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Teaching Case

Data Analytics Projects with Microsoft Excel

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Abstract

This paper describes three business analytics projects using publicly available data. Each project is relatively small in scope and focuses on several specific skills within Microsoft Excel, yet flexible enough that they could be easily modified to accommodate more in-depth analysis. These projects may be used as additional classroom practice or assessment focusing on critical thinking skills that will help prepare students for their future careers in all disciplines upon graduation.

Keywords: Microsoft Excel, data analysis, data analytics, business analytics, analytics project, teaching case

1. INTRODUCTION

With the increasing demand of data analysis and data presentation skills in the workplace, college graduates are required to demonstrate their proficiency in these areas upon entering the workforce (Arnett, 2017). As one of the most popular productivity software packages in the world, Microsoft Excel is one of the required digital skills that can help a candidate find a job (Weber, 2015).

There are many resources to learn about Microsoft Excel. Many of these materials focus on how to do certain tasks using the program. Some practice and follow up assignments provide opportunities for students to apply what they have learned in different scenarios. However, these task-based practice materials are still far from what students will encounter when working in real-world organizations.

This paper presents three data analysis projects using Microsoft Excel. These assignments are designed to focus on higher-level learning where students apply the computer skills to real world scenarios using publicly available data. Students are also required to use Microsoft Excel to analyze data and interpret the results of their analysis in order to find answers to the questions.

The next sections describe the three analytics projects in more detail. Each project starts with a short introduction followed by the list of prerequisite skills, i.e., what students should already know how to use on Microsoft Excel. The case scenario is described next, followed by the project requirements.

2. EXCEL ANALYTICS PROJECT 1 – BENCHMARKING STUDY

Critical thinking is one of many skills employers are looking for from college graduates. In this assignment, students will work on developing this important skill using Microsoft Excel as a tool.

Prerequisites Skills
For this assignment, students should be familiar with the following skills using Microsoft Excel

1. Open, save, close, and navigate through a workbook and worksheet
2. Plan and create a workbook
3. Enter text, dates, and numbers data
4. Enter basic formulas
5. Enter basic SUM, AVERAGE, and COUNT functions

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6. Use AutoFill and Flashfill
7. Format cells content, background, and borders
8. Prepare and format a worksheet for printing

Case Scenario

One day at a family dinner, your dad and your uncle got into a debate about which basketball team is better. Your dad is a loyal fan of the State University while your uncle graduated from the University of State, a big rival of the State University. Your great aunt chimed in that the University of Next- State's basketball team is the best.

You mentioned that there are multiple different ways you can compare the performance of the basketball teams and you will bring in your analysis to the next family dinner.

Project Requirements

1. Please watch the "What is Benchmarking?" video to learn about Benchmarking, an approach used by many organizations to measure and compare themselves with others. The video is available at https://youtu.be/R6tJpyaFiQc.
2. Visit the College Basketball Stats and History website at http://www.sports-reference.com/cbb/. Select three comparable college men's basketball teams (to represent the three college teams from the above scenario) and locate their latest complete season statistics on the website.
3. Using Microsoft Excel, please conduct a benchmarking study comparing the performance of the three men's basketball teams side-by-side.
4. For each of the three teams, locate statistics that represents each TEAM's, not conference, performance. At the minimum, please include the following performance indicators for each team:
    a. Number of games won
    b. Number of games lost
    c. PTS -- Total Points
    d. G -- Games (i.e., number of games played during the season)
    e. FG% -- Field Goal Percentage
    f. 2P% -- 2-Point Field Goal Percentage
    g. TOV -- Total Turnovers
5. Please write an Excel formula to calculate the following statistics for each team:
    a. Win-lose percentage (W-L%) = Number of games won / Total number of games played
    b. Average points per game = Total Points / Total number of games played
    c. Average Turnovers per Game = Total Turnovers / Total number of games played
6. Provide TWO additional performance indicators that you think are appropriate.
7. Use clear titles, labels, sheet name, and other appropriate spreadsheet formats (e.g., font type, size, colors, borders, etc.) so users can easily locate the information.
8. Include appropriate information on the Page Header and Page Footer
9. Apply appropriate settings so that all information will be printed on one page.
10. Use information from your analysis to answer the following questions:
    a. According to the data, which team had the highest Win-lose percentage (W-L%)?
    b. According to the data, which team had the highest Field Goal Percentage (FG%)?
    c. What is the Average Points per Game for the State University, i.e., your dad's favorite team, during the most recent season?
    d. What is the Average Turnovers per Game for the University of State, i.e., your uncle's favorite team, during the most recent season?
    e. According to the data, which team had the best performance in the most recent season when it comes to Turnovers? Note: In basketball, a turnover occurs when a team loses possession of the ball to the opposing team before a player takes a shot at his team's basket.
    f. Discussion: What were the two additional performance indicators that you selected? Why did you choose these indicators and which team performed the best according to these indicators? Please explain your answer.
    g. Discussion: According to your spreadsheet, which performance indicator do you think is the most important for this analysis and why? Please explain your answer.
    h. Discussion: Among the three teams, which team do you think performed the best during the season and why? Please explain your answer using information from the analyses you conducted on the spreadsheet.
11. Save the Excel file and submit it as required by your instructor.

