Combatting the High Employee Attrition Rate Two Analytics and Accounting Case Scenarios

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ABSTRACT

The paper contains two accounting and analytics-based case scenarios. The case scenarios focus on visualizations and time series analysis in an accounting context. A teaching guide for the case scenarios is also included.

Keywords: accounting, visualizations, analytics, time series analysis, CPA exam

This is a fictitious case. All information contained herein was fabricated by the author(s). Any similarity contained herein to actual persons, businesses, events, etc. is purely coincidental and is the responsibility of the author(s). Please contact the case author(s) directly with any concerns.

INTRODUCTION

The revised Certified Public Accountant (CPA) exam will include more analytics-based topics. As a result, the authors have developed two short case scenarios that introduce analytics topics to students. These case scenarios can be used in accounting and/or analytics-based courses.

The first case focuses on visualizations. Students are given data and tasked with creating visualizations to answer a series of questions. Possible visualizations may include line charts, histograms, Pareto graphs, treemaps, bar graphs, and pie charts. These visualizations can be created in Excel, Tableau (Desktop or Public), or with other applicable software applications.

The second case scenario focuses on forecasting techniques. Students will use different forecasting methods such as moving average, weighted moving average, exponential smoothing, and linear trend to make predictions, and then use techniques such as MSE (mean square error) to compare forecasting methods.

CASE SCENARIO 1: VISUALIZATIONS

The CEO and Human Resources Director of a company have been meeting regarding the recent high employee attrition rate at the company.

CEO: "Have the employees given any reasons as to why they have chosen to leave?"

HR Director: "We asked them to fill out a brief survey of the top three reasons as to why they have chosen to leave. However, I have not had time to analyze the data."

CEO: "We should take a look at this survey. We should also look at how much we are spending on salaries and benefits for our employees, and then benchmark the findings with our industry to see how we compare."

HR Director: "I'll talk with our analytics team. The team can provide us with visualizations to help us answer why employees are leaving. In addition, I will pull some industry benchmarks and have the analytics team provide us with information on how we stack up to the industry in terms of salaries and benefits for our employees."

A little while later, the HR Director meets with the analytics team.

HR Director: "Here is information on employees that have left the company (see Table 1 in the Appendix). In addition, here are the financials (see Tables 2 and 3 in the Appendix) for the past ten years and some comparative industry benchmarks (see Table 4 in the Appendix). I would like for you to create some visualizations that answer the following questions:

1) How has revenue and the amounts spent on salaries and benefits changed over the past ten years? Has revenue, salaries, and benefits increased, decreased, or stayed mainly constant / flat?
2) What percentage of revenue are salaries and benefits?

3) How does the company stack up in terms of salaries and benefits compared to other similar industries?
4) What are the main reasons employees give for leaving the company?
5) Which areas of the company have had the largest employee attrition?
6) How many years have the employees leaving been with the company?
7) What is the salary range for the employees that have quit their jobs?

Analytics team: "Yes, we can create these visualizations for you. We will have these for you by next week."

Next Steps

You are a member of the analytics team at this company. Your job is to create at least one visualization for each question. You may use Excel, Tableau (Desktop or Public), or other software to create these visualizations. In addition, please provide at least one paragraph discussing the purpose and results of the visualization. Present your results to the CEO and HR Director.

CASE SCENARIO 2: TIME SERIES ANALYSIS

The CEO and Human Resources Director have reviewed the visualizations and want to increase employee salaries and benefits in order to be more in line with industry standards. However, the CEO wants to know how revenue for the company will look over the next several months prior to implementing any changes.

CEO: "I would like to see us increase salary and benefits in order to better retain our current employees and attract new employees."

HR Director: "Yes, we need to be more in line with industry standards and offer competitive salaries and benefits."

CEO: "I would like to look at projected revenues over the next several months prior to implementing any changes."

HR Director: "I will talk with the analytics team to see if the team can make some predictions for us."

