

AGENDA

January 19, 2016

ARKANSAS WORKFORCE DEVELOPMENT BOARD PROGRAM AND PERFORMANCE EVALUATION COMMITTEE MEETING

10:00 A.M.

Call to Order..... Scott Bull, PPE Committee Chair

Chairman's Comments..... Scott Bull, PPE Committee Chair

Agenda Item 1 - ACTION

Minutes of the November 20, 2015 Committee Meeting

Agenda Item 2 - ACTION

WIOA Performance Goals for Core Programs..... Tammy Dragon, Program Operations Manager
Department of Workforce Services

Agenda Item 3 - INFORMATION & COMMITTEE DISCUSSION

Talent Supply & Demand Dashboard Toolkit..... Tammy Dragon, Program Operations Manager
Department of Workforce Services

Announcements

Adjournment

NEXT MEETING DATE

April 12, 2016	10:00 a.m.	Committees	Little Rock
	1:00 p.m.	Full Board Meeting	Little Rock

Crowne Plaza Hotel
201 S Shackleford Road
Little Rock, Arkansas



**For Consideration of the
Arkansas Workforce Development Board
Program and Performance Evaluation Committee**

January 19, 2016

AGENDA ITEM 1 – ACTION: Minutes of November 20, 2015 Committee Meeting

RECOMMENDATION: It is recommended that the Program and Performance Evaluation Committee approve the minutes of the November 20, 2015 committee meeting.

INFORMATION/RATIONALE: Minutes of the meeting are attached.

UNOFFICIAL

MINUTES

**ARKANSAS WORKFORCE DEVELOPMENT BOARD
Program & Performance Evaluation Committee
November 20, 2015**

A meeting of the Program & Performance Evaluation Committee of the Arkansas Workforce Development Board was held on November 20, 2015, beginning at 2:01 p.m., via teleconference. Chair Scott Bull presided with the following members present: Ms. Abby Houseworth, Mr. Alan Hughes, Mr. Bart Langley, Mr. Alan McClain, Mr. Brett Powell, Mr. Kelley Sharp, and Ms. Holly Little. Mr. Jeff Griffin and Mr. Gary Sams were unable to participate.

A quorum being present, Chair Bull called the meeting to order and began by thanking the members for being present for the Program & Performance Evaluation Committee teleconference.

Agenda Item 1 – ACTION - Minutes of the October 13, 2015 Committee Meeting: Chair Bull proceeded to Agenda Item 1, asking if there were any additions or corrections to the minutes. Chair Bull stated staff informed him of one change; that Mr. Mark Lane was proxy for Mr. Brett Powell during the October 13th meeting. **With no other additions or corrections, a motion to accept the minutes with amendment was made by Mr. Alan Hughes, seconded by Mr. Bart Langley, and the motion carried unanimously.**

Agenda Item 2 – ACTION – Review of the Performance Targets Established for Eligible Training Providers Continued Eligibility Policy: Chair Bull stated that the next item was the review of the performance targets for eligible training providers continued eligibility policy. He stated the full board approved the initial eligibility criteria at the June meeting. He explained this policy represents continued eligibility for training providers and must be in place no later than December 31 per the WIOA federal law. Ms. Cindy Varner provided an overview and answered questions. **A motion to accept the recommended performance targets for the Eligible Training Providers Continued Eligibility Policy was made by Mr. Bart Langley, seconded by Mr. Alan Hughes, and carried unanimously.**

Announcements: Chair Bull announced the next regular meeting of the Arkansas Workforce Development Board is scheduled for November 30 - December 1. He informed the committee that the next regular meeting of this committee is scheduled for January 12, 2016 at 10:00 a.m.

Adjourn: Chair Bull adjourned the meeting at 2:16 p.m., on a motion make by Ms. Abby Houseworth, seconded by Mr. Kelly Sharp, and carried unanimously.

Mr. Scott Bull, Program & Performance
Evaluation Committee, Chair

Daryl Bassett, Director
Department of Workforce Services

*Minutes recorded by Stephanie Carlo
Department of Workforce Services Staff*

**For Consideration of the
Arkansas Workforce Development Board
Program and Performance Evaluation Committee**

January 19, 2016

AGENDA ITEM 2 – ACTION: WIOA Performance Goals for Core Programs

RECOMMENDATION: It is recommended that the Program and Performance Evaluation Committee approve the proposed WIOA Performance Goals for Core Programs and submission of a State waiver request for the Credential Attainment Rate for all programs and the Measurable Skill Gains measure for Vocational Rehabilitation for these measures to be baseline indicators for the first two years.

INFORMATION/RATIONALE: Each State submitting a Unified or Combined Plan is required to identify expected levels of performance for each of the primary indicators of performance for the first two years covered by the plan. The State is required to reach agreement with the Secretary of Labor, in conjunction with the Secretary of Education on state adjusted levels of performance for the indicators for each of the first two years of the plan.

To effect an orderly transition to the performance accountability system in Section 116 of the WIOA, the Departments will use the transition authority under WIOA sec. 503(a) to designate certain primary indicators of performance as “baseline” indicators in the first plan submission. A “baseline” indicator is one for which States will not propose an expected level of performance in the plan submission and will not come to agreement with the Departments on adjusted levels of performance. “Baseline” indicators will not be used in the end of the year performance calculations and will not be used to determine failure to achieve adjusted levels of performance for purposes of sanctions. The selection of primary indicators for the designation as a baseline indicator is made based on the likelihood of a state having adequate data on which to make a reasonable determination of an expected level of performance and such a designation will vary across core programs.

States are expected to collect and report on all indicators, including those that have been designated as “baseline”. The actual performance data reported by States for indicators designated as “baseline” in the first two years of the Unified or Combined Plan will serve as baseline data in future years. Each core program must submit an expected level of performance for each indicator, except for those indicators that are listed as “baseline” indicators above.

Waiver Recommendation

The staff is recommending that the State submit a waiver request for the Credential Attainment Rate for all programs and the Measurable Skill Gains measure for Vocational Rehabilitation for these measures to be baseline indicators for the first two years. The current data systems for these programs do not have the data required in an extractable format to establish baselines for the measures. The waiver would allow agencies to collect information for the first two years to establish a baseline level for each measure.

