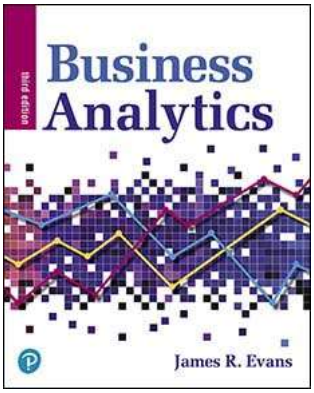
Business Analytics: Methods, Models, and Decisions

Third Edition



Chapter 3

Data Visualization

Data Visualization

- **Data visualization** - the process of displaying data (often in large quantities) in a meaningful fashion to provide insights that will support better decisions.
  - Data visualization improves decision-making, provides managers with better analysis capabilities that reduce reliance on IT professionals, and improves collaboration and information sharing.

Example 3.1: Tabular vs. Visual Data Analysis

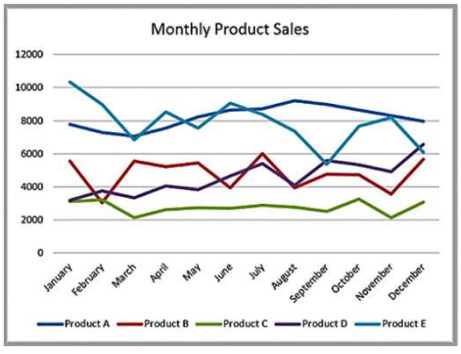
(computed as 1 – B3 / B1).

- Tabular data can be used to determine exactly how many units of a certain product were sold in a particular month, or to compare one month to another.
  - For example, we see that sales of product A dropped in February, specifically by 6.7% (computed as 1 – B3 / B1). Beyond such calculations, however, it is difficult to draw big picture conclusions.

	A	B	C	D	E	F
1	Month	Product A	Product B	Product C	Product D	Product E
2	January	7792	5554	3105	3168	10350
3	February	7268	3024	3228	3751	8965
4	March	7049	5543	2147	3319	6827
5	April	7560	5232	2636	4057	8544
6	May	8233	5450	2726	3837	7535
7	June	8629	3943	2705	4664	9070
8	July	8702	5991	2891	5418	8389
9	August	9215	3920	2782	4085	7367
10	September	8986	4753	2524	5575	5377
11	October	8654	4746	3258	5333	7645
12	November	8315	3566	2144	4924	8173
13	December	7978	5670	3071	6563	6088

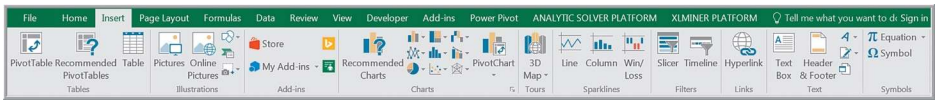
Example 3.1 Continued

- A visual chart provides the means to
  - easily compare overall sales of different products (Product C sells the least, for example);
  - identify trends (sales of Product D are increasing), other patterns (sales of Product C is relatively stable while sales of Product B fluctuates more over time), and exceptions (Product E's sales fell considerably in September).



Creating Charts in Microsoft Excel

- Highlight the data.
- Select the *Insert* tab.
- Click on the chart type, then subtype.



- Use the options in the *Design* (*Chart Design* in Mac) and *Format* tabs to customize your chart.

Column and Bar Charts

- Excel distinguishes between vertical and horizontal bar charts, calling the former **column charts** and the latter **bar charts**.
  - A *clustered column chart* compares values across categories using vertical rectangles;
  - a *stacked column chart* displays the contribution of each value to the total by stacking the rectangles;
  - a *100% stacked column chart* compares the percentage that each value contributes to a total.
- Column and bar charts are useful for comparing categorical or ordinal data, for illustrating differences between sets of values, and for showing proportions or percentages of a whole.

Example 3.2: Creating a Column Chart

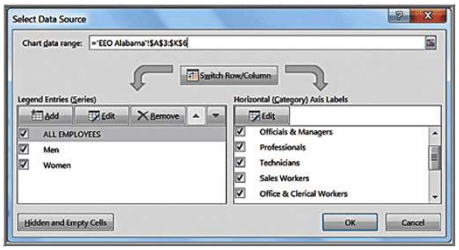
Highlight the range C3:K6, which includes the headings and data for each category. Click on the *Column Chart* button and then on the first chart type in the list (a clustered column chart).

