E-COMMERCE DATA ANALYSIS USING BUSINESS INTELLIGENCE TOOLS

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OBJECTIVE & SCOPE

OBJECTIVE

- Apply Business Intelligence (BI) tools to analyze e-commerce transaction data

- Transform raw data into actionable business insights

- Evaluate sales performance, customer segmentation, and market trends

- Support data-driven decision-making for inventory, customer retention, and market expansion

SCOPE

- Analyze sales performance and revenue distribution

- Segment customers to identify high-value groups

- Explore geographic distribution of sales to highlight expansion opportunities

PROBLEM STATEMENT

In today's e-commerce industry, businesses generate massive volumes of transaction data. However, many retailers struggle to extract meaningful insights from this data.

- It is difficult to determine which products are most profitable.
- Identifying and retaining high-value customers is challenging.
- Companies often lack clarity on which countries or regions offer the best opportunities for expansion.

BUSINESS QUESTIONS

1. Which products drive the highest revenue and sales volume, and how can inventory be optimized to meet demand?

2. How do customers differ in terms of value, and which segments should be prioritized for retention and marketing campaigns?

3. Which countries contribute most to overall revenue, and where should the company focus for potential market expansion?
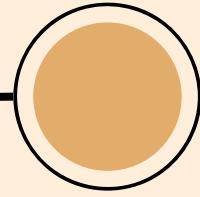
DATASET OVERVIEW
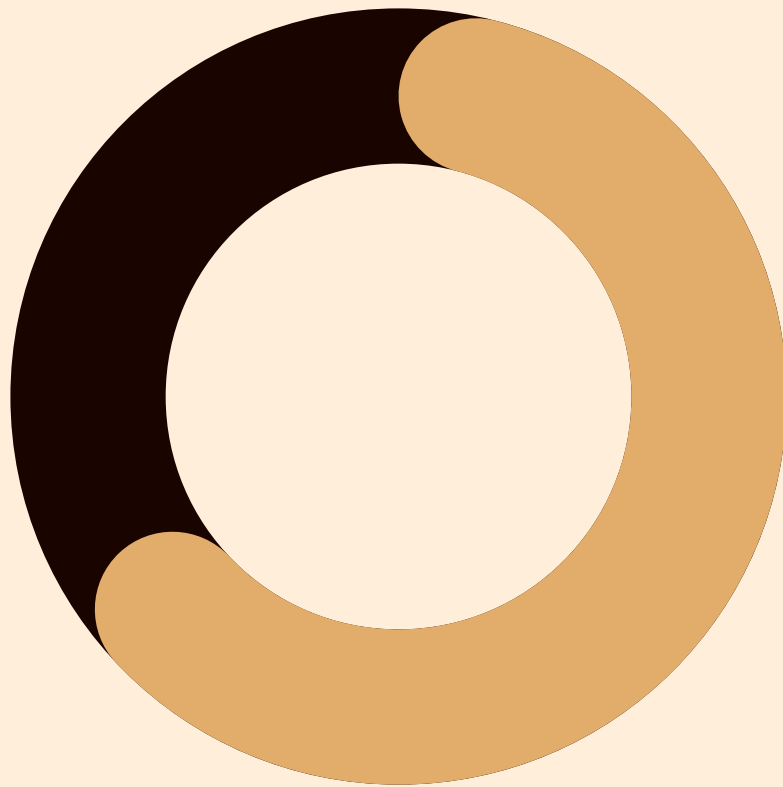
- Source: UCI Repository / Kaggle

- Period: Dec 2009 – Dec 2011

- Records: 1,048,575 → 737,097 after cleaning

- Countries: 41, Columns: 8 (Invoice, StockCode, Description, Quantity, InvoiceDate, Price, Customer ID, Country)

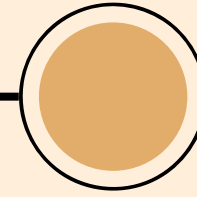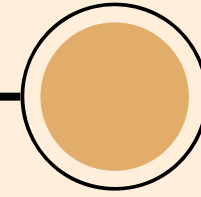# DATA PREPROCESSING
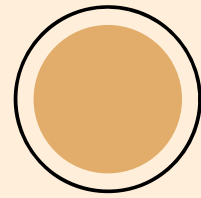
Removed 34,150 duplicate entries.

