

# Accounting Information Systems

## Spring 2023 – Tableau Part 1

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### Overview

The learning objective of this module is to introduce you to data analytics which employers consistently tell us are important to new accountants. We will be using an EY-developed case, *Implementing the DuPont Method*, which I have edited for AIS.

A key purpose of financial statements is to provide useful information to decision makers, including investors. Investors can use the information contained in financial statements to better understand company performance so they can make better investment decisions. One introductory framework that has been especially useful in understanding company performance is the DuPont Method (sometimes called DuPont Analysis, DuPont Model or DuPont Framework).

The project consists of several tasks to implement the analytics mindset in an audit context to learn to:

- Ask the right business questions
- Extract, transform and load relevant data (i.e., the ETL process)
- Apply appropriate data analytics techniques
- Interpret and share the results with stakeholders

In this case, you will implement an analytics mindset by comparing and contrasting different companies within different industries using the accounting ratios from the DuPont method. **Your overall goal is to develop an investment recommendation for an investor.**

You will need to read and understand the *Tableau Case Background* document to complete the Tableau Module. It describes the DuPont Method, the history of the model, an overview of the case and provides descriptions of the data file used in the case. You will need information from the case background to complete both Part 1 and Part 2.

The data for this case was extracted from company financial statements posted online from credible sources and has been loaded into the Excel file. You can assume that the web scrapper accurately and completely extracted the information and loaded it into Excel. In this part of the case, you will be verifying your data loaded successfully into Tableau, verifying the data loaded correctly, and creating preliminary analytics.

Realize for many situations, extracting, transforming, and loading (ETL) the data can account for over 80 percent of the time in the entire data analysis process. This case simplifies this process so you can focus on developing other aspects of an analytics mindset.

**Part 1** is an introduction to Tableau which you will **complete and submit individually**. It consists of two tasks to introduce you to the software and the analytics mindset.

- **Task 1** – Practice asking the right questions by completing the Task 1 Exercise on Blackboard.
- **Task 2** – Load the data into Tableau, apply data analytics techniques and develop a dashboard highlighting your analysis.

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## Required

### Task 1: Ask the right questions

This task focuses on developing an analytics mindset — **Ask the right questions**. A significant portion of developing your analytical mindset happens before you analyze data.

The purpose of this exercise is to help you gain an understanding of a few accounting ratios, which will help you to develop the right questions about the companies you are analyzing. While you already have a fundamental understanding of the DuPont Method and are aware of the data elements available to you, you have not yet determined the best way to analyze the data to provide the most relevant insights. To gather the most relevant insights, you must start by asking the right questions of the data.

In this exercise which you will complete on Blackboard, you will think through the DuPont Method in detail, so you understand some of the business context. Read the *Tableau Case Background* document and then complete the exercise on Blackboard. See Blackboard for a sample worksheet which will help you organize your thoughts before entering the answers online.

### Task 2: Load data and perform analytics

This task focuses on two primary parts of performing data analytics:

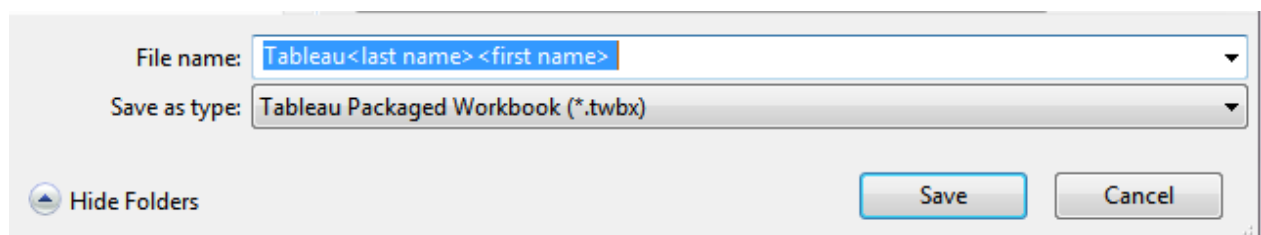
- **Extract, transform and load process (ETL)** – The data extraction has already been performed, and you will complete the transformation and load steps including verifying the data loaded completely and accurately.
- **Analyze Data** – You will answer specific questions by creating views/visualizations based on the starting data file.
- You will need information from the *Tableau Case Background* document to complete the ETL and Analytics portions of Task 2.

