

Using Visualization Software in the Audit of Revenue Transactions to Identify Anomalies

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ABSTRACT: Recent changes in the accounting profession require students to enter the workforce with technical and critical-thinking skills using large datasets. In an audit setting, an important skill is the ability to identify anomalies and risk factors in the client's data. This instructional case provides students with experience using visualization to identify anomalous transactions for further substantive testing based on relationships between financial data (revenues) and nonfinancial data (weather patterns). Students must also create a memo for the workpaper files that documents their findings, including recommendations for the audit team to select specific sales transactions for substantive testing. Aside from gaining experience with Tableau visualization software, this case will improve students' problem-solving and analytical skills by encouraging them to work independently and to break a complex problem into manageable pieces. This case is most applicable for implementation in undergraduate or graduate auditing or internal auditing courses.

Keywords: audit risks; Big Data; data analytics; data visualization; identifying anomalies; revenues.

THE CASE

Company Background

You were recently promoted to audit senior at your firm, Aoife & Josephine LLP, and one of your primary clients is Souper Bowl Inc. Souper Bowl ("the company") is a privately held business headquartered in Maine, and has a fiscal year-end of December 31. The company has been in business for nine years and prides itself on offering creative soups at a reasonable price and that are made with locally sourced ingredients. The most popular soups include sweet potato corn chowder, curried root vegetable and lentil, and maple-roasted butternut squash. Souper Bowl typically experiences increased sales during winter months since soup hits the spot on a cold and snowy day. To further encourage sales on days when customers often avoid venturing outside, the company provides a delivery service and guarantees that soup can be delivered to anyone no matter what the weather. The company found this strategy to be particularly successful in 2015 when New England (including Maine) experienced record snowfall during February and March.

Souper Bowl sells their soup at several restaurant locations throughout Maine. The company employs three managers that direct the day-to-day operations for a group of stores that are organized by approximate geographic region: northern Maine (Store Type 1), mid-Maine (Store Type 2), and coastal Maine (Store Type 3). Appendix A provides a map of these store locations. Each manager knows their local market well and has the flexibility to advertise and offer promotions with the overall goal of increasing sales year over year. If total sales at the end of the year exceed total sales from the prior year for that manager's set of locations (i.e., "Store Type"), then the manager earns a monetary bonus from the company.

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Supplemental material can be accessed by clicking the link in Appendix C.

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An audit of the company is required to comply with debt covenants related to a large bank loan that the company entered into when it began operations. Specifically, Souper Bowl must provide audited annual financial statements to the bank within 90 days of the fiscal year-end. The company must also provide unaudited quarterly financial statements to the bank within 45 days of the end of each quarter. The debt contract includes a financial covenant that requires pre-tax income in each quarter to be greater than zero. If not met, the bank has multiple remedies at its disposal, including calling the loan such that the entire balance is due immediately, seizing the company's assets that are posted as collateral, or providing a waiver for the violation. Souper Bowl's net income for the year ended December 31, 2016 is \$468,810, while net income for the prior year ended December 31, 2015 was \$825,229.

Auditing Revenues

As part of your new role as audit senior, you will be performing a large portion of the planning and testing of sales for the 2016 audit of Souper Bowl. AU-C Section 240.26 states that "when identifying and assessing the risks of material misstatement due to fraud, the auditor should, based on a presumption that risks of fraud exist in revenue recognition, evaluate which types of revenue, revenue transactions, or assertions give rise to such risks." During planning for the audit, the partner and manager determined that the following three management assertions represent significant risks for revenues:

- (1) recorded sales occurred;
- (2) sales are accurately recorded; and
- (3) sales are recorded in the proper period.

In prior years, the audit approach relied on random sampling to test revenues. However, the partner wanted to develop more focused procedures in the current year to hone in on potentially riskier sales transactions. As a result, the plan is to perform disaggregated sales analytics to identify unusual trends in the daily sales data with the goal of identifying sales on specific days at specific store locations that should be subjected to substantive testing due to heightened risks. The remainder of the population would then be sampled using a random sampling approach.¹

Based on your experience from prior audits, you know that Souper Bowl's daily sales fluctuate with temperature and snow accumulation. To perform your revenue analytics, you request a file from the client that includes daily sales by store location for both 2016 (current year) and 2015 (prior year). You also retrieve daily weather data from the National Oceanic and Atmospheric Administration's (NOAA) website for the weather centers closest to Souper Bowl's store locations. Total revenue for the current year ended December 31, 2016 is \$18.8 million, while total revenue for the prior year ended December 31, 2015 was \$19.1 million. The audit team's workpapers include the following lead sheet for revenue testing, and the total balances for each year agree to the trial balance and the company's draft financial statements for 2016.

