**Chapter 3**

**Data Visualization**

**Solutions:**

1.



Some of the changes made in this table include:  
 Deleting unnecessary gridlines in the table

Removing bolded font except for column titles

Left align text column and right align numerical columns

Adding commas to dollar values to ease readability and removing unnecessary digits to right of decimal place

2. a. The readability of the table could be improved by: removing unnecessary gridlines, left-aligning the first column because it contains text entries, right aligning all other columns because they contain numerical values, reducing the number of digits displayed by displaying numerical values in millions or billions of dollars and using shading to differentiate the columns. Note that we could also sort these values by GDP in 2010 if this was the value of most interest.

b.



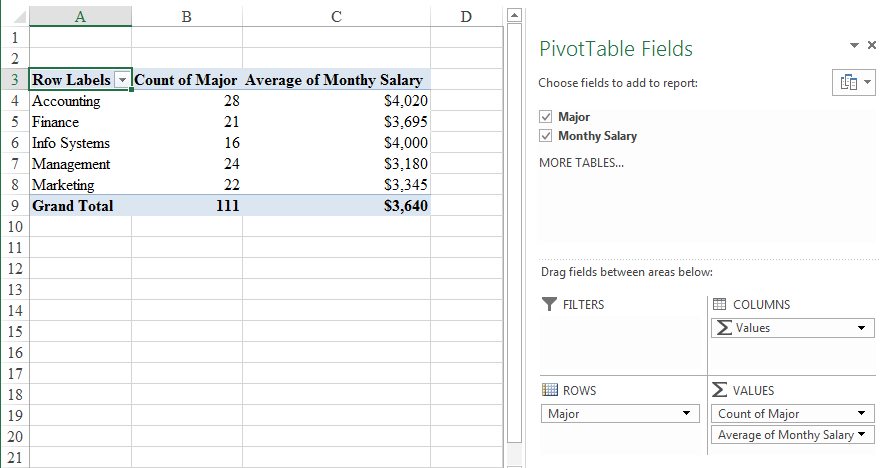
3. a. The chart contains unnecessary gridlines, the y-axis label values are spaced much too close together, the shading of the chart does not add value.

b.



Note that here we have also added small markers on the line chart at each data point to indicate that the data are not continuous.

4.



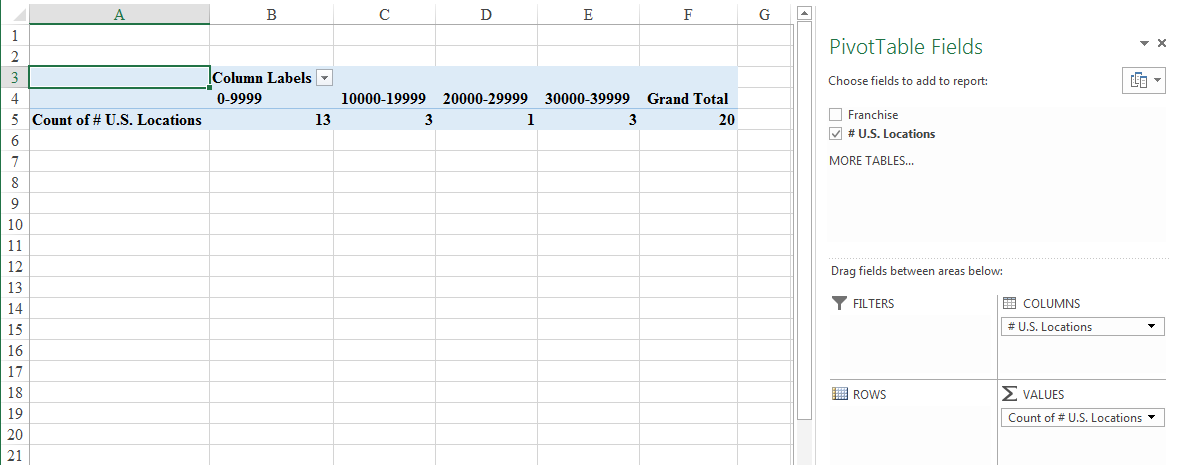
a. The PivotTable shows that accounting major has the greatest number of students with 28 students.

b. Accounting has the highest average starting monthly salary at $4020.

c. By changing the Value Field Settings for Monthly Salary from Average to Max, we see that an accounting student has the highest starting salary at $5650.