All the detailed steps for the ETL and Analytics portions of Task 2 are listed in the table starting on the page 4.

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## Submit your Assignment

- **Task 1** – Complete the exercise on Blackboard.
- **Task 2**
  - **Review the Tableau Checklist before submitting your file.**
  - Save your Tableau file as a Tableau Package by following the menu path: File>Save As>. Choose “Tableau Packaged Workbook” from the “Save as Type” drop down menu.



- Verify the file extension is .twbx before uploading!
- Upload your Tableau Package to Blackboard on the Software Modules>Tableau Module Folder page before the due date. The item name is “Submit Tableau Task 2”.

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## Tableau Submission Checklist

<input checked="" type="checkbox"/>	#	Instructions
	<b>A</b>	Ensure all tabs for the worksheets and the dashboard are named correctly
	<b>B</b>	Verify all the numbers are formatted correctly (percent, decimal numbers, etc.) <ul style="list-style-type: none"> <li>• Axis</li> <li>• Pane</li> </ul>
	<b>C</b>	Ensure you edit the title for each view to include the <Sheet Name> and descriptive text
	<b>D</b>	Double check that “Show Captions” is activated for the worksheets
	<b>E</b>	Verify all data values are labeled and all label marks are clearly visible
	<b>F</b>	Axes are readable.
	<b>G</b>	All label marks are visible
	<b>H</b>	Save your file as a Tableau Packaged Workbook <b>.twbx</b> file

# Load Data

✓	#	Instructions	Tips	Useful Links
	A	Download the Excel source data		
	B	Import the data into Tableau		<a href="#">Tableau - Connect to your data</a>
	C	Link the tables using joins		
		We need to tell Tableau how the data in each tab is connected to each other. Tableau will interpret each tab as an individual table, and we will join our data to create a logical table that contains values merged from all underlying physical tables. All the joins will be inner joins and you will need to edit the fields used for every join.		<a href="#">Tableau - Logical and Physical Layers in Tableau's Data Model</a>
		<ul style="list-style-type: none"> <li>Drag the first table on to the canvas and open the physical layer.</li> </ul>	<i>You should have as many fields (columns) and rows of data as you do in that tab in the Excel file.</i>	<a href="#">Tableau - Join your data</a>
		<ul style="list-style-type: none"> <li>Drag the second table onto the canvas and create an appropriate join to ensure each company in the <b>1 - Company Info</b> table can match multiple lines in the <b>2 - Balance Sheet</b> table as each company has multiple years of data.</li> </ul>	<i>Think of how to uniquely identify each company and how to "foreign keys" help us connect different tables.</i>	Tableau Case Background document
		<ul style="list-style-type: none"> <li>Connect the <b>3 - Income Statement</b> and <b>4 - Supplemental Data</b> with appropriate joins so that you match each table by a field that acts as a unique company identifier <b>and</b> by a field that allows you to match one row per company year.</li> </ul>	<i>You should end up with each row in the merged table representing a company-year, for a total of 1764 rows.</i>	<a href="#">Tableau - Join Clauses</a>
	D	Name your Tableau file " <b>Tableau_1-2_&lt;surname&gt;_&lt;first name&gt;</b> ".		

# Verify Data

✓	#	Instructions	Tips	Useful Links
		In this section we will create some worksheets to help us validate that the data was imported correctly.		
	A	<p>Answer the questions below to make sure you loaded the data correctly by creating a separate “visualization”, “viz” or “view” for each question.</p> <p>In each worksheet, apply the following formatting:</p> <ul style="list-style-type: none"> <li>Name each worksheet created “V1”, “V2” and “V3”.</li> <li>Edit the title to each worksheet and add text to tell an audience what the visualization is trying to communicate. Keep the worksheet reference name and add descriptive text.</li> <li>Show captions for each worksheet.</li> </ul>	<i>Check figures provided to verify your data</i>	<a href="#">Tableau - Drag and drop to take a first look</a>
	V1	<p><b>What are the combined total assets of all companies for all years?</b></p> <ul style="list-style-type: none"> <li>Display as a single number</li> <li>Add number formatting to show the “\$” symbol and “,” separator</li> </ul>	<i>\$61,136,986,998,000</i>	
	V2	<p><b>How many different companies are in each industry? How many different companies are included in the dataset?</b></p> <ul style="list-style-type: none"> <li>Display as a highlight table</li> <li>Sort smallest to largest</li> <li>Add stepped color based on the number of companies calculated in any palette of your choosing and in 5 steps</li> <li>Add a column grand total</li> </ul>	<p>14 Telecommunication Services</p> <p>15 Consumer Durables &amp; Apparel</p> <p>15 Consumer Services</p> <p>18 Commercial &amp; Professional Svs.</p> <p>19 Automobiles &amp; Components</p> <p>19 Media &amp; Entertainment</p> <p>19 Transportation</p> <p>20 Food, Beverage &amp; Tobacco</p> <p>20 Materials</p> <p>311 Grand Total</p>	<p>20 Semiconductors &amp; Semiconductor Equip.</p> <p>20 Utilities</p> <p>21 Capital Goods</p> <p>22 Energy</p> <p>22 Technology Hardware &amp; Equip.</p> <p>23 Retailing</p> <p>24 Software &amp; Services</p> <p><a href="#">Tableau – Build a Highlight Table (Heatmap)</a></p> <p><a href="#">Tableau - Color Palettes</a></p>