A little while later, the HR Director meets with the analytics team.

HR Director: "Here are the revenues for the past several months (see Table 5 in the Appendix). We would like to see estimates of the revenues for the next six months."

Analytics team: "We will run some different forecasting methods on the data, identify the best technique to use, and present you with some revenue forecasts by next week."

Next Steps

You are a member of the analytics team at the company. Your job is to use the actual revenues from the past several months and come up with forecasts for the next six months. Use a three- and four-month moving average, three month weighted moving average, exponential smoothing, and linear trend forecasting methods to determine the forecasts. Then use techniques such as MSE (mean square error) to determine the best forecasting method. Present your results to the CEO and HR Director.

TEACHING GUIDE

The two case scenarios were created to help instructors prepare students for the analytics portion of the newly revised CPA exam which will launch in January 2024. The first case study focuses on visualizations. Students are presented with data and questions and asked to build visualizations to address the questions. Case 1 can help prepare students for the following learning outcomes found in the AICPA and NASBA CPA Evolution Model Curriculum document:

- "Describe the data visualization techniques used to identify patterns, trends, and correlations" (Part I CPA Evolution Core, Section 1 Accounting and Data Analytics Core, Module 8 Financial Data Analytics, Topic 5 Visualization, 20)
- "Match the appropriate data visualization method to specific data sets and circumstances" (Part I CPA Evolution Core, Section 1 Accounting and Data Analytics Core, Module 8 Financial Data Analytics, Topic 5 Visualization, 20)
- "Apply data visualization methods to specific data sets and circumstances" (Part II CPA Evolution Discipline, Section 1 Business Analysis and Reporting (BAR) Discipline, Module 10 Advanced Data Analytics, Topic 6 Advanced Data Visualization, 64)

The visualizations can be created using Excel, Tableau Desktop/Public, or other software applications. Figures 1 through 7 (Appendix) are possible visualizations to address the questions. These visualizations were created using Tableau Desktop.

- Figure 1 (Appendix) is a line chart that shows the trend for revenue, salaries, and benefits over the past ten years.
- Figure 2 (Appendix) is a line chart that shows the percentage of revenue for salaries, benefits, and profits.
- Figure 3 (Appendix) is a bar graph that compares the company's salaries, benefits, and net income to other similar industries.
- Figure 4 (Appendix) is a Pareto diagram that shows the main reasons why employees are leaving the company.
- Figure 5 (Appendix) is a treemap that shows the main functional areas that have lost employees.
- Figures 6 and 7 (Appendix) are histograms that show the number of years these employees worked at the company and their salaries.

The second case study focuses on predictive analytics. Students are given data and asked to use time series analysis techniques to predict revenue. The second case can help prepare students for the following learning outcomes found in the AICPA and NASBA CPA Evolution Model Curriculum document:

- "Describe the analytical maturity model (descriptive, diagnostic, predictive, and prescriptive)" (Part I CPA Evolution Core, Section 1 Accounting and Data Analytics Core, Module 8 Financial Data Analytics, Topic 4 Analysis of Financial Data, 20)
- "Determine and interpret appropriate diagnostic data analysis, correlations, patterns, and anomalies" (Part I CPA Evolution Core, Section 1 Accounting and Data Analytics Core, Module 8 Financial Data Analytics, Topic 4 Analysis of Financial Data, 20)
- "Determine / interpret appropriate predictive analysis, (e.g., regression, time series, forecasting)" (Part II CPA Evolution Discipline, Section 1 Business Analysis and Reporting (BAR) Discipline, Module 10 Advanced Data Analytics, Topic 5 Advanced Data Analysis, 64)

Students are asked to predict revenue for the next six months using a three-month and four-month moving average. In addition, students are asked to use a three-month weighted moving average, exponential smoothing, and linear trend forecasting techniques. The forecasting methods can then be compared using MSE or other techniques. Table 6 (Appendix) shows the forecasts and MSE calculations for the various forecasting methods.

