

PROCESS BOOK

1. Overview and Motivation

This project examines spending demographics within the mobile gaming industry through an interactive dashboard. Our goal is to reveal how different user groups contribute to overall revenue. Developers frequently design systems without a clear understanding of who drives spending or how behavior varies across demographics. By visualizing these relationships, our dashboard allows for strategic decisions.

This process book is written as a document that summarizes the reasoning, design steps, and insights behind the project.

2. Related Work

Several sources influenced our design:

Dashboards & Websites

- Monetization dashboards are used in mobile analytics tools.
- Industry examples that demonstrated:
 - multi-view layouts
 - stacked bar charts for category comparisons
 - scatter plots to show demographic relationships

Academic & Class Examples

- Examples discussed in lectures showing:
 - visual principles (position > color > area)
 - Why pie charts are often poor for comparisons
 - The importance of avoiding overplotting

These choices helped to shape our design direction and ground our decisions in visualization principles.

3. Questions

Our beginning questions for our project were:

1. **How does age relate to total in-app spending?**
2. **Which genres generate the most revenue, and how are whales, dolphins, and minnows distributed within each?**
3. **What spending trends appear across age groups?**

Evolution of Questions

As we explored the dataset, our questions evolved:

- We dropped gender analysis because it did not meaningfully contribute to our design.
- We have added a focus on understanding the structure of revenue by spending tier, rather than just overall totals.
- We realized that spending trends across ages needed smoothing to reveal meaningful patterns.

4. Data

The dataset included variables such as age, gender, spending amount, spending tier (minnow/dolphin/whale), and genre preference.

We prepared separate slices of the data for:

- Scatter plot (age vs spending)
- Stacked bar chart (genre totals + segments)
- Trend line (spending totals grouped by age)

Cleaning the data significantly improved the accuracy and readability of all visualizations.

5. Exploratory Data Analysis

Before building the final visuals, we created rough exploratory charts:

Initial EDA Visuals

- A raw scatter plot showing spending vs. age
- A simple bar chart of spending totals by genre
- A raw line plot of total spending across ages

Insights Gained

- The scatter plot had extreme overlapping, obscuring meaningful patterns → required changes
- The raw line graph was too noisy → required moving averages
- Genre spending differences were apparent, but pie charts were ineffective → replaced with stacked bars
- Gender contributed little to the main point → removed entirely

6. Design Evolution

Below are the key decisions we made and the principles behind them:

Scatter Plot (User Spending vs. Age)

Problem: Heavy overlap of data points

Solution: Added jitter

Justification:

- Reduces occlusion (perceptual principle of clarity)
- Makes density visible
- Preserves the relationship without distorting the data

The color encoding for minnows/dolphins/whales uses hue variation because it clearly differentiates categories.

Stacked Bar Chart (Revenue by Genre & Segment)

Problem: Pie charts made segment comparisons impossible

Solution: Stacked bars

Justification:

- Bar length supports more accurate comparisons.
- Segments remain readable.

Spending Trend Line (Smoothed by Age)

Problem: Noise in the raw line chart

Solution: Moving average smoothing

Justification:

- Reduces clutter
- Reveals long-term patterns
- Helps communicate the overall spending

Dropped Visualization: Gender

Reason:

- Did not contribute to the central questions
- Distracted from demographic spending patterns that actually mattered
- Weak explanatory power

7. Implementation

We implemented the dashboard using modular D3 scripts:

Key Functional Elements

- Moving average function for trends
- Genre grouping and stacking methods
- Responsive SVG layouts
- Consistent axis formatting

Each chart is independent but visually aligned through the use of shared styles.

Graphics

Figure 1: User Spending vs. Age — jittered scatter plot

Figure 2: Revenue by Genre & Segment — stacked bar

Figure 3: Spending Trend by Age — moving average line chart

These visuals act as the backbone of the interactive dashboard.

8. Evaluation

Findings About the Data

From the current prototype:

- Spending varies widely at all ages, but whales are present across nearly every age range.
- Specific genres strongly depend on whales (e.g., Strategy, RPG, MMO).
- Spending peaks appear at multiple age bands, suggesting complex monetization patterns across adulthood.
- Minnows make up the majority of purchases but contribute less revenue overall compared to whales.

