

# Global Layoffs Analysis: Exploratory Data Analysis 2020-2025

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## Executive Summary

This comprehensive exploratory data analysis (EDA) examines global layoff events from 2020 to 2025, capturing workforce reductions across companies, industries, and geographies during a period of significant economic volatility, post-pandemic adjustments, and sector-specific transformations.

### Key Highlights:

- Layoffs have become increasingly prevalent, reflecting structural shifts in labor markets
  - Technology sector leads in both absolute layoff numbers and frequency of events
  - Geographic disparities reveal North America's dominant position in layoff volumes
  - Late-stage companies account for the majority of layoffs in absolute terms
  - Temporal patterns indicate accelerating layoff trends from 2022 onwards
  - Multiple companies have experienced repeated layoff events, indicating sustained workforce adjustments
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# 1. Dataset Overview

## Data Scope

The layoff3 dataset contains records of workforce reductions spanning 2020-2025. Each record includes:

- **Company:** Organization name
- **Total\_laid\_off:** Absolute number of employees separated (integer format)
- **Percentage\_laid\_off:** Proportion of workforce affected (0 to 1 scale)
- **Date:** Date of layoff announcement or occurrence
- **Industry:** Business sector classification
- **Country:** Geographic location of company headquarters
- **Stage:** Company funding/maturity stage (Seed, Series A/B/C/D/E, Post-IPO, etc.)

## Data Quality Transformation

The following data transformation ensures accurate aggregation:

```
ALTER TABLE layoff3
MODIFY COLUMN total_laid_off INT;
```

This converts total\_laid\_off to integer format to prevent type conversion errors during aggregation.

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## 2. Maximum Layoff Metrics

### Severity Indicators

#### Query:

```
SELECT
MAX(total_laid_off) AS max_laid_off,
MAX(percentage_laid_off) AS max_layoff_percentage
FROM layoff3;
```

This identifies the most severe single layoff event and the highest proportion of workforce affected in any incident.

### Complete Workforce Shutdowns

#### Query:

```
SELECT
company,
percentage_laid_off
```

```
FROM layoff3  
WHERE percentage_laid_off = 1;
```

**Interpretation:** Complete workforce layoffs (100% separation) indicate company closures, major pivots, or market exits. These represent the most severe disruption events and suggest business model failures rather than workforce optimization.

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## 3. Company-Level Analysis

### Top Companies by Total Layoffs

**Query:**

```
SELECT  
company,  
SUM(total_laid_off) AS total_laid_off  
FROM layoff3  
GROUP BY company  
ORDER BY total_laid_off DESC;
```

Cumulative layoff volume reveals which organizations have undergone the most significant workforce reductions over the 2020-2025 period.

### Layoff Frequency and Repetition

**Query:**

```
SELECT  
company,  
COUNT(
```

```
) AS layoff_events  
FROM layoff3  
GROUP BY company  
HAVING COUNT() > 1  
ORDER BY layoff_events DESC;
```

**Key Insight:** Companies with multiple layoff events indicate:

- Ongoing operational challenges and extended restructuring
- Phased workforce reduction strategies
- Cyclical business model challenges
- Potential instability in workforce planning

### Average Layoff Intensity by Company

**Query:**

```
SELECT  
company,  
AVG(total_laid_off) AS avg_layoff_size  
FROM layoff3  
GROUP BY company  
ORDER BY avg_layoff_size DESC;
```

This identifies companies that, when conducting layoffs, affect the largest absolute number of employees per event—typically indicating large established organizations.

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## 4. Industry Analysis

### Industries Most Affected by Layoffs

#### Query:

```
SELECT
industry,
SUM(total_laid_off) AS total_laid_off
FROM layoff3
GROUP BY industry
ORDER BY total_laid_off DESC;
```

#### Expected Trends:

1. **Technology Sector** dominates in absolute numbers
2. **Finance/Fintech** shows vulnerability to interest rate changes and investor sentiment
3. **Retail/Logistics** affected by e-commerce shifts and supply chain restructuring
4. **Travel/Hospitality** recovered post-pandemic but faced new market challenges

### Layoff Frequency by Industry

#### Query:

```
SELECT
industry,
COUNT(*) AS layoff_events
FROM layoff3
GROUP BY industry
ORDER BY layoff_events DESC;
```

Industries with high event frequency indicate recurring restructuring challenges rather than isolated incidents.

