altered consumer viewing habits. The dataset for this project is from the year 2018, a period that is particularly insightful as it captures a critical time when streaming was rapidly gaining popularity, but before the COVID-19 pandemic caused a massive disruption to the market. A key limitation of this analysis is its reliance on historical data. Since a more recent and comprehensive dataset is not available, this project uses the 2018 data as a foundational baseline. While limited to a single year, it provides a valuable snapshot of audience behavior in a traditional theatrical environment. Understanding these pre-pandemic patterns is essential for developing robust strategies today and offers a critical benchmark for comparison against future data.

Business Domain

Description of the Business Domain

The business domain of this project is the cinema industry, a segment of the entertainment market that generates revenue primarily through ticket sales, concessions, and film-related merchandise. The industry's financial model is highly sensitive to consumer discretionary spending and faces intense competition from alternative forms of entertainment. The most significant challenge confronting the modern cinema industry is the paradigm shift in media consumption driven by the rise of on-demand streaming services. This digital disruption has created immense competitive pressure, eroding traditional revenue streams and making customer retention and operational efficiency more critical than ever.

Benefits of Analysis for the Domain

In this competitive landscape, data analysis transitions from a mere advantage to a strategic necessity. A thorough analysis of historical sales data empowers cinema operators to gain a significant competitive edge. The primary benefits include forecasting key business trends to better manage financial resources, optimizing the entire operational workflow from film scheduling to staffing to increase revenue, and developing a deeper understanding of customer needs and preferences to build loyalty and drive repeat business. Ultimately, harnessing data enables the cinema industry to build a more resilient and profitable business model fit for the modern entertainment market.

Target Users

Characteristics of the Users

There are three main user groups for this project: Cinema Chain Management, Marketing Departments, and Corporate Executives. Each group has different priorities but relies on the same sales and occupancy data to make informed decisions.

1. **Cinema Chain Management team**

   Cinema managers are responsible for operational efficiency across branches. They focus on monitoring occupancy rates, branch-level sales, and screening schedules. With the new cinema location reference table, they can interpret results using branch names and locations instead of coded identifiers. This allows them to act quickly on underperforming branches, optimize film allocation, and improve customer satisfaction by reducing empty seats.

2. **Marketing Department (for Cinema or Distributors)**

   The marketing team measures how pricing, film selection, and promotions affect ticket sales. They rely on customer demand insights to design effective campaigns and maximize attendance. With the film name reference table, they can evaluate the popularity of specific movies, test price sensitivity, and track the impact of promotions across different cinema locations. This enables them to refine marketing strategies and compare campaign outcomes across branches.

3. **Corporate Executives (Strategies-level)**

   Executives focus on long-term strategy, profitability, and expansion. Their interest lies in identifying top-performing and underperforming locations, understanding seasonal demand, and planning investments. With clear visualizations of cinema performance by location and forecasted sales, executives can lower investment risks, identify growth opportunities, and prioritize resource allocation for sustainable expansion.

User Needs and Expectations

1. **Cinema Chain Management team**

   Cinema managers require real-time monitoring of performance through dashboards that provide occupancy rates, seasonal demand, cinema-level revenue, and location-based trends. They expect clear insights for optimizing screening schedules, adjusting ticket prices, and allocating resources efficiently. Comparisons across branches are essential for identifying the best- and worst-performing cinemas, while guidance on balancing popular blockbuster films with niche offerings helps ensure both customer satisfaction and higher overall revenue.

2. **Marketing Department (for Cinema or Distributors)**

   The marketing team requires dashboards that show how ticket prices, promotions, and discounts influence attendance and total sales. They expect tools for evaluating campaign effectiveness, analyzing film popularity, and tracking customer response across different cinema locations. By examining ticket price sensitivity, film-level performance, and promotional outcomes, marketers can refine strategies, compare results across branches, and design targeted campaigns that maximize both attendance and profitability.

3. **Corporate Executives (Strategies-level)**

   Executives require dashboards that summarize sales patterns, highlight profitable and underperforming cinema locations, and reveal long-term business trends. They expect clear insights into audience demand, seasonal peaks, and overall operational performance to guide strategic decisions. Visualizations comparing revenue per seat and occupancy rates allow them to quickly identify top-performing branches and prioritize resources effectively. By focusing on location performance and sales distribution across different film types, executives can make informed decisions on investment, expansion, and long-term profitability.

Objectives of the Work

Project Goals

The main objective of this project is to apply historical cinema sales data to actionable insights. With the inclusion of additional reference tables for film names and cinema locations, the dashboards become more interpretable and user-friendly. Instead of coded identifiers, users will see actual movie names and cinema branches with locations, making the insights easier to apply in real business decisions.

How the Project Supports Users

These objectives are operationalized through Power BI dashboards, each tailored to the specific needs of cinema managers, marketing teams, and executives. By integrating cleaned sales data from Alteryx, the dashboards transform raw records into practical business intelligence that supports both daily operations and long-term planning.

Example Scenarios and Question Types

User 1: Cinema Chain Management Team

Background:

Cinema managers are responsible for daily operations such as monitoring branch performance, optimizing schedules, and reducing empty seats. Their challenge is ensuring that screenings across different cinemas achieve acceptable occupancy levels and contribute to overall profitability.

Example Scenario Questions & Solutions:

- **Question:** Which cinemas consistently operate below 50% capacity?
  Solution: Use a Bar Chart to compare average occupancy across cinema branches (by name and location). Highlighting those below the 50% threshold helps managers identify underperforming cinemas and adjust scheduling or film allocation.
- **Question:** What was the average occupancy rate by cinema during 2018?
  Solution: Use a Line or Column Chart with cinema location vs. average occupancy, aggregated monthly or quarterly. This shows seasonal occupancy patterns and helps managers benchmark one cinema against another.

User 2: Marketing Department (Cinema or Distributors)

Background:

The marketing team focuses on evaluating how pricing, promotions, and film selection influence ticket sales. Their challenge is to measure the effectiveness of campaigns and ensure that marketing strategies increase both attendance and revenue.

Example Scenario Questions & Solutions:

- **Question:** How do ticket prices influence sales volume?

  Solution: Use a Scatter Plot with ticket price on the x-axis and tickets sold on the y-axis. This visual shows price sensitivity and reveals the price range where sales are maximized.

- **Question:** Which films drive most of the revenue?

  Solution: Use a Treemap visualization to display ticket sales by film. Each block represents a movie, and its size corresponds to the total revenue it generated. This makes it easy to see which films contribute the largest share of total sales.

User 3: Corporate Executives (Strategic Level)

Background:

Executives are responsible for long-term strategy, growth, and investment decisions. Their challenge is to identify high-performing cinemas, anticipate demand patterns, and minimize risks in expansion or resource allocation.

Example Scenario Questions & Solutions:

- **Question:** Which cinema locations consistently outperform others in both sales and occupancy?

  Solution: Use a Clustered Bar Chart ranking cinema locations by revenue per seat and average occupancy rate. This allows executives to identify top-performing branches, establish benchmarks, and prioritize investment toward high-return locations.

- **Question:** How do sales and occupancy levels vary across the year, especially during peak months?

  Solution: Use a Combo Chart (Line + Column) showing monthly total sales alongside average occupancy %. This visual highlights seasonal patterns and helps executives prepare for high-demand periods such as holidays or blockbuster releases.

Data Description

Title and Source of Dataset (with Kaggle Link)

The dataset named “Cinema Tickets”

- https://www.kaggle.com/datasets/arashnic/cinema-ticket

Description of Dataset

This dataset describes the historical sale data of movie tickets along with related data points, examples of ticket_price, film_code, and tickets_sold, etc. It contains around eight months of sales history from different cinemas in 2018. The key purpose of the dataset is to analyze cinema performance at different levels — by film, cinema, screening time, and date. All cinema locations and movie identifiers are encoded and anonymized, ensuring data privacy while still allowing comparisons and clustering. The total sales are computed by date, cinema, movie, and time. For the occupation percent, it was calculated from the show time. Some tickets can be cancelled due to a reservation or any other reason.

Data Characteristics (columns, data types, size, quality)

Dataset Size & Structure

Main table

- **Records**: 142,524 rows.
- **Columns**: 14 variables (numeric, categorical, and temporal).
- **Granularity**: Each record = one movie screening in a specific cinema on a specific date and time.
- **Period**: Data covers ~8 months in 2018 (February-November), sufficient to capture both short-term weekly cycles and seasonal effects (holidays, blockbuster seasons).

Cinema Table

- **Records:** 246 rows.
- **Column:** 3 columns.

Film Table

- **Records:** 48 rows
- **Columns:** 3 columns.

Characteristics of each data field

Main Table

In each column, discuss the description or the meaning of the attribute, its data type, an example of data, the range of the data, whether unique or not, and whether it has null values or not.