V3	<p><b>How many distinct companies are in each stock exchange?</b></p> <ul style="list-style-type: none"> <li>Choose Pie chart on the Marks shelf. (Show Me will not work for this.)</li> <li>Add color to chart based on stock exchange</li> <li>Add the number of unique companies to both size and labels</li> <li>Also add stock exchange to labels so both the exchange and company count are shown</li> </ul>	<p>182 NYSE</p> <p>129 NASDAQ</p>	
B	<p>Create a Dashboard that includes V1, V2, and V3.</p> <ul style="list-style-type: none"> <li>Define the Dashboard size to be PowerPoint (1600 x 900)</li> <li>Arrange the tiles so that the data is easy visible at a glance and there are no scroll bars</li> <li>Name the Dashboard tab "Dashboard"</li> </ul>		

# Transform Data

✓	#	Instructions	Tips	Useful Links
		In this section we will transform the data by adding fields needed for further analysis. We will also create worksheets that use these new fields.		
	A	<p>When dates are interpreted as strings or numbers, we lose all of the features and conveniences of working with date fields, so we want to try to convert the fiscal year data that get read into Tableau into a date field.</p> <p>Create a new date field, FS Year, that Tableau can recognize as a Date data type by using the Fiscal Year(FYEAR) in a calculated field formula.</p>	<p>Use the following formula:</p> <ul style="list-style-type: none"> <li><code>dateparse("yyyy", STR([Fiscal Year (FYEAR)]))</code></li> </ul>	<a href="#">Tableau - Convert a Field to a Date Field</a>  <a href="#">Tableau - Date Functions</a>
	B	<p>Create four (4) new calculated fields for the ratios involved in the DuPont Method:</p> <ul style="list-style-type: none"> <li>Return on Equity = Net Income / Stockholder's Equity</li> <li>Net Profit Margin Ratio = Net Income / Revenue</li> <li>Asset Turnover Ratio = Revenue / Total Assets</li> <li>Financial Leverage Ratio = Total Assets / Stockholder's Equity</li> </ul>	<p><i>Note: we will be using year end numbers for this project to calculate the ratios.</i></p>	<a href="#">Tableau - Create a Simple Calculated Field</a>
	C	<p>For each of the new calculated fields in "B", set the Default Properties &gt; Number Format as follows:</p> <ul style="list-style-type: none"> <li>Percentage, 2 decimal places for <ul style="list-style-type: none"> <li>Return on Equity</li> <li>Net Profit Margin Ratio</li> </ul> </li> <li>Number(custom), 2 decimal places for <ul style="list-style-type: none"> <li>Asset Turnover Ratio</li> <li>Financial Leverage Ratio</li> </ul> </li> </ul>	<p><i>Setting a default will mean every time one of these gets added into a view, the values will show up formatted that way, saving time. However, the format on the axis or the pane can still be manipulated and changed in each individual view.</i></p>	<a href="#">Tableau - Format Text and Numbers</a>
	D	Answer the questions below to review the fields you created. Create a separate worksheet for T1 and T2 below.		