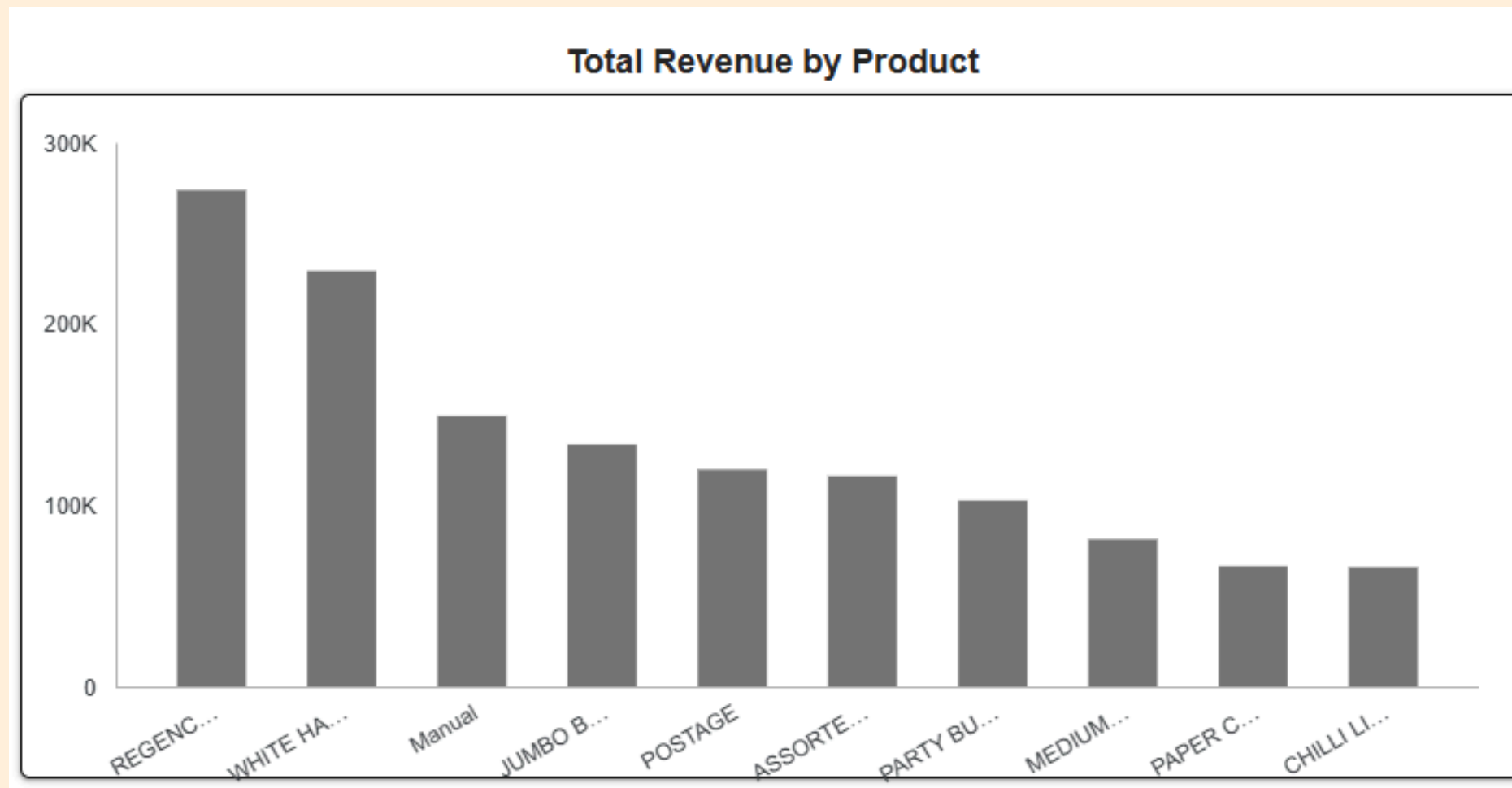Handled missing values in product descriptions and customer IDs.