- **film_code:** It's the film ID (V_String) which is linked to the film_table that holds the list of movies released in 2018, starting from 1471 to 1589. Totaling 48 unique values but showing across the various dates. It has no Null value.
- **Cinema_code:** It's the cinema ID stored as (V_String), which is linked to the Cinema table (has 3 attributes = cinema_code, a brief location point, such as Pleonchit, and cinema_fees). It has a total of 246 unique cinema codes across the whole data set.
- **Total_sales:** It's the total sales for each movie in each cinema, similar to the occu_perc because it can be calculated from the ticket_use.
- **Tickets_sold:** It's the number of tickets sold. Stored as an INT and must not exceed the capacity of each cinema based on the cinema ID.
- **Tickets_out:** It's the number of tickets canceled. Typically, value will be in integers from 0 to the max capacity of each cinema, but generally speaking, it should be in the range of 0 to 20 because more than should be extreme cases.
- **Show_time:** It's the screening room used based on each movie.
- **Occu_perc:** represents the occupation rate in percentage, which can be calculated from the ticket_sold / capacity *100.
- **Ticket_price:** represents the ticket price based on the film_code and cinema_code because some cinemas have bigger screens or better views, and some films might be more expensive than others. Typically, price bands are 250, 30,0, and 400 baht.
- **Ticket_use:** It represents the total number of tickets used each day for each movie. This data can be calculated from tickets_sold - tickets_out.
- **Capacity:** It represents the capacity of each movie theatre, which is normally set at 200, 230, and 250 seats.
- **Date:** It represents the date in the format of yyyy-mm-dd stored as (originally V_String but changed to Date). It has a total of 234 unique values, starting from 2018-02-21 to 2018-11-04.

Additionally, we also created two tables in the data cleaning process because the original data are quite difficult to process further; Film_table and Cinema_table. For the cinema table, we created it by collecting real movie theatre name from SF and Major websites. For the Film_table, we use generative ai to help create with human supervision in order to check correctness of data. These two tables can enhance the visualization.

Film_table has three attributes:

- **film_id:** this film_code is linked to the main table, the list of movies released in 2018, starting from 1471 to 1589, stored as integers. Totaling 48 unique values but showing across the various dates. It has no Null value.
- **film_name:** the name of both Thai and International films that were released in 2018. It has no null values. This data field will be stored as (String or V_String in Alteryx).
- **price:** standard price for the movie stored as integers and will be in the range of (200, 250, 300, 350).

Cinema_table has three attributes:

- **cinema_code:** It's the cinema ID stored as (V_String, which can be linked to the master table.
- **cinema_location:** a brief location point, such as Pleonchit, Siam Paragon. Typically, the community malls are in each area of Bangkok and other provinces. This Data field will be stored as integers.
- **cinema_fees:** the fees that each cinema collects for their operational cost, stored as integers and will be in the range of (30, 50, 100, 150). These fees will be based on the location of the cinema.

Data Types

- **Numeric Fields** (e.g., total_sales, tickets_sold, capacity) are mostly integers or floats, ideal for aggregation and KPI calculation.
- **Categorical Encoded Fields** (film_code, cinema_code) are anonymized identifiers, useful for grouping, clustering, and benchmarking.
- **Temporal Fields** (date, month, quarter, day, show_time) support trend analysis, forecasting, and seasonality detection.

Completeness & Missing Data

- Most fields are fully populated, except:
    - occu_perc → 125 missing values (0.09%). Can be recalculated as tickets_sold ÷ capacity × 100.
    - capacity → also 125 missing values (same rows).
- No missing values in key financial metrics (total_sales, ticket_price, tickets_sold).
- This high completeness ensures minimal preprocessing effort.

Data Quality Observations

The dataset is well-structured with no duplicate records and consistent relationships between fields (e.g., total_sales ≈ tickets_sold × ticket_price). The numeric fields are free from nulls except for the limited missing capacity values. Outliers are present but expected; blockbuster screenings generate extremely high sales, while niche films in small cinemas record low occupancy. These outliers are valuable for business interpretation rather than errors. The overall data distribution is naturally skewed toward high-demand events, reflecting real market conditions in the cinema industry.

Analytical Potential of Each Field

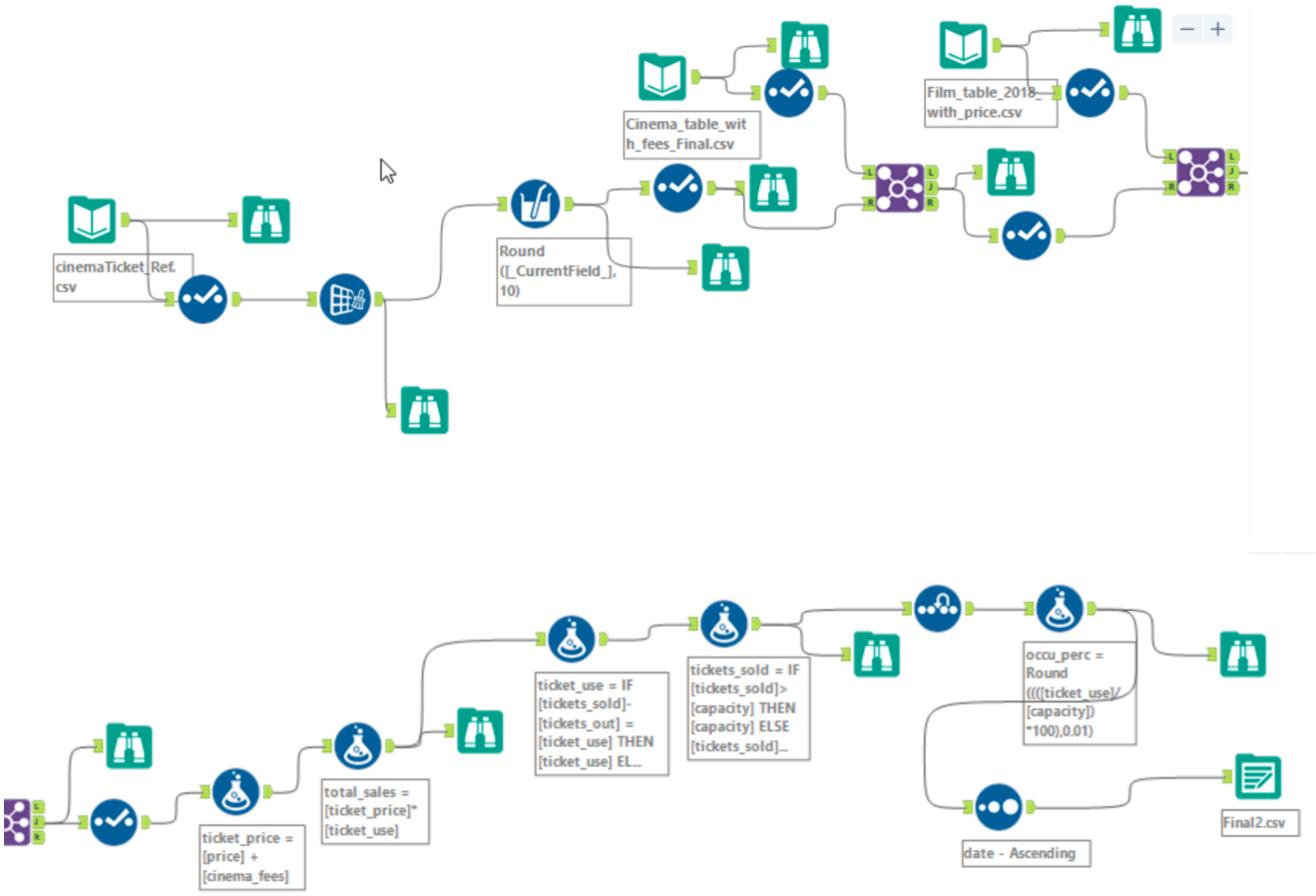
- **film_code:** Analyze movie-level performance (sales, occupancy).
- **cinema_code**: Compare locations; identify underperformers vs. hotspots.
- **total_sales**: Core revenue metric; basis for forecasting.
- **tickets_sold** & **ticket_use**: Measure demand and no-shows.
- **tickets_out**: Track cancellations and unredeemed tickets.

- **occu_perc**: Key KPI for efficiency (capacity utilization).
- **ticket_price**: Analyze price sensitivity and marketing ROI.
- **capacity**: Allows normalization (Revenue per Seat, Occupancy %).
- **date / month / quarter / day**: Enables time-series and seasonal trend analysis.
- **show_time**: Supports operational decisions (best-performing slots).

Business Relevance

The dataset is highly versatile. Cinema chains can use it to benchmark performance and identify underperforming locations. Marketing teams can evaluate the impact of ticket price on demand, the success of promotions, and the most profitable show times. Corporate executives can study revenue trends, identify high-performing clusters of cinemas, and forecast future sales during peak seasons such as holidays. The combination of transactional, operational, and temporal variables makes the dataset well-suited for Power BI dashboards that address the needs of all three target user groups.

