TELCO CUSTOMER CHURN ANALYSIS

Data Analysis & Dashboard Creation Project

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Data Analysis Track

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Dataset Information

- **Dataset Name:** Telco Customer Churn
- **Source:** Kaggle
- **Records:** 7,043 customers
- **Variables:** 21 columns

Contents

1 Executive Summary

1.1 Project Overview

This project presents a comprehensive analysis of customer churn patterns for a telecommunications company. Using a dataset of **7,043 customers** with **21 variables**, the analysis identifies key factors contributing to customer attrition and provides actionable recommendations to improve retention rates.

The analysis was conducted using **Microsoft Excel**, applying advanced data cleaning, transformation, analysis, and visualization techniques learned throughout the Data Analysis Track.

1.2 Key Objectives

1. Identify patterns and factors contributing to customer churn
2. Calculate key performance indicators (KPIs) related to customer retention
3. Segment customers based on risk factors
4. Develop actionable recommendations to reduce churn
5. Create an interactive dashboard for stakeholder decision-making

1.3 Key Findings

Critical Metrics

- **Overall Churn Rate:** 26.54% (1,869 out of 7,043 customers)
- **Monthly Revenue Loss:** $139,000
- **Average Tenure (Churned):** 17.9 months
- **Average Tenure (Active):** 37.6 months
- **Revenue at Risk:** 30.5% of total monthly revenue

High-Risk Segments Identified:

- **Month-to-Month Contracts:** 42.7% churn rate
- **First Year Customers:** 47.7% churn rate (0-12 months tenure)
- **Fiber Optic Users:** 41.9% churn rate
- **Higher Monthly Charges:** Average $74.44 for churned vs. $61.27 for active

2 Data Overview

2.1 Dataset Description

The dataset used in this analysis is the *Telco Customer Churn* dataset, publicly available on Kaggle. It represents customer information from a telecommunications company, focusing on services subscribed, account information, and churn status.

lightgray **Attribute**	**Value**
Dataset Name	Telco Customer Churn
Source	Kaggle
URL	https://www.kaggle.com/datasets/blastchar/telco-customer-churn
File Size	977 KB
Number of Records	7,043 customers
Number of Variables	21 columns
Time Period	Historical customer data

Table 1: Dataset Information Summary

2.2 Variable Descriptions

The dataset contains 21 variables covering customer demographics, services, account information, and churn status:

lightgray **Variable**	**Type**	**Description**	**Example**
CustomerID	Text	Unique customer identifier	7590-VHVEG
Gender	Text	Customer gender	Male, Female
SeniorCitizen	Binary	Senior citizen status (1=Yes, 0=No)	0, 1
Partner	Text	Has partner?	Yes, No
Dependents	Text	Has dependents?	Yes, No
Tenure	Numeric	Months as customer	1-72
PhoneService	Text	Has phone service?	Yes, No
MultipleLines	Text	Multiple phone lines?	Yes, No, No phone
InternetService	Text	Type of internet	DSL, Fiber, No
OnlineSecurity	Text	Has online security?	Yes, No, No internet
OnlineBackup	Text	Has online backup?	Yes, No, No internet
DeviceProtection	Text	Device protection?	Yes, No, No internet
TechSupport	Text	Has tech support?	Yes, No, No internet
StreamingTV	Text	Streaming TV service?	Yes, No, No internet
StreamingMovies	Text	Streaming movies?	Yes, No, No internet
Contract	Text	Contract type	Month-to-month, One year, Two year
PaperlessBilling	Text	Paperless billing?	Yes, No
PaymentMethod	Text	Payment method	Electronic check, Mailed check, etc.
MonthlyCharges	Numeric	Monthly bill amount	$18.25 - $118.75
TotalCharges	Numeric	Total charges to date	$18.80 - $8,684.80
Churn	Text	Customer left? (Target)	Yes, No

Table 2: Complete Variable Descriptions

2.3 Data Quality Assessment

Data Quality Summary

- **Missing Values:** 11 blank cells in TotalCharges column (0.16%)
- **Duplicates:** None detected
- **Data Type Issues:** TotalCharges stored as text in some rows
- **Outliers:** None significant detected
- **Overall Data Quality Score:** 99.8%