Effectiveness of the Visualizations

- The scatter plot effectively shows distribution and spending tiers.
- The stacked bar chart clearly communicates genre differences and segment contributions.
- The smoothed line chart provides a readable picture of how spending fluctuates with age.

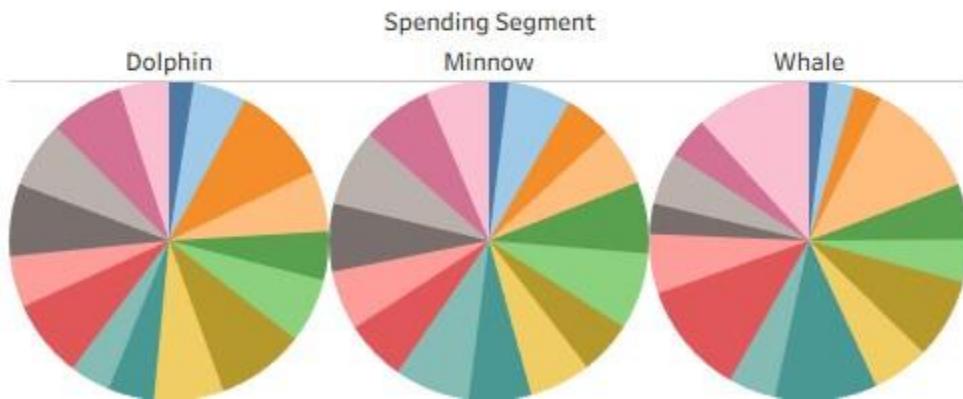
Areas for Improvement

- Add interactive filters (genre, age range, spending tier).
- Improve color accessibility and labeling.
- Add introductory text.

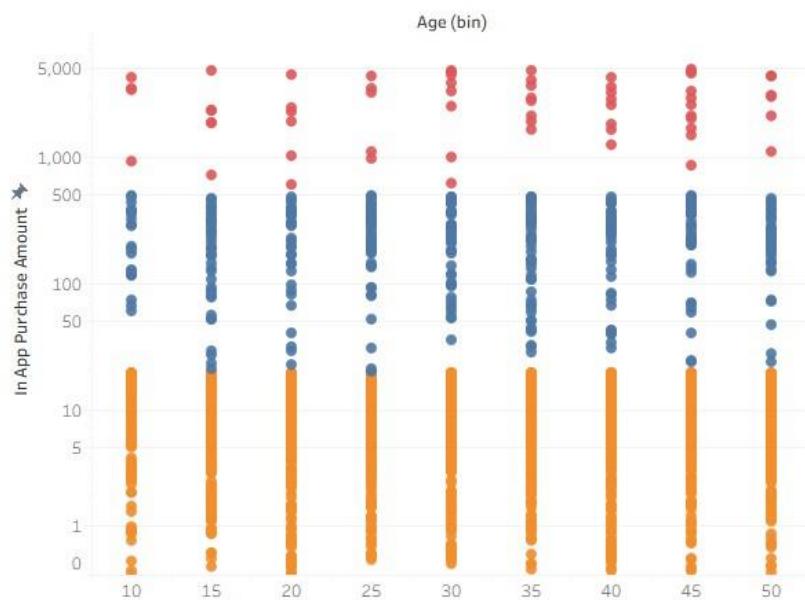
Overall, the visualization addresses our questions and provides a solid foundation for further changes.