Data Preparation with Alteryx

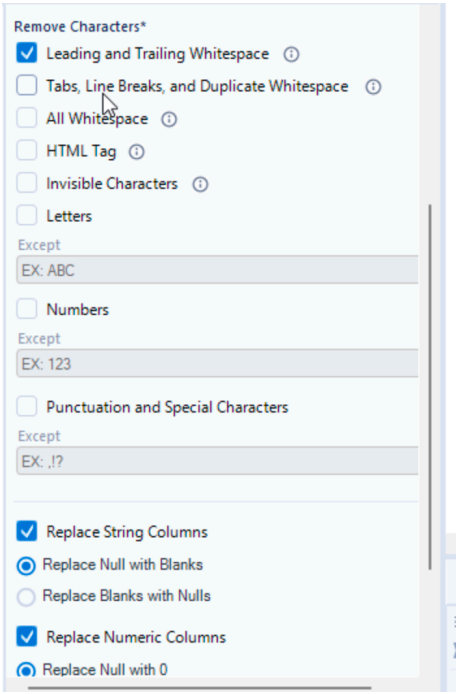


In data cleaning steps, many steps have been taken to clean and optimize data for further analysis, including joining other tables to make the master table more useful.

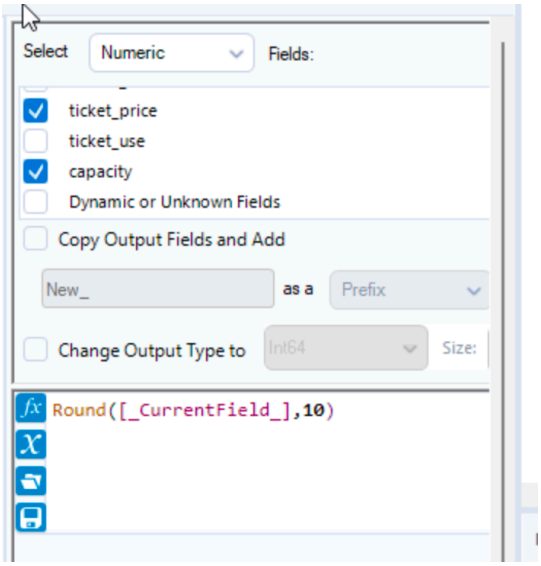
First, We import data into the Alteryx by using the “Input Data” then we transform the type of data on column with number (total_sales, tickets_sold, tickets_out, tickets_use, and capacity) from VString to Int16, Int64, Double and Float. In the beginning, capacity contains decimal so we change it into double so that we can round it in the subsequent step.

Column	Type	Size	Rename
film_code	V_WString	254	
cinema_code	V_WString	254	
total_sales	Int64	8	
tickets_sold	Int16	2	
tickets_out	Int16	2	
show_time	V_WString	254	
occu_perc	V_WString	254	
ticket_price	Float	4	
ticket_use	Int16	2	
capacity	Double	8	
date	V_WString	254	
month	V_WString	254	
quarter	V_WString	254	
day	V_WString	254	
*Unknown	Unknown	0	

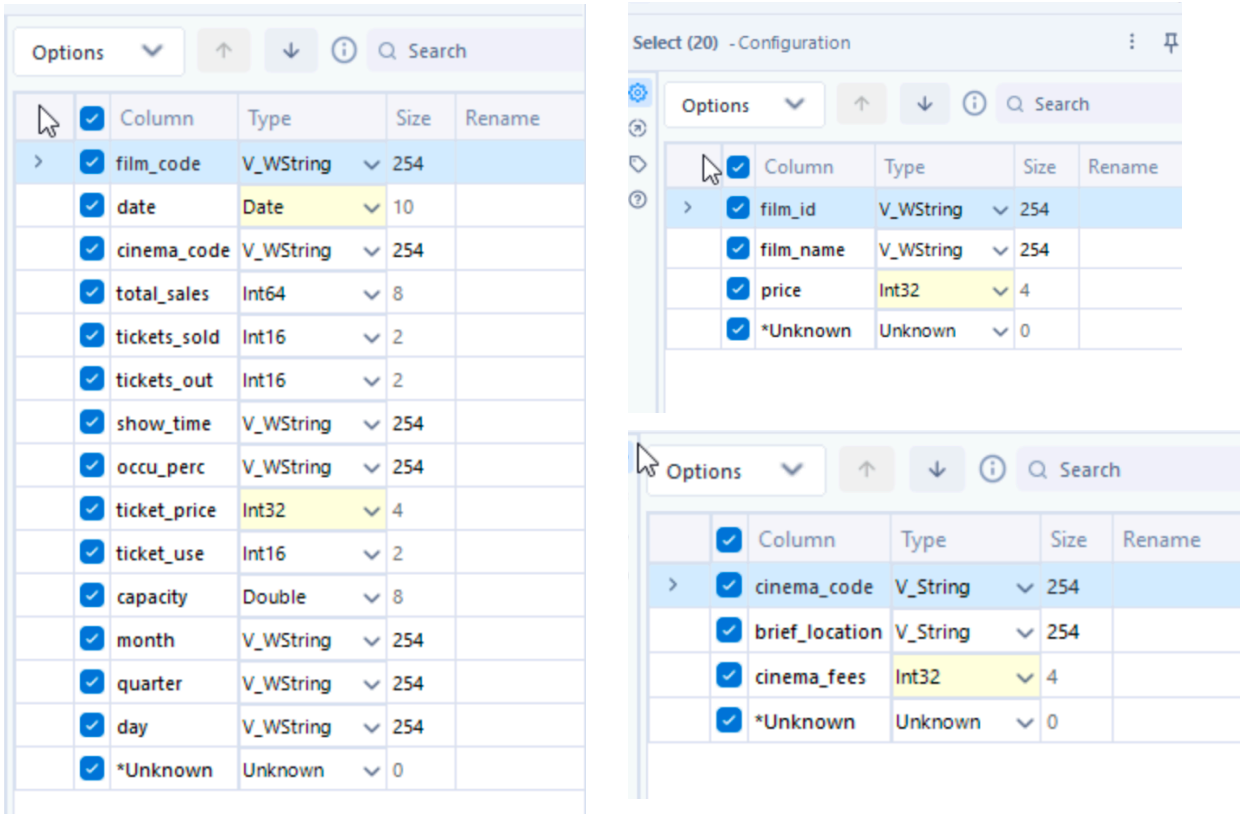
After that, we used the “Data Cleanse Pro” to clean data where there are null and 0. In the capacity, there are 125 rows that contain “Null” in them which this process will replace them with 0 and later on we imputed the 0 from the calculated average of capacity.

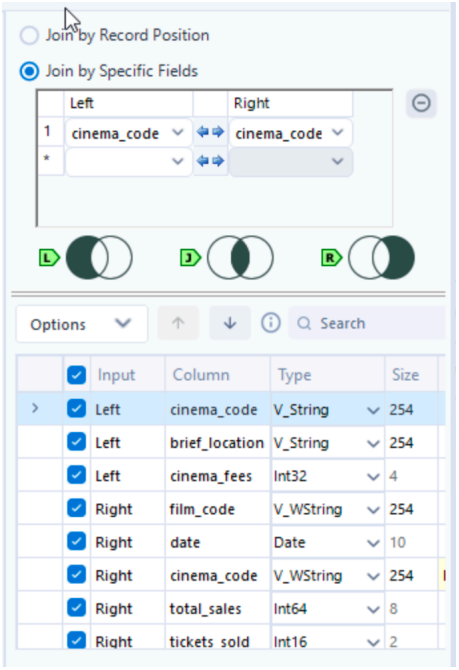


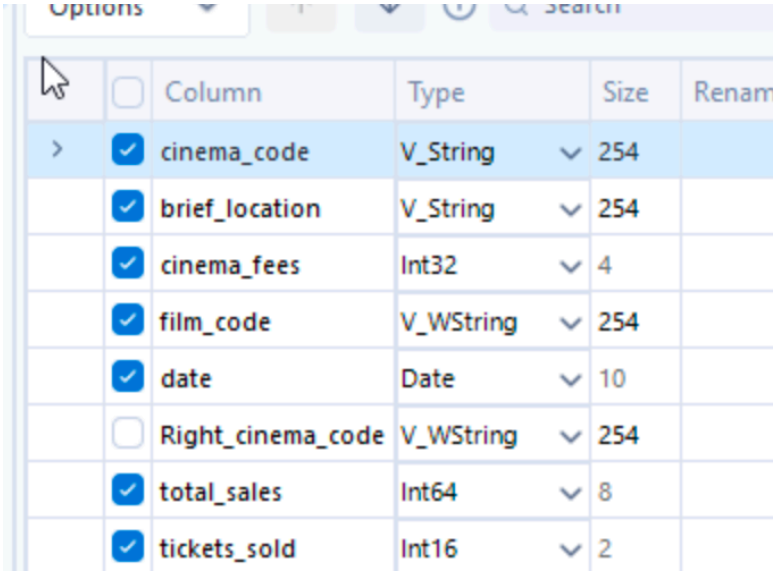
After Data has been cleaned briefly from “Data Cleanse Pro”, we use a “multi-field formula” to round up the columns that previously have been decimal.

