

# IDENTIFYING THE DATA VISUALIZATION CONTENT FOR INTRODUCTION TO COMPUTER INFORMATION SYSTEMS

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## ABSTRACT

The business world is now converging on big data and the ability to use this data in business decision making. The best way to consume this data is through visualization, or placing the data into patterns, trends or correlations that uncover relationships. The course content of introductory Computer Information Systems classes currently exposes business majors to an assortment of spreadsheet and/or data management concepts that allow students to manipulate data. The natural progression is to enhance this knowledge with the addition of data visualization. To identify the appropriate data visualization tool and knowledge to include in an introductory computer information systems class, we chose to interview business faculty and current data visualization practitioners, and to survey alumni. The results of the interviews and survey will be used to establish learning objectives, create teaching materials, and design the assessment materials for this new content inclusion.

**Keywords:** data visualization, course content, assessment

## INTRODUCTION

Data management, data driven, big data, data in the cloud, data interpretation . . . these are now common phrases in the business world. Each phrase centers on the idea that the amount of data now available for business decision making has grown exponentially since the advent of the Internet. This growth in data has fostered a new business trend to present data in a better way; to present data with data visualization. For example, data visualization is used to analyze social media success. Data visualization allows e-marketers to see patterns, identify trends, and discover visual insights from these patterns (Munoz & Wood, 2015). And, the Federal Reserve uses data visualization when manipulating economic data in order to illustrate theoretical relationships. Visualization is used to develop the connection between theories and the empirical evidence (Mendez-Carbajo, 2015).

This growing need for data visualization now requires a College of Business to enhance its core of common business knowledge with an understanding of the tools necessary to produce data-based visual images. Data visualization makes data more understandable to users and data visualization is becoming more popular for decision support and decision making (Dilla & Raschke, 2015; Knafllic, 2015). The topic of data visualization is discussed in many of the introduction to computer information systems text books (Rainer, Prince & Watson, 2015), but there is little or no actual application of data visualization tools (Kroenke & Boyle, 2016). Adding an applied component on data visualization is a natural extension of the spreadsheet and/or relational database concepts normally presented.

In addition, the Accreditation Standards for Business Accreditation (AACSB, 2013) describe in Standard 9 [Curriculum Content], that data creation, data sharing, data analytics, data mining, and data reporting

between and across organization is essential. Establishing data visualization in the business curriculum is a natural extension of this current requirement.

## **OBJECTIVE AND METHOD**

The objective of this research is to four fold. Since the successful use of data visualization will be a growing need in the general business and management knowledge area, we will do the following:

1. Identity the appropriate data visualization tool to be used,
2. Established learning objectives for data visualization,
3. Determine the data visualization knowledge and content to teach, and
4. Design a final data visualization activity that allows for the assessment of the established objectives.

To determine the data visualization knowledge and content to be taught, business faculty, data visualization practitioners, and other business stakeholders were interviewed. Tools, such as Datawrapper, Tableau, Google Charts, etc., were discussed to identify a choice for the initial implementation.

## **OUTCOMES**

The project to identify the appropriate data visualization tool, establish the learning objective for data visualization, determine the knowledge and content to teach, and to design a final activity for assessment is only partially complete at the time of submission. The presentation at the conference will have the completed document.

### **Identify a Data Visualization Tool**

To begin, faculty from multiple business fields (accounting, finance, marketing, computer information system, etc.) were interviewed to identify the data visualization tool preferred from the multiple business disciplines. There was mostly agreement that Tableau is the tool used by most of the disciplines at our institution. For example, the accounting faculty are using Tableau in the accounting information systems course, the finance faculty are using Tableau as the data visualization tool in two courses and marketing is considering its implementation. In computer information systems, there was a slight conflict. Faculty teaching the senior level business intelligence course favored Tableau because of its simplicity, while faculty currently teaching the introductory computer information systems course to freshman favor “anything but.” They felt strongly that Tableau was complex and would prove difficult for beginners.

The decision was made to provide Tableau instruction to the faculty that are currently teaching introductory classes. This would permit them to be a more informed about the tool and the possibility of making a more knowledgeable decision.

Two data visualization practitioners were also consulted. Both have extensive experience with spreadsheet applications, database applications and data visualization. Not surprisingly, both began using data visualization as an enhancement to spreadsheets, moving from spreadsheet tools such as pivot tables and simple graphs to the creation of dashboards. Both are currently employed as information technology consultants and both have now moved to consulting almost full-time in the development of data visualization projects. Our data visualization practitioners both favored the idea of Tableau for business majors. They listed reasons such as, 1) common in the market, 2) easy to learn (though both practitioners

had a computer information systems background (i.e. one was a major and the other a minor)), 3) available learning tools (books, computer-based learning, instructional videos from Youtube.com and others) and 4. favored by college competitions (both mentioned that they had observed advertisements for data visualization competitions for college students that used Tableau). Both also discussed the use of more complex data visualizations tools when engaged in more complex problems that involved more analytics or business intelligence, but felt that these tools would not be appropriate for a course offered to a broad array of non-technical business majors in a lower-level course.

At this writing, we have not yet finalized on the data visualization tool. We are in the process of providing direction for those faculty that need to learn more about the topic and the tools, so that they can make an informed decision.

### **Established Learning Objectives for Data Visualization**

After a discussion of the current computer information systems (CIS) course, it was determined that, though data visualization is an emerging field, the inclusion in an introductory CIS course would be limited to the content necessary to explain the concept and its application in business. In addition, the topic of data visualization would follow learning activities involving the design, creation and implementation of a small database. So students would already be familiar with sorting, filtering, and querying, and the concept and application of data importing and exporting from one tool to another (i.e. importing from a database to a spreadsheet or importing a spreadsheet into a data visualization tool).

There was agreement that conceptual content should include outlines and standards for choosing the best type of chart or visual for a given data set or question. And, there was agreement that the students should be provided the opportunity to create multiple visuals, ranging from simple charts (i.e., vertical and horizontal bar, line, pie, scatter plots and histograms) and to possibly include symbol maps. A large data set would be used that would permit students to explore the data and to answer complex, but level-appropriate, questions.

The learning objective for the data visualization content would be:

1. Students will experience the benefits of data visualization by completing an introductory-level guided experience.
2. Using the knowledge gained from this experience, student will create a data visualization to assist in decision making for a common business problem.

The guided experience will include the concepts of how to present information in an understandable, efficient, effective, and aesthetic manner, for the purposes of explaining ideas. In addition, the guided experience will allow the students to participate in “hands on” learning.

### **Determine Data Visualization Knowledge & Content**

Discussions surrounding the knowledge and content to include in the guided exercises and final data visualization project are ongoing. Outcomes from the input from faculty and data visualization practitioners will be included during the presentation.

## **Designing Final Data Visualization Activity for Assessment**

The authors are currently completing interviews with faculty in multiple business fields and engaging data visualization business practitioners. Outcomes from the faculty and practitioner's interviews, and the results of an online survey, will produce a draft assessment activity to be presented at the conference.

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