Souper Bowl Inc. Revenue Lead Sheet December 31, 2016

	2016	2015	Change	PBC % Change
Revenue, Store Type 1	\$4,062,390.97	\$4,032,383.16	\$30,007.81	0.74%
Revenue, Store Type 2	9,331,175.81	9,558,584.07	(227,408.26)	-2.38%
Revenue, Store Type 3	5,425,421.53	5,546,767.89	(121,346.36)	-2.19%
Total Revenue	\$18,818,988.31	\$19,137,735.12	\$(318,746.81)	-1.67%

Your manager stated that Tableau is a popular data visualization tool that your firm recently adopted and she instructed that you learn how to use it to perform these sales analytics. Since she is busy overseeing the planning and testing of other audit areas, she wants you to take the first pass and then document your results in a memo for her review. The manager wants you to provide thoughtful analyses and a thorough exploration of the possible relationships in the data. You are eager to impress her with your work, especially following your recent promotion to senior.

¹ As noted in [Christensen, Elder, and Glover \(2015\)](#), most of the large accounting firms emphasize the use of specific identification testing before random sampling to increase the efficiency and effectiveness of substantive tests. Specific identification testing, also referred to as directed sampling, is usually used to select and test individually significant items and those items identified as having a higher risk of misstatement.

Requirements

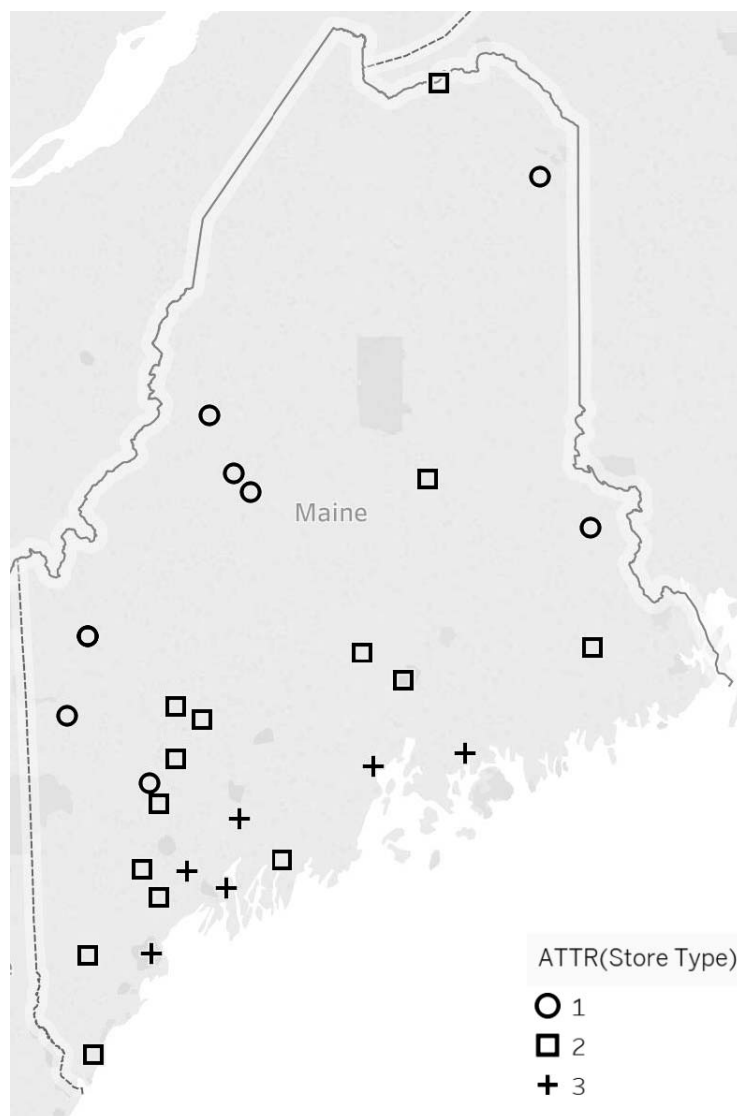
1. Read the articles assigned by your instructor to gain an understanding about how Big Data, data analytics, and new technologies are transforming external audits. After reading these articles, provide a response to the following two questions:
 - a. Discuss at least three specific ways in which Big Data, data analytics, and new technologies can enhance external audits. How does each item discussed improve the effectiveness and/or efficiency of the audit?
 - b. On the other hand, what challenges do auditors face when using Big Data, data analytics, and new technologies during an audit?
2. As noted in the case, auditing standards specifically require auditors to identify revenue recognition as a fraud risk in most audits. Based on your understanding of the company, what factors may increase the risk of fraudulent financial reporting in Souper Bowl's 2016 revenues?
3. Use the daily sales by location as provided by the client (2016 and 2015) and the weather data from NOAA to perform disaggregated sales analytics in Tableau. Your goal is to develop visualizations that identify potential outliers in the 2016 daily sales data related to the significant risks identified by the partner and manager. Using the memo template in Appendix B, document your analyses and conclusions as to the specific daily sales from certain locations that you recommend selecting for focused substantive testing.

