Picturing the Workforce
Considerations for Effectively Presenting Data

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Introduction

In the field of workforce development, data can provide important information for decision-makers and the public when they need to gauge the effectiveness of programs and policy. Yet, the amount of data coming out on education, training, and the labor market can seem overwhelming. Data visualization is one way to manage this information and make it usable.

Data visualization simply refers to the presentation of data in pictures or graphs, such as a bar graph or flow chart, and thus provides a way to communicate vast amounts of information efficiently.¹ Policymakers and members of the public, who are short on time and have many pressing issues to manage, can benefit from analyses that include high visual impact.

State workforce officials often want to share data—such as program performance metrics and labor market information—with non-expert audiences. The stakes are high; data visualization could influence students and workers choosing a postsecondary program to achieve career goals, or convince employers to set up business in one region over another. Workforce experts, however, may feel daunted by the task of presenting data to varied audiences.

With the right approach, tools, and contextual information, data visualization can play an important role in communicating information and may contribute to meaningful change. For those exploring user-friendly ways to present data, here are some issues and examples to consider.²
Your existing audience, or the audience you want to attract, is interested in knowing the answers to key questions. In addition to ensuring that the data exist to answer these questions, the level of detail appropriate for the audience should influence the design of the visualization. Non-expert audiences (policymakers, students, workers, employers) benefit from basic visualizations, while state agency leaders and workforce practitioners may need more detail.

It is important to think about how the target audience will view the visualization: in a printed report, on a computer screen, or with a mobile device. Reaching wider audiences may be possible if visualizations are suitable for different formats. Consider providing multiple interactive tools via the same website—including some with simplified graphics that can be viewed on mobile devices.

Example 1: Idaho Occupational Employment Statistics (OES) Dashboard

Using Tableau software, the Idaho Department of Labor hosts interactive charts that show the number of people employed and median annual wages for major occupation groups (Example 1, previous page). One chart allows viewers like American Job Center counselors and state legislative staff to quickly answer questions such as “which high-paying jobs employ large numbers of workers in the state?” Employers can use the detailed occupations bar graph as they are recruiting new workers, in order to benchmark the wage for a specific job opening. The graph can also show how many workers in the state have particular job titles, which employers may want to factor into their choices when naming and describing a job opening in classified ads.

The American Institutes for Research, Gallup Inc., and the U.S. Chamber of Commerce Foundation’s Center for Education and Workforce partnered with the Colorado Association of Commerce and Industry (CACI) and USA Funds to create “Launch My Career Colorado” (Example 2). The website, which is powered by College Measures, answers commonly asked questions with information tailored for students’ specific education and career interests. The website provides easy access to viewing high demand jobs and skills, as well as top majors and schools in the state. Students can search for information according to what major, job, or school they want, or by what industry they prefer. Cost of degrees and average wage outcomes provide students with an estimated return on investment (ROI), as well as indicators of career satisfaction. Launch My Career Colorado also provides a mobile site so prospective students can access this information when they are not in front of a computer or do not have Internet access at home.

Example 2: Excerpts from Launch My Career Colorado

Welcome to Launch My Career Colorado!

It can be hard to know which colleges—and which majors—might be right for you and your goals. LaunchMyCareer, made possible with support from USA Funds, helps you cut through the confusion and find programs of study that can lead to well-paying jobs and a good life. Click on one of the options below to get started, and find your best course.

Launch My Career Colorado website and mobile platform, powered by College Measures, http://launchmycareercolorado.org/ (Snapshots taken August 26, 2016.)
Those creating data visualizations may need to experiment and use their judgement to decide which visualizations will lead viewers to the right conclusions. The type of chart is important. Simple line or bar graphs can allow the user to see trends in response to changes in variables over time. Intricate graphs, on the other hand, allow the user to see different relationships and levels of movement. For instance, Example 3 (right) conveys how one's field of study can enable a person to work in a multitude of industries.