By changing the Value Field Settings for Monthly Salary to Min, we see that a management student has the lowest starting salary at $2240.

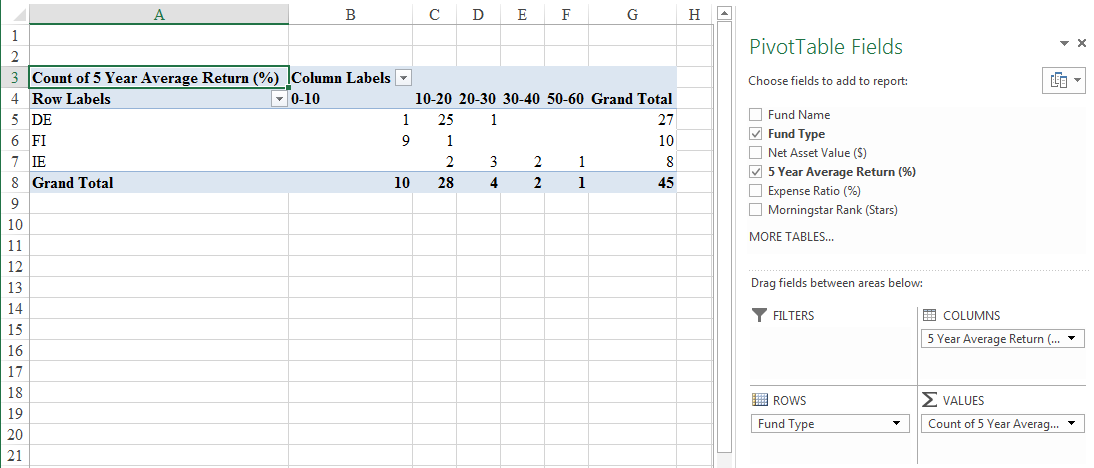
5.



a. 13 franchises have between 0 and 9999 locations.

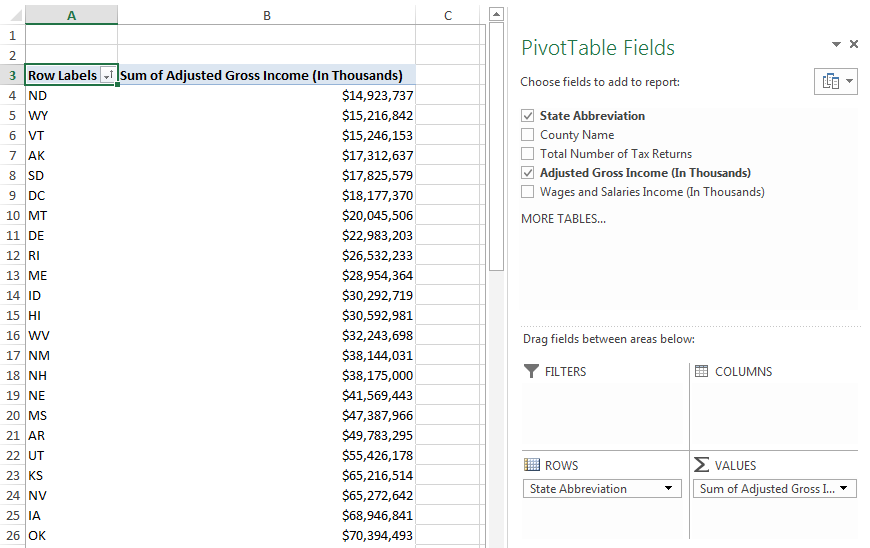
b. 3 franchises have more than 30,000 locations.

6. a.