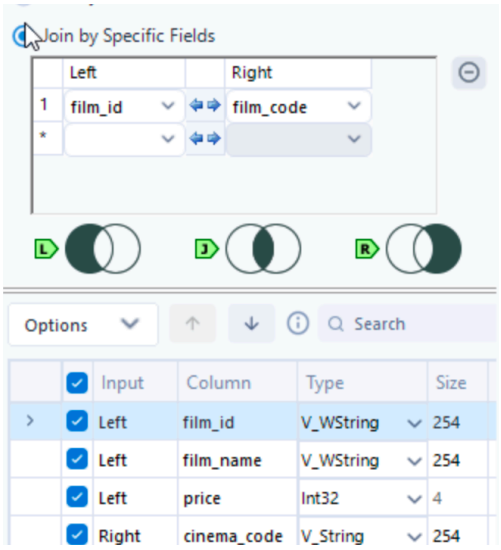


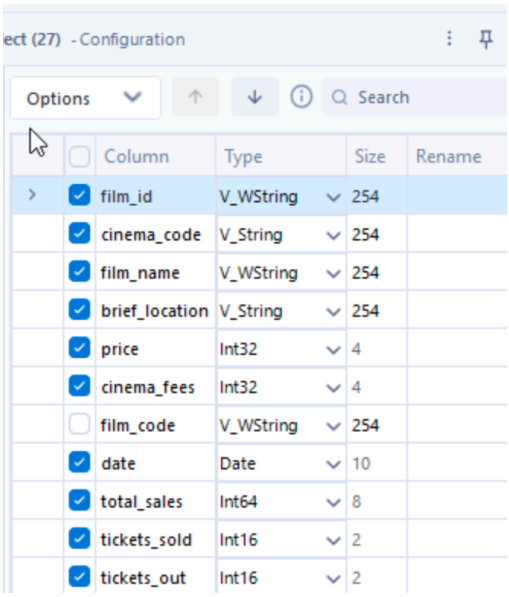
After rounding data, we now change the data type one again on **"Date"** to be data type of **date** and **"ticket_price"** to be **int32** for support the calculation of ticket price in later step since the data of original **ticket_price** are not optimal (e.g. the ticket price are unbelievably high and inconsistent). The new ticket_price are calculated by adding movie_fees from the **Film_table** and cinema_fees from **Cinema_table**



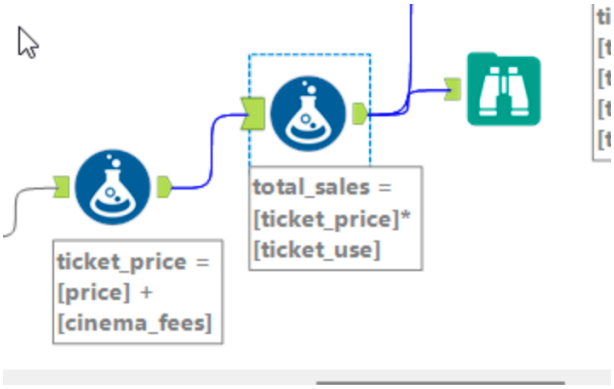




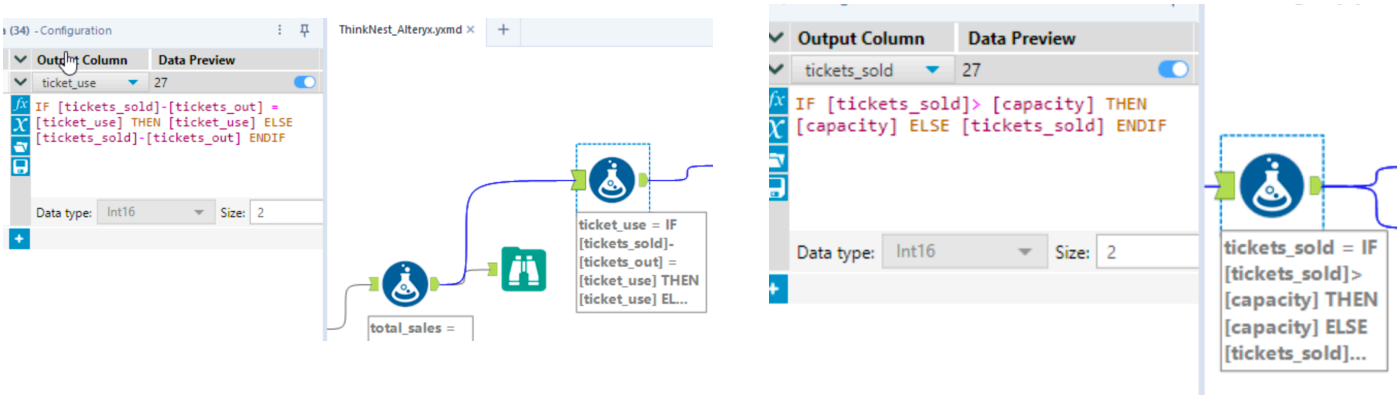




Before we could join the additional two tables, we have to change the data type of numerical fields that are going to be used for calculation first. After that we joined with an inner join and deleted the duplicate field out.

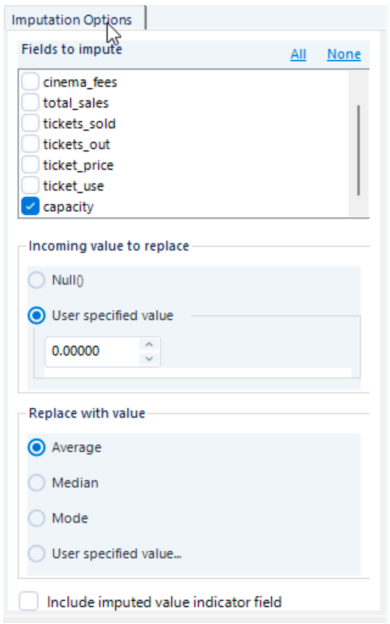


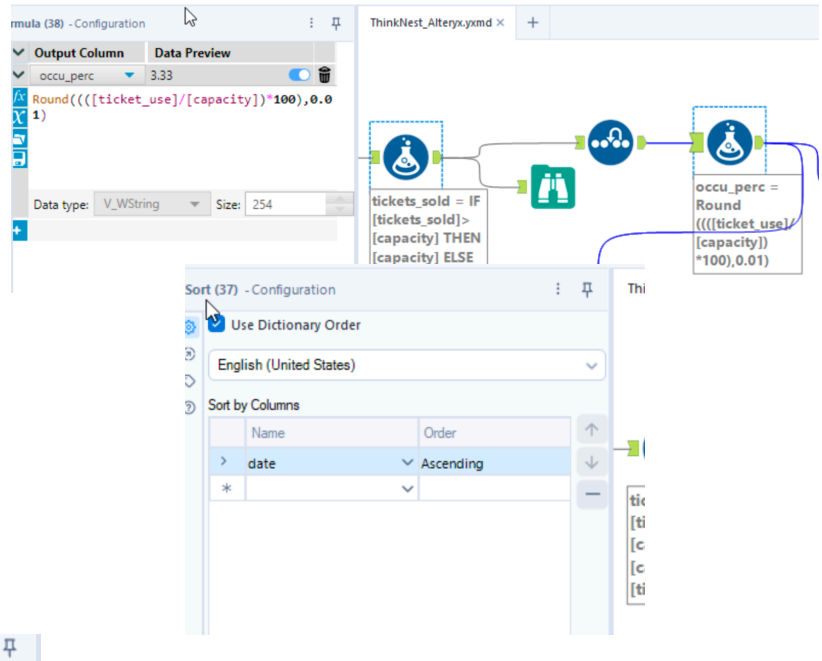
After the joining step, we recalculate the ticket_price and total_sales. Ticket_price recalculated by adding the film_price with cinema fees. For the total_sales, recalculated by multiplying ticket_price with ticket_use.

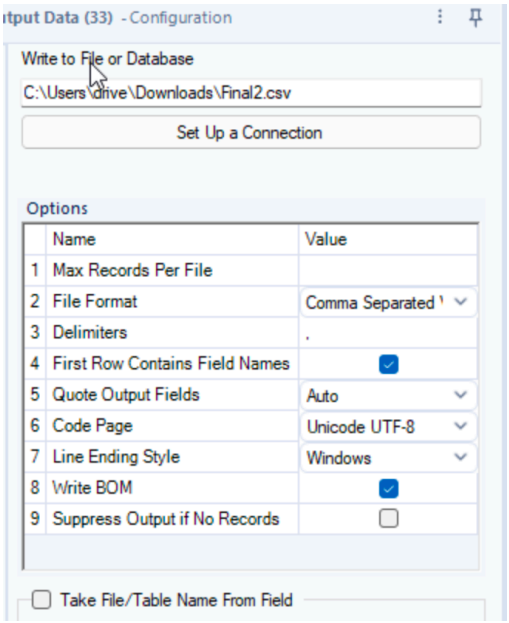


Also, we have added the condition for checking the ticket_use and ticket_sold as well. For ticket_use, we use if-else condition to check **if** ticket_sold is **subtracted** with ticket_out, **get** ticket_use or not. **If it's then no change, if not,** recalculate again by subtracting the ticket_sold with ticket_out. ticket_out is the ticket that got cancelled.