Grading rubrics can be found in Tables 7 and 8 (Appendix) for the two cases. Finally, the complete dataset and solutions for the two cases can be requested by emailing the authors.

REFERENCES

- AICPA and NASBA. (2021). CPA Evolution Model Curriculum. https://nasba.org/wp-content/uploads/2021/06/Model-curriculum_web_6.11.21.pdf
- Tableau Desktop Professional Edition

APPENDIX

Table 1: Partial Dataset of Information on Employees that have Left the Company
(The full dataset of 500 observations can be requested by emailing the authors)

Employee Number	Number of Years at the Company	Most Recent Base Salary	Dept.	Reason for Leaving 1 (Top)	Reason 2	Reason 3
1	6	$75,251	Production	Retirement 401K	Vacation Time	Base Salary
2	25	$132,468	Production	Social Responsibility	Flexible Hours / Some Remote Work	Base Salary
3	1	$50,352	Information Technology	Career Advancement	Base Salary	Retirement 401K
4	18	$125,543	Information Technology	Career Advancement	Base Salary	Social Respon-sibility
5	6	$68,545	Production	Base Salary	Retire-ment 401K	Bonus
6	4	$58,515	Marketing	Retirement 401K	Flexible Hours / Some Remote Work	Social Respon-sibility
7	10	$78,557	Information Technology	Career Advancement	Base Salary	Flexible Hours / Some Remote Work
8	23	$121,586	Accounting	Vacation Time	Career Advance-ment	Flexible Hours / Some Remote Work
9	22	$100,753	Accounting	Career Advancement	Retire-ment 401K	Bonus

Table 2: Income Statement Years 1 to 5

Year	1	2	3	4	5
Revenue	$219,307,330	$241,484,632	$279,401,943	$302,347,234	$317,537,775
Base Salaries	$168,105,574	$150,879,024	$103,525,222	$152,388,434	$141,048,473
Benefits	$83,630,644	$85,655,482	$85,521,457	$90,481,029	$96,126,626
Office Expenses	$19,549,163	$21,625,183	$34,008,562	$19,985,541	$23,700,625
Operating Income	$(51,978,051)	$(16,675,057)	$56,346,702	$39,492,230	$56,662,051
Interest	$6,694,773	$3,598,592	$4,761,143	$6,089,462	$5,963,906
Income before Taxes	$(58,672,824)	$(20,273,649)	$51,585,559	$33,402,768	$50,698,145
Taxes	$(16,135,027)	$(5,575,253)	$14,186,029	$9,185,761	$13,941,990
Net Income	$(42,537,797)	$(14,698,396)	$37,399,530	$24,217,007	$36,756,155

Table 3: Income Statement Years 6 to 10

Year	6	7	8	9	10
Revenue	$340,036,150	$450,122,934	$480,147,094	$550,838,614	$698,285,835
Base Salaries	$132,049,142	$178,893,121	$186,303,213	$195,303,213	$204,303,213
Benefits	$97,223,184	$120,401,848	$115,215,064	$125,232,533	$135,252,523
Office Expenses	$33,771,112	$31,100,535	$28,226,563	$27,377,455	$15,865,892
Operating Income	$76,992,712	$119,727,430	$150,402,254	$202,925,413	$342,864,207
Interest	$5,617,956	$3,760,753	$6,908,065	$5,844,714	$6,134,562
Income before Taxes	$71,374,756	$115,966,677	$143,494,189	$197,080,699	$336,729,645
Taxes	$19,628,058	$31,890,836	$39,460,902	$54,197,192	$92,600,652
Net Income	$51,746,698	$84,075,841	$104,033,287	$142,883,507	$244,128,993

Table 4: Comparative Data with Similar Industries Averages

	The Company	Industry A	Industry B	Industry C
Base Salaries / Revenue	29.3%	35.6%	39.6%	37.3%
Benefits / Revenue	19.4%	25.3%	28.4%	30.5%
Net Income / Revenue	35.0%	28.5%	22.8%	27.2%