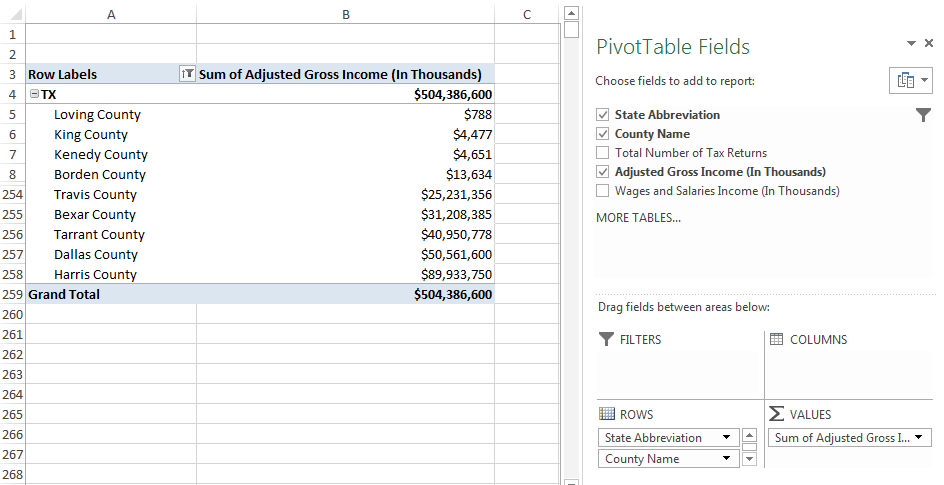
b. Fixed Income (FI) funds have had lower average returns than domestic equity (DE) or international equity (IE) funds; no FI funds has an average return greater than 19.99% and 9 of the 10 have average returns less than 9.99%. IE funds have had greater returns with no IE fund having an average return of less than 10%. IE funds are the only funds to have surpassed a 30% average return.

7. a.



North Dakota (ND) has the smallest sum of adjust gross income with $14,923,737,000.

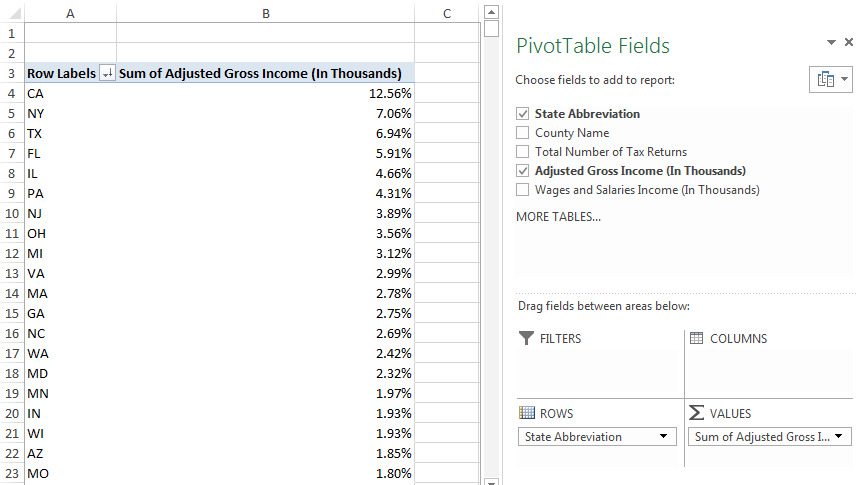
b.



Loving county had the smallest sum of adjusted gross income in Texas; Harris county had the largest sum of adjusted gross income.

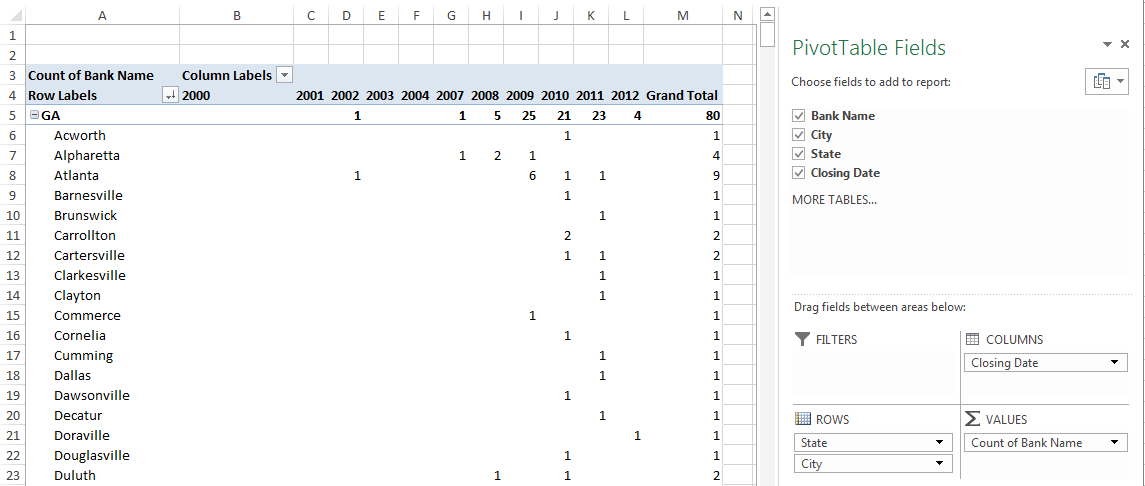
c. Harris county has the highest percentage of adjusted gross income in Texas at 17.83%.