Performance Goals for the Core Programs

	PY 2016 / FY 2017		PY 2017 / FY 2018	
	Proposed/ Expected Level	Negotiated/ Adjusted Level	Proposed/ Expected Level	Negotiated/ Adjusted Level
Employment (Second Quarter after Exit)				
Adults	74%		75%	
Dislocated Workers	73%		74%	
Youth (Educ, Trng, or Employ.)	75%		76%	
Wagner-Peyser	60%		61%	
Adult Education	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Vocational Rehabilitation	52%		53%	
Vocational Rehabilitation/Blind	34%		35%	
Employment (Fourth Quarter after Exit)				
Adults	73%		74%	
Dislocated Workers	73%		74%	
Youth (Educ, Trng, or Employ.)	74%		75%	
Wagner-Peyser	60%		61%	
Adult Education	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Vocational Rehabilitation	51%		52%	
Vocational Rehabilitation/Blind	32%		33%	
Median Earnings (Second Quarter after Exit)				
Adults	\$6,281		\$6,300	
Dislocated Workers	\$6,253		\$6,300	
Youth	\$2,923		\$2,950	
Wagner-Peyser	\$4,228		\$4,300	
Adult Education	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Vocational Rehabilitation	\$4,210		\$4,300	
Vocational Rehabilitation/Blind	\$4,558		\$4,600	
Credential Attainment Rate				
Adults	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator
Dislocated Workers	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator
Youth	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator
Wagner-Peyser	N/A	N/A	N/A	N/A
Adult Education	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Vocational Rehabilitation	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator
Vocational Rehabilitation/Blind	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator

Measureable Skill Gains				
Adults	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Dislocated Workers	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Youth	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Wagner-Peyser	N/A	N/A	N/A	N/A
Adult Education	41%		42%	
Vocational Rehabilitation	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator
Vocational Rehabilitation/Blind	Waiver Request	Baseline Indicator	Waiver Request	Baseline Indicator
Effectiveness in Serving Employers				
Adults	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Dislocated Workers	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Youth	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Wagner-Peyser	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Adult Education	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Vocational Rehabilitation	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator
Vocational Rehabilitation/Blind	Baseline Indicator	Baseline Indicator	Baseline Indicator	Baseline Indicator

Baseline Indicator Explanation: Each State submitting a Unified or Combined Plan is required to identify expected levels of performance for each of the primary indicators of performance for the first two years covered by the plan. The State is required to reach agreement with the Secretary of Labor, in conjunction with the Secretary of Education on state adjusted levels of performance for the indicators for each of the first two years of the plan.

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States are expected to collect and report on all indicators, including those that have been designated as “baseline”. The actual performance data reported by States for indicators designated as “baseline” in the first two years of the Unified or Combined Plan will serve as baseline data in future years. Each core program must submit an expected level of performance for each indicator, except for those indicators that are listed as “baseline” indicators above.

**For Consideration of the
Arkansas Workforce Development Board
Program and Performance Evaluation Committee**

January 19, 2016

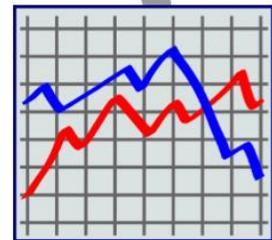
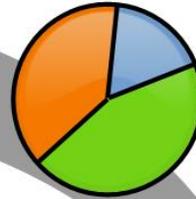
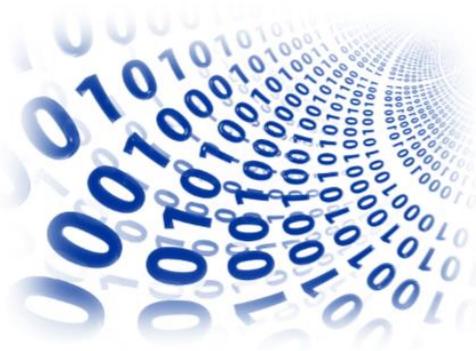
AGENDA ITEM 3 – INFORMATION: Talent Supply and Demand Dashboard Toolkit

INFORMATION/RATIONALE: At the October 13, 2015 meeting of the committee, members expressed a desire to establish a dashboard for monitoring performance and other evaluations. It is recommended that the Program and Performance Evaluation Committee review and discuss how to approach developing a talent supply and demand dashboard for Arkansas. A Talent Supply and Demand Dashboard Toolkit from National Governors Association is attached for consideration and discussion by the committee.

Talent Supply and Demand Dashboard Toolkit



**National Governors Association
Talent Pipeline Policy Academy, July 2015**



Acknowledgements

This toolkit is the product of a series of meetings and consultations with the Talent Supply and Demand Dashboard Workgroup, part of the National Governors Association's Talent Pipeline policy academy on aligning education and training systems with the needs of the economy. The workgroup consisted of a talented and experienced team of state representatives that contributed to the content and editing of this toolkit:

Kate Akers, Executive Director, Kentucky Center for Education & Workforce Statistics

Melissa Bread, Office of Financial Management, Washington

Meihui Bodane, Senior Analyst for Labor Market Intelligence, Labor & Economic Analysis Division, NC Department of Commerce

Mary Kay Dugan, Director, Battelle Seattle Research Operations, Washington

Sara Dunnigan, Executive Director, Virginia Board of Workforce Development, Secretary of Commerce and Trade, Office of Governor Terence R. McAuliffe

Alan Hardcastle, Director of Research, Washington Student Achievement Council

Betty McGrath, Director of Workforce Research and Evaluation, North Carolina Department of Commerce

Jeff Rosenthal, Senior Workforce Analyst, North Carolina Department of Commerce

Jim Schmidt, Senior Forecast Coordinator, Washington Office of Financial Management

Susana Schowen, Director of Workforce Initiatives, Louisiana Economic Development

Jenee Slocum, Director, Workforce Investment Council, Louisiana Workforce Commission

Jeremy Varner, Administrator, Division of Community Colleges, Iowa Department of Education

Lauren Victor, Policy Analyst, Talent Development Research, Colorado Department of Higher Education

Georgetown University's Center on Education and the Workforce provided crucial subject matter expertise and guidance throughout the conception and development of the toolkit:

Cary Lou, Senior Analyst

Neil Ridley, Director of State Initiatives

Jeff Strohl, Director of Research

The NGA Center for Best Practices staffed the workgroup, organizing and leading meetings and compiling and authoring content for the toolkit:

Paul Lapointe, Economic, Human Services, and Workforce Scholar

Martin Simon, Director of Workforce Development Programs

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I. Introduction

The Talent Pipeline

In an economy where technology and globalization are constantly changing the skills that are valued in the workforce, governors face the dual challenge of ensuring that the workers in their state are receiving the training that they need to succeed in the labor market and that employers have the skilled labor required to compete globally. In light of these challenges, and mounting evidence that higher levels of skill are needed in general, governors across the country have embarked on an effort to identify what policies and programs can help develop the workforce that this country needs to continue to grow.¹ To assist governors, the NGA formed the Talent Pipeline Policy Academy in 2014, through which this toolkit was developed, to align education and training systems with the needs of the economy.

Talent Supply and Demand

Governors' dual mandate of preparing individuals for the workforce and providing employers with the resources they need to succeed is represented through the concept of the labor supply and demand market. The supply side of labor encompasses a state's incumbent workforce, new entrants, and pipeline of students. The demand side reflects the current and future labor needs of both private and public sector employers. When the skills of the labor supply and the skills demanded by employers are not aligned, economists will often refer to the problem as a *skills problem*. Peter Cappelli, of Wharton Business School, details three types of skills problems:

Skills Gap: students leaving the education system lack the basic skills that are needed to be employed; this is the most extreme of the skills problems.