Converted InvoiceDate into a proper datetime format.

Created new features such as Total Revenue, Average Order Value, and Product Category.

REVENUE ANALYSIS

Total Revenue by Product

Total Revenue	Total Order	Average Order Value (AOV)	Unique Customers	Unique Products
16,273,396.94	34,945	£465.69	5,771	4,509

- Total Revenue : £16,273,396.94
- Total Orders : 34,945
- Average Order Value (AOV) : £465.69
- Unique Customers : 5,771
- Unique Products : 4,509

Top 5 Products by Revenue:

1. Regency Cakestand (3 Tier) – £273,694 (23,780 units)
2. White Hanging Heart T-Light Holder – £229,063 (84,966 units)
3. Manual (Gift-related) – £149,143 (8,560 units)
4. Jumbo Bag Red Retrospot – £133,467 (73,806 units)
5. Postage – £119,624 (5,017 units)

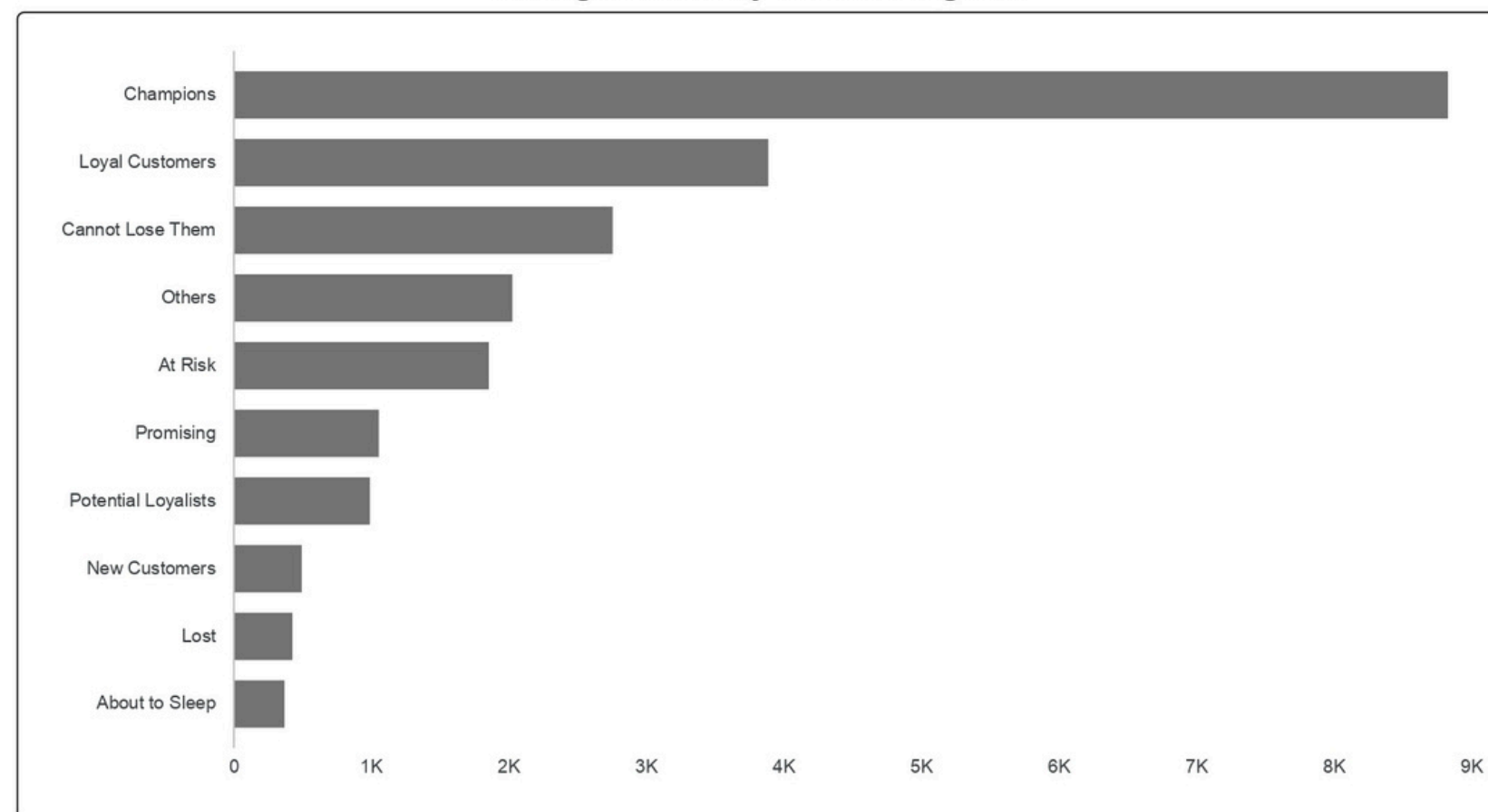Customer Segment Distribution

Average Revenue by Customer Segment

CUSTOMER ANALYSIS
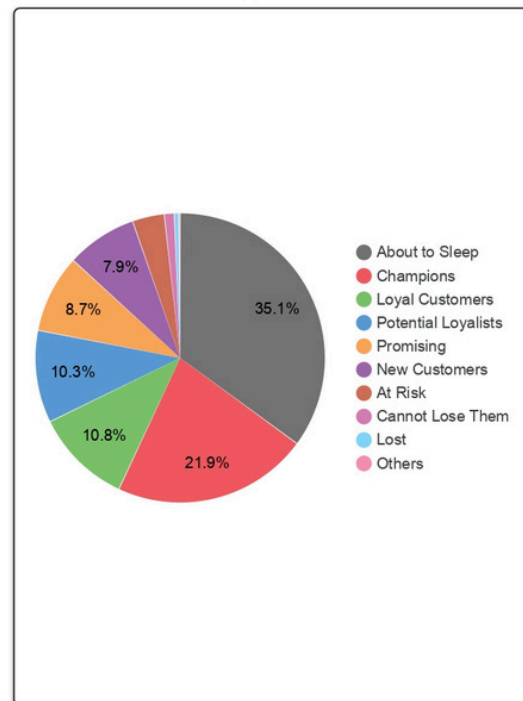
Method: Used RFM (Recency, Frequency, Monetary) model to segment customers

- About to Sleep: 35.1%
- Champions: 21.9%
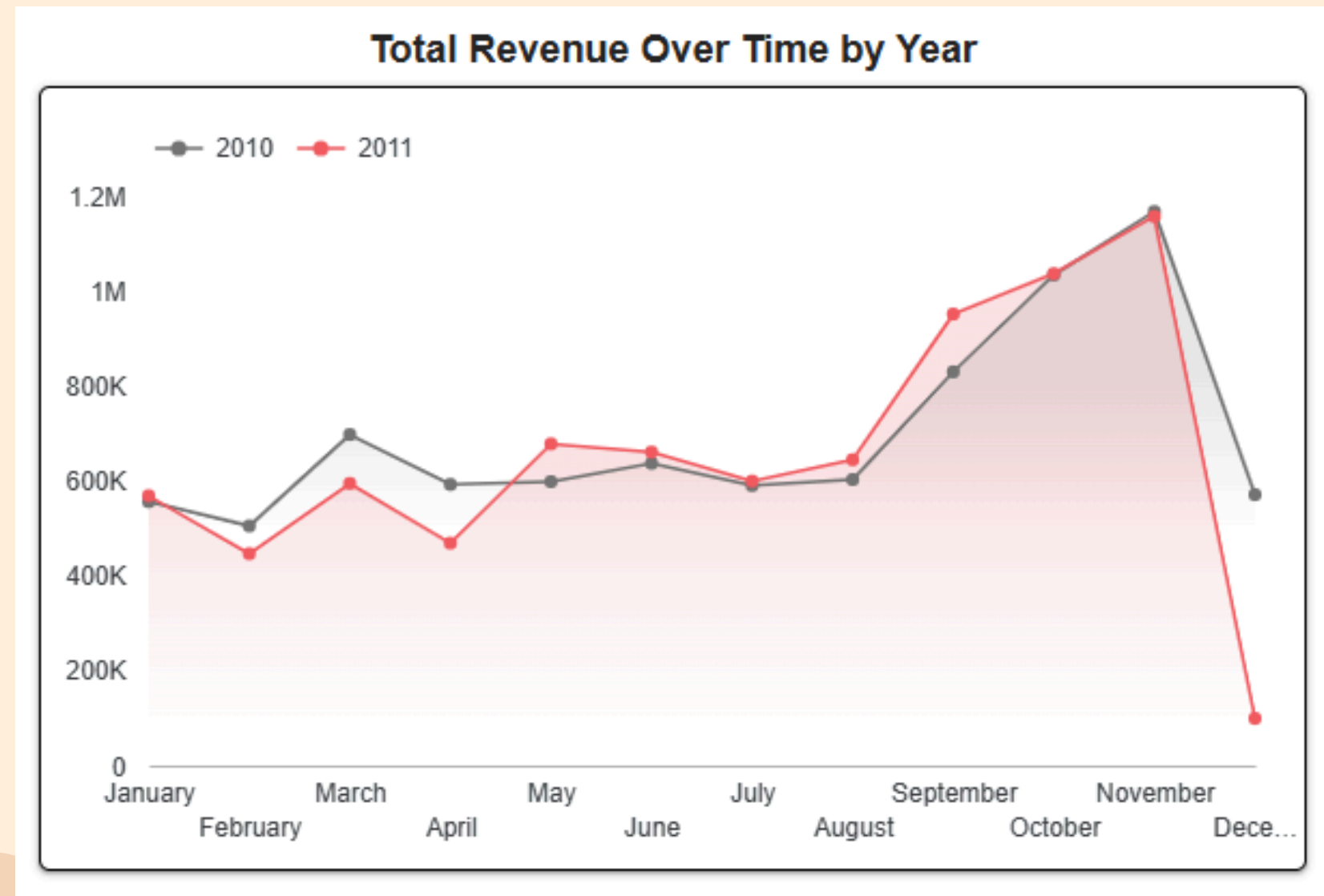- Loyal Customers: 10.8%
- Potential Loyalists: 10.3%