3. EXCEL ANALYTICS PROJECT 2 – DATA VISUALIZATION

Data presentation and visualization are two of the top skills required by employers (Fisher, 2016). In this assignment, students will learn about appropriate chart types for data visualization and create several charts and graphs using Microsoft Excel.

Prerequisites Skills

For this assignment, students should be familiar with the following skills using Microsoft Excel

1. Open, save, close, and navigate through a workbook and worksheet
2. Move and copy a worksheet across workbooks
3. Create a chart
4. Modify the chart's data source
5. Format a chart legend and other chart elements
6. Move and resize a chart

Reading Requirements

1. Please read the article Best Excel charts types for data analysis, presentation, and reporting (Sharma, 2017)
2. Examine "bad" examples on Misleading Graphs: Real Life Examples (Andale, 2016)
3. Review the guidelines on how to Choose the Right Chart Type for your Data (Agarwal, 2016) You may also use the Chart Chooser (Hilburn, 2012) to help you decide.

Case Scenario

National Park Services (NPS) is a federal agency of the United States government responsible for managing all U.S. national parks, many American national monuments, and many other conservation and historical properties. Information about visitation at units of the NPS is publicly available and may be downloaded at https://irma.nps.gov/Stats/

You work for a company that specializes in guided tours of national parks across the United States. As an assistant to the Director of Marketing, you were asked to analyze some visit data at selected national parks. Your boss is specifically interested in the number of visitors as well as the trend of recreational visits over the years. The information will be used to develop marketing strategies, promotional packages, as well as advertising campaigns for the next five years.

Project Requirements

1. Please prepare a data file for the analysis. The data are publicly available and can be downloaded from the NPS Stats website located at https://irma.nps.gov/Stats/.
   a. From the NPS Stats Home page, navigate to the **National Reports** section and click the **Recreation Visitation By State and by Park (1979 – Last Calendar Year)** report. Select one or more states as indicated by your instructor and click View Report. Click the Export dropdown menu and select Excel. Save the exported Excel file.
   b. From the NPS Stats Home page, navigate to the **Park Reports** section. Select a park (of your choice or as indicated by your instructor) from the dropdown list and click the **Recreation Visits By Month (1979 - Current Calendar Year**) report. Click the Export dropdown menu and select Excel. Move the worksheet containing the Park Report data so it is located on the same file as the State Report from step 1a and make sure to update the worksheet name accordingly. Repeat these steps as needed to pull data for other parks as indicated by your instructor.
2. Using the data file prepared in the previous steps, please answer the following questions. Some questions might require you to create charts and/or graphs using Microsoft Excel.
   a. What are the parks located in the state that you selected?
   b. How many people visited the parks in the state that you selected during the most recent calendar year? Please create ONE chart that provides the answer(s) to this question.
   c. What is the percentage of visitors at each location? In other words, what were the compositions of NPS visitors in the selected state by location? Please create ONE chart that provides the answer(s) to this question.
   d. When was the most popular time, i.e., month, to visit the top three parks in the state during the current calendar year? Please create ONE chart that could provide the answer visually. This chart should show the number of visitors for each location for each month.
   e. Select one park from your data set and create ONE chart showing the visitor trend over the years. In your own words, please describe the trend according to the chart you created.
   f. Discussion: What type of Excel chart did you choose to create in order to provide answer to each question? Why did you

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select this chart type? Please explain your answer.