Table 5: Recent Monthly Revenues

Month	Revenue (in millions)
1	$50.2
2	$40.3
3	$39.5
4	$49.7
5	$36.6
6	$52.4
7	$39.4
8	$48.3
9	$35.4
10	$42.2
11	$45.9
12	$48.5
12	$49.5
13	$53.6
14	$65.8
16	$75.9
17	$80.3

Table 6: MSE and Forecasts for Months 18 to 23

Forecast Method	MSE	Forecast Month 18	Forecast Month 19	Forecast Month 20	Forecast Month 21	Forecast Month 22	Forecast Month 23
Three Month Moving Average	101.82	$74.0	$74.0	$74.0	$74.0	$74.0	$74.0
Four Month Moving Average	119.32	$68.9	$68.9	$68.9	$68.9	$68.9	$68.9
Weighted Moving Average w1 = 0.50, w2 = 0.30, w3 = 0.20	87.75	$76.08	$76.08	$76.08	$76.08	$76.08	$76.08
Exponential Smoothing Alpha = 0.55	88.30	$74.94	$74.94	$74.94	$74.94	$74.94	$74.94
Linear Trend	84.33	$66.99	$68.82	$70.65	$72.47	$74.30	$76.13

Table 7: Rubric Case 1 Visualization and Discussion

Score	Description
13 to 15	The visualization clearly and appropriately answers the question. The write-up clearly and correctly discusses the visualization. Correct grammar and spelling Minor mistake(s)
10 to less than 13	A decent attempt. However, the visualization could be better developed to answer the question. The write-up does not sufficiently address the visualization. Some grammar and spelling issues.
0 to less than 10	Not attempted or the visualization clearly does not answer the question. The write-up does not address the visualization. Grammar and spelling issues

Table 8: Rubric Case 2 Forecasting Methods

Score	Description
4 to 5	The forecast method is applied correctly to the data. The six-month forecasts are correct. The MSE is calculated correctly. Minor mistake
3 to less than 4	A decent attempt. However, the forecast method was not applied correctly. The MSE is not calculated correctly. There are errors on the six-month forecasts
0 to less than 3	Not attempted or not a decent attempt Many errors on the applied forecasting method Six-month forecasts missing or not correct. MSE not calculated or not calculated correctly.