For ticket_sold, we use if-else condition as well by checking if tickets_sold more than capacity or not, **If it's more than capacity (which is not normal)** set the tickets_sold to only the capacity **Else** stay the same.







After implementing conditions for checking, we implemented the imputation to replace the 0s data in a capacity column that has around 125 rows by replacing it with the average, along with recalculation of the occupancy percentage column by dividing the ticket_use by capacity and multiplying by 100 to get a percentage, with a rounding function used outside to round up to 2 decimal places only. Following that, we sort the data by date in ascending order and then output it as a CSV.

Power BI Visualization

Dashboard Design and Pages

Page	Dashboard Title	Target User	Purpose
1	Executive Overview Dashboard	All stakeholders - Executives, Cinema Managers, Marketing Teams	Provide a clear snapshot of overall cinema industry performance in 2018.
2	Cinema Management Dashboard	Cinema Chain Management Team	Help managers monitor occupancy and identify underperforming cinemas.
3	Marketing & Pricing Dashboard	Marketing Department	Evaluate how pricing, promotions, and film performance influence sales.
4	Executive Performance & Profitability Dashboard	Corporate Executives	Evaluate profitability per cinema and identify top-performing branches by film and date.

Types of Visuals Used

Visual Type	Count	Dashboard Example	Purpose
Slicer	7	Page 1,2,3,4	• Allows users to filter visuals by specific time periods for dynamic, real-time exploration of cinema performance trends. • To facilitate dynamic, user-driven

			analysis by segmenting the entire dataset based on a specific cinema location identified by its cinema code. ● This allows for adjustable insights by filtering data by films, date, or cinema location. ● Enables users to dynamically analyze different movies or specific periods without altering the report layout.
Card	12	Page 1,2,3,4	● Provide quick performance indicators for executives. Cards summarize total revenue, customer volume, seat utilization, and overall market scope at a glance. ● Summary highlights key business metrics that provide an immediate overview of performance. It includes total revenue generation (Total Sales), operational efficiency (Average Occupancy Percentage), profitability per asset (Revenue Per Seat), and a direct count of areas needing attention (Underperforming Cinemas). ● Represent the average ticket price. ● Provides at-a-glance KPIs showing which cinema leads in profitability.
Line Chart	1	Page 1	● Shows monthly revenue progression across 2018, allowing users to detect sales peaks, seasonality, and trends over

			time.
Line and clustered column chart	2	Page 1, 2	• Compares monthly financial performance against occupancy rates. Helps assess how efficiently cinemas convert audience attendance into revenue. • To demonstrate the relationship between revenue generation (sales) and operational efficiency (occupancy) throughout the year.
Treemap	1	Page 1	• Highlights top-performing films contributing to total sales. Enables marketing and executives to identify which movies drive profitability.
Gauge	1	Page 1	• Visually compares average occupancy performance to the company's efficiency benchmark (70%). Quickly communicates whether operations meet goals.
Matrix	1	Page 2	• To uncover consistent patterns in audience behavior over time, thus aiding in strategic planning for operations and marketing.
Clustered Bar Chart	5	Page 2,3, 4	• To enable a comparison of cinema locations against a set performance benchmark of 50% occupancy. • To serve as an interactive diagnostic

			tool that allows for analyzing the performance contributions of individual films at specific locations. ● To highlight the most popular films, making it easy to identify top performers boosting overall sales. ● Compares how efficiently each cinema generates revenue for every available seat. ● Displays total ticket sales in THB across all branches for the selected movie and date range.
Funnel	1	Page 3	● This helps identify potential gaps between sales and actual attendance for performance evaluation.
Stacked Bar	1	Page 3	● To compare total sales between films with and without promotions, helping identify how promotional activities impact revenue.
Table	1	Page 4	● Provides deep insights into ticket price, tickets sold, total sales, capacity, occupancy rate, and revenue per seat for each location.

Total visuals: 30

Unique visual types: 11

New/Quick Measures Implemented

1. **Executive Overview Dashboard**

   DAX Measures

   - **Total Sales (THB)**

     ```
     Total Sales(THB)=
     SUM('outputTEMP2-2'[total_sales])
     ```

     Purpose: Calculates total revenue generated from all cinemas and films combined.

     Used in: KPI Card, Line Chart (Revenue Trend), and Combo Chart (Monthly Revenue vs Occupancy).

   - **Total Tickets**

     ```
     Total Tickets =
     SUM('outputTEMP2-2'[tickets_sold])
     ```

     Purpose: Aggregates the total number of tickets sold across all cinemas, providing insight into overall demand.

     Used in: KPI Card and contextual comparison against total sales.

   - **Average Occupancy %**

     ```
     Average Occupancy % =
     VAR avgOccu = AVERAGE('outputTEMP2-2'[occu_perc])
     RETURN
     IF(avgOccu <= 1, avgOccu * 100, avgOccu)
     ```

     Purpose: Measures the overall seat utilization rate across all screenings, serving as a key operational efficiency indicator.

     Used in: KPI Card, Combo Chart (Monthly Revenue vs Avg Occupancy), and Gauge Visual (vs Target 70%).

- **Average Ticket Price**

```
Average Ticket Price =
DIVIDE(
    [Total Sales (THB)],
    [Total Tickets]
)
```

Purpose: Calculates the average ticket price across all cinemas to assess pricing consistency and customer spending behavior.

Used in: KPI Card and as context for profitability trends.

- **Total Cinemas**

```
Total Cinemas =
DISTINCTCOUNT('outputTEMP2-2'[cinema_code])
```

Purpose: Counts the number of unique cinema locations in operation during 2018.

Used in: KPI Card for a quick snapshot of operational scale.

- **Occupancy Target (Static Measure)**

```
Occupancy % Target = 70
```

Purpose: Establishes a 70% occupancy benchmark for the Gauge visual, helping users quickly evaluate performance against goal.

Used in: Gauge visual - “Occupancy vs Target (70%)”.

2. **Cinema Management Dashboard**

DAX Measures

- **Total Sales**

```
Total Sales = SUM('outputTEMP2-2'[total_sales])
```

Purpose: To calculate the sum of all revenue from ticket sales based on the current filters.

Used in:

- "Total Sales" KPI Card
- "Monthly Sales vs. Occupancy Trend" chart (the column values)
- "Total Sales by Film Name" chart (the bar values)

- **Average Occupancy %**

```
Average Occupancy % =
AVERAGE('outputTEMP2-2'[occu_perc])
```

Purpose: To calculate the average of the seat occupancy percentage across all relevant screenings. This is the primary metric for measuring operational efficiency.

Used in:

- "Average Occupancy %" KPI Card
- "Average Occupancy Rate by Cinema Code" chart
- "Monthly Sales vs. Occupancy Trend" chart
- "Weekly & Monthly Patterns" heatmap

- **Revenue Per Seat**

```
Revenue Per Seat =
DIVIDE(SUM('outputTEMP2-2'[total_sales]),
SUM('outputTEMP2-2'[capacity]))
```

Purpose: To calculate the average revenue generated by each available seat. This provides a fair profitability comparison between cinemas of different sizes.

Used in:

- "Revenue Per Seat" KPI Card

- **Underperforming Cinemas**

```
Underperforming Cinemas =
COUNTROWS(
    FILTER(
        SUMMARIZE('outputTEMP2-2',
'outputTEMP2-2'[cinema_code], "AvgOcc", [Average
```

```
Occupancy %]),
        [AvgOcc] < 50
    )
)
```

Purpose: To count the total number of distinct cinema locations where the Average Occupancy % is below the predefined 50% target. This serves as a critical, high-level alert for management.

Used in:

- "Underperforming Cinemas" KPI Card

3. Marketing & Pricing Dashboard

DAX Measures

- **Top 100 Performance**

```
EVALUATE
ADDCOLUMNS(
    TOPN(100, 'outputTEMP2-2'),
    "Total Sales", SUM('outputTEMP2-2 (2)'[total_sales]),
    "Tickets Sold", SUM('outputTEMP2-2 (2)'[tickets_sold]),
    "Tickets Used", SUM('outputTEMP2-2 (2)'[tickets_sold]) - SUM('outputTEMP2-2
    (2)'[tickets_out]),
    "Weighted Avg Ticket Price", DIVIDE(SUM('outputTEMP2-2 (2)'[total_sales]),
    SUM('outputTEMP2-2 (2)'[tickets_sold]), 0),
    "Avg Ticket Price", AVERAGE('outputTEMP2-2 (2)'[ticket_price])
)
```

Purpose: Generates a summary table of the top 100 records with key metrics such as total sales, tickets sold, tickets used, and ticket prices for performance comparison.

Used In: Applied in Power BI table visuals to analyze and compare top-performing films or cinemas based on sales and ticket data.

4. Executive Performance & Profitability Dashboard

DAX Measures

- **Revenue per Seat:**

```
Revenue per Seat =
DIVIDE(
```

```
    SUM('outputTEMP2-2'[total_sales]),
    SUM('outputTEMP2-2'[capacity])
)
```

Purpose: Evaluates how efficiently a cinema utilizes its capacity in monetary terms.