Please keep in mind that, at the minimum, each chart should...

- Use an appropriate chart type to the data that you're trying to represent.
- Provide an accurate and complete answer(s) to the question.
- Include appropriate and meaningful chart elements (e.g., chart title, data labels, legend keys, etc.) without being too cluttered.
- Use clear and appropriate titles and labels without being too cluttered.
- Be placed on its own chart sheet with appropriate worksheet (i.e., tab) names.

4. EXCEL ANALYTICS PROJECT 3 – DATA ANALYSIS WITH PIVOT TABLE

The Pivot Table in Microsoft Excel is a powerful yet easy to use tool that can be used to analyze and manage large volume of data. In this assignment, students will analyze data using Excel Pivot Tables in order to find answers to common business-related questions.

Prerequisites Skills

For this assignment, students should be familiar with the following skills using Microsoft Excel

1. Create and modify a PivotTable
2. Apply PivotTable styles and formatting
3. Filter a PivotTable
4. Insert a slicer to filter a PivotTable
5. Create a PivotChart

Case Scenario

Headquartered in Memphis, TN, Grenadier Super Store (GSS) specializes in office supplies and furniture. The company's customers range from individual consumers and small businesses (retail), to corporate organizations (wholesale) located in the United States and Canada.

You are an intern working for the Canada division of GSS. Your supervisor has given you an Excel file containing Order data from 2009-2012 and he would like you to analyze Orders/Customers/Sales data using PivotTables and PivotCharts.

Project Requirements

1. Please download the data file (Excel Format) (or obtain a copy from your instructor)
   a. Using data from the starting data file, please create PivotTables and PivotCharts that can be used to answer the following questions.

   b. **What are the Regional Sales by Product Category and Product Sub-Category?** Please create ONE PivotTable showing Total Sales breakdown by Region, Product Category, and Product Sub-Category. Use information from the PivotTable to answer the following questions:
      i. What was the Total Sales figure included in this data set?
      ii. Which Product Category had the highest sales?
      iii. Which Region had the lowest sales?
      iv. What was the Total Sales of Appliances in Ontario?

   c. **What are the Total Costs of Shipping by Order Priority and Ship Mode?** Please create ONE PivotTable showing the total Shipping Costs organized by Ship Mode and Order Priority. On the same worksheet, please also create one a PivotChart (based on the PivotTable) to visually compare the shipping information. Use information from the PivotTable and PivotChart to answer the following questions:
      i. What was the Total Shipping Cost for Critical orders?
      ii. GSS incurred the most shipping costs using which shipping method?
      iii. Discussion: If the Delivery Truck is the most economical but the slowest shipping method and Express Air is the fastest but the most expensive one, do you think the company appropriately spent shipping costs based on the Order Priority? Please explain your answer.

   d. **Who are the most valuable customers?** Please create ONE PivotTable showing the Customer Names who placed orders with GSS during 2009-2012. For each customer, please also show the total number of orders, Total Sales, and Total Profit. Add a Slicer or a Filter that can be used to show the information specifically for each Customer Segment. Use information from the PivotTable to answer the following questions (Hint: Filter and sort the data in the PivotTable to locate the answer):
      i. Which Small Business customer had the highest sales?

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ii. Which Corporate customer placed the most number of orders in 2009-2012? How many orders were placed by the Corporate customer?
iii. Which Consumer customer was the most profitable one?
iv. What is the sales figure of the least profitable Home Office customer?

At the minimum, each PivotTable should...

- Contain all required information
- Be well structured in order to easily locate information and provide accurate and complete answer(s) to the question.
- Use clear and meaningful headings and labels
- Use an appropriate number format
- Be placed on its own worksheet with an appropriate worksheet (i.e., tab) name.
- The PivotChart should be on the same worksheet as the PivotTable. Make sure to use an appropriate chart type with complete and meaningful chart elements (e.g., chart title, data labels, legend keys, etc.) and clear and appropriate titles and labels without being too cluttered.

2. Save the file and submit it as required by your instructor.

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