d.



New York provides 7.06% of the total adjusted gross income in the United States.

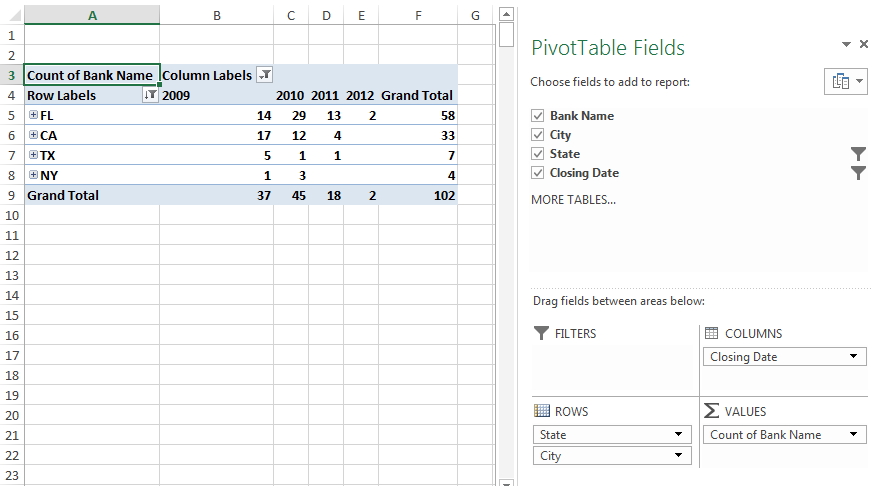
8. a.



Georgia (GA) had the greatest number of bank closures between 2000 and 2012.

b. Nevada experienced 4 bank closures in 2010. These occurred in Carson City, Las Vegas and Reno.

c.



There were 102 bank closures between 2009 and 2012 in the states of California, Florida, Texas and New York.

d. Naples had the greatest number of bank closures in Florida between 2009 and 2012 with 4 bank closures.

e.

Bank closures peaked in 2010 in Florida and have decreased since then.

9. a.



b.



There appears to be a negative linear relationship between the *x* and *y* variables.

10. a.



There appears to be a positive linear relationship between profits and market capitalization. As profit increases, market capitalization also increases.

b.



The trendline confirms that there is a positive linear trend between profits and market capitalization.

11. a.



Note that we have made several changes to the line chart here to improve readability. We have added axes labels, we have differentiated the lines using different line styles and we have placed labels in the chart for each line.

b. GM produced the greatest number of vehicles in Years 1 and 2, but was passed in year 3 by Toyota. Both GM and Toyota produced fewer vehicles in Year 4. By Year 5, Toyota and GM were producing approximately the same number of vehicles. Hyundai has seen significant increases in vehicle production in Years 4 and 5.

c.



Leading Manufacturers

Year 1: GM

Year 2: GM  
Year 3: Toyota  
Year 4: Toyota  
Year 5: Toyota (although GM and Toyota are producing about the same number of vehicles in Year 5)

12. a.



Gasoline prices were relatively steady for about the first 16 to 18 months and then increased rapidly through about month 25 before falling before rising in the last few months. Overall the price of gasoline appears to be increasing over the 36 months, but it is not a constant increase.

b.



The trendline confirms that there is an overall linear increase in the price of gasoline over the 36 months.

13. a.



b. and c.



Sorting can be done by selecting the data in Excel and then using the **Sort** function in the **Sort & Filter** group under the **DATA** tab. Data labels can be added by right clicking on one of the columns in the chart and selecting **Add Data Labels**.