Skills Shortage: potential workers lack the specific technical skills needed for particular occupations or industries, resulting in employers unable to fill vacancies.

Skills Mismatch: the supply of skills and demand for skills are not aligned; can be either an oversupply or undersupply depending on the skills.²

These imbalances inhibit growth and prevent economies from reaching their full potential. Governors and their workforce and education agencies play an important role in helping labor supply and labor demand reach equilibrium.

The Value of a Dashboard

States, federal agencies, private companies and non-profits collect a vast amount of data that can be utilized by governors and state agencies in ensuring that their talent supply and demand are aligned. One valuable tool that combines and translates this data into useable information is a dashboard, which highlights important figures and visualizes large datasets in ways that users can easily digest and use to spur action.

The IBM Center for the Business of Government's definition of a dashboard: "Typically, dashboards display data integrated from multiple sources and exhibited in an easy-to-comprehend, informative graphic representation with explanatory text. This allows a reader to understand complex information in less time than it would take to read a full report. At the same time, dashboards are self-contained in explanation."³

As a part of the NGA's Talent Pipeline Policy Academy, states were required to submit action plans for how they will achieve the goal of enhancing their state's talent. In almost every action plan, states mentioned that creating a dashboard to measure supply and demand would be a key step in identifying policies and programs that would lead to successful outcomes. To help states adopt and improve talent supply and demand dashboards, a workgroup was formed comprising of representatives from seven states, the Georgetown Center on Education and the Workforce, and the NGA Center for Best Practices. The workgroup was tasked with creating this toolkit, which guides states through the dashboard development process.

This Toolkit

The purpose of this toolkit is to provide states with guidance on how to approach developing a talent supply and demand dashboard. Section II outlines the overall process that a state can take to design and implement the dashboard. Section III offers suggestions on how to refine the scope and purpose of the dashboard. Sections IV and V address the content of the dashboard, including selecting measures, finding data, and putting it all together. Finally, sections VI and VII describe how to use the dashboard effectively and sustainably.

Throughout the toolkit, users will find guiding questions and implications, potential pitfalls to consider, examples of best practices, and summaries of resources that may be of use. What users will not find is a step by step prescriptive process for creating a one-size-fits-all dashboard. This is because each state's dashboard should address the specific priorities and needs of that state. While all states have certain commonalities in their talent pipeline needs, many states will differ in what data they require to make effective policy decisions.

The toolkits contain hyperlinks to many resources and examples, and users are encouraged to click on the links and explore for themselves; in many cases, it is tough to capture the functionality and interactiveness of the dashboard examples through a screenshot and description. If accessing this toolkit in print form, users can find the URLs in the endnotes.

II. Development Process for a Talent Supply-Demand Dashboard

Table 1 outlines a high level process that an agency (or group of agencies) can take in developing a talent supply and demand dashboard. While this is not the only path for a successful project, it includes key steps that can be taken by a state workgroup to ensure the development of a useful and sustainable dashboard. An important early step in developing a dashboard is to outline a project plan. The process outlined in Table 1 can be used as a starting point; the lead agency will need to assign owners for each activity. The five main steps in developing a dashboard are:

- **Planning:** Prior to beginning work on putting together a dashboard, there are several steps that an agency should take in order to ensure that the final product meets stakeholder needs.
- **Measure Development:** The measure development phase transforms data into answers to identified policy questions.
- **Dashboard Design:** The number of platform options available to dashboard project teams has increased dramatically over the last couple of decades. Teams should carefully consider which platform is best suited for their purpose.
- **Implementation:** Well-designed dashboards must be used effectively to derive value.
- **Sustainability:** Typically, dashboards are not meant to be one-time efforts. Therefore, careful planning needs to be done to ensure that dashboards live beyond project teams.

Table 1: Step-by-step dashboard development process

Steps	Activities	Owner
1. Planning	a. Determine what policy questions the dashboard is supposed to answer	
	b. Identify the measures that would be ideal in answering these questions	
	c. Scan available data sources and existing dashboards to determine if there is enough data to move forward with the dashboard and no suitable dashboard already exists	
	d. Assemble Dashboard Development Team with Lead – Define scope and purpose of dashboard and develop a work plan; decide whether capacity exists to develop or external 3 rd party needed to assist	
	e. Review literature on supply and demand measures and summarize	
	f. Review dashboard systems/best practices and audiences	
2. Measure Development	a. Specify range of potential measures (data sources, calculations), periodicity of data, and data breakdowns	
	b. Conduct analysis and test candidate measures for performance – how do they perform over time? Reliability, validity, opportunity to show change?	
	c. Engage stakeholders in priority setting, present work to date, consider cost of data collection for measures that don't exist and gain input/consensus on priority measures	
3. Design Dashboard	a. Evaluate potential dashboard delivery methods (in-house, out of box, SaaS, etc.) and select the appropriate method based on cost constraints, target audience, and specific measures to be included	
	b. Based on data and dashboard delivery costs, reconvene stakeholders and make a go/no-go decision on whether to move forward producing the dashboard	
	c. Design presentation for each measure (visualization, table, time period, comparison group)	
	d. Convene a focus group of target users to review the dashboard and measure presentation to offer feedback on usability and clarity	
	e. Adjust the dashboard design based on focus group feedback	
	f. Develop a process for updating the dashboard, including timing and ownership	
4. Implementation	a. Implement the dashboard process	
	b. Conduct training and socialization sessions with potential users	
5. Sustainability	a. Monitor usage of the dashboard and the updating process	
	b. Reconvene and reevaluate measures to determine if dashboard is driving value and if any changes should be made to the dashboard or process	
	c. Ongoing review of systems/measures and engagement of stakeholders	

III. Strategy

Prior to embarking on a dashboard initiative, it is important to ensure that everyone involved is on the same page in regards to the purpose and goals of the effort. To this end, it is helpful to sit down and ask the group some scoping questions (Table 2) that can help the group identify an explicit direction for their work which will help inform the project throughout each stage. One of the most important scoping questions that the group will need to answer is “what are the policy questions that the dashboard will be used to answer?” Table 3 presents sample policy questions that a dashboard might be used for, but is not meant to be exhaustive.

Table 2: Scoping questions

Who is the audience that will be using the dashboard to make decisions?
What is the time horizon that is being looked at?
Is the dashboard targeted at something specific, such as STEM or middle skills?
Will the dashboard be made publically available or will the audience be limited to government agencies and partners?
Is the dashboard meant to track performance against targets or to be an exploratory tool for users?
What policy questions will the audience be using the dashboard to answer? (see examples below)

Table 3: Example policy questions that a dashboard might be used to answer:

Do the skills of the labor supply match the skills demanded by employers?
Are students graduating with certifications and degrees that employers value?
What populations should be targeted? How are traditionally disadvantaged populations faring?
What sectors should be targeted?
Who are the largest and fastest growing employers in the state?
What level of education do students need to achieve in order to succeed in the labor market?
What occupations are growing in the state?
Geographically, where are the job opportunities in the state?

