



TERRADOTTA

Data Visualizations 101

The basics of storytelling through numbers

Colleges and universities have a lot of stories to tell to a lot of different people. Prospective students and parents want to know if your school or program will be the right fit. Grant writers and donors want to know if your program is worthy of their support. Administrators want to know if the goals and objectives they have set are being met, and upper administration needs to know when institutional priorities are shifting from the bottom up.





More often than not, the stories these stakeholders want to see are built on numbers.

- What is the makeup of the student body?
- What percentage of students receive scholarships and financial aid?
- How many students find employment upon graduation?
- How is a school increasing its international footprint and creating more globally aware citizens?

Because nothing will put the average reader to sleep faster than a sea of numbers, it is important for anyone trying to present complex sets of data to a diverse audience to understand the basic tenets of data visualization—defining the story, identifying the relevant data, putting it into context, and presenting it in a way that makes the story easily understood.

What is data visualization?

In simplest terms, it is “the graphical display of abstract information for two purposes: sense-making (also called data analysis) and communication.”¹

This paper highlights a few things to consider as you communicate data driven stories to your various stakeholders.

Defining the Story

When it comes to telling a story (with numbers or otherwise) the first step is always getting a complete understanding of what it is you want to tell.

Start by answering the following questions:

- Who should we communicate it to?
- Why are we communicating it?
- What do we want to communicate?

The **Data Journalism Handbook** offers some good advice for anyone trying to tell a story through numbers:

*"In many ways, working with data is like interviewing a live source. You ask questions of the data and get it to reveal the answers. But just as a source can only give answers about which he or she has information, a data set can only answer questions for which it has the right records and the proper variables... Basically, you work backwards. First, list the data-evidenced statements you want to make in your story. Then decide which variables and records you would have to acquire and analyze in order to make those statements."*²

In short, your decisions about what data elements to track should be defined by what story you ultimately want to tell. Relying on what's available or on conventional assumptions without assessing how it will contribute to your story will hamper communication in the long run.

Identifying the Relevant Data

Once you have a clear vision of what you would like to communicate, the next step is identifying all the subsets of data necessary to adequately tell the story.

If the story you want to tell, for example, is the ever-broadening focus on internationalization at your university, you need to define and then locate the statistics that will help you tell the story in the most comprehensive way possible.

Below, you can find examples of data that would be relevant to the objective stated above.

International Students on the Home Campus

- International enrollment by numbers and international enrollment as a percent of your total student body
 - Total
 - Graduate
 - Undergraduate
- Global regions and countries represented
- Fields of study
- Student profiles

Faculty International Involvement

- Participation in international meetings
- Presentations at international conferences
- Research trips and sabbaticals
- International community service
- International student advising
- Grants for faculty for international activity

Overseas Study

- Study abroad enrollment
- International service learning enrollment
- Faculty-led study abroad programs
- Leading destinations
- Host regions (including traditional v. non-traditional)
- Duration of study
- Fields and forms of inquiry
- Student profiles, including:
 - Major field of study
 - Ethnicity, and
 - Socioeconomic or first-generation status

Curriculum Internationalization

- Number of courses with an international focus
- Number of foreign languages offered

Campus International Organizations and Activities

“Data is a representation of real life. It’s not just a bucket of numbers. There are stories in that bucket. There’s meaning, truth, and beauty. And just like real life, sometimes the stories are simple and straightforward: and other times they’re complex and roundabout.”³

—Nathan Yau, Visualize This

Ensuring Your Data Set Is Complete

Sometimes you won't have data to support what you want to say. If the data is not complete, you are not necessarily communicating the truth. You need to have clean data or put caveats on your data.

It is important, therefore, to have clearly defined goals and clearly defined means of measuring progress and tracking data. If your school keeps detailed easily accessible records that can be shared across departments, this should not be difficult. If each individual office is working with excel spreadsheets printed out and then filed in cabinets, it could be a challenge..

Collaborating with your institution's office of institutional research or a similar division is essential. It will allow you to get a clearer picture of what data points are complete and available. This way you will know the areas about which data needs to be captured, and you can better manage your own expectations of what is possible with the data you have.