14. a. It is difficult to distinguish the relative sizes of the different pieces of the pie chart. It can also be difficult to distinguish the different colors in the pie chart. Finally, it takes a lot of work for the reader to match the salesperson names to the different pieces of the pie chart.

b. A sorted column or bar chart would be preferable to display these data.

c.



15. a.



b. All customers preferred the six cylinder engine type, regardless of which exterior color they preferred. However, few customers who preferred red or black exterior colors preferred the four cylinder engine, but customers who preferred the white exterior color were more evenly split between the four and six cylinder engine. If this is a representative sample of customers, it appears that the company will sell very few red models with four cylinder engines, but may sell more white models with four cylinder engines.

16. a.



b.



c. Younger respondents are more likely to own smartphones; older respondents are more likely to have other cell phones or to own no cell phone, particularly those in the 65+ age category.

The clustered column chart makes it easier to compare the relative percent ownership values within an age category. It is much easier to interpret from the clustered bar chart that a greater percentage of respondents age 18-24 own smartphones than other cell phones than it is to interpret this from the stacked bar chart.

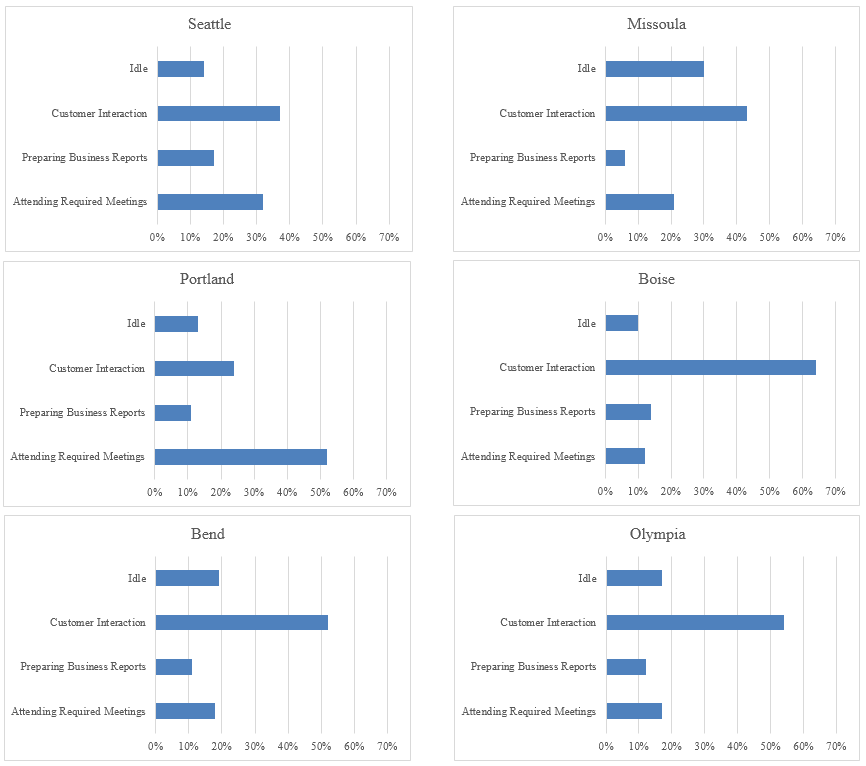
17. a.



b.



c.



Note that here we have taken care to make sure that the horizontal axes in each bar chart have the same range (0 – 70%) for easy comparisons among locations. We have also retained the vertical gridlines here to ease comparisons, but this is mainly a matter of stylistic preference.

d. Both the stacked and clustered bar charts become very busy for these data, so many readers will prefer the individual bar charts. However, some readers may prefer the clustered bar chart which may make comparisons between locations easier.