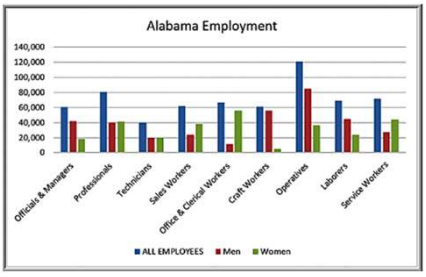
Highlighted Cells

	A	B	C	D	E	F	G	H	I	J	K
1	Equal Employment Opportunity Commission Report - Number Employed in State of Alabama, 2006										
2											
3	Racial/Ethnic Group and Gender	Total Employment	Officials &	Professionals	Technicians	Sales Workers	Office & Clerical	Craft Workers	Operatives	Laborers	Service Workers
4	ALL EMPLOYEES	632,329	60,258	80,733	39,868	62,019	67,014	61,322	120,810	68,752	71,553
5	Men	349,353	41,777	39,792	19,848	23,727	11,293	55,853	84,724	44,736	27,603
6	Women	282,976	18,481	40,941	20,020	38,292	55,721	5,469	36,086	24,016	43,950
7											
8	WHITE	407,545	51,252	67,622	28,830	41,091	44,565	45,742	67,555	26,712	34,176
9	Men	237,516	36,536	34,842	16,004	17,758	7,656	42,699	50,537	17,802	13,684
10	Women	170,029	14,716	32,780	12,826	23,335	36,909	3,043	17,018	8,910	20,492
11											
12	MINORITY	224,784	9,006	13,111	11,038	20,928	22,449	15,580	53,255	42,040	37,377
13	Men	111,837	5,241	4,950	3,844	5,971	3,637	13,154	34,187	26,934	13,919
14	Women	112,947	3,765	8,161	7,194	14,957	18,812	2,426	19,068	15,106	23,458

Example 3.2 Continued

- To add a title, click on the first icon in the Chart Layouts group. Click on “Chart Title” in the chart and change it to “EEO Employment Report—Alabama.” The names of the data series can be changed by clicking on the Select Data button in the Data group of the Design tab. In the Select Data Source dialog (see below), click on “Series1” and then the Edit button. Enter the name of the data series, in this case “All Employees.” Change the names of the other data series to “Men” and “Women” in a similar fashion.

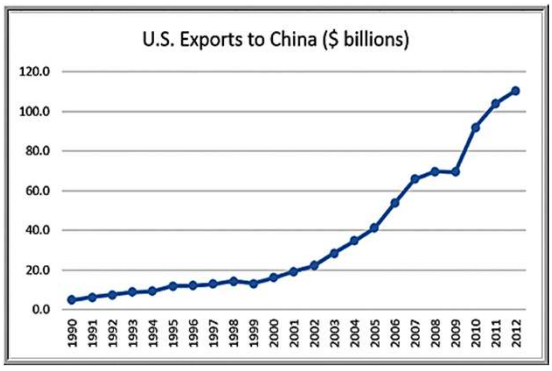




Line Charts

- Line charts provide a useful means for displaying data over time.
  - You may plot multiple data series in line charts; however, they can be difficult to interpret if the magnitude of the data values differs greatly. In that case, it would be advisable to create separate charts for each data series.

Example 3.3: A Line Chart for China Export Data

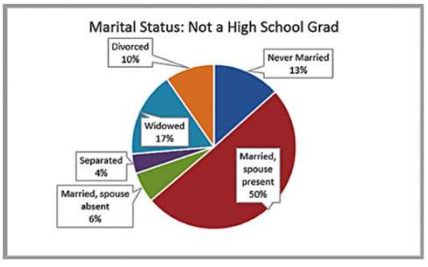


Pie Charts

- A pie chart displays the relative proportion of each data source to the total by partitioning a circle into pie-shaped areas.