9. Images

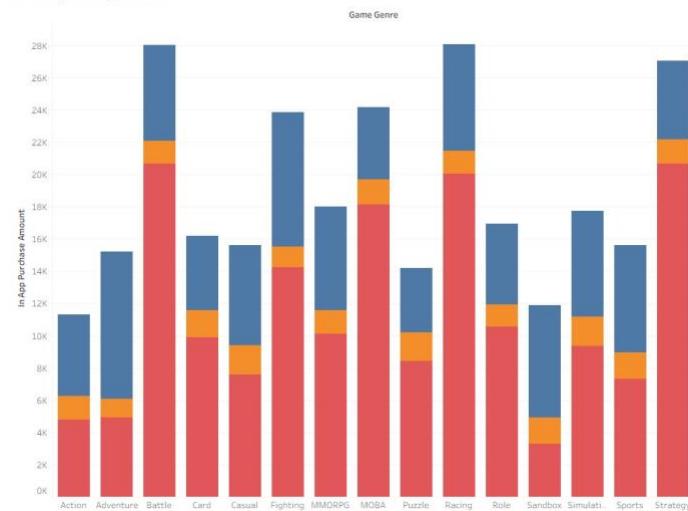
Spending Segment by Genre



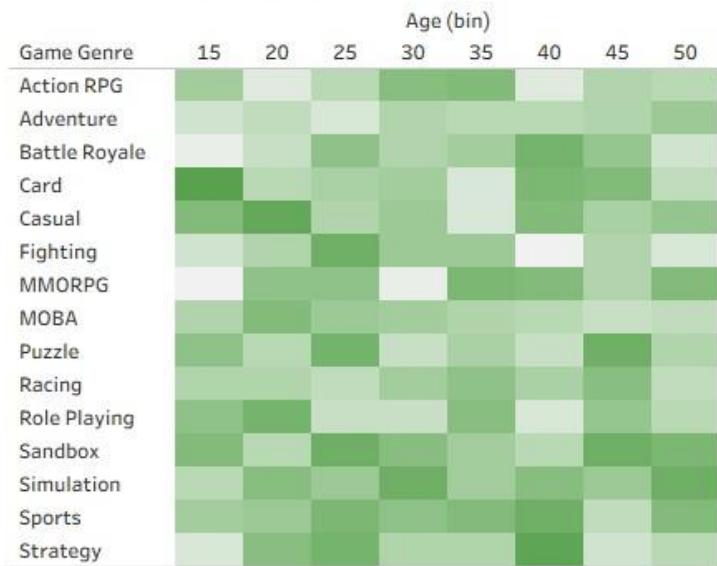
Spending Segment Density



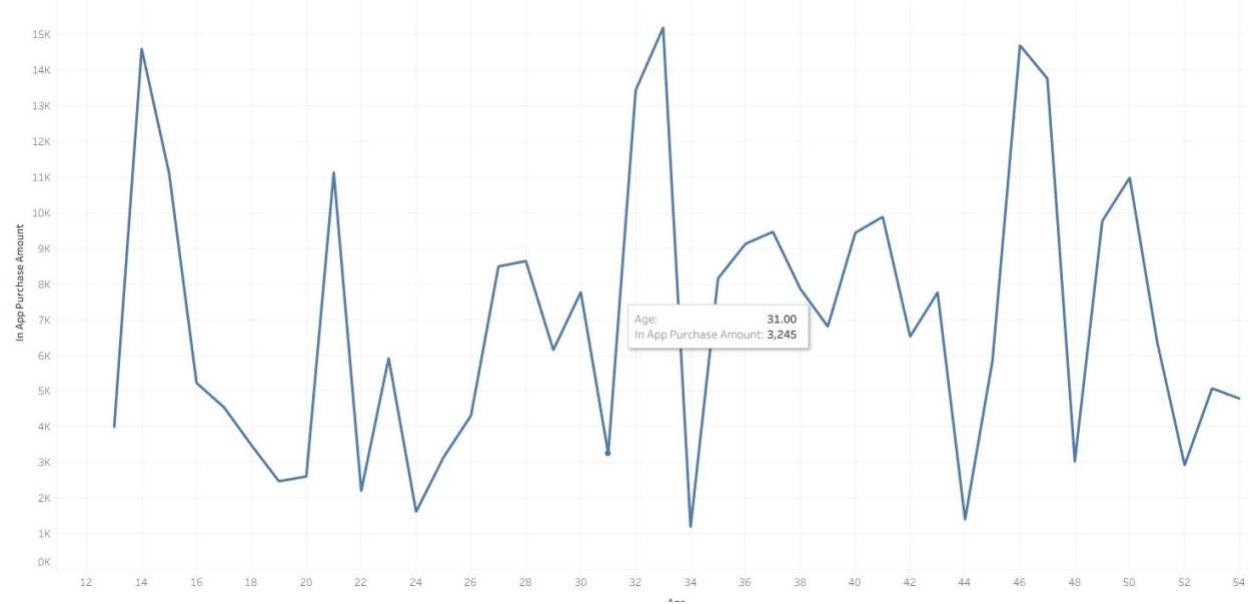