Some visualization types might contain too many details, however, and overwhelm the user. For situations where a website is limited to using a small version of the graph or when a printed version is required, simpler visualizations will more likely succeed in conveying the most important information.3

Even when a data visualization is well-designed, it might convey the wrong message without proper context. If the data visualization deals with a particularly sensitive policy area, creators of the visualization should consult with agencies providing the relevant data to understand its limitations and anticipate potential misinterpretations. Consulting with agencies not only assists with appropriately packaging the visualization, but also generates buy-in among data contributors that lays a foundation for future collaborations. This can be important for building trust and integral to “Soliciting Feedback” (which is another step in refining visualizations discussed further below).

The Utah Data Alliance offers charts that show recent education and workforce trends. This bubble chart uses Tableau software to show industry of employment by field of study (Example 3).4 The narrative at the top clearly explains the overall message that the chart conveys: students who graduate from a particular major, such as engineering, end up with careers in many different industries. This message has significant implications for education and training policy decisions, such as how accountability systems measure post-completion employment in jobs related to programs of study. The different-size circles quickly draw viewers’ eyes to the industries with the most graduates, represented by the largest bubbles.

The State Workforce and Education Alignment Project (SWEAP), an initiative of the National Skills Coalition, is helping states to develop data tools, including dashboards, to enable leaders to answer key questions about the effectiveness of their states’ education and training programs toward closing skills gaps.
Identify necessary tools and capacity

Current staff in state offices, even if they are not design experts, can develop effective visualizations. In addition to the chart capabilities in Excel, there are several free or low-cost data visualization software packages that are relatively easy to learn. Commonly used software includes Tableau, Google Charts, and HighCharts. For staff who want to incorporate design principles and best practices, see the Appendix for a number of highly-regarded resources. For high-priority projects, it could make sense to seek outside technical or communications expertise.

Rhode Island’s RI DataHUB has worked with a professional journalist to create compelling narratives aimed at policymakers. DataHUB uses a series of charts and graphs to reveal key workforce and higher education trends, and incorporates clear visualizations into “Data Stories,” such as “Adult Learners in RI’s Workforce,” which examines the potential role of Adult Education in making the state’s workforce more competitive. (One of four graphs from the story is shown below in Example 4.) This approach helps to make data and graphs more relatable to readers, and allows the creators to clearly communicate their point of view about what the data mean.

Example 4: Excerpt from a Rhode Island DataHUB “Data Story”

**Adult Education: Impact on Employer Type**

This chart displays workplace information for RI’s working adult learners upon entry and one year from entering adult education [top 10 industries only]. Adult Education appears to correspond to shifts in the mix of industries in which its participants work after their participation. Notably, the portion of participants working in the Accommodation and Food Services sector tends to decrease one year out from their adult education experience, while the portion employed in the Health Care and Social Assistance sector increases.

Source: RI DataHUB. For the complete Data Story of “Adult Learners in RI’s Workforce,” see: [http://ridatahub.org/datastories/adulted-outcome/](http://ridatahub.org/datastories/adulted-outcome/) (Snapshot taken September 2, 2016.)
For long-term projects, ensure the use of consistent data definitions and measurement. This is important for projects such as dashboards that will use the same visualization over time – allowing policymakers and others to see changes in certain socioeconomic indicators and to monitor the progress of certain policies and programs.

Also consider the resources needed to keep a visualization operational, up to date, and whether staff or consultants will need to upload data to the visualization in the future. It may be helpful to regularize the training of in-house staff to perform these tasks and also to adopt a practice of training new staff in these skills. Staff should understand the reasons why the visualizations are important and the general analyses driving them. In an effort to save time, some visualizations can be automatically updated with data using the right Application Programming Interface (API), which is a set of instructions for software applications.

The Texas Workforce Commission hosts a dashboard that allows program administrators and policymakers to see how much of an impact various programs have on median earnings over time (Example 5). The dashboard shows results for cohorts who have exited education and training programs associated with programs such as the Supplemental Nutrition Assistance Program (SNAP) or Apprenticeships. In doing so, it follows the cohort from one quarter to a year later, which requires consistent data definitions and tracking of these program customers.