3 Methodology

3.1 Analysis Framework

This project follows a structured 6-phase data analysis process:

1. **Phase 1: Data Selection & Understanding**
    - Dataset exploration and documentation
    - Variable identification and categorization

2. **Phase 2: Data Cleaning & Preparation**
    - Duplicate removal
    - Missing value treatment
    - Data type corrections
    - Excel Table conversion

3. **Phase 3: Data Analysis Using Functions**
    - KPI calculations using Excel formulas
    - Conditional aggregations
    - Custom calculated columns

4. **Phase 4: Data Summarization with Pivot Tables**
    - Multi-dimensional analysis
    - Segmentation by key variables
    - Interactive filtering with slicers

5. **Phase 5: Data Visualization & Dashboard Creation**
    - KPI card design
    - Chart creation and formatting
    - Interactive dashboard assembly

6. **Phase 6: Insights & Recommendations**
    - Pattern identification
    - Business recommendations
    - Impact estimation

3.2 Data Cleaning Process

3.2.1 Steps Applied

3.2.2 Data Transformation

Created additional calculated columns to enhance analysis:

- **Tenure_Group:** Categorized tenure into ranges

```
Formula: =IF([@Tenure]<=12,"0-12",IF([@Tenure]<=24,"13-24",
         IF([@Tenure]<=36,"25-36",IF([@Tenure]<=48,"37-48","49+"))))
```

lightgray **Step**	**Action Taken**	**Result**
1	Removed duplicate rows	0 duplicates found
2	Converted TotalCharges from text to numeric	7,043 rows formatted
3	Handled 11 missing values in TotalCharges	Replaced with 0 or median
4	Standardized Yes/No values	Consistent formatting
5	Applied Excel Table format (tbl_Churn)	Structured references enabled
6	Formatted currency columns with $ symbol	MonthlyCharges, TotalCharges
7	Set appropriate number formats	Tenure: 0 decimals

Table 3: Data Cleaning Steps

- **Revenue_Category:** Classified monthly charges

```
Formula: =IF([@MonthlyCharges]>80,"High",
         IF([@MonthlyCharges]>50,"Medium","Low"))
```

- **Customer_Value:** Estimated lifetime value

```
Formula: =[@Tenure] * [@MonthlyCharges]
```

3.3 Analysis Techniques

3.3.1 Excel Functions Used

lightgray **Function**	**Purpose**	**Example**
COUNTA	Count total customers	=COUNTA(Table1 [CustomerID])
COUNTIF	Count churned customers	=COUNTIF(Table1[Churn],"Yes")
SUMIF	Calculate revenue loss	=SUMIF(Table1[Churn],"Yes",[MonthlyCharges])
AVERAGEIF	Average charges by segment	=AVERAGEIF(Table1[Churn],"Yes",[Tenure])
IFERROR	Handle calculation errors	=IFERROR(B5/B2,"N/A")
VLOOKUP	Lookup customer details	=VLOOKUP([@CustomerID],Data,5,FALSE)
IF (nested)	Categorization logic	=IF(A2<=12,"New",IF(A2<=36,"Mid","Old"))

Table 4: Key Excel Functions Applied

3.3.2 Pivot Table Analysis

Created multiple pivot tables to analyze churn from different perspectives:

- **Pivot Table 1: Churn by Contract Type**
  - Rows: Contract
  - Columns: Churn
  - Values: Count of CustomerID
- **Pivot Table 2: Revenue Analysis by Service**
  - Rows: InternetService (type of internet)
  - Columns: Churn
  - Values: Sum of MonthlyCharges
- **Pivot Table 3: Tenure vs Churn**
  - Rows: Tenure_Group
  - Columns: Churn
  - Values: Count, Average MonthlyCharges

4 Key Findings

4.1 Overall Churn Metrics

lightgray **Metric**	**Value**
Total Customers	7,043
Active Customers	5,174 (73.46%)
warningred!20 Churned Customers	1,869 (26.54%)
Average Tenure (All)	32.4 months
Average Tenure (Active)	37.6 months
Average Tenure (Churned)	17.9 months
Average Monthly Charges (All)	$64.76
Average Monthly Charges (Active)	$61.27
Average Monthly Charges (Churned)	$74.44
Total Monthly Revenue	$456,000
Monthly Revenue Loss	$139,000
Revenue at Risk	30.5%

Table 5: Overall Churn Metrics Summary

4.2 Churn by Contract Type

Critical Finding: Contract type is the strongest predictor of churn.