Figure 1: Revenues, Salaries, and Benefits

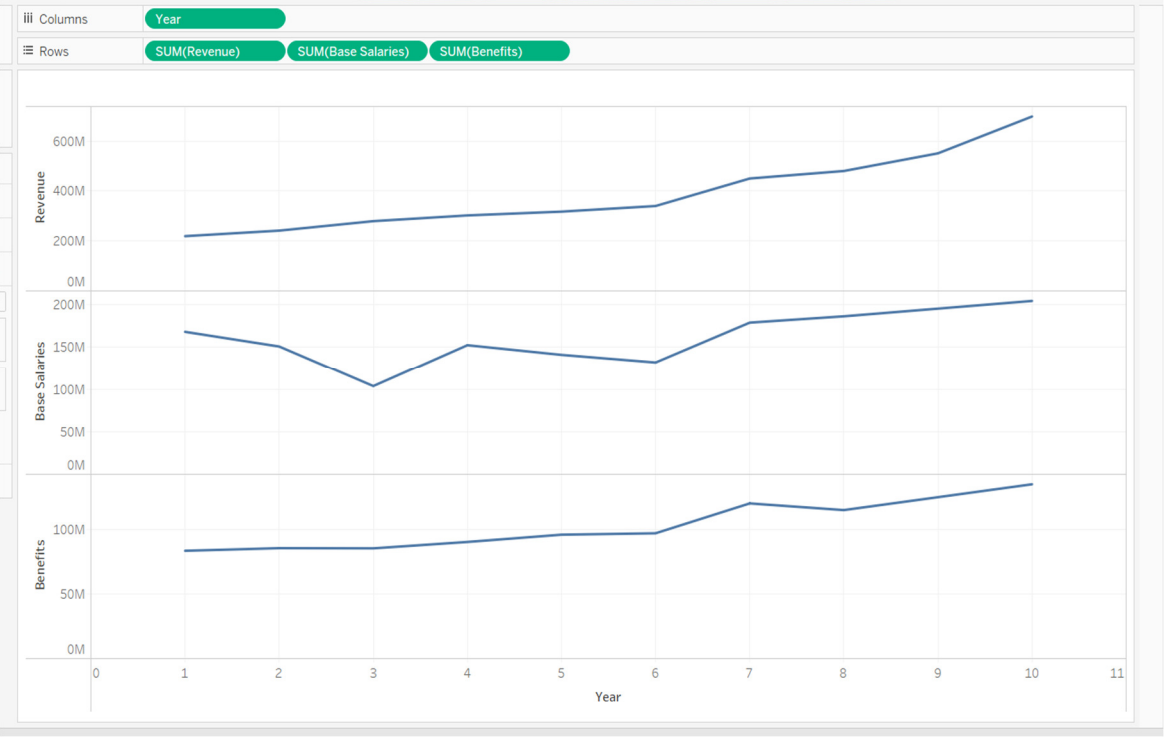

Figure 2: Salary, Benefits, and Profits as a Percentage of Revenue

