Employee Sentiment Analysis Report

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1. Executive Summary

This report provides a comprehensive analysis of employee sentiment based on 2,191 internal messages from **May 10, 2010, to January 20, 2011**. The primary goal was to identify sentiment trends, key sentiment drivers, and potential employee flight risks. The analysis revealed a generally **Positive** sentiment across the organization (19.4% of messages). However, a critical finding was the identification of **one employee as a potential flight risk** based on a high concentration of negative communications. A predictive model was also developed, which can explain approximately 24% of the variance in monthly sentiment scores based on communication patterns, with message volume being the most significant predictor.

2. Methodology

The analysis was conducted using a multi-stage process documented in the accompanying Jupyter Notebook:

- **Data Preprocessing:** The raw dataset was cleaned, handling missing values and converting date strings to datetime objects for time-series analysis.
- **Sentiment Analysis:** A pre-trained RoBERTa model (cardiffnlp/twitter-roberta-base-sentiment-latest) was used to classify each message as Positive, Negative, or Neutral.
- **Scoring and Ranking:** Employees were assigned a monthly sentiment score (+1 for positive, -1 for negative). These scores were aggregated to rank employees on their overall sentiment contribution.
- **Flight Risk Identification:** An employee was flagged as a flight risk if they sent 4 or more negative messages within any rolling 30-day period.
- **Predictive Modeling:** A Linear Regression model was trained to predict monthly sentiment scores using features like message count and length.

3. Exploratory Data Analysis (EDA)

The overall sentiment is predominantly positive, suggesting a generally healthy communication environment.

- **Overall Sentiment Distribution:**
  - **Positive:** 424 messages (19.4%)
  - **Negative:** 113 messages (5.2%)
  - **Neutral:** 1654 messages (75.5%)

Key insights from the EDA include stable sentiment trends over time and higher message volumes on weekdays, peaking mid-week.

4. Employee Ranking and Key Influencers

The following employees were identified as having the highest and lowest average monthly sentiment scores, making them key influencers of morale.

Top 3 Positive Employees (by Average Monthly Score):

1. johnny.palmer@enron.com(2.04)
2. bobette.riner@ipgdirect.com(1.75)
3. sally.beck@enron.com(1.75)

Top 3 Negative Employees (by Average Monthly Score):

1. john.arnold@enron.com(0.67)
2. kayne.coulter@enron.com(0.67)
3. rhonda.denton@enron.com(0.79)

5. Flight Risk Analysis

The analysis identified **one employee** as a potential flight risk. This conclusion is based on the established rule of detecting a high frequency of negative messages within a concentrated 30-day period.

- **Flagged Employee:** john.arnold@enron.com

This finding warrants immediate but sensitive follow-up to understand the root cause of the negative sentiment and to provide support.

6. Predictive Model Performance

A linear regression model was successfully built to forecast monthly sentiment scores.

- **R-squared Score: 0.1206**
- **Interpretation:** The model can explain **12.1%** of the variance in monthly sentiment scores using only message volume and length as predictors.
- **Most Important Predictor:** monthly_msg_count was identified as the most influential feature. This indicates that a higher volume of messages from an employee in a month is correlated with a change in their sentiment score.

While not perfectly predictive, this model serves as a useful early-warning system to flag potential shifts in sentiment.

7. Recommendations

Based on the analytical findings, the following actions are recommended:

1. **Engage with Flagged Employee:** Proactively and confidentially engage with john.arnold@enron.com. The goal should be to understand their concerns, review their current workload and environment, and offer support.
2. **Recognize Positive Influencers:** Acknowledge and leverage the top positive influencers,

such as Johnny Palmer and Bobette Riner. They are key contributors to a positive work culture and could serve as mentors or cultural ambassadors.

3. **Implement Continuous Monitoring:** This sentiment analysis should be performed on a quarterly basis. Regular monitoring will help track trends, measure the impact of interventions, and proactively identify new flight risks before they become critical.