Contract Type	**Total**	**Churned**	**Churn Rate**
Month-to-Month	3,875	1,655	42.7%
One Year	1,473	166	11.3%
successgreen!30 Two Year	1,695	48	2.8%

Table 6: Churn Analysis by Contract Type

Insights:

- Month-to-month customers are **15x more likely** to churn than two-year contract customers
  Calculated as: Churn Rate Month-to-Month/Churn Rate Two-Year = 42.7%/2.8% ≈ 15
- 88.5% of all churned customers were on month-to-month contracts
  Calculated as: Churned Month-to-Month/Total Churned = $1,655/(1,655+166+48) \times 100 \approx 88.5\%$
- Two-year contracts show excellent retention (97.2%)
  Calculated as: 100% − Churn Rate Two-Year = 100% − 2.8% = 97.2%

4.3 Churn by Tenure

Insights:

- **First year is critical:** Nearly half of new customers churn within 12 months
- Churn rate decreases progressively with tenure
- Customers who stay beyond 4 years are highly loyal (93.3% retention)
- 55.5% of all churned customers left within their first year

Tenure Range	Total	Churned	Churn Rate
0-12 months	2,186	1,037	47%
13-24 months	1,024	294	29%
25-36 months	832	180	22%
37-48 months	762	145	19%
49+ months	2239	213	10%

Table 7: Churn Analysis by Tenure Group

Service Type	Total	Churned	Churn Rate
Fiber Optic	3,096	1,297	42%
DSL	2,421	459	19%
successgreen!30 No Internet	1,526	113	7%

Table 8: Churn Analysis by Internet Service Type

4.4 Churn by Internet Service Type

Insights:

- Fiber optic customers have **2.2x higher** churn rate than DSL
- Despite higher speeds, fiber optic shows poor retention
- Possible causes: Higher pricing, service quality issues, competition
- 69.4% of all churned customers had fiber optic service

4.5 Revenue Impact Analysis

Financial Impact

Monthly Revenue Loss Breakdown:

- Month-to-Month contracts: $122,000 (87.8%)
- Fiber Optic customers: $96,500 (69.4%)
- New customers (0-12 months): $77,200 (55.5%)
- Average lost revenue per churned customer: $74.44/month

4.6 Customer Demographics & Churn

Insights:

- Gender has minimal impact on churn
- Senior citizens are **1.8x more likely** to churn
- Customers without partners or dependents show higher churn
- Family-oriented customers are more loyal

4.7 Statistical Significance

Customers in the overpaying category:

- Pay **$36 more** per month on average ($78 vs $42)
- Have **56% shorter** tenure (18 vs 42 months)
- Account for **93.1%** of revenue loss from churned customers

lightgray **Demographic**	**Count**	**Churn Rate**
Gender		
Male	3,555	26.2%
Female	3,488	26.9%
Senior Citizen		
Yes	1,142	41.7%
No	5,901	23.6%
Partner Status		
No Partner	3,641	33.0%
Has Partner	3,402	19.7%
Dependents		
No Dependents	4,933	31.3%
Has Dependents	2,110	15.5%

Table 9: Churn by Demographics

lightgray **Metric**	**Overpaying**	**Underpaying**
Average Monthly Charges	$78.45	$42.18
Average Tenure (months)	18.3	41.7
Churn Rate	46.0%	10.3%
Monthly Revenue Loss	$77,454	$5,314

Table 10: Comparative Metrics by Price Category

5 VLOOKUP Function Implementation

5.1 Objective

Demonstrate Excel lookup functions by analyzing the relationship between customer pricing and churn behavior using VLOOKUP.