Example 5: Excerpt from Workforce Development Area Programs in Texas

<table>
<thead>
<tr>
<th>Workforce Development Area</th>
<th>Statewide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>TWC Website</td>
</tr>
<tr>
<td>Download Report</td>
<td>Full Report</td>
</tr>
<tr>
<td>Program</td>
<td>All Programs</td>
</tr>
</tbody>
</table>

![Median Quarterly Wages](chart)

Cohort Composition:
- SNAP E&T
- Choices
- WIA
- SDF
- Rapid Response
- Apprenticeship
- NCP Choices
- TAA
- SSF

Data visualizations usually cannot be used by individuals with visual impairments. Therefore, using visualizations as the only source of information would not comply with the Americans with Disabilities Act (ADA), which applies to most government agencies. Additionally providing the data in plain text or machine-readable form allows visually-impaired users to have the option of using screen-reader software to read the text aloud.11

The Texas Dashboard feature in Example 5 (previous page) provides accessible data by offering a report download, which has tables that are clearly labeled with row and column headers that may be read out loud by computers with screen-reader software (Example 6).12 The Texas Workforce Commission also has an Electronic & Information Resources Accessibility Policy associated with its data visualization, and an agency point of contact to provide further information and assistance.13

Example 6: Excerpt from Texas Workforce Development Area Report

<table>
<thead>
<tr>
<th>Category</th>
<th>Group</th>
<th>Number of Customers</th>
<th>Number Working, Q2 2012</th>
<th>Percent Working, Q2 2012</th>
<th>Quarterly Earnings, Q2 2012</th>
<th>Number Working, Q4 2013</th>
<th>Percent Working, Q4 2013</th>
<th>Quarterly Earnings, Q4 2013</th>
<th>Employment Change, 2012-2013</th>
<th>Earnings Change, 2012-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Statewide</td>
<td>131,588</td>
<td>66,306</td>
<td>60.5%</td>
<td>$4,129</td>
<td>82,450</td>
<td>62.7%</td>
<td>$4,741</td>
<td>+ 12.2%</td>
<td>+ $612</td>
</tr>
<tr>
<td>Age</td>
<td>21 - 30</td>
<td>40,819</td>
<td>21,109</td>
<td>51.7%</td>
<td>$2,827</td>
<td>26,502</td>
<td>65.1%</td>
<td>$3,832</td>
<td>+ 13.4%</td>
<td>+ $1,005</td>
</tr>
<tr>
<td></td>
<td>31 - 40</td>
<td>38,111</td>
<td>18,968</td>
<td>49.6%</td>
<td>$4,200</td>
<td>23,808</td>
<td>62.5%</td>
<td>$4,922</td>
<td>+ 12.7%</td>
<td>+ $722</td>
</tr>
<tr>
<td></td>
<td>41 - 50</td>
<td>29,336</td>
<td>14,440</td>
<td>49.2%</td>
<td>$5,450</td>
<td>17,924</td>
<td>61.1%</td>
<td>$5,675</td>
<td>+ 11.9%</td>
<td>+ $219</td>
</tr>
<tr>
<td></td>
<td>51 or Over</td>
<td>16,533</td>
<td>9,771</td>
<td>59.1%</td>
<td>$9,927</td>
<td>10,232</td>
<td>62.3%</td>
<td>$9,052</td>
<td>+ 3.2%</td>
<td>- $920</td>
</tr>
<tr>
<td></td>
<td>20 or Under</td>
<td>6,721</td>
<td>2,077</td>
<td>30.9%</td>
<td>$1,070</td>
<td>3,802</td>
<td>56.6%</td>
<td>$2,413</td>
<td>+ 25.7%</td>
<td>+ $1,343</td>
</tr>
<tr>
<td></td>
<td>Unknown Age</td>
<td>36</td>
<td>31</td>
<td>86.1%</td>
<td>$10,661</td>
<td>32</td>
<td>88.9%</td>
<td>$11,559</td>
<td>+ 2.8%</td>
<td>+ $898</td>
</tr>
</tbody>
</table>

Solicit user feedback

Testing visualizations with target audiences can help improve the design, and ensure that creators are providing appropriate context to convey the right message. After visualizations are released to the public, it is important to monitor use. Website analytics reveal whether the target audience is using the visualization, and if so, how they are using it. Ongoing feedback can inform outreach efforts that bring attention to visualization tools, and suggest revisions and upgrades. Evidence of visualization impact may also be critical to help state officials advocate for funding to support data capacity.