Example:

The Kentuckiana workforce system recently started publishing [career pathway charts](#) (Figure 1). The charts follow a very intentional design that caters to a specific audience and purpose. The charts are intended for students and parents as they make their educational choices, are aligned with career pathways in six industries identified as priorities, and are designed with specific career ladders in mind. Identifying the specific questions, audience and purpose of a dashboard can help lead to intentional designs like this one.⁴



Figure 1: Kentuckiana Advanced Manufacturing Career Pathway chart (June 9, 2015):

Phased Approach

When launching a project to design and implement a dashboard, agencies may be inclined to tackle all of their analytic needs at once. The experiences of the workgroup members, however, suggest that it may be better to start small and take an incremental approach in establishing a dashboard process. By using a phased approach, agencies can see what is and is not working as they go, ensuring that they don't waste time and resources on building a highly complex process that ends up not being used. Teams can start with one or two simple policy questions that they are trying to answer, find a couple of measures that provide insight, build and use a dashboard for those measures, then step back and reevaluate whether or not the process is working. If the dashboard is not being used, or value is not being driven from it, maybe a different format is needed, or the dashboard is not reaching the appropriate audience. Further, teams may find that stakeholders are more willing to buy-in to initiatives that start small and solicit regular feedback as they grow.

Does this dashboard already exist?

Prior to expending resources on designing and implementing a new dashboard process, the team should look to see if the identified policy questions can be answered using dashboards already in existence. In addition to evaluating existing internal dashboards and dashboard from other agencies, there are various organizations that put out dashboards that may serve a state's particular needs.

The [US Cluster Mapping Project](#) (Figure 2) is a partnership between the US Economic Development Agency and the Harvard Business School that provides insight into a variety of measures that may be of use to state agencies. The project includes the ability to look at measures both at the state level and at sub-state levels. The data is lagged by two years, limiting the policy questions that it can answer, but may be sufficient for teams looking for answers to questions around long-term trends and patterns. The project's website provides a [rundown](#) of the measures available through the dashboard and the source for each.⁵

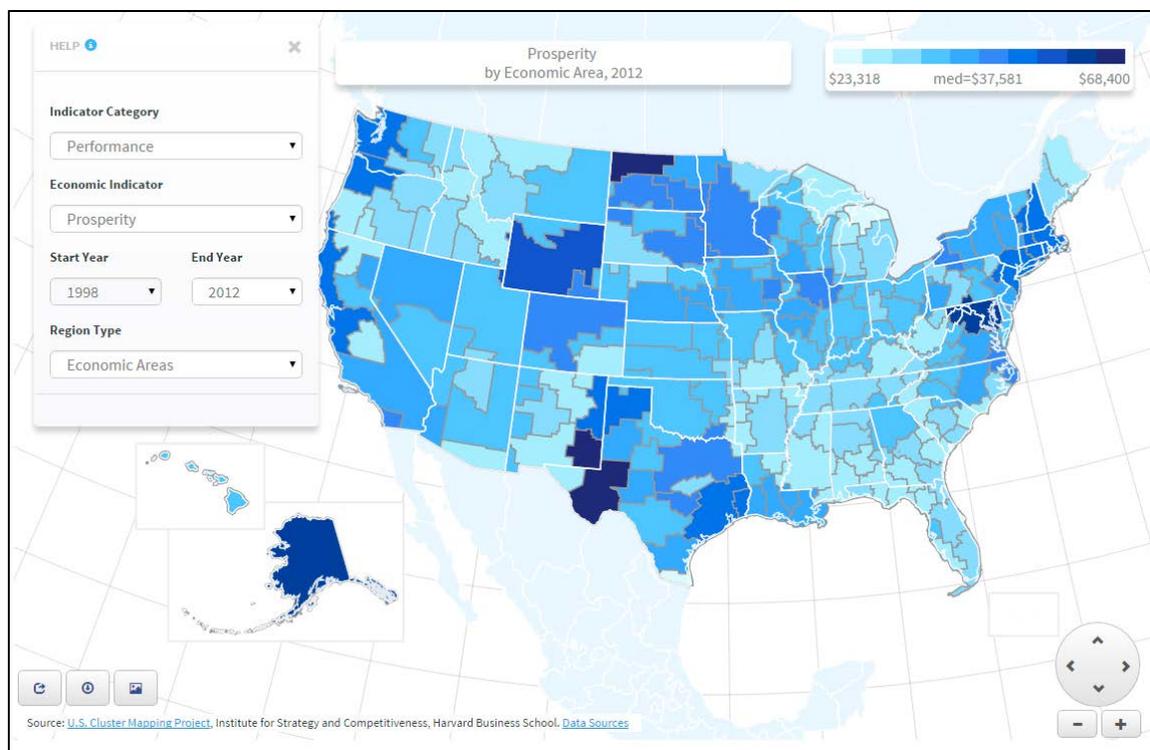


Figure 2: U.S. Cluster Mapping Dashboard (June 9th, 2015):

Additionally, other organizations may be producing or publishing dashboards that can be of use. An example is the North Carolina Chamber of Commerce, which produces the [NC Dashboard 2030](#).⁶ Other states may find that similar dashboards which address their needs are already being compiled by organizations in their state such as trade and industry groups, third party data vendors, labor organizations, institutions of higher education, or research organizations. A quick scan of these types of organizations operating in a state could result in saved time and resources.

The Project Team

Once the decision is made that there is a need for a dashboard and that existing dashboards do not serve this need, a project lead and team will need to be assigned to conduct the bulk of the work in designing the dashboard and process and then implementing it. The project team should consist of individuals who are familiar with the audiences and policy questions outlined when scoping, individuals familiar with the type of data that can help answer these questions, and individuals who will be involved in analyzing and using the data presented on the dashboard. It is generally advisable to have representation from the lead agency's (or agencies') information and technology department, as they will be most familiar with the processes involved in collecting the data and converting it into the dashboard.

Stakeholders

Talent supply and demand has broad implications for individuals and groups across the breadth of both the public and private sector. When embarking on the development of a dashboard, directly involving some of these potential stakeholders, in addition to formally gathering feedback from others, can substantially enhance the value of the dashboard. While the scope of the dashboard will largely dictate who should be involved in its development, there are some stakeholders that will likely be involved in most projects (Table 4).