### Average Layoff Size by Industry

#### Query:

```
SELECT
industry,
AVG(total_laid_off) AS avg_layoffs
FROM layoff3
GROUP BY industry
ORDER BY avg_layoffs DESC;
```

**Analysis:** Industries with high average layoffs per event are characterized by large employer bases—typically mature, established companies with significant workforce populations.

## Full Shutdowns by Industry

**Query:**

```
SELECT
industry,
COUNT(*) AS full_shutdowns
FROM layoff3
WHERE percentage_laid_off = 1
GROUP BY industry
ORDER BY full_shutdowns DESC;
```

High shutdown rates indicate structural industry vulnerabilities, weak business model viability, and greater exposure to market volatility.

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## 5. Geographic Trends

### Countries Most Impacted by Layoffs

**Query:**

```
SELECT
country,
SUM(total_laid_off) AS total_laid_off
FROM layoff3
GROUP BY country
ORDER BY total_laid_off DESC;
```

#### Expected Geographic Distribution:

- **United States:** Dominates due to concentration of tech companies and venture-backed startups
- **United Kingdom:** Strong fintech and tech hub status
- **Canada:** Growing tech sector presence
- **India:** Emerging tech talent hub with significant outsourcing influence
- **Germany/EU:** Strong industrial and fintech bases

### Average Layoff Size by Country

**Query:**

```
SELECT
country,
AVG(total_laid_off) AS avg_layoffs
FROM layoff3
GROUP BY country
ORDER BY avg_layoffs DESC;
```

### Geographic Concentration of Full Layoffs

**Query:**

```
SELECT
country,
COUNT(*) AS full_layoffs
FROM layoff3
WHERE percentage_laid_off = 1
GROUP BY country
ORDER BY full_layoffs DESC;
```

---

## 6. Temporal Patterns

### Time Period Coverage

**Query:**

```
SELECT
MIN(date) AS start_date,
MAX(date) AS end_date
FROM layoff3;
```

### Layoffs by Year

**Query:**

```
SELECT
YEAR(date) AS year,
SUM(total_laid_off) AS total_laid_off
FROM layoff3
GROUP BY YEAR(date)
ORDER BY total_laid_off DESC;
```

**Expected Pattern:**

- **2022-2023:** Peak layoff years as interest rate hikes impacted tech funding
- **2024-2025:** Continued elevated levels with potential stabilization

### Monthly Layoff Trends

**Query:**

```
SELECT
SUBSTRING(date, 1, 7) AS month,
SUM(total_laid_off) AS total_layoffs
FROM layoff3
GROUP BY month
ORDER BY month ASC;
```

### Rolling Cumulative Analysis

**Query:**

```
WITH rolling_total AS (
SELECT
```

```

SUBSTRING(date, 1, 7) AS month,
SUM(total_laid_off) AS total_layoffs
FROM layoff3
GROUP BY month
)
SELECT
month,
total_layoffs,
SUM(total_layoffs) OVER (ORDER BY month) AS rolling_total
FROM rolling_total;

```

**Significance:** Rolling totals reveal cumulative impact and acceleration trends, showing whether layoff intensity is increasing or stabilizing over time.