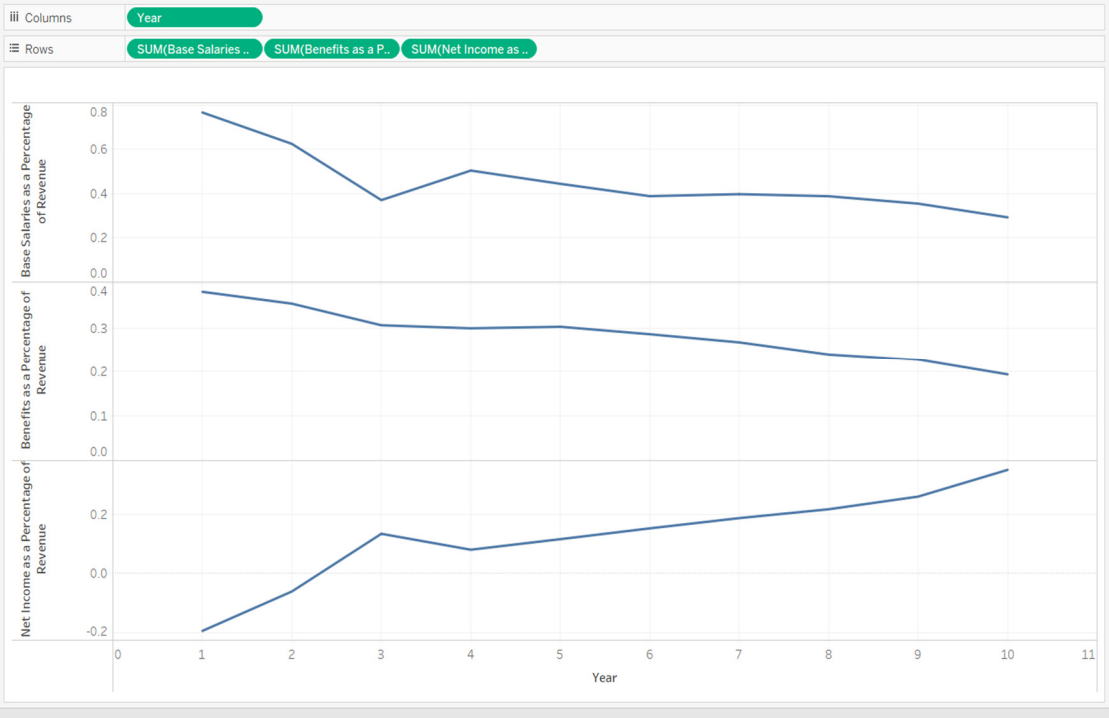

Figure 3: Comparative Benchmarks

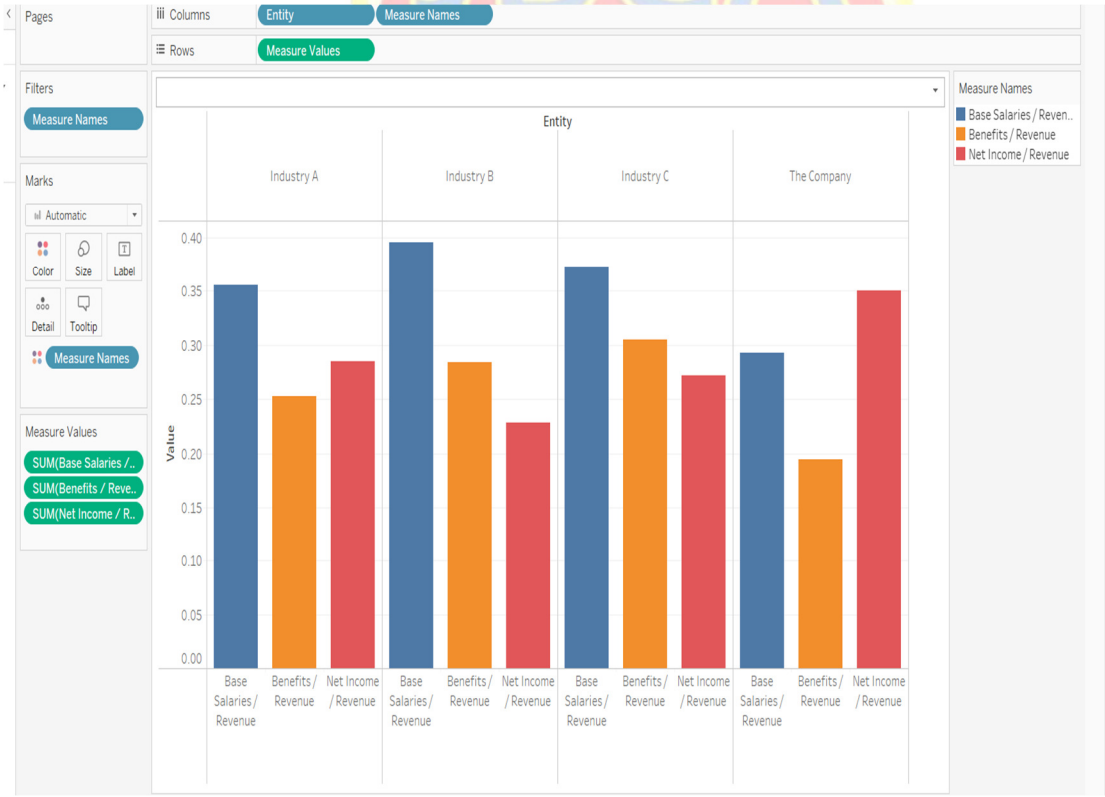

Figure 4: Pareto Analysis of the Top Reasons