Putting Context to the Data

Nigel Holmes, a leader in the field of information graphics, was quoted as saying, “Numbers are wonderful and data are wonderful and information is wonderful, but context is the key to understanding.”⁴

Whether in story form or in visual form, a set of numbers alone does not tell a complete story. To give the full picture, you must provide context around the numbers.

Context can be given in a variety of ways, from **proportion** (Yes, you have about 1,000 students who studied abroad graduating each year, but

what percentage is that of your average graduating class?), to change over time (Is study abroad participation trending up or down?), to comparison (Who sends more students abroad, your school of business or your school of arts and sciences?), to measurement against stated objectives (Is the percentage of first-generation students on your campus who study abroad increasing?).

Presenting Data in a Way That Makes the Story Easily Understood

Stephen Few, data visualization guru, put it this way: “As the saying goes, ‘a picture is worth a thousand words’—often more—but only when the story is best told graphically rather than verbally and the picture is well designed. You could stare at a table of numbers all day and never see what would be immediately obvious when looking at a good picture of those same numbers.”⁵

Selecting the Right Type of Chart or Charts to Present Your Data

A good first step to communicating your information clearly is determining how to portray it.

There are several basic categories of charts and graphs, each of which is most appropriate for a specific purpose.

- **Comparison or Relationship**—column charts and bar charts
- **Composition**—pie charts, waterfall charts
- **Trends or Transition**—line charts, area charts
- **Distribution or Location**—scatter charts, maps, column histogram

Selecting the Right Colors

Color can also make or break the visual presentation of data. As independent consultant Maureen Stone of Stone Soup Consulting so aptly put it in her paper *Expert Color Choices for Presenting Data*, “Color used well can enhance and clarify a presentation. Color used poorly can muddle and confuse.”⁶

The following rules, as identified by Stephen Few in *Practical Rules for Using Color in Charts*,⁷ will go a long way to helping you pull your presentations together.

- 1 If you want different objects of the same color in a table or graph to look the same, make sure that the background—the color that surrounds them—is consistent.
- 2 If you want objects in a table or graph to be easily seen, use a background color that contrasts sufficiently with the object
- 3 Use color only when needed to serve a particular communication goal.
- 4 Use different colors only when they correspond to differences of meaning in the data.
- 5 Use soft, natural colors to display most information and bright or dark colors to highlight information that requires greater attention.
- 6 When using color to encode a sequential range of quantitative values, stick with a single hue (or a small set of closely related hues) and vary intensity from pale colors for low values to increasingly darker and brighter colors for high values.
- 7 Non-data components of tables and graphs should be displayed just visibly enough to perform their role, but no more so for excessive salience could cause them to distract attention from the data.
- 8 To guarantee that most people who are colorblind can distinguish groups of data that are color coded, avoid using a combination of red and green in the same display.
- 9 Avoid using any visual effects in graphs.

Poor

Last Name	First Name	Year	Term	Country	Region	Gender	Ethnicity
Spann	D'marreio	2012	Fall	Argentina	South Ame	Male	African American
Goldstein	Gretchen	2012	Fall	France	Europe	Female	African American
McLaughlin	Dolores	2012	Fall	France	Europe	Female	African American
Barnes	Miriam	2013	Spring	New Zealand	Australia/P	Male	African American
Greene	Valeria	2013	Spring	France	Europe	Female	African American
Johnston	Jerome	2012	Fall	France	Europe	Male	African American
Desai	Julia	2012	Fall	France	Europe	Female	African American

Fair

Year	Term	Country	Region	Gender	DOB	Instruction language	Ethnicity
2012	Fall	Australia	Australia/Pacific Islands	Male	2/19/77	English	Asian
2012	Fall	Argentina	South America	Male	9/10/78	Spanish	Hispanic
2012	Fall	Argentina	South America	Female	1/9/81	English, Spanish	Caucasian
2012	Fall	Argentina	South America	Male	10/20/81	English, Spanish	African American
2013	Summer	Thailand	Asia	Female	1/14/84	English	
2013	Spring	China	Asia	Female	1/15/84	English	
2013	Spring	United States	North America	Male	3/14/84	English	