Used in: KPI Card and Revenue per Seat bar chart.

- **Average Occupancy**

```
Average Occupancy =
VAR occ = DIVIDE( SUM('outputTEMP2-2'[tickets_sold]),
                  SUM('outputTEMP2-2'[capacity]))
RETURN IF(ISBLANK(occ), "No data for selection",
FORMAT(OCC, "0.00%")
```

Purpose: Measures average seat utilization rate across all cinemas (0–1 ratio formatted as %).

Used in: Supporting metrics in the data table and bar chart analysis.

- **Top Cinema**

```
Top Cinema =
VAR TopCinema =
     TOPN(
          1,
          VALUES('outputTEMP2-2'[brief_location]),
          [Revenue per Seat],
          DESC
     )
VAR CinemaName =
     CONCATENATEX(TopCinema,
     'outputTEMP2-2'[brief_location], ",")
RETURN
IF(
```

```
    ISBLANK(CinemaName) || CinemaName = "",
    "No Data",
    CinemaName
)
```

Purpose: Dynamically returns the top-performing cinema location based on Revenue per Seat.

Special Features: Includes a fallback message when the selected filter returns no data.

Used in: Supporting the card (KPI)

- **Revenue per Seat (Card)**

```
Revenue per Seat (Card) =
VAR RowCount =
    CALCULATE( COUNTROWS('outputTEMP2-2') )
VAR Top1 =
    TOPN(
        1,
        VALUES('outputTEMP2-2'[brief_location]),
        [Revenue per Seat], DESC,
        'outputTEMP2-2'[brief_location], ASC
    )
VAR RPS =
    CALCULATE( [Revenue per Seat], KEEPFILTERS(Top1) )
VAR TicketsTop =
    CALCULATE( SUM('outputTEMP2-2'[tickets_sold]),
KEEPFILTERS(Top1) )
VAR Note =
    IF( NOT ISBLANK(TicketsTop) && TicketsTop = 0,
        "*0 recorded tickets*",
        ""
    )
RETURN
```

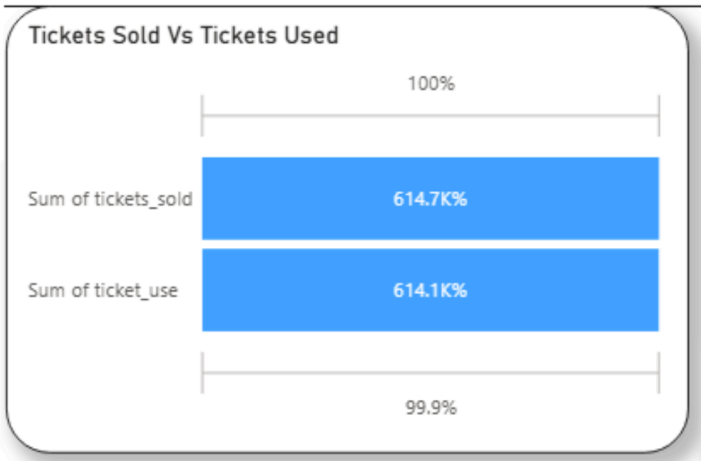
```
IF(
    RowCount = 0 || ISBLANK(RPS),
    "⚠ No data for current selection",
    FORMAT(RPS, "#,##0.00") & " THB/seat" & Note
)
```

Purpose: Ensures clear communication in KPI cards by displaying a text message instead of blanks when there is no data.

Special Features: Includes a fallback message when the selected filter returns no data.

Used in: Supporting the card (KPI)

Custom Visual from Power BI Apps

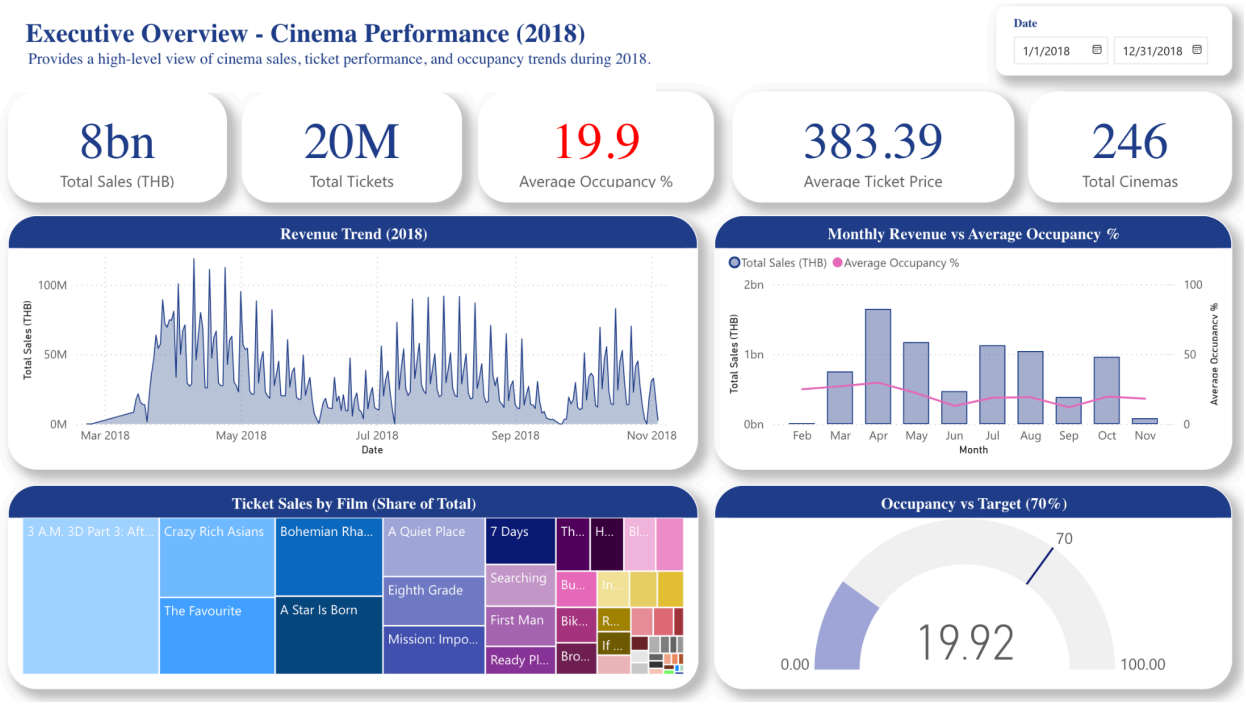


This funnel is a key metric for measuring the operational efficiency and revenue accuracy of the cinema.

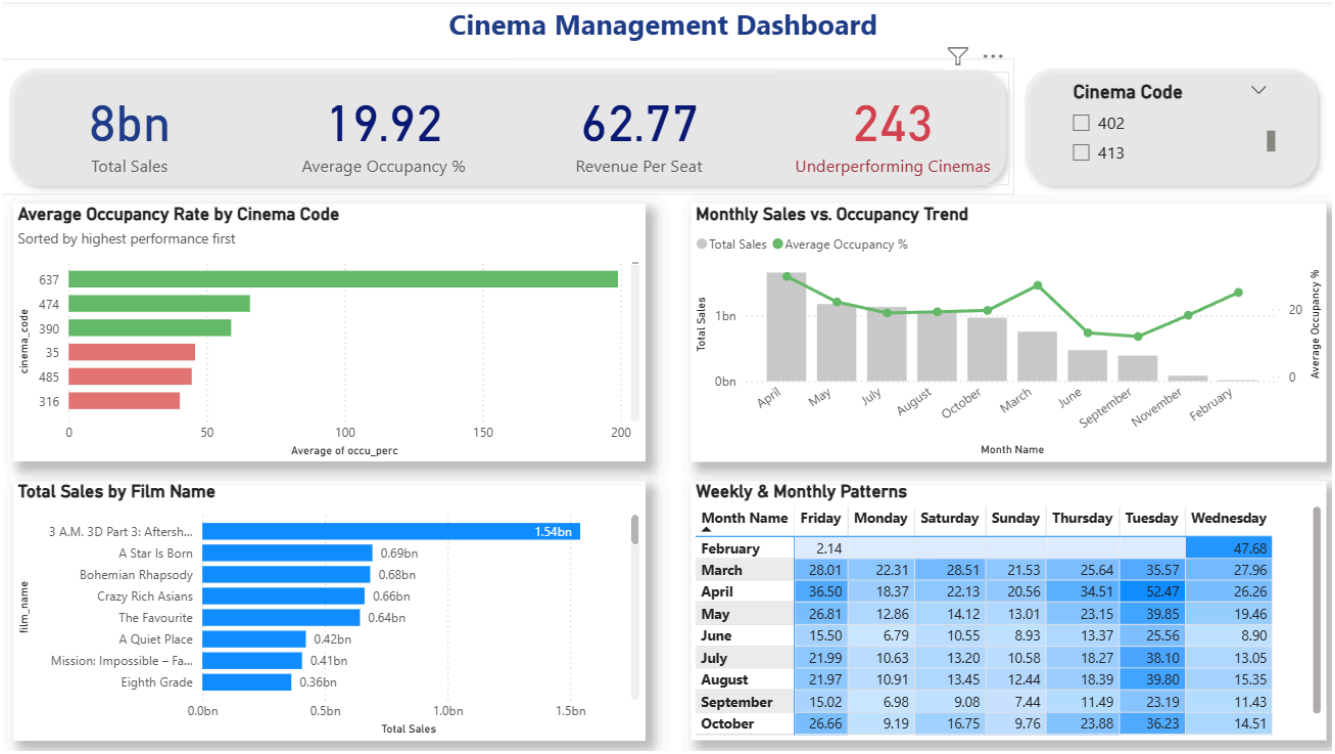
- **Calculate the Redemption Rate:** By comparing the total number of tickets sold against the total number of tickets actually used.
- **Quantify No-Shows:** The difference between the two bars represents tickets that were sold but never used (no-shows). This value is crucial for pricing strategies and capacity planning, as high no-show rates can impact concession sales and future promotions.