## Year-over-Year Growth Analysis

**Query:**

```

WITH yearly AS (
SELECT
YEAR(date) AS year,
SUM(total_laid_off) AS layoffs
FROM layoff3
GROUP BY YEAR(date)
)
SELECT
year,
layoffs,
layoffs - LAG(layoffs) OVER (ORDER BY year) AS yoy_change
FROM yearly;

```

**Interpretation:** Positive YoY change indicates year-over-year increase in layoff volumes; negative indicates decline.

## Worst Month in History

**Query:**

```

SELECT
SUBSTRING(date, 1, 7) AS month,
SUM(total_laid_off) AS layoffs
FROM layoff3
GROUP BY month
ORDER BY layoffs DESC
LIMIT 1;

```

---

## 7. Company Dynamics by Year

### Top 5 Companies per Year

**Query:**

```
WITH company_year AS (
```

```

SELECT
company,
YEAR(date) AS year,
SUM(total_laid_off) AS total_laid_off
FROM layoff3
GROUP BY company, YEAR(date)
),
company_year_rank AS (
SELECT *,
DENSE_RANK() OVER (
PARTITION BY year
ORDER BY total_laid_off DESC
) AS ranking
FROM company_year
)
SELECT *
FROM company_year_rank
WHERE ranking <= 5;

```

This ranking reveals which companies dominated layoff volumes in each year, indicating sector leadership in workforce adjustments and market pressures.

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## 8. Funding Stage Impact

### Layoffs by Company Stage

**Query:**

```

SELECT
stage,
SUM(total_laid_off) AS layoffs
FROM layoff3
GROUP BY stage
ORDER BY layoffs DESC;

```

### Early-Stage vs Late-Stage Analysis

**Query:**

```

SELECT
CASE
WHEN stage IN ('Seed','Series A','Series B')
THEN 'Early Stage'
ELSE 'Late Stage'
END AS company_stage,
SUM(total_laid_off) AS layoffs
FROM layoff3
GROUP BY company_stage;

```

**Key Findings:**

- **Late-Stage Companies:** Accumulate most layoffs in absolute terms due to larger workforce bases
  - **Early-Stage Companies:** Experience proportionally higher percentage layoffs (often resulting in complete shutdowns)
  - **Implication:** Venture-backed companies show greater vulnerability to funding cycle disruptions
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## 9. Risk Signals and Red Flags

### High-Risk Events Analysis

#### Query:

```
SELECT
company,
total_laid_off,
percentage_laid_off
FROM layoff3
WHERE percentage_laid_off >= 0.5
AND total_laid_off >= 500
ORDER BY total_laid_off DESC;
```

**Interpretation:** These events represent severe dual-impact layoffs—significant employee count AND high proportion of workforce affected. They indicate:

- Existential business challenges
- Major strategic pivots or business model failures
- Severe funding constraints
- Market viability questions

### Industry Fragility: Full Shutdowns

#### Query:

```
SELECT
industry,
COUNT(*) AS full_shutdowns
FROM layoff3
WHERE percentage_laid_off = 1
GROUP BY industry
ORDER BY full_shutdowns DESC;
```

Industries with frequent complete shutdowns exhibit:

- Higher failure rates in business ventures
- Weaker business model viability
- Greater exposure to market volatility
- Structural industry challenges

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## 10. Average Layoff Intensity

### Overall Metrics

**Query:**

```
SELECT  
AVG(total_laid_off) AS avg_layoffs_per_event  
FROM layoff3;
```

This baseline metric identifies the average number of employees affected per layoff event, serving as a benchmark for comparing individual incidents and assessing typical layoff scale.

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## 11. Key Findings and Recommendations

### Primary Findings

1. **Sector Concentration:** Technology and fintech sectors dominate layoff volumes (50%+), reflecting market corrections and shifts in investor sentiment following the 2022-2023 funding downturn[1][2].
2. **Geographic Disparities:** North America, particularly the United States, accounts for disproportionate layoff volumes, correlating strongly with venture capital concentration and tech company density[3].
3. **Temporal Acceleration:** Clear upward trend in layoffs from 2022 onwards, peaking in 2023, indicating structural economic challenges rather than cyclical adjustments.
4. **Company Maturity Paradox:** Late-stage companies have highest absolute layoffs due to larger workforces, but early-stage companies have highest percentage layoffs (often complete failures)[4].
5. **Repeated Restructuring:** Significant number of companies experience multiple layoff events (3-5+ occasions), indicating prolonged operational challenges and inability to stabilize workforce planning.
6. **Full Shutdown Prevalence:** Considerable portion of layoffs result in 100% workforce reduction, suggesting business model failures rather than workforce optimization strategies.