Table 4: Common dashboard stakeholders

Stakeholder	Involvement
Governor's Office	Talent supply and demand are integral components of a state's economic and social health. Therefore, the talent supply and demand dashboard should be aligned with the governor's overall priorities.
Workforce Agency	The workforce agency is responsible for many programs that are intended to close the gap between talent supply and demand, and should therefore be an integral part of any dashboard project. Workforce will often lead the process of creating a supply and demand dashboard.
Education System	The education system in a state is tasked with developing the future talent supply for that state, and therefore must stay intimately informed of the demand for talent within the state. In some states, the education system may lead the process of creating a supply and demand dashboard.
Economic Development Agency	A state's talent is an important component of the economic development ecosystem and therefore the state economic development agency should be included as a stakeholder throughout so that their needs are addressed. In some states, the economic development agency may lead the process of creating a supply and demand dashboard.
Training Providers	Depending on the level of detail that a dashboard goes into, the dashboard may provide valuable information that can inform providers' offerings and priorities.
Employers	Engaging some of the employers in a state can help put context behind talent demand measures. Additionally, employers can help validate the messaging that the dashboard elicits.
Students, Workers, and the General Public	Often, public facing dashboard are intended to provide information that the general public can use when making career decisions, but even if this is not the intent, it should be remembered that those that make up the labor supply are an important stakeholder in the process.
Data Vendors	Third party data vendors can be an invaluable resource in creating a supply and demand dashboard. Often, there will be data that these vendors have that is not easy for agencies to compile on their own, and engaging them early on can help inform project teams about data that they might not have known existed.

IV. Measures and Data

The value driven by a dashboard is through the measures that are included on it. In picking the measures to be included on the dashboard, the focus should be on the policy questions that were identified earlier in the process so that each measure contributes to answering those questions. Table 5, Table 6, and Table 7 outline some common measures that are on talent supply and demand dashboards.

Example:

Michigan has launched a [Talent Dashboard](#) (Figure 3) which provides an overview of the current level of performance for measures that are related to their state goals and priorities. The dashboard ties each metric to one of five key categories: Attraction and Retention, Employment Environment, Innovation, Global, and Connections. Within each category are measures that specifically relate to policy initiatives and the Governor’s priorities. For example, under the Global category, there are three measures: persons obtaining legal resident status, international students studying in Michigan, and Michigan students studying abroad.⁷

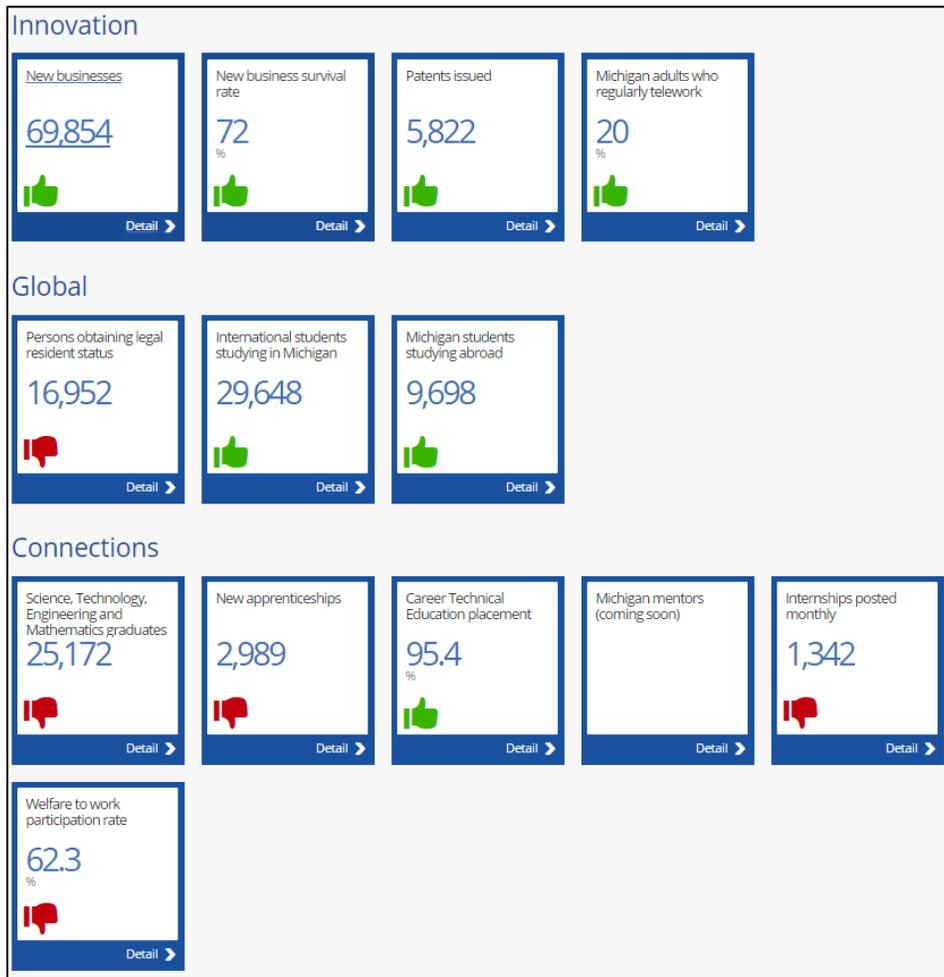


Figure 3: Michigan Talent Dashboard (June 9, 2015):

Table 5: Common measures of talent supply

Measure	Description	Potential Pitfalls to Address	Potential Data Sources
Number of Employed	Counts the number of residents within the state that are employed	Can be influenced by both economic and population shifts.	Bureau of Labor Statistics
Number of Unemployed	Counts the number of residents within the state that are not employed and are actively seeking work	Can be influenced by both economic and population shifts.	Bureau of Labor Statistics
Unemployment Rate	The number of unemployed individuals divided by the number of unemployed plus employed individuals within the state. Often this is looked at in tandem with labor force participation.	Different unemployment measures count the number of unemployed differently.	Bureau of Labor Statistics
Labor Force Participation Rate	The percent of working age individuals within the state that are included in the labor force	Interstate mobility is a key consideration in calculating this rate.	Bureau of Labor Statistics
New Entrants to the Labor Force	The flow of new workers into the labor force; this includes students that have left the education system to join the workforce, adult workers who have decided to begin working, and previously discouraged workers returning to the job market.		Bureau of Labor Statistics
Credential/Educational Attainment	The number of graduates with different education levels and degrees, typically for the most recent cohort of students.		State education administrative databases, the Integrated Postsecondary Education Data System (IPEDS)

Table 6: Common measures of talent demand

Measure	Description	Potential Pitfalls to Address	Potential Data Sources
Employment Projections	Predicts the demand for employment in future years. Typically broken out by occupation and industry in order to provide guidance on where training should be focused.	Projections are estimates of future economic and labor market activity; accuracy can be improved by utilizing both qualitative and quantitative projections from multiple sources.	BLS Employment Projections
Job Openings	The number of jobs currently available in the state, typically broken down by industry, occupation, and or education level.	Duplications and multiple openings for a single listing must be accounted for (often the vendor will address this).	Real-time LMI data is available from multiple vendors. A vendor scan conducted by JFF is referenced below. ¹ Some states have job vacancy surveys
Number of Establishments	The number of firms within a state. Often broken down into region or firm size.		Statistics of US Businesses
New Business Starts / Business Terminations	The flow of businesses in a state. Used to look at overall change in the number of businesses operating as well as volatility. Often broken down into region or firm size.		Statistics of US Businesses