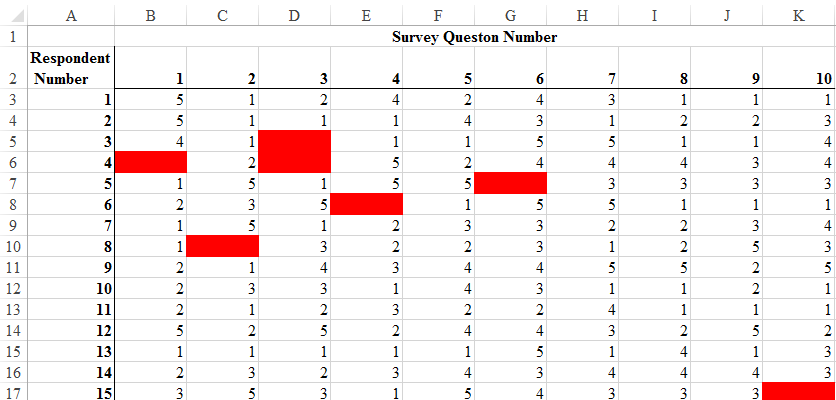
e. The managers in Boise, Bend and Olympia spend more time (relatively) in customer interactions than managers in Seattle, Missoula and Portland. The Portland manager in particular appears to spend an excessive time attending required meetings while the manager in Missoula appears to have more idle time.

18. a.



b. Projects 6, 3, 2 and 5 appear to be on the efficient frontier.

19. a. The screen shot below shows the first 15 respondents of the survey results with the blank cells highlighted.



b. Question 1: Respondents 4, 18

Question 2: Respondents 8, 74, 87, 100

Question 3: Respondents 3, 4, 78, 101

Question 4: Respondents 6, 15, 23, 76, 82, 106

Question 5: None

Question 6: Respondents 5, 70, 86

Question 7: Respondents 34, 81

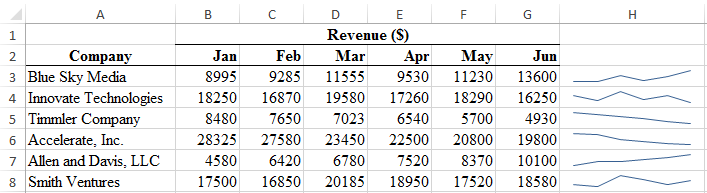
Question 8: Respondents 82, 96

Question 9: Respondents 23, 50

Question 10: Respondents 15, 37, 45

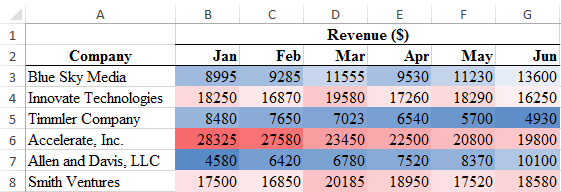
Question 4 has the highest non-response rate with six respondents not providing answers.

20. a.



b. Timmler Company and Accelerate, Inc. appear to have generally decreasing revenues over these six months. Allen and Davis, LLC appears to have had the most consistent growth over these six months. Blue Sky Media, Innovate Technologies and Smith Ventures have revenues that have both increased and decreased over the six months.

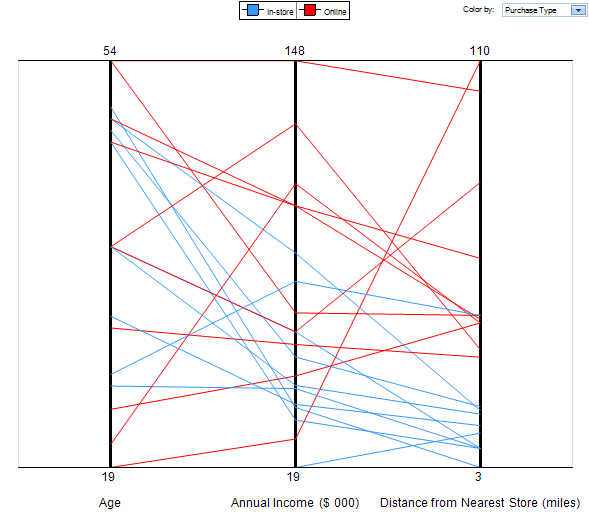
c.



It is difficult to create a heat map that effectively conveys the overall trend of revenues during the six months for each company. The heat map shows the relative magnitude of the revenues which is absent from the sparklines, but the trend for each company is less apparent.