		<p>In each worksheet, apply the following formatting:</p> <ul style="list-style-type: none"> <li>Edit the title to each worksheet and add text to tell an audience what the visualization is trying to communicate. Keep the worksheet reference name and add descriptive text.</li> <li>Show captions for each worksheet.</li> <li>Name each worksheet created "T1", "T2".</li> </ul>												
	T1	<p><b>What are the DuPont ratios for each company for every fiscal year?</b></p> <p>Create a text table that shows one row for each company-year, with companies grouped by industries, and different columns for each of the four calculated DuPont ratios.</p> <p>This table will serve mostly reference purposes and to validate your calculated fields.</p> <table> <tr> <th>Requirements</th><th>Chart Type</th><th>Mark Labels</th><th>Color</th><th>Tips &amp; Links</th></tr> <tr> <td> <ul style="list-style-type: none"> <li>Show Industry, Company Name, Ticker Symbol and Year data in rows</li> <li>Each DuPont ratio will form its own column</li> <li>Sort by Industry by Company Name by Year</li> </ul> </td><td>Text Table</td><td>Measure values</td><td>N/A</td><td> <a href="#">Tableau - Build a Text Table</a>            Tableau may to the sort correctly for you if you add the fields in the specified order.         </td></tr> </table>	Requirements	Chart Type	Mark Labels	Color	Tips & Links	<ul style="list-style-type: none"> <li>Show Industry, Company Name, Ticker Symbol and Year data in rows</li> <li>Each DuPont ratio will form its own column</li> <li>Sort by Industry by Company Name by Year</li> </ul>	Text Table	Measure values	N/A	<a href="#">Tableau - Build a Text Table</a> Tableau may to the sort correctly for you if you add the fields in the specified order.		
Requirements	Chart Type	Mark Labels	Color	Tips & Links										
<ul style="list-style-type: none"> <li>Show Industry, Company Name, Ticker Symbol and Year data in rows</li> <li>Each DuPont ratio will form its own column</li> <li>Sort by Industry by Company Name by Year</li> </ul>	Text Table	Measure values	N/A	<a href="#">Tableau - Build a Text Table</a> Tableau may to the sort correctly for you if you add the fields in the specified order.										
	T2	<p><b>What are the DuPont ratios for each Industry?</b></p> <p>For each industry, show the median ratio value for all company-years in a multi-bar graph display. (Check figure - ROE for Retailing is 20.01%)</p> <p>Here we start dealing with aggregation for calculated fields, whereas in T1 everything is disaggregated because our underlying data is at the company year level, and our view is also at the company year. Defining the aggregation to be MEDIAN() means we are displaying the median value of all of those company-year level calculations. We will</p>												



			use median as it is less susceptible to outliers than average.		
Requirements	Chart Type	Mark Labels	Color	Tips & Links	
<ul style="list-style-type: none"><li>Each industry should have its own row and each ratio will form its own column</li><li>Define median as the aggregation for all ratios</li><li>Sort by Return on Equity descending</li></ul>	Bar	Measure values	Differentiate ratios (Each ratio should be a different color)	<p>You could flip the rows and columns if it makes it easier to compare in your display</p> <p><a href="#">Tableau - Build a Bar Chart</a></p>	

# Analyze Data

✓	#	Instructions				Tips		Useful Links
	A	<p>Create new worksheets to answer each of the questions below with a view.</p> <p>In each worksheet, apply the following formatting:</p> <ul style="list-style-type: none"> <li>Edit the title to each worksheet and add text to tell an audience what the visualization is trying to communicate. Keep the worksheet reference name and add descriptive text.</li> <li>Show captions for each worksheet.</li> <li>Name each worksheet created "A1", "A2", etc.</li> <li>Ensure measure values have the following number format: <ul style="list-style-type: none"> <li><b>Any financial number</b> - As number or currency, "," separator, "billions(b), millions (m), etc." units optional as appropriate</li> <li><b>ROE or NPM ratios</b> - As percentages % with 2 decimal points as default</li> <li><b>Asset turnover and financial leverage ratios</b> - As numbers with 2 decimal points as default</li> </ul> </li> </ul>						<a href="#">Tableau - Titles</a> <a href="#">Tableau - Captions</a> <a href="#">Tableau - Format Titles, Captions, Tooltips and Legends</a>
	A1	Which companies had over \$20B in Net Income for 2021?						
		Requirements	Chart Type	Mark Labels	Color	Apply Filter	Show Filter	Tips & Links
		<ul style="list-style-type: none"> <li>Show only company name and Net Income on view</li> <li>Show only the 10 companies meeting the threshold.</li> <li>Sort in descending order by Net Income.</li> </ul>	Bar	Net Income	Diff. Industries	1 measure and 1 dimension	N/A	<a href="#">Tableau - Sort Data in a Visualization</a> <a href="#">Tableau – Show, Hide, and Format Mark Labels</a> <a href="#">Tableau - Build a Bar Chart</a>