Table 7: Other measures commonly found on talent supply and demand dashboards

Measure	Description	Potential Pitfalls to Address	Potential Data Sources
Median Wages	The middle of the distribution of worker’s income; provides a complementary view to employment measures which can provide insight into the quality of jobs in the labor market.	Only looking at wages in the middle can hide significant changes at the extremes.	State UI wage records database, Bureau of Labor Statistics , Census Bureau
Population Demographics	Can measure demographics of the entire population or the labor force in order to provide insight into the particular needs of the location. Typical demographics include age ranges, education levels, race/ethnicity, and veteran status. Often broken down by region.		Current Population Survey , American Community Survey

¹ Job for the Future’s (JFF) *Real-Time Labor Market Information: Environmental Scan of Vendors and Workplace Users* is described and linked to on [page 14](#).

Comparisons, Reference Points and Breakdowns

Beyond identifying appropriate measures and quality data sources for the dashboard, consideration should be given to what comparisons and reference points will be provided for each measure. Simply providing a number with no context will be of little use for all but the most expert of users. For each measure, the team should ask what the number is supposed to tell users and provide a reference point that allows them to gain that insight (and derive conclusions of their own). Table 8 provides some examples of messages that measures are intended to convey and what reference point to use.

Table 8: Guidance on measure comparison groups, reference points, and breakdowns

Message to be Conveyed	Reference Point
How the state is performing on a key performance indicator compared to a goal.	Provide the target that the state aims to hit, along with indication of whether the measure should be above or below that target.
What the measure has been trending towards.	Add in historical levels, often in line graph form, that provide context of whether the measure is trending up, down, or flat. Time period selection is important, as the message can change depending on the period selected. Unless there is a reason to limit the time period, more data is generally better as it lets the reader draw their own conclusions. If how the data is collected or measure defined has changed over the time period, call that out.
How the measure compares to other areas of the country.	Providing data for all 50 states can often be too much (unless it is made interactive so users can select states to compare to), so either picking peer states or using national totals is typically preferred.
How different parts of the state are faring on the measure.	For states with distinct economic regions and regional needs, breaking measures out into economic regions, counties, or MSAs can be helpful. This is especially true if the audience includes local agencies and training providers. Some states choose to show all of the regions together, others may offer different versions of the dashboard for each or make the dashboard interactive to allow the user to change the region.
How target populations differ in their needs and their performance on the measure.	Talent supply and demand dashboard are often used to show disparities between different populations. Common breakdowns include age groups, race/ethnicity, veteran status, and education.

Example:

Montana's Census & Economic Information Center publishes the [CEIC Economic Dashboard](#) (Figure 4), which includes a visualization of the state's unemployment rate overlaid on a visualization of the state's labor force. By combining the two measures onto a single grid with two different axes, users can easily see whether or not changes in the unemployment rate are potentially being driven by changes in the labor force. When combining two measures onto a single graphic, an important consideration is how to set the two axes against each other; often, the axes will be set in order to maximize the amount of space being utilized for both measures, but occasionally there will be a logical conversion between two measures which should dictate the range of the axes and how they are aligned.⁸

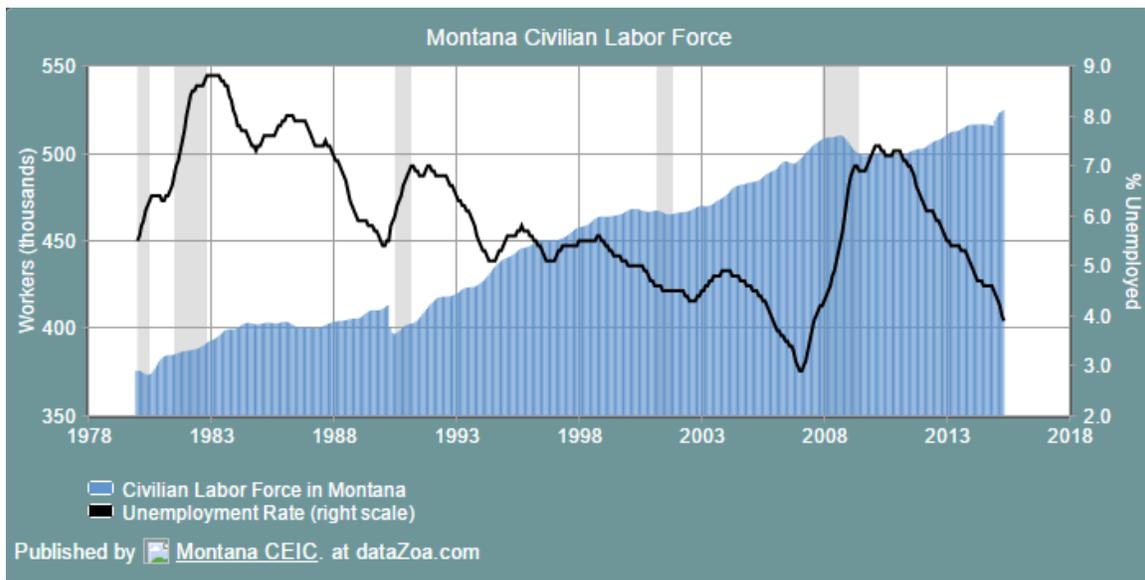


Figure 4: Montana's CEIC Economic Dashboard (June 30, 2015)

*See additional examples in appendix

Other resources for selecting and defining measures:

Using Workforce Information for Degree Program Planning in Texas

This [report](#) is the result of a legislative mandated investigation of Texas's future workforce needs, conducted by the RAND Corporation. While the target of the research was the Texas workforce system, the learnings are useful for any state as they develop a talent supply and demand dashboard.

The report examined the measures being used in the Texas workforce system and made several recommendations on how to improve the processes and measures. Specifically, the report highlights how data from the American Community Survey (ACS) can be used to provide projections for future occupational demand and provides some tools that can help utilize the ACS data.