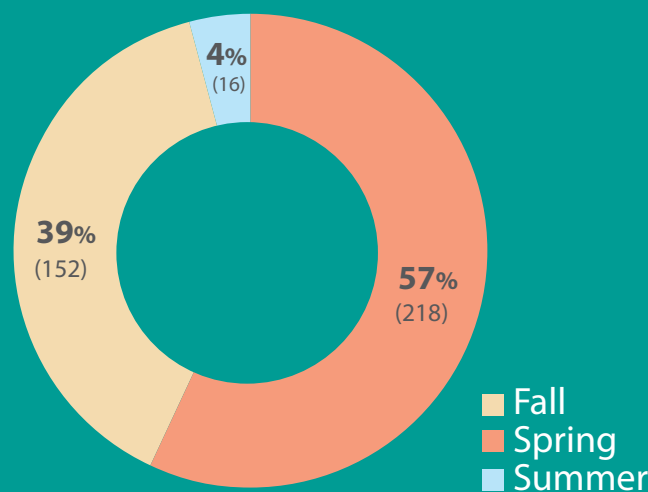
Good

	Count	%
2012	152	39.38%
Fall	152	39.38%
Asia	2	0.52%
China	2	0.52%
Australia/Pacific Islands	2	0.52%
Australia	2	0.52%
Europe	143	37.05%

Better

	Count	%		Count	%
Argentina	3	0.78%	Africa	47	12.18%
Australia	2	0.52%	Asia	70	18.13%
Belgium	22	5.70%	Australia/Pac	12	3.11%
Brazil	5	1.30%	Central Amer	3	0.78%
Bulgaria	16	4.15%	Europe	234	60.62%
China	21	5.44%	North Americ	9	2.33%
Denmark	10	2.59%	Programs at	3	0.78%

Best



Conclusion

From defining the story, to identifying and collecting the relevant data, to putting it into context, and to presenting it in a way that makes the story easily understood, there is a lot that goes into creating data visualizations that will effectively communicate your intended message to your stakeholders. The end result, however, will be well worth it.

Sources:

¹ Few, Stephen (2013): Data Visualization for Human Perception. In: Soegaard, Mads and Dam, Rikke Friis (eds.). "The Encyclopedia of Human-Computer Interaction, 2nd Ed.". Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/data_visualization_for_human_perception.html

² Basic Steps in Working with Data (n.d.). In Data Journalism Handbook. Retrieved February 18, 2014, from http://datajournalismhandbook.org/1.0/en/understanding_data_2.html

³ Yau, Nathan. Visualize This: The FlowingData Guide to Design, Visualization, and Statistics. Indianapolis, IN: Wiley Publishing, Inc, 2007. Print.

⁴ Smith, S. (2013, March 4). Visualization Experts: Data Needs Context and Clarity to Connect with Audience. In DataInformed. Retrieved February 18, 2014, from <http://data-informed.com/visualization-experts-data-needs-context-and-clarity-to-connect-with-audience/>

⁵ Few, Stephen (2013): Data Visualization for Human Perception. In: Soegaard, Mads and Dam, Rikke Friis (eds.). "The Encyclopedia of Human-Computer Interaction, 2nd Ed.". Aarhus, Denmark: The Interaction Design Foundation. Available online at http://www.interaction-design.org/encyclopedia/data_visualization_for_human_perception.html

⁶ Stone, M. (n.d.). Expert Color Choices for Presenting Data. Retrieved February 18, 2014, from <https://courses.washington.edu/info424/2007/documents/Stone-Color%20Choices.pdf>

⁷ Few, S. (2008, February). Practical Rules for Using Color in Charts. In Perceptual Edge. Retrieved February 18, 2014, from http://www.perceptualedge.com/articles/visual_business_intelligence/rules_for_using_color.pdf



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ABOUT TERRA DOTTA

Terra Dotta is committed to effective process automation and the secure management of data. The flexibility and robust features have made our software essential to all types of organizations. Terra Dotta's international education roots and innovative software capabilities serve the complex needs of many educational and business offices.

Terra Dotta software simplifies your everyday processes from the way you access information to the way you gather data and create reports. Risk management capabilities are an integral aspect of the software, providing the ability to locate and communicate with your applicants and travelers worldwide. Simply put, Terra Dotta software allows you to realize the full potential of your data and use the software your way at your institution.

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