for Leaving the Company

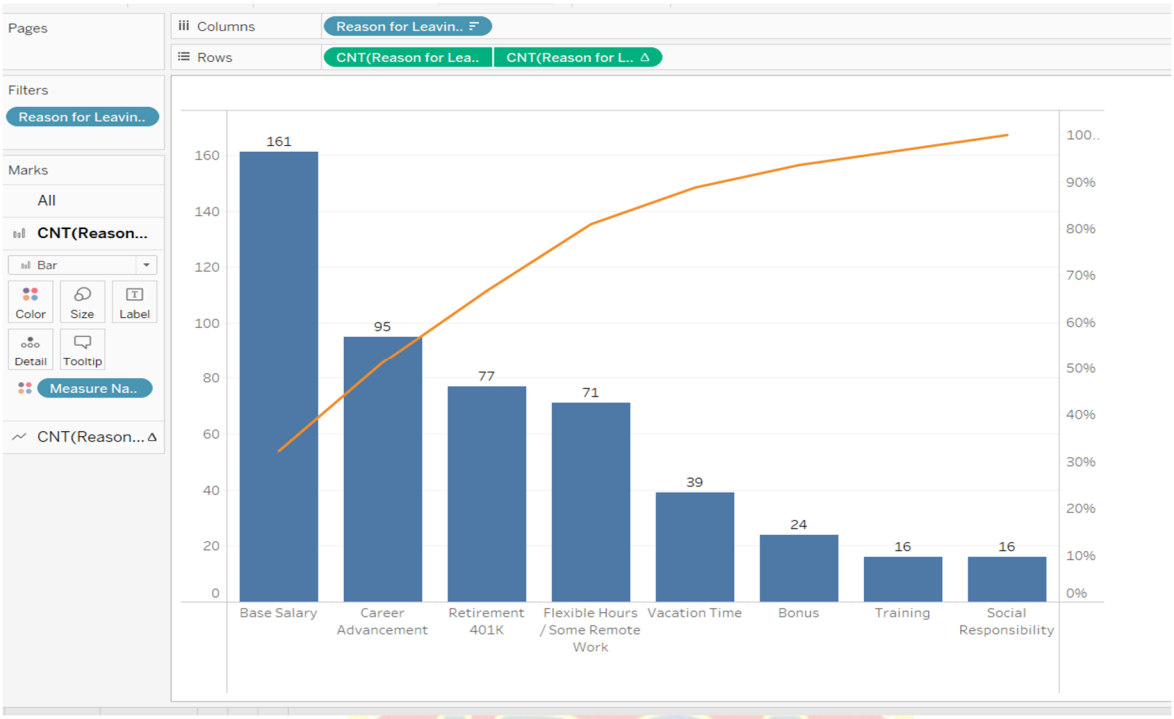

Figure 5: Treemap Showing Functional Areas that Employees Have Left