Average Revenue by Segment (Approximate):
- Champions: £8,000–£9,000
- Loyal Customers: £6,000–£7,000
- Cannot Lose Them: £5,000–£6,000

TIME-BASED ANALYSIS

Total Revenue Over Time by Year

Monthly revenue trends (2010–2011) show strong seasonality

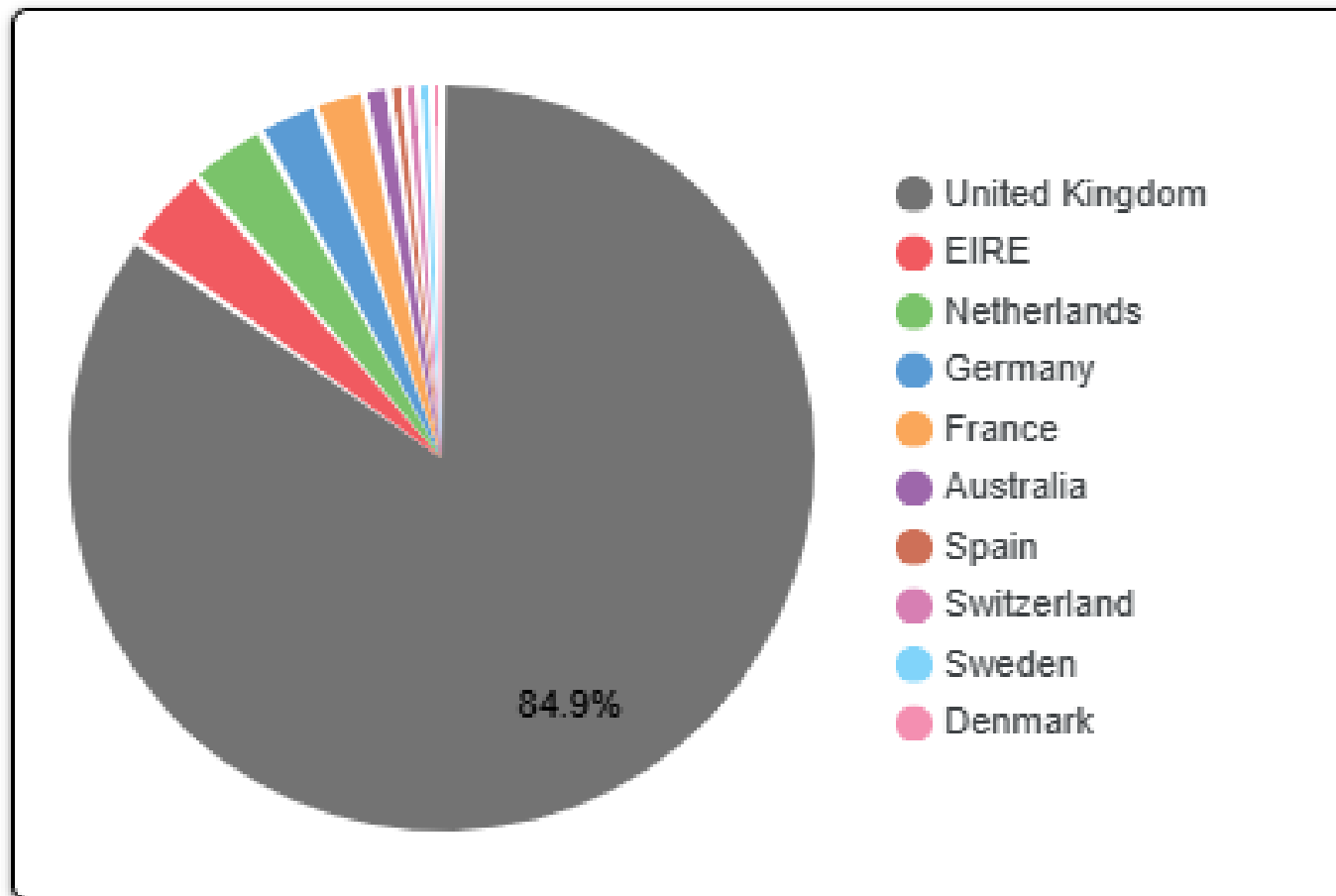Peak months: October – December
- October 2010 & 2011 revenues > £1.03M
- November 2010 & 2011 revenues > £1.16M

Seasonal events:
- Christmas & holiday shopping boost sales
- Promotions like Black Friday drive demand

GEOGRAPHIC ANALYSIS

Revenue Share by Top 10 Countries

Top 5 Countries by Revenue
1. United Kingdom – £13.40M (84.9%)
2. Ireland (EIRE) – £592K
3. Netherlands – £527K
4. Germany – £408K
5. France – £337K

- Other notable markets: Australia (£169K), Spain (£100K), Switzerland (£99K), Sweden (£91K), Denmark (£67K).

BUSINESS INSIGHTS

- Few products generate most revenue (Cake Stand, T-Light Holder, Jumbo Bag).
- Sales peak in Q4 due to holiday shopping.
- Customer segmentation reveals diverse groups: "About to Sleep" indicates high inactivity, while "Champions" and "Loyal Customers" drive the most revenue.
- Medium-value segments like "Potential Loyalists" and "Promising" can be nurtured to increase spending and move toward higher tiers.
- Lower segments need win-back strategies to reduce churn.
- UK dominates sales, but Europe (Netherlands, Germany, France) shows growth potential.

RECOMMENDATION

- Ensure stock availability of top products, especially during peak seasons.
- Introduce loyalty programs and personalized promotions for "Champions" and "Loyal Customers" to retain high-value groups.
- Launch campaigns to encourage more spending from medium-value segments like "Potential Loyalists" and "Promising", gradually elevating them.
- Implement re-engagement initiatives for "About to Sleep" , "At Risk," and "Lost" to prevent churn and recover revenue.
- Target European markets with localized marketing and partnerships.
- Combine short-term operational focus with long-term international growth.

CONCLUSION

- Modern data analysis and BI tools turn raw data into valuable insights.
- Focus on product performance, customer segmentation, and international markets enables:
    a. Better inventory management
    b. Stronger customer loyalty
    c. Global expansion opportunities
- Findings stress the importance of data-driven decision-making in e-commerce.
- Future improvement: predictive modeling (demand forecasting, churn prediction).

THANK YOU