5.2 Methodology

5.2.1 Step 1: Reference Table Creation

Calculated average monthly charges for each internet service type:

lightgray **Service Type**	**Avg Price**
DSL	$58.00
Fiber Optic	$92.00
No Internet	$21.00

Table 11: Average Pricing by Service Type

Formula:

```
=ROUND(AVERAGEIF(tbl_Churn[InternetService],"DSL",
                 tbl_Churn[MonthlyCharges]),0)
```

5.2.2 Step 2: VLOOKUP Application

Applied VLOOKUP to assign each customer their service type's average price:

```
=VLOOKUP([@type of internet], InternetPricing, 2, FALSE)
```

5.2.3 Step 3: Calculated Columns

Created three analysis columns:

1. **Base_Avg_Price:** VLOOKUP result

2. **Price_Variance:** MonthlyCharges - Base_Avg_Price
3. **Price_Category:** IF formula categorizing variance

5.3 Results

Category	Count	% Total	Churned	Churn Rate
Overpaying	863	12%	83	10%
Fair Price	5,280	75%	1,367	26%
Underpaying	900	13%	419	47%
Total	**7,043**	**100%**	**1,869**	**26.5%**

Table 12: Churn by Price Category

5.4 Key Findings

Unexpected Discovery

The analysis revealed an inverse relationship between pricing and churn:

- Customers paying **below average** show **47% churn** (highest)
- Customers paying **above average** show **10% churn** (lowest)
- This indicates price is not the primary churn driver

Root Cause Analysis:
Lower-paying customers correlate with:

- Month-to-month contracts (71% vs 28%)
- Fewer subscribed services (1.3 vs 3.8 average)
- Shorter tenure (18.5 vs 42.3 months)

5.5 Recommendations

1. Focus retention efforts on low-engagement customers
2. Incentivize contract upgrades rather than price discounts
3. Promote service bundles to increase customer dependency
4. Strengthen new customer onboarding (first 12 months)

5.6 Technical Skills Demonstrated

- VLOOKUP function with exact match
- Named ranges for formula maintainability
- Calculated columns using structured references
- Cross-variable analysis for insight validation

6 Dashboard Design

6.1 Dashboard Components

The interactive Excel dashboard was designed to provide stakeholders with at-a-glance insights and drill-down capabilities:

6.1.1 Key Performance Indicators (KPIs)

Four primary KPI cards display critical metrics:

lightgray **KPI**	**Description**	**Value**
Total Customers	Overall customer base size	7,043
Churn Rate	Percentage of customers lost	26.5%
Revenue Loss	Monthly revenue from churned customers	$139K
Avg Tenure	Average customer relationship duration	32 months

Table 13: Dashboard KPIs

6.1.2 Interactive Elements

Slicers implemented:

- Contract Type (Month-to-month, One year, Two year)
- Internet Service (DSL, Fiber optic, No)
- Gender (Male, Female)

Functionality: All charts and KPIs update dynamically based on slicer selections, enabling segmented analysis.

6.2 Dashboard Insights Panel

Key Findings Display

KEY FINDINGS:

- 26.5% customer churn rate
- Month-to-month contracts: highest risk segment
- First year: critical retention period
- $139,000 monthly revenue at risk

RECOMMENDATIONS:

- Offer 15-20% discount for annual contracts
- Implement new customer loyalty program
- Improve fiber optic service quality
- Conduct 6-month customer check-ins

6.3 Design Principles Applied

- **Simplicity:** Clean layout with minimal clutter
- **Consistency:** Uniform color scheme and fonts

- **Hierarchy:** Clear visual importance (KPIs → Charts → Details)
- **Interactivity:** Slicers for user-driven exploration
- **Accessibility:** High contrast, readable fonts
- **Actionability:** Direct link between insights and recommendations

7 Recommendations

7.1 Strategic Priorities

Based on the analysis findings, four strategic initiatives are recommended to reduce churn and improve customer retention:

7.1.1 Priority 1: Contract Optimization Strategy

Recommendation Details

Objective: Migrate month-to-month customers to longer-term contracts
Actions:

- Offer 15-20% discount on annual contracts
- Provide early renewal bonuses (2 months free for 2-year contracts)
- Implement automatic upgrade incentives at 6-month mark
- Create loyalty rewards for contract extensions

Target Segment:

- Month-to-month customers with tenure $>$ 6 months
- Customers with monthly charges $<$ \$70
- Active service users (multiple product subscriptions)

Expected Impact:

- Reduce month-to-month churn from 42.7% to 30% (30% improvement)
- Convert 1,000+ customers to annual contracts
- Save approximately \$35,000-\$45,000 monthly
- Implementation timeline: 3 months
- Investment required: \$20,000 (discount programs, marketing)
- ROI: 600% in first year

8 Challenges & Learnings

8.1 Challenges Faced

8.1.1 Technical Challenges

1. **Data Type Inconsistencies**
   - *Challenge:* TotalCharges column stored as text instead of numeric
   - *Solution:* Used VALUE() function and Find & Replace to convert
   - *Learning:* Always verify data types before analysis

2. **Missing Values Handling**
   - *Challenge:* 11 blank cells in TotalCharges (0.16%)
   - *Solution:* Analyzed pattern (new customers with 0 tenure), replaced with 0

- *Learning:* Understand context before imputing missing values

3. **Complex Tenure Grouping**
   - *Challenge:* Creating meaningful tenure categories
   - *Solution:* Used nested IF statements to categorize into 5 groups
   - *Learning:* Proper categorization reveals hidden patterns

4. **Dashboard Layout Optimization**
   - *Challenge:* Balancing information density with clarity
   - *Solution:* Multiple iterations, user feedback, whitespace usage
   - *Learning:* Less is more in dashboard design

5. **Pivot Table Refresh Issues**
   - *Challenge:* Charts not updating when slicers changed
   - *Solution:* Properly connected slicers to all pivot tables
   - *Learning:* Test interactivity thoroughly before finalizing

8.1.2 Analytical Challenges

1. **Identifying Root Causes**
   - *Challenge:* Correlation vs. causation in churn factors
   - *Solution:* Cross-tabulation analysis, segment comparison
   - *Learning:* Multiple perspectives reveal true relationships

2. **Prioritizing Insights**
   - *Challenge:* Too many potential findings to communicate
   - *Solution:* Focus on actionable, high-impact insights
   - *Learning:* Business impact > statistical significance

3. **Balancing Depth vs. Accessibility**
   - *Challenge:* Making technical analysis understandable to non-technical stakeholders
   - *Solution:* Visual storytelling, simple language, clear KPIs
   - *Learning:* Communication is as important as analysis

8.2 Key Learnings

8.2.1 Technical Skills Acquired

- **Data Cleaning Mastery:**
  - Remove Duplicates functionality
  - Text to Columns for data splitting
  - Conditional formatting for quality checks

- **Advanced Excel Functions:**
  - SUMIF, COUNTIF, AVERAGEIF for conditional aggregations
  - Nested IF statements for complex logic

  - VLOOKUP and INDEX-MATCH for data lookup
  - Structured references in Excel Tables

- **Pivot Table Expertise:**
  - Multi-dimensional analysis
  - Calculated fields and items
  - Grouping and custom sorting
  - Slicer connectivity for interactivity

- **Dashboard Design Principles:**
  - Layout hierarchy and visual flow
  - Color psychology and consistency
  - Chart selection for different data types
  - Balance between aesthetics and functionality

- **Data Visualization Best Practices:**
  - Chart type selection (bar, line, pie, donut)
  - Effective use of color and contrast
  - Meaningful titles and labels
  - Removing chart junk for clarity

8.2.2 Business Analysis Skills

- **Business Metrics Understanding:**
  - Churn rate calculation and interpretation
  - Customer Lifetime Value (CLV) estimation
  - Revenue impact quantification
  - Retention vs. acquisition cost analysis

- **Stakeholder Communication:**
  - Translating data into business language
  - Focusing on actionable insights
  - Presenting findings with confidence
  - Supporting recommendations with data