A2	What are the forecasted R&D expenditures for Alphabet, Amazon and Apple for 2022-2026?							
	Requirements	Chart Type	Mark Labels	Color	Apply Filter	Show Filter	Tips & Links	
	<ul style="list-style-type: none"> <li>Create a multi-line chart with R&amp;D expense from 2016 - 2021</li> <li>Manually select the companies in the filter</li> <li>Add a forecast model and customize it using options: <ul style="list-style-type: none"> <li>Forecast for 2022 - 2026</li> <li>Aggregate by year</li> <li>Do not ignore any years</li> <li>Create custom forecast model with additive trend and no seasonality</li> </ul> </li> </ul>	Line	XRD	Diff. companies & forecast	1 dimension	N/A	<a href="#">Tableau - Create a Forecast</a> <a href="#">Tableau - Build a Line Chart</a> <a href="#">Tableau - Format Numbers and Null Values</a>	

A3	What is the correlation between median Asset Turnover and median Net Profit Margin for each company by Industry? (*Interactive)					Feel free to play around and change the size and the shape of the marks		
	Requirements	Chart Type	Mark Labels	Color	Apply Filter	Pages*	Tips & Links	
	<ul style="list-style-type: none"> <li>Show median Asset Turnover on the x-axis</li> <li>Show median Net Profit Margin on the y-axis</li> <li>Show a (detail) mark per company and label the mark with the ticker symbol</li> <li>Add an average line for both axes to the pane</li> <li>Show pages by industry</li> <li>Add Company Name as a Tooltip</li> </ul>	Scattered plot	Ticker	N/A	N/A	Show pages by Industry	<a href="#">Tableau - Build a Scattered Plot</a> <a href="#">Tableau - Interacting with Views, Using Page Playback</a> <a href="#">Tableau - Tooltips</a>	

A4	What are the trends for Walt Disney Revenue Total and COGS? (*Interactive)							
	Requirements	Chart Type	Mark Labels	Color	Apply Filter	Show Filter*	Tips & Links	
	<ul style="list-style-type: none"> <li>Create a combination chart for Total revenue and COGS for only one company.</li> <li>Assign REVT as a line and COGS as bar</li> <li>Dual axis</li> <li>Synchronize axis</li> </ul>	Comb. Bar & Line	Measure Values	Diff. measures	1 dimension	Company Name or Ticker as single value dropdown	<a href="#">Tableau - Build Combination Charts</a> <a href="#">Tableau - Interacting with Views, Filtering Data</a>	

	A5	<b>What is the distribution of company EPS by industry for the year 2021, excluding outliers? (*Interactive)</b>						
		Requirements	Chart Type	Mark Labels	Color	Apply Filter	Show Filter*	Tips & Links
		<ul style="list-style-type: none"> <li>Create one box and whisker plot for each industry</li> <li>Show a (detail) mark for each company</li> <li>Exclude outliers over \$50</li> </ul>	Box and whisker	N/A	Diverging centered at zero	1 dimension 1 measure	Year as multi value list	<a href="#">Tableau - Build a Box Plot</a> <a href="#">Tableau - Interacting with Views, Filtering Data</a> <a href="#">Tableau - Color Palettes and Effects</a>

	A6	<b>What is the distribution for Audit Financial Statement Opinion and Audit Internal Control Opinion?</b>						
		Requirements	Chart Type	Mark Labels	Color	Apply Filter	Show Filter	Tips & Links
		<ul style="list-style-type: none"> <li>Create a highlight table (which we will use as a heat map) and display auditor opinion on the y axis by auditor opinion – internal control on the x axis</li> <li>Display a row for the count of companies receiving the combination of opinions for each auditor</li> <li>Add color to the counts</li> <li>Sort by the first column in descending order</li> </ul>	Adjusted Heat map	Ticker	Stepped color with 4 steps ending at 15 (under advanced)	N/A	N/A	<a href="#">Tableau – Build a Highlight Table (Heatmap)</a>