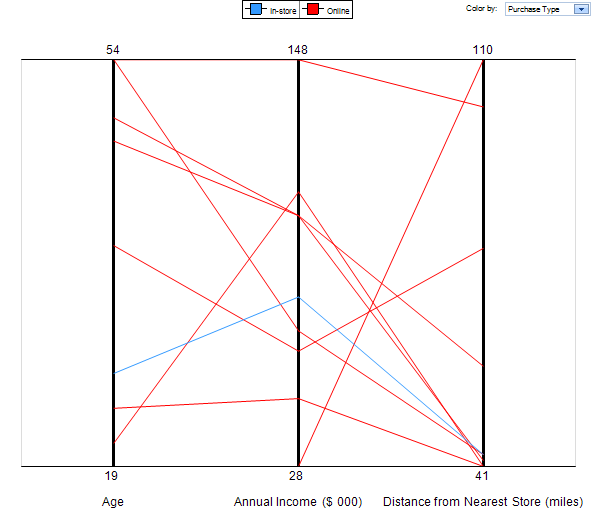
21. Online customers appear to be generally younger, have higher annual income and live further distance away from a store.

22. a.



b. There does not appear to be a clear differentiation between the ages of online versus in-store customers for electronics. However, online customers for electronics still appear to have higher annual incomes and to live further from a store.

c.

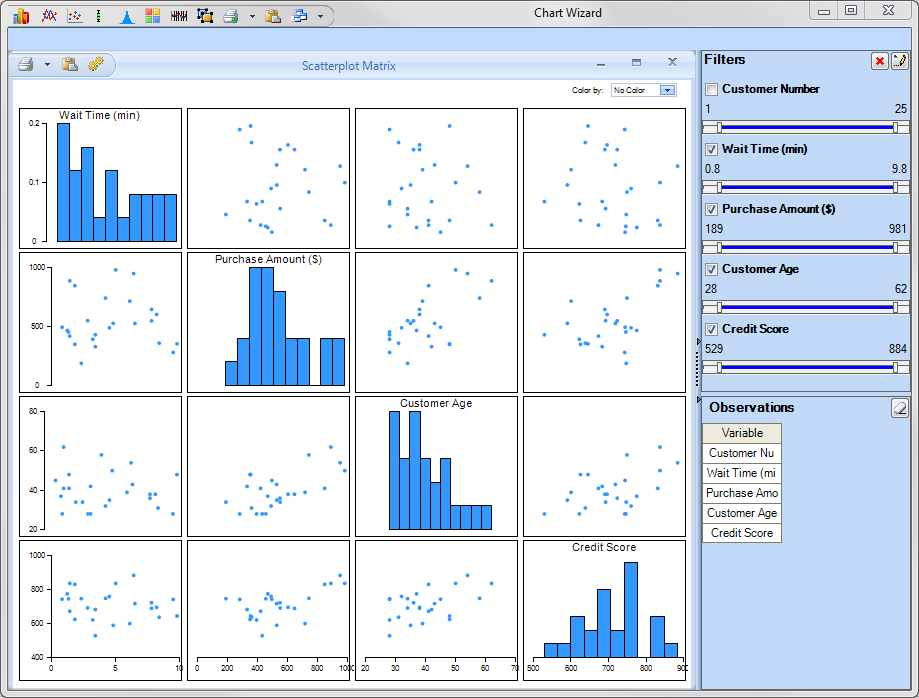


All but one customer who lives more than 40 miles away made their purchase online.

23. a. Some possible key performance indicators include patient wait times, current and projected utilization of the resources available (technicians, physicians, nurses, equipment, etc.). Other information that would be helpful includes number of patients currently waiting to be seen, number of patients expected to arrive today (by procedure type, etc.), number of technicians, physicians, nurses available, etc.

b. The CEO would probably be more interested in key performance indicators such as revenue generated by each clinic, costs at each clinic separated by cost type (salaries for physicians, nurses, operating expenses, etc.). Patient satisfaction scores and/or patient wait times for each clinic could also be very helpful. It would probably be important for the CEO to also see these data plotted over recent history so that she could infer trends and plan for the future.

24. a.



b. Purchase amount appears to have a positive relationship with customer age and credit score. Older customers and customers with higher credit scores appear to place larger purchase amounts. There are no obvious relationships between wait time and the other variables. Customer age and credit score also appears to have a positive relationship. Older customers appear to have higher credit scores.