Note: Your conclusion needs to be precise enough to pull specific transactions—for example, you would not list the “month of March” in store 1010 because this would result in too many observations to feasibly test. Also, you should not recommend testing observations from 2015. Your engagement team completed that audit in the prior year—instead, you are using 2015 data as a component of your baseline prediction for 2016.

REFERENCE

- Christensen, B., R. Elder, and S. Glover. 2015. Behind the numbers: Insights into large audit firm sampling policies. *Accounting Horizons* 29 (1): 61–81. <https://doi.org/10.2308/acch-50921>

APPENDIX A
Map of Store Locations for Souper Bowl Inc.



APPENDIX B

Example Memo Template*

Souper Bowl Inc.—December 31, 2016**Disaggregated Revenue Analytics**

Purpose: The purpose of this memo is to document plausible trends and expectations for disaggregated revenue data and to identify specific days and locations that warrant further substantive investigation.

Data: We obtained a listing of daily sales by location from the client's IT system. We tested the details for mathematical accuracy, as summarized in the table below:

	<u>Total Sales, 2015</u>	<u>Total Sales, 2016</u>
Store Type 1	\$	\$
Store Type 2	\$	\$
Store Type 3	\$	\$
Total	\$	\$

Procedures: Based on our risk assessment process, we identified the following assertions as significant risks related to revenues/sales:

- Recorded sales occurred.
- Sales are accurately recorded.
- Sales are recorded in the proper period.

Because Souper Bowl's operations are solely in the state of Maine, we obtained disaggregated data that reports daily sales by store location and Store Type. Based on discussions with management and our review of the board of director minutes, we are unaware of any new store locations or other major changes to operations during the year. Therefore, we expect the prior year's revenues to be a reasonable baseline expectation for this year's revenues (e.g., similar seasonal trends). Because the business can also be impacted by weather conditions, which vary by year, we also perform analyses that consider changes in weather patterns to predict expected changes from the prior year's sales. We performed several analytics to identify unusual trends as compared to the prior year's sales, taking weather conditions into consideration. The purpose of these analytics is to identify specific observations (or specific sets of observations) to select for further substantive testing. The analytics that we performed are as follows:

- **Visualization Analysis #1: Title**

[Provide a description of the relationship you expected to observe in the data, along with screenshots of the visualization results. Clearly identify (using circles, arrows, etc.) the part of the visualization that leads you to believe that a specific location/day is an anomaly. Ensure that all tables and graphics are properly labeled (x axis, y axis, etc.).]

- *Results: [In each of the "Results" sections, include a brief summary of your findings so that your manager can see (in words) the way that you interpret the visualization screenshots.]*

- **Visualization Analysis #2: Title**

- *Results:*

- *[The number of analyses that you perform is up to you. Remember that you want to impress your manager, but you also know that the manager's time is valuable. Therefore, each analysis that you report should offer new information and conclusions (e.g., avoid repeating the same type of analysis with different coloring, shapes, etc., if the conclusions drawn are the same.)]*

Conclusion: Based on the procedures described above, the audit team will pull supporting sales information to substantively test transactions from the following locations and days:

- *This section of the memo can be achieved by using lists or tables, but regardless of the style of presentation, it should clearly describe which item(s) you are recommending that the audit team look into further (based on all the analyses above). For each item, you should reference which analysis # the item comes from. The item should be a specific location on a specific day, or a sample of certain days from a set of observations that exhibit the same unusual trend based on your analyses above (e.g., if you identify an unusual relationship for Q4 for location #1001, but you cannot identify one specific day or set of days that is driving the unusual relationship, you may choose to sample from Q4*

instead). Remember that it takes time and resources to test each selection, so be strategic in your selections and include justification for your decisions in this section of the memo.

* NOTE: Appendix B is available as a downloadable Word document, see Appendix C for the link.

APPENDIX C

iace-52146_Example Memo Template: <http://dx.doi.org/10.2308/iace-52146.s01>