Washington State’s Office of Financial Management (OFM) vetted its Statewide Public Four-Year Dashboard with relevant agencies and legislators (Example 7). The state’s Department of Enterprise Services also conducted usability sessions, which it used to refine the dashboard’s tools that were created with Xcelsius data visualization software. A group of institutional researchers and registrars from the six public four-year institutions met regularly to discuss the data they submitted to the OFM. When possible, a representative from that group attended weekly meetings with IT staff building the dashboard. Once an initial version of the dashboard was ready, institutional researchers were asked to participate in usability sessions so they could perform tasks and provide feedback.

Legislators and their staff also tested the dashboard so they could provide feedback on usability. After additional changes were complete, the dashboard went through an additional month of testing before its public launch. Washington’s dashboard stakeholders continue to meet and discuss the information that goes into the dashboard, as well as its usability. Regular meetings can help establish trust between agencies and institutions providing the data, those who develop the information into usable data visualizations, and audiences that rely on this information.

Example 7: Excerpt from Washington Statewide Public Four-Year Dashboard

<table>
<thead>
<tr>
<th>Degrees Awarded</th>
<th>Years:</th>
<th>Institution and Statewide:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Type:</td>
<td>2014-15</td>
<td>Statewide</td>
</tr>
<tr>
<td>Undergraduate</td>
<td></td>
<td>Central Washington University</td>
</tr>
<tr>
<td></td>
<td>2015-16</td>
<td>Eastern Washington University</td>
</tr>
<tr>
<td>Graduate</td>
<td>2012-13</td>
<td></td>
</tr>
</tbody>
</table>

Total Degrees: 24,865

What you are looking at:
Annual number of degrees awarded (Fall, Winter, Spring, Summer terms). Filtered by: Undergraduate, 2014-15, Statewide

An increasing number of agencies and institutions are taking advantage of new data processing and visualization technologies. Most of these visualizations have come online only within the past few years, and thus the long-term utility and impact of these visualizations remains to be seen. Future technology will make for even more ways to create online tools, although this also means that the task of choosing which visualizations are right for the job could become more challenging. Starting with the basic considerations of audience, message, capacity, longevity, accessibility, and feedback can make the process of choosing data visualizations for workforce development more manageable.
Appendix: Selected Resources on Best Practices in Data Visualization

The Association of Public Data Users (APDU) occasionally provides training on data visualization. APDU has also begun an annual “Data Viz” award that encourages the creation of new visualizations using publicly-available data across a range of issues. Visit http://apdu.org for more information.


Data USA, website hosting visualizations using public data, developed by Deloitte, Macro Connections - The MIT Media Lab, and Datawheel, http://www.datausa.io/.


Notes


2. Data visualization definitions and best practices are covered by many experts and in commercial blogs. The basic steps suggested in this paper reflect similar, but far more elaborate, discussions on data visualization. See the Appendix for examples of more in-depth resources and training. Data visualization examples shown may not reflect current indicators and are subject to change. Reference to particular software is mentioned for informational purposes only, and is not an endorsement.

3. For advice on which kinds of visualizations are best for particular data and messages, and how much information to convey through various graphics, such as bar or pie charts, see the discussion in: United Nations Economic Commission for Europe, “A Guide to Presenting Statistics,” Part 2 in Making Data Meaningful, Geneva: United Nations, 2009, especially pp. 19-29.


8. Ibid.


16. Ibid.

17. Ibid.