The authors classify demand and supply measures into two broad categories, flow measures (Figure 5) and stock measures (Figure 6). Stock measures look at supply and demand at a point in time, while flow measures examine changes over time. The report highlights that stock models have an advantage over flow models in that they encompass all sources of workers, whereas flow models may miss some parts of the labor supply due to geographic migration of workers.⁹



Figure 5: RAND's flow model structure

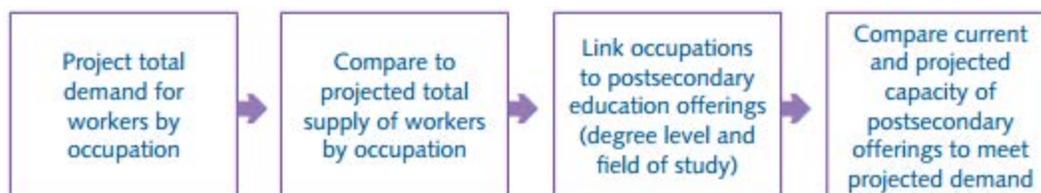


Figure 6: RAND's stock model structure

How Many More Skilled Workers Do We Need? Using Supply and Demand Reports for State Workforce Planning

The National Skills Coalition's State Workforce Education Alignment Project (SWEAP) released this [report](#) offering guidance on measuring and comparing supply and demand in labor markets in order to match skill attainment in the education and workforce systems with the skill needs of employers.

The report details how to measure the flow of new workers into the workforce by measuring credential attainment and comparing it to projections created by each state's BLS Labor Market Information office. The report goes on to address pitfalls with these measures that users need to be aware of and adjust for and discusses how the measures can be used effectively to drive policy and program decisions.

When measuring supply indicators such as credential attainment, the report suggests aligning on specific definitions at the beginning of the effort, as often training providers and educational institutions will differ in how they define certain terms. To this end, the authors put forward definitions for three middle-skill supply measures common across dashboards:

- Certification: "A credential awarded by a certification body (not a school or government agency) based on an individual demonstrating, through an examination process, that he or she has acquired the designated knowledge, skills and abilities to perform a specific occupation or skill. The examination can be written, oral or performance-based. Certification is a time-limited credential that is renewed through a recertification process."
- License: "A credential that permits the holder to practice in a specified field. A license is awarded by a government licensing agency based on predetermined criteria. The criteria

may include some combination of degree attainment, certifications, certificates, assessment, apprenticeship programs or work experience. Licenses are time-limited and must be renewed periodically.”

- Certificate: “A credential awarded by a training provider, educational institution or certification body based on completion of all requirements for a program of study, including coursework and tests or other performance evaluations. Certificates, as an academic award, are not time-limited and do not need to be renewed.”¹⁰

Success in Real-Time: Using Real-Time Labor Market Information to Build Better Middle-Skill STEM Pathways

As an alternative and supplement to traditional measures of labor demand, such as long-term BLS employment projections, many workforce agencies are turning to real-time labor market information (LMI), which curates job posting information from popular job search websites in order to build a comprehensive picture of what occupations and skills employers are looking for. In this [report](#), Jobs for the Future examines how real-time LMI can be used in building career pathways for middle-skill STEM workers. Real-time LMI can provide a rich and informative data source for users, but teams should give consideration to the fact that actual job openings do not have a one to one relationship with online job postings; some companies may list one opening, but hire dozens of applicants that respond to it; others may frequently repost a listing for a job that they intend to hire only one person, and; some industries or occupations may not be regular online recruiters, but instead prefer finding candidates through other avenues such as job fairs or classified ads.

Real-Time Labor Market Information: An Environmental Scan of Vendors and Workforce Development Users

Jobs for the Future and Maher & Maher released a [report](#) identifying and reviewing eight vendors for real-time labor market information (LMI). For each vendor, the report highlights the type of data they provide, how the data is collected, and who common users of the vendor are. The report also highlights some important limitations to real-time LMI that users need to be aware of when using the data.¹¹

V. The Dashboard

Identifying the right measures and finding quality data that can populate those measures is not the end of the story, an appropriate format is vital in conveying that information to the intended audience. There are many options for how to do this, and there is no single correct or best method. Instead, the method should be selected based on who the audience is and how they will be interacting with the measures.

There are several key questions (Table 9) that the state can ask when determining the appropriate format for their dashboard. These questions help determine whether the dashboard will need to be web-based, interactive, and purchased or developed in-house.

Table 9: Guiding questions for choosing the dashboard format

Question	Implications
Who is the target audience?	When selecting the format for the dashboard, consideration should be given to who the users will be. Different target audiences will have different levels of technical skills and expertise and will use the scorecard in differing ways.
Will the dashboard be made publically available?	If the dashboard is to be published to the public, it will most likely need to be distributed through a website. If not, then other options may be open, such as distributing it through email or in print; however, web-based options may still be preferable for non-open dashboards, especially if the audience is large.
Will each measure have multiple breakdowns?	The more breakdowns there are for each measure, the more helpful a dynamic dashboard becomes. A static dashboard with many breakdowns can end up having dozens of visualizations, and users typically will only be looking for a few specific measures at a time.
What is the budget for developing the dashboard?	Some dashboard delivery methods require procuring services or products from private vendors, and therefore may be outside the budget for some projects. Resource limitations may impact in-house development as well, as the team may be limited to already procured software and freeware.
Does my agency have expertise and experience in designing the type of dashboard we need?	Limited expertise and experience in dashboard creation may require some projects to seek outside support, such as consulting, or may limit the complexity and format of the dashboard. Striving for a highly interactive, web-based, customized dashboard without the qualified expertise to create one could result in a project that does not meet expectations or never comes to fruition.
What are the formats of other dashboards that my stakeholders use?	Retaining consistency with other dashboards that share a similar audience can help streamline the training process and could make adoption of the dashboard an easier process for users. However, the team should still consider whether or not the format meets their needs, and should not sacrifice usefulness for consistency.

There are a wide variety of resources that offer advice on enhancing the usefulness of dashboards. Below are some of those resources:

Use of Dashboards in Government

In 2011, the IBM Center for the Business of Government released a [report](#) on how the government can more effectively use dashboards to drive actions and improvement. While the report is focused on federal efforts, the information contained can largely be applied to all levels of government.¹²

In examining several case studies, the authors identify four key lessons that dashboard project teams should consider:

- “Data quality is key to the credibility of dashboard performance measures.”
 - Data quality issues can not only provide misleading information, but also can hurt the long-term credibility of the dashboard. The report suggests addressing data quality through using standardized data definitions and robust training of key personnel.
- “Best practices resources are necessary in the design and use of dashboards.”
 - Best practice dashboards and resources can enhance the quality of the dashboard design, according to the report. This toolkit is intended to provide some of those resources and link to best practice dashboards.
- “Performance measures should reflect organization goals.”
 - Identifying what policy questions the dashboard is meant to answer in the first stage of the development process and then tying them to each measure is key to creating a dashboard that drives value.
- “Dashboards are only tools; effectiveness depends on use.”
 - Incorporating the dashboard into decision-making processes is vital to maximizing its value to the organization.

The report presents three different types of dashboards, which can be applied to categorize talent supply and demand dashboards. Most talent supply and demand dashboards at the agency level will either fall into the tactical or strategic categories, while training providers and educational institutions are more likely to have operational dashboards.