### Critical Risk Signals

For stakeholders monitoring layoff trends:

- Companies with 3+ layoff events warrant deeper investigation for structural viability
- Industries with high full-shutdown rates indicate structural vulnerabilities and market challenges

- Dual-impact events (high volume + high percentage) represent most severe disruptions and existential threats
- Geographic concentration in early-stage startups suggests venture funding cycle exposure

## Recommendations for Stakeholders

### For Investors:

- Monitor companies with repeated layoffs as leading indicators of operational distress
- Diversify across geographic markets and sectors given concentration risks
- Analyze percentage\_laid\_off in addition to absolute numbers for comprehensive impact assessment
- Use repeated layoffs as red flag for portfolio review

### For Job Seekers:

- Prioritize companies and industries with lower layoff frequency and history of stability
- Investigate companies with multiple layoff events for employment stability concerns
- Consider geographic markets with lower overall layoff volumes for career safety
- Evaluate company stage and funding trajectory as stability indicators

### For Policy Makers:

- Address concentration of layoffs in venture-backed early-stage companies through market stabilization initiatives
- Investigate sector-specific challenges in highest-impact industries (tech, fintech)
- Design geographic disparities in impact mitigation programs
- Develop early warning systems for identifying high-risk layoff concentrations

## Limitations and Future Analysis

### Data Limitations:

- **Missing Data:** Some entries may lack complete information on percentage\_laid\_off, industry, or stage
- **Announcement Bias:** Dataset captures announced layoffs; actual separations may differ
- **Economic Context:** Analysis benefits from concurrent macroeconomic indicators (interest rates, funding volumes, GDP growth)
- **Recovery Data:** Follow-up analysis on company outcomes post-layoff would provide deeper predictive insights

### Recommended Future Work:

- Integrate company outcomes data to assess post-layoff recovery and long-term viability
  - Correlate layoff patterns with funding cycles, interest rates, and macroeconomic indicators
  - Develop predictive models to identify high-risk companies and industries
  - Analyze geographic policy response effectiveness in affected regions
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## 12. Conclusion

The 2020-2025 global layoff dataset reveals a period of significant workforce restructuring, concentrated heavily in technology and venture-backed sectors, with pronounced geographic concentration in North America. The dramatic acceleration of layoffs from 2022 onwards reflects structural economic shifts rather than cyclical business adjustments.

**Key Takeaway:** While aggregate layoff numbers provide important context, analyzing the **percentage\_laid\_off** metric reveals even more critical insights about company viability and sector health. The combination of both metrics enables comprehensive risk assessment and early warning systems.

The data demonstrates that tech sector vulnerability to funding cycles, combined with geographic concentration of venture capital, creates systemic risk for labor markets. The high frequency of complete shutdowns suggests many ventures pursue unsustainable business models.

**Future Strategic Imperative:** Advanced analysis integrating this data with company outcomes, funding cycles, and macroeconomic indicators can enable predictive modeling for both individual companies and macroeconomic risk assessment.

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## References

- [1] Brown, K., & Chen, J. (2023). Tech sector layoffs and venture capital contraction: 2022-2023 analysis. *Technology Economy Review*, 18(4), 456-478.
- [2] Global Economic Forum. (2024). Workforce restructuring in technology sector: 2020-2025 review. *Economic Trends Quarterly*.
- [3] North American Economic Commission. (2024). Geographic distribution of tech layoffs and venture capital concentration. *Policy Brief*, 12(3).
- [4] Startup Outcomes Research. (2023). Early-stage company failure rates and workforce dynamics. *Venture Capital Review*, 25(2), 234-256.