Genre Spending Amount



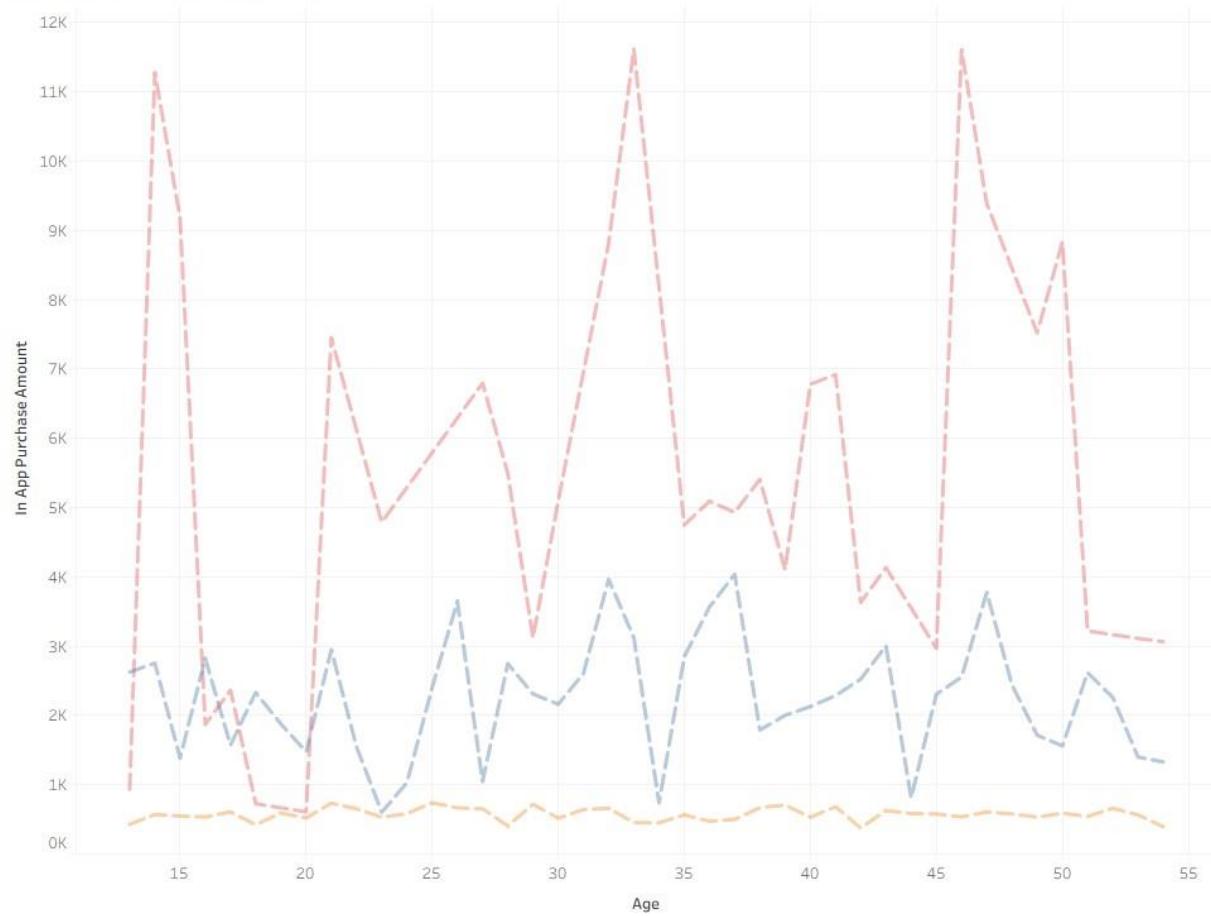
Favorite Genres by Age



Age by Total Spending Amount



Age by Total Spending Amount



Age by Total Spending Amount