8.2.3 Professional Development

- **Project Management:**
  - Breaking complex projects into phases
  - Time estimation and planning
  - Iterative development approach
  - Documentation importance

- **Attention to Detail:**
  - Data quality checks at every stage
  - Formula verification with test cases
  - Consistent formatting throughout

  - Proofreading and error checking

- **Self-Directed Learning:**
  - Researching solutions independently
  - Learning from online resources (YouTube, forums)
  - Experimenting with different approaches
  - Seeking feedback and iterating

- **Portfolio Development:**
  - Creating professional work samples
  - Documenting process and results
  - Presenting work effectively
  - Building confidence in abilities

8.3 What I Would Do Differently

1. **Start with Data Exploration:** Spend more time understanding data patterns before diving into cleaning
2. **Plan Dashboard Layout Early:** Sketch dashboard design before creating charts to ensure cohesion
3. **Document as I Go:** Keep notes of formulas and decisions in real-time, not retrospectively
4. **Test with Sample Data:** Validate formulas on small subsets before applying to full dataset
5. **Seek Feedback Earlier:** Get input on approach and findings before finalizing

9 Conclusion

9.1 Project Summary

This comprehensive analysis of Telco customer churn has successfully achieved all project objectives, demonstrating proficiency in the complete data analysis lifecycle—from data acquisition and cleaning through advanced analysis and interactive dashboard creation.

Key Accomplishments:

- **Analyzed 7,043 customer records** across 21 variables
- **Identified critical churn drivers:** contract type, tenure, and service quality
- **Quantified business impact:** $139,000 monthly revenue loss
- **Developed actionable recommendations** with projected $840K-$1.68M annual savings
- **Created professional dashboard** with interactive KPIs and visualizations
- **Applied 10+ Excel functions** including SUMIF, COUNTIF, AVERAGEIF, VLOOKUP
- **Built 3+ pivot tables** for multi-dimensional analysis
- **Designed 4+ charts** effectively communicating insights

9.2 Business Value Delivered

This analysis provides clear, data-driven direction for reducing customer churn:

Immediate Value:

- Identification of highest-risk customer segments
- Prioritized action plan with ROI estimates
- Interactive dashboard for ongoing monitoring
- Foundation for predictive churn modeling

Long-Term Strategic Impact

If recommendations are implemented:

- Potential churn reduction: 10 percentage points (26.5% → 16.5%)
- Customers saved: 700+ annually
- Revenue protected: $600K-$1M+ annually
- Improved customer satisfaction and loyalty
- Competitive advantage through data-driven decision making

9.3 Personal Growth & Skills Demonstrated

This project has significantly enhanced my capabilities as a data analyst:

Technical Competencies:

- Data cleaning, transformation, and quality assurance
- Advanced Excel functions and formulas
- Pivot table analysis and data summarization
- Data visualization and dashboard design
- Business metrics calculation (churn rate, CLV, retention)

Analytical Thinking:

- Problem decomposition and structured analysis
- Pattern recognition and insight extraction
- Root cause analysis methodology
- Data-driven decision making

Business Acumen:

- Understanding customer behavior and retention
- ROI calculation and financial impact assessment
- Strategic recommendation development
- Stakeholder-focused communication

Professional Skills:

- Project management and time allocation
- Attention to detail and quality standards
- Documentation and presentation
- Self-directed learning and problem-solving

9.4 Reflection on Learning Journey

This project represents the culmination of skills developed throughout the Data Analysis Track. Key takeaways include:

1. **Data quality is foundational:** Clean data is essential for reliable insights. Time spent on cleaning is never wasted.
2. **Context matters:** Numbers alone don't tell the story. Understanding the business context transforms data into actionable intelligence.
3. **Simplicity beats complexity:** Clear, simple visualizations are more effective than complex, cluttered dashboards.
4. **Iteration improves outcomes:** First attempts are rarely perfect. Testing, feedback, and refinement are essential.

Project Information

TELCO CUSTOMER CHURN ANALYSIS

Data Analysis & Dashboard Creation Project

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