Screenshots of Dashboards

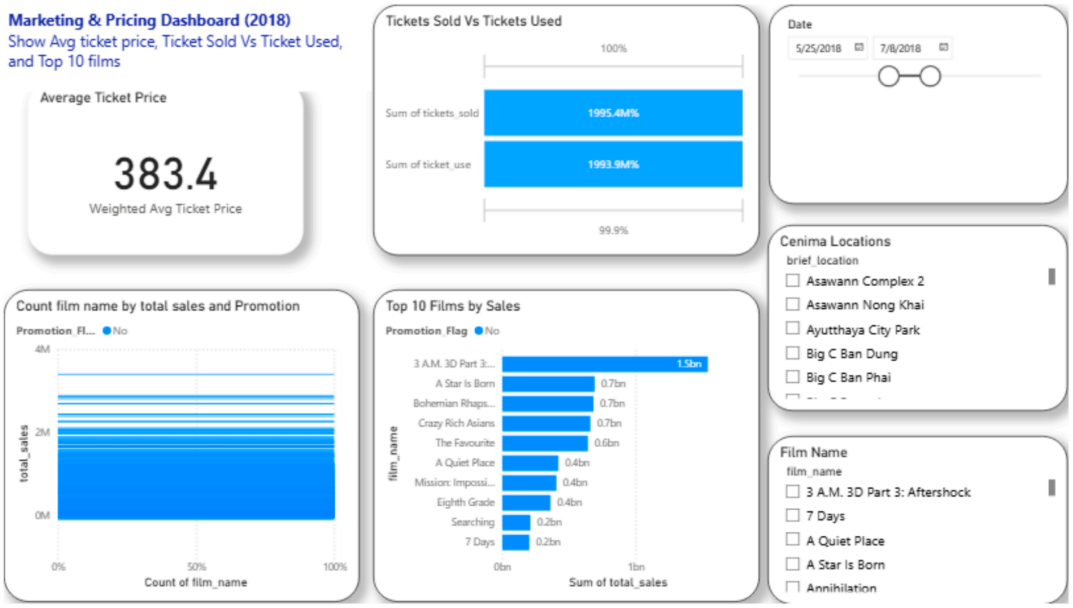
Page 1: Executive Overview Dashboard



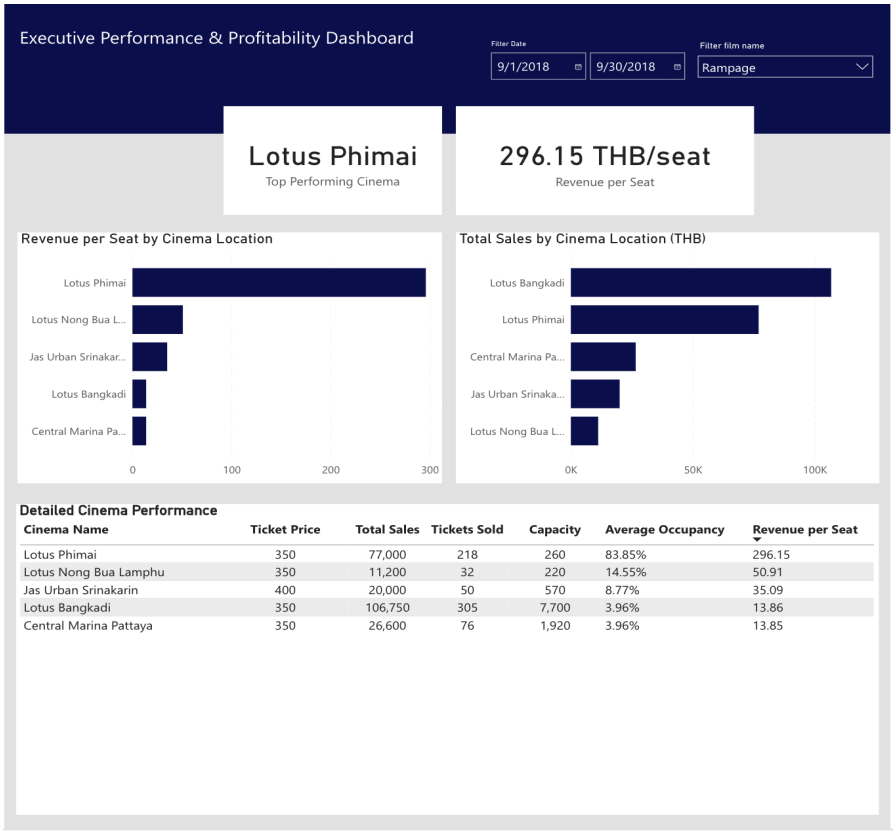
Page 2: Cinema Management Dashboard



Page 3: Marketing & Pricing Dashboard



Page 4: Executive Performance & Profitability Dashboard



Analysis and Insights

Key Findings from Data Visualization

1. Executive Overview Dashboard

The Executive Overview Dashboard provides a high-level summary of overall cinema industry performance in 2018. Designed for executives, cinema managers, and marketing teams, it offers a comprehensive snapshot of the industry's operational efficiency and financial outcomes at a glance. This page highlights the relationship between sales, occupancy, and film performance across all cinema branches, allowing stakeholders to assess the organization's overall health without navigating complex datasets.

From the dashboard visualization, several key findings can be drawn:

1. **Strong sales but low occupancy.**

   Even though total sales and ticket numbers were high, the average occupancy was only around 20%. This means many seats were left empty, showing there's room to improve how cinemas use their capacity.

2. **Ticket prices are consistent.**

   The average ticket price is about 380 THB, which means most cinemas use a similar pricing strategy. So, differences in revenue likely come from film popularity or marketing, not price.

3. **Seasonal trends are clear.**

   The revenue trend line shows peaks in months like April, July, and October, likely from holidays or blockbuster movies. This pattern helps cinemas plan promotions during high-demand months.

4. **Revenue and occupancy do not always align.**

   From the monthly sales vs. occupancy chart, some months with high revenue still have low seat usage. This shows that some cinemas earn more from a few big screenings but still have unused capacity overall.

5. **Few films make most of the money.**

   The treemap shows that only a few blockbuster movies bring in most of the ticket sales, meaning cinemas rely heavily on a small number of popular films.

6. **Occupancy below target.**

   The gauge visual highlights that actual occupancy (around 20%) is far below the 70% target. This helps managers easily see that improving attendance should be a key goal.

7. **Date slicer for flexible analysis.**

   The date slicer lets users filter data by any period to easily explore performance over time.

Overall, this dashboard gives a simple, clear view of how cinemas performed in 2018. It shows good revenue but low seat usage, helping managers and executives quickly understand what's working and where to improve.

2. The Cinema Management Dashboard

This Cinema Management Dashboard provides a clear analysis of performance, from a high-level summary down to location-specific details identified by their unique cinema code. By combining key financial and operational metrics, the dashboard allows management to identify issues and opportunities without needing to examine raw data.

The following key findings emerge from the visuals:

1. **Performance varies greatly by location.**

   The dashboard shows a clear difference between high- and low-performing cinemas. While some locations are well above the 50% occupancy benchmark, many others, such as Cinema Code 316, fall significantly short. This indicates that performance challenges are specific to certain locations and require focused, individual strategies identified by their code.

2. **High sales do not always mean high efficiency.**

   The "Monthly Sales vs. Occupancy Trend" chart shows that the months with the highest sales are not always the ones with the highest occupancy. This important finding suggests that strong revenue can sometimes hide operational issues, like a high number of empty seats. This presents a key opportunity: improving occupancy during high-revenue periods could lead to substantial profit growth.

3. **Clear seasonal and weekly patterns affect operations.**

   The heatmap reveals predictable patterns in audience behavior. Performance consistently peaks during weekends and certain months like December, while weekdays in other months are underutilized. This shows that demand is not constant, meaning that marketing and operational plans must be timed well to take advantage of these patterns.

4. **Film choice is key to a location's success.**

   The interactive "Film Performance" chart shows that a cinema's performance is tied to both its operations and its content. By filtering for a specific underperforming cinema code, managers can see that some films do not attract the local audience. This highlights that a successful content strategy must align with local market demand.