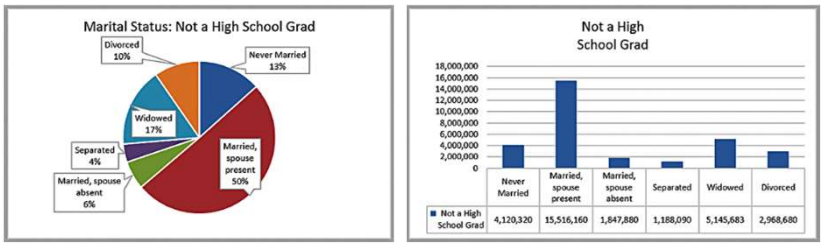
Example 3.4: A Pie Chart for Census Data

	A	B	C	D	E	F	G
1	Census Education Data						
2		Not a High School Grad	High School Graduate	Some College No Degree	Associate's Degree	Bachelor's Degree	Advanced Degree
18	Marital Status						
19	Never Married	4,120,320	7,777,104	4,789,872	1,828,392	5,124,648	2,137,416
20	Married, spouse present	15,516,160	36,382,720	18,084,352	8,346,624	19,154,432	9,523,712
21	Married, spouse absent	1,847,880	2,368,024	1,184,012	465,392	670,712	301,136
22	Separated	1,188,090	1,667,010	842,715	336,165	405,240	185,780
23	Widowed	5,145,683	4,670,488	1,765,010	556,657	977,544	475,195
24	Divorced	2,968,680	7,003,040	3,806,000	1,674,640	2,340,690	1,217,920



Pie Chart Alternatives

- Data visualization professionals don't recommend using pie charts. In a pie chart, it is difficult to compare the relative sizes of areas; however, the bars in the column chart can easily be compared to determine relative ratios of the data.

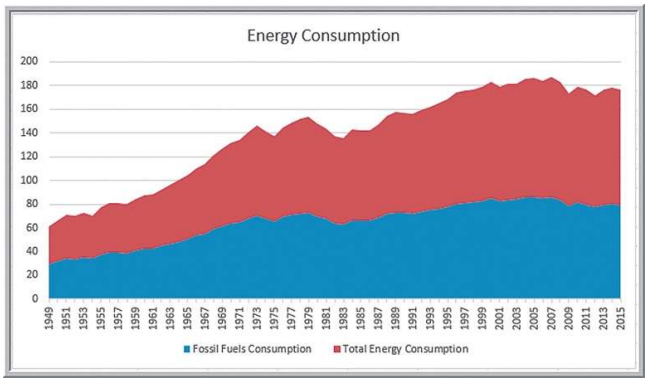


  - If you do use pie charts, restrict them to small numbers of categories, always ensure that the numbers add to 100%, and use labels to display the group names and actual percentages. Avoid three-dimensional (3-D) pie charts—especially those that are rotated—and keep them simple.

Area Charts

- An area chart combines the features of a pie chart with those of line charts.
  - Area charts present more information than pie or line charts alone but may clutter the observer's mind with too many details if too many data series are used; thus, they should be used with care.

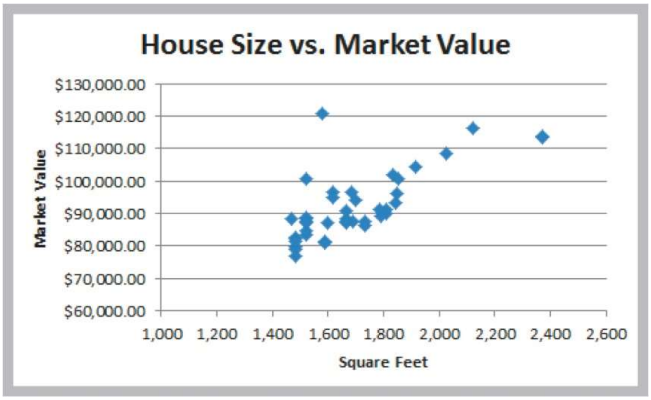
Example 3.5: An Area Chart for Energy Consumption



Scatter Charts

- Scatter charts show the relationship between two variables. To construct a scatter chart, we need observations that consist of pairs of variables.

Example 3.6: A Scatter Chart for Real Estate Data



Geographic Data Using Tableau

- Many applications of business analytics involve geographic data. Visualizing geographic data can highlight key data relationships, identify trends, and uncover business opportunities. In addition, it can often help to spot data errors and help end users understand solutions, thus increasing the likelihood of acceptance of decision models.
- Companies like Nike use geographic data and information systems for visualizing where products are being distributed and how that relates to demographic and sales information. This information is vital to marketing strategies.
- *Tableau* applications