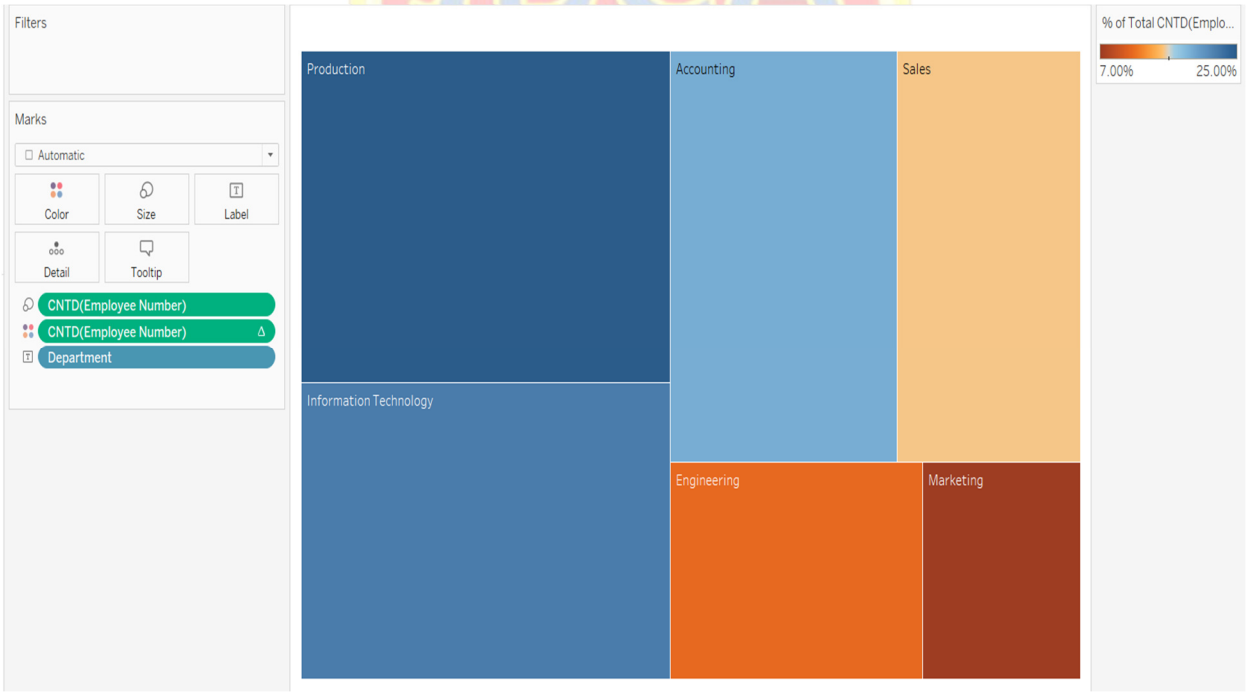

Figure 6: Histogram of Salary Range

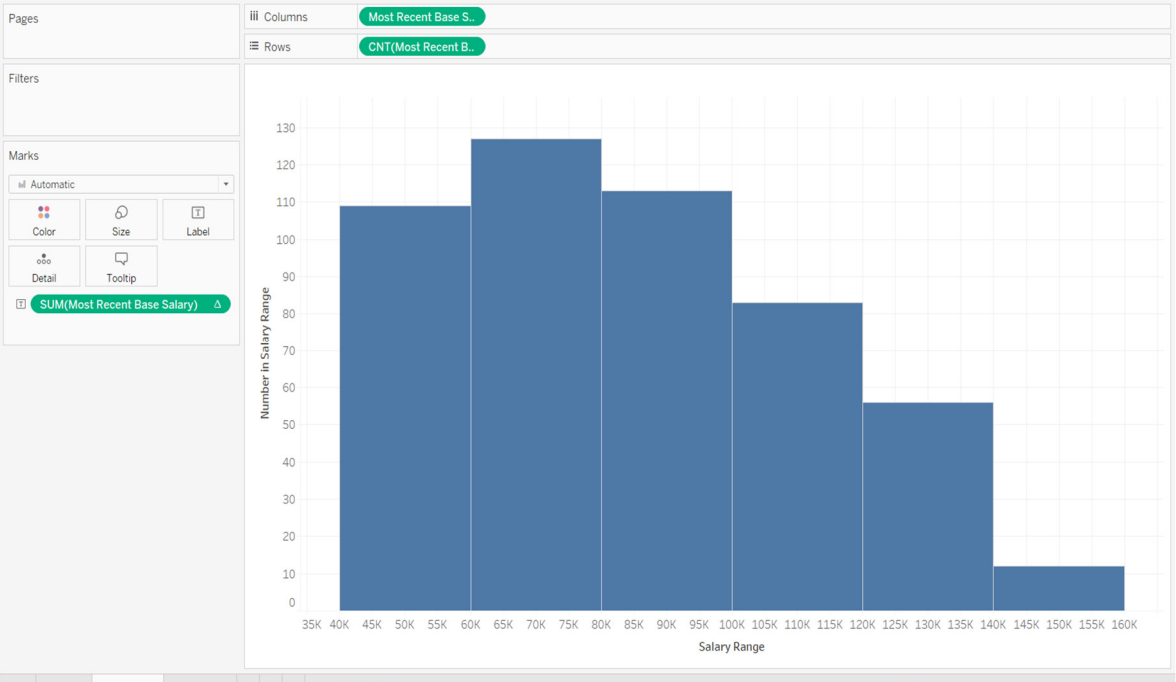

Figure 7: Histogram of Number of Years at the Company