- **Operational** dashboards monitor real-time programmatic work, such as program enrollment and completion.
- **Tactical** dashboards facilitate medium-term analytics and could be used to benchmark indicators versus peers to identify areas of opportunity or to identify in-demand occupations in order to direct candidates to the right programs.
- **Strategic** dashboards are used to evaluate long-term policy decisions and guide leadership decisions relating to starting or stopping particular programmatic offerings, redirecting priorities and funding, or identifying target sectors and occupational categories.

Any of these three types of dashboards can be presented in either a static or dynamic manner. A static dashboard presents an unchanging, non-interactive view of each measure for a specific period of time, whereas a dynamic dashboard is interactive and often updated in real-time (or as data becomes available). Both static and dynamic dashboards can drive value, and teams will need to determine which is appropriate for their purposes. Some teams may find that while a dynamic dashboard is functionally preferable, the added costs are not justifiable. Table 10 addresses some of the pros and cons of each type.

Table 10: Static vs. dynamic dashboards

	Pros	Cons
Static	<ul style="list-style-type: none"> • Takes less resources (time and money) to publish and maintain • The publication typically comes with an announcement or is on a specific date (i.e.; first day of the month), creating an impetus for users to look at the dashboard 	<ul style="list-style-type: none"> • May not present the most up-to-date information available • Users are limited in how they can view the dashboard, which may inhibit exploratory analysis
Dynamic	<ul style="list-style-type: none"> • Can be valuable in exploratory analysis, since users can create a custom view of the measures • Typically has the most up-to-date information available • Interactive features can be attention-grabbing and generate interest in the dashboard 	<ul style="list-style-type: none"> • Can be costly (in both time and money) to create and maintain • Requires high level of technical expertise • Users need to proactively remember to utilize the dashboard as there is generally no “publication date” or announcement

5 Best Practices for Creating Effective Dashboards

Tableau, one of the largest dashboard centric software companies in the world, released a [report](#) outlining both best practices and mistakes to avoid when creating dashboards. These are tips that apply to any dashboard, including a talent supply and demand dashboard.¹³

Tableau’s five best practices:

- Choose metrics that matter
- Keep it visual
- Make it interactive
- Keep it current or don’t bother
- Make access easy

Tableau’s mistakes to avoid:

- Starting off with too much complexity
- Using metrics no one understands
- Cluttering the dashboards with low-value graphics and unintelligible widgets
- Waiting for complex technology and big business intelligence deployment projects
- Underestimating the need to maintain the dashboard
- Failing to match metrics to the goal
- Using ineffective, poorly designed graphs and charts

Example:

Indiana's [Management and Performance Hub](#) (Figure 7) allows users to select an agency, then populates a dashboard with the key performance indicators for that agency. For each KPI, the dashboard will provide an explanation of why it is measured, how it is measured, how the goal is determined, the reporting frequency, and a visualization showing recent performance versus goals. Each KPI is displayed in a consistent format, which prevents the user from having to figure out how to read each one. The explanations provided for why and how the KPI is measured ensure that users understand the purpose and specifics of the measure.¹⁴

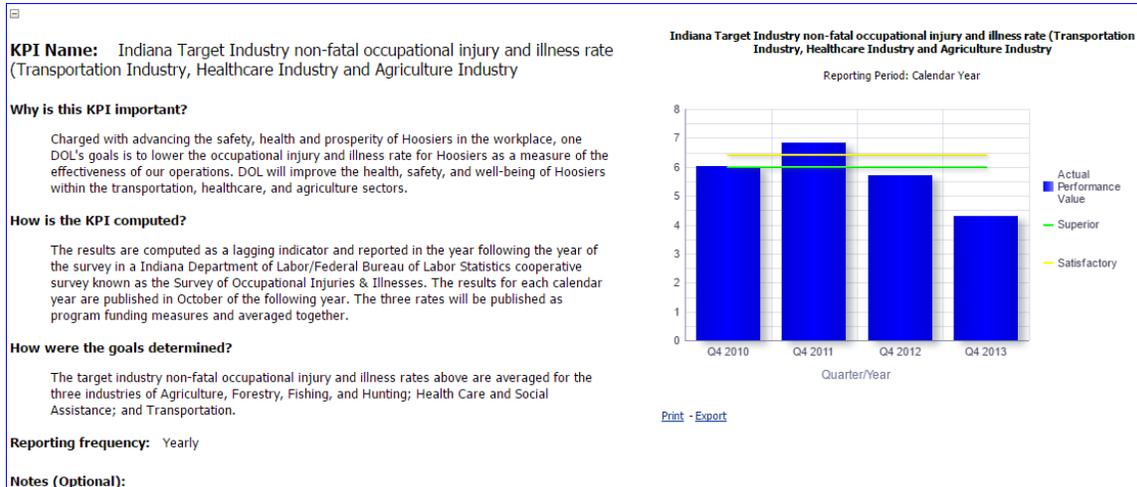


Figure 7: Indiana's Management and Performance Hub (June 30, 2015)

*See additional example in appendix

Data Visualizations

An important component of any dashboard is data visualization. Visualizations allow a dashboard to easily convey where a measure is relative to other measures, past performance, and targets. Successful visualizations allow readers to quickly grasp the key message behind the numbers; unsuccessful visualizations obscure or distort the message, potentially leading to non-productive or counter-productive actions being taken. Therefore, selecting what visualizations to use on the dashboard is an important step in ensuring its effectiveness. Below are some resources that can help in deciding what type of visualizations to use and how to construct them.

The Use of Data Visualization in Government

IBM's Center for the Business of Government released a [report](#) offering guidance on how visualizations can be used to drive value at all levels of government. The report offers some information on different types of visualizations, links to resources for creating visualizations, and offers several case studies on how government entities have effectively used data visualizations.

Included in the report are tables linking to and summarizing data visualization resources and tools. These tables have valuable sources that dashboard development teams may find useful if creating their own data visualizations and are reproduced in the appendix at the end of this report for ease of access (see appendix Table 1 and Table 2).¹⁵

Creating Valuable and Meaningful Graphics to Help Analyse Data

Gov.uk published a [guide](#) for their agencies in selecting and creating data visualizations. The guide offers a high-level, quick overview of the visualization process and provides some guidance in choosing between different chart types.¹⁶

Chart Suggestions: A Thought-Starter

Dr. Andrew Abela, Catholic University provost and corporate communications consultant, created a simple [chart](#) (Figure 8) that helps users pick which chart to use depending on the purpose of the visual and characteristics of the data. The chart was created in 2006, so many recently developed chart types are not included, but includes those most often used on dashboards.¹⁷

Advances in statistical programming software and technologies such as machine learning have facilitated a rapid expansion in visualization types, some of which can be very information and visually appealing. Teams should be cautious, though, as the more complex and unique a visualization is, the more training users will require in order to be able to glean information from it. Often, the simplest option is the best option.