3. The Marketing & Pricing Dashboard

The Marketing & Pricing Dashboard offers a thorough analysis of sales patterns, ticket pricing behaviors, and the efficiency of promotions across various cinemas and films. The dashboard's combination of several visuals enables marketing analysts to understand the ways that pricing strategies and campaigns impact overall sales performance.

From the demonstration and analysis, several key insights were observed:

1. **Average ticket price**

   Shows a stable average of around 380 THB across films and cinemas. This consistency suggests that pricing is standardized, and variations in sales are driven more by film popularity or promotional efforts than by ticket cost.

2. **Ticket usage is highly efficient, with minimal no-shows.**

   The funnel chart shows that almost all sold tickets were used, indicating high customer commitment and satisfaction with the booking and viewing experience. This highlights strong operational reliability in ticket management.

3. **Average ticket prices remain stable across films.**

The Weighted Average Ticket Price card reveals a consistent average of around 380 THB, showing that pricing is standardized across cinemas. However, variations in sales performance suggest that factors like movie popularity and marketing efforts play a larger role than price alone.

4. **Top-performing films dominate overall revenue.**

   The Top 10 Films by Sales chart identifies a small group of movies generating the majority of total revenue. This concentration indicates that blockbuster titles continue to drive the largest share of cinema income.

5. **Promotional efficiency varies by film.**

   The Stacked Bar visualization shows that while some films rely heavily on promotions to achieve high sales, others perform strongly even without discounts. This differentiation helps the marketing team assess which titles benefit most from promotional support.

4. The Executive Performance & Profitability Dashboard

The Executive Performance & Profitability Dashboard provides a clear, movie-based analysis of cinema performance across locations. By focusing on one film at a time, the dashboard allows executives to isolate and interpret key operational and financial patterns without overlapping data from other titles.

From the demonstration using the movie “Rampage” (September 2018), several key findings emerged:

1. **Profitability varies significantly across locations.**

   Although some cinemas, such as Lotus Bangkadi, generated high total sales, their revenue per seat and occupancy rates were extremely low. This indicates that large venues are not necessarily more profitable if they fail to attract sufficient audiences.

2. **Smaller cinemas can achieve higher efficiency.**

   Lotus Phimai achieved the highest revenue per seat (296.15 THB) and a strong occupancy rate (83.85%), outperforming larger cinemas. This highlights that operational efficiency — not just scale — determines profitability.

3. **Low utilization is the main profitability issue.**

   Across most locations, occupancy rates remained below 30%, suggesting that many screenings are underutilized. Even with standard ticket prices, insufficient seat usage reduces potential revenue.

4. **Price consistency does not guarantee performance.**

   Ticket prices were similar across most cinemas (350–400 THB), yet revenue outcomes differed widely. This reveals that location-based demand and marketing impact play a larger role than pricing alone.

5. **Revenue per seat is more reliable than total sales for executive decisions.**

   The dashboard confirmed that Revenue per Seat is a stronger metric for comparing cinemas fairly, accounting for differences in capacity and showtime volume, and offering a more realistic view of profitability.

How Analysis Meets Project Objectives

1. **Executive Overview Dashboard**

   The Executive Overview Dashboard successfully meets the project's main goal of turning historical cinema sales data into meaningful business insights. It provides a quick, high-level summary of the 2018 cinema performance through key metrics like Total Sales, Tickets Sold, Average Occupancy, and Average Ticket Price.

   Each visualization serves a purpose:

   - KPI Cards instantly show core business health indicators.
   - Line Chart reveals the overall revenue trend throughout 2018.
   - Combo Chart compares monthly sales and occupancy, highlighting seasonal peaks and low-demand periods.
   - Treemap identifies top-performing films by ticket sales.
   - Gauge Visual tracks the current occupancy rate against the 70% target.
   - Date Slicer allows dynamic filtering, making the analysis flexible and interactive.

Together, these visuals allow executives, managers, and marketers to quickly assess performance, spot trends, and make data-driven decisions to improve profitability and efficiency.

2. The Cinema Management Dashboard

This dashboard is very effective at its task of helping managers monitor occupancy and identify underperforming theaters. It achieves this by taking historical data and turning it into actionable business intelligence through a series of disparate visual components.

The dashboard first provides a strategic summary and a clear foundation for action. The four KPI cards provide a concise overview of important business metrics for a rapid performance check. This is complemented by the "Average Occupancy Rate by Cinema Code" bar chart, which is a direct action list, allowing management to see at once which cinema codes require attention.

The dashboard also facilitates deeper trend and efficiency analysis. The "Monthly Sales vs. Occupancy Trend" chart plots the relationship between revenue and operating efficiency over time, helping to uncover whether sales are strong at the cost of underlying performance issues.

Finally, it provides root cause analysis and strategic planning tools. The "Monthly & Weekly Pattern" heatmap shows periodic temporal trends in audience traffic, which helps with planning targeted events such as promotions or staffing. Completing the analysis, the interactive "Film Performance" chart is a diagnostic tool to investigate why a given site is underperforming, to help distinguish between operational and content-based problems.

By integrating these characteristics, the dashboard provides a total system for performance measurement, supporting both shorter-term operating adjustments and longer-term strategic planning.

3. The Marketing & Pricing Dashboard

The Marketing & Pricing Dashboard is a critical, data-driven tool that transforms raw cinema transaction volume into actionable insights, establishing a strategic

framework to analyze pricing tiers, promotional effectiveness, and sales performance via key metrics like Weighted Average Ticket Price and the Tickets Sold vs. Used ratio, thereby enabling granular exploration and revenue optimization.

4. The Executive Performance & Profitability Dashboard

The analysis presented in the Executive Performance & Profitability Dashboard (Page 4) directly fulfills the main project objective of transforming historical cinema sales data into actionable business intelligence that supports profitability optimization and strategic decision-making. This dashboard enables executives to easily identify top-performing cinema locations through a dynamic KPI card that highlights the branch with the highest Revenue per Seat, such as Lotus Phimai, allowing management to set realistic performance benchmarks.

The paired bar charts provide a clear visual comparison of Revenue per Seat and Total Sales, distinguishing between operational efficiency and sales volume to reveal whether high revenue comes from strong demand or simply larger capacity. Additionally, the detailed table consolidates key indicators, including ticket price, occupancy rate, and revenue metrics, to guide decisions on where to allocate more screenings or optimize underperforming locations. By focusing on one movie at a time, the dashboard mirrors real-world business analysis practices, offering a structured and repeatable framework for evaluating film-specific performance and supporting long-term strategic planning for cinema investment and expansion.

Implications for Users and Business Domain

The **Executive Overview Dashboard** supports all key user groups:

- **Executives:** Quickly review company-wide revenue and occupancy trends to guide long-term strategy.
- **Cinema Managers:** Monitor performance, identify underperforming periods, and adjust screening schedules.
- **Marketing Teams:** Recognize which films and months attract the most customers and plan campaigns effectively.

By transforming complex data into simple visuals, this dashboard improves communication, supports faster decisions, and aligns goals across departments to increase profitability and customer satisfaction.

For the Cinema Chain Management team

The dashboard serves as a focal point for operational performance tracking and tactical decision-making as well. It allows for the chance for the team to move beyond mere passive reports and actually assess the health of every cinema in the chain. The managers can take the "Average Occupancy Rate by Cinema Code" chart as an immediate "action list" and notice which of the cinema codes they need to address immediately. With the use of the "Monthly & Weekly Pattern" heatmap, they can enhance screen scheduling and staff rostering based on projected demand, while the interactive "Film Performance" chart allows them to examine whether underperformance is an issue of operation or caused by misplaced content from the local market, which can then be followed up by more efficient and targeted interventions.

For the Marketing Department

The Marketing Department (User 2) is directly equipped to evaluate the success of campaigns and refine audience targeting. By clearly visualizing the correlation between ticket price, promotions, and attendance, the team can analyze price sensitivity and determine the optimal discount strategy to maximize sales volume. The dashboard supports the identification of high-engagement film genres and screening times, allowing for the precise scheduling and promotion of key titles. Ultimately, these insights ensure marketing expenditure is allocated efficiently to the most responsive segments, driving both audience reach and overall profitability.

For Corporate Executives

The dashboard provides a direct profitability lens, showing which cinemas deliver strong returns and which underperform. It supports strategic resource allocation, such as focusing investment on high-performing locations or revisiting marketing plans for weaker branches. Executives can use these insights to evaluate the return on film distribution, compare performance across geographic regions, and plan future expansion or downsizing.

Conclusion

In conclusion, this project demonstrates how data analytics and visualization can transform raw cinema sales data into meaningful business intelligence. Through the integration of Alteryx for data preparation and Power BI for visualization, the team successfully created interactive dashboards that serve the distinct needs of cinema managers, marketing teams, and corporate executives. The analysis highlights key trends in occupancy, ticket pricing, and revenue performance across different locations and films. These insights empower decision-makers to identify top-performing cinemas, optimize scheduling and pricing strategies, and plan for long-term profitability. Ultimately, this project shows how data-driven decision-making can help the cinema industry stay competitive and efficient in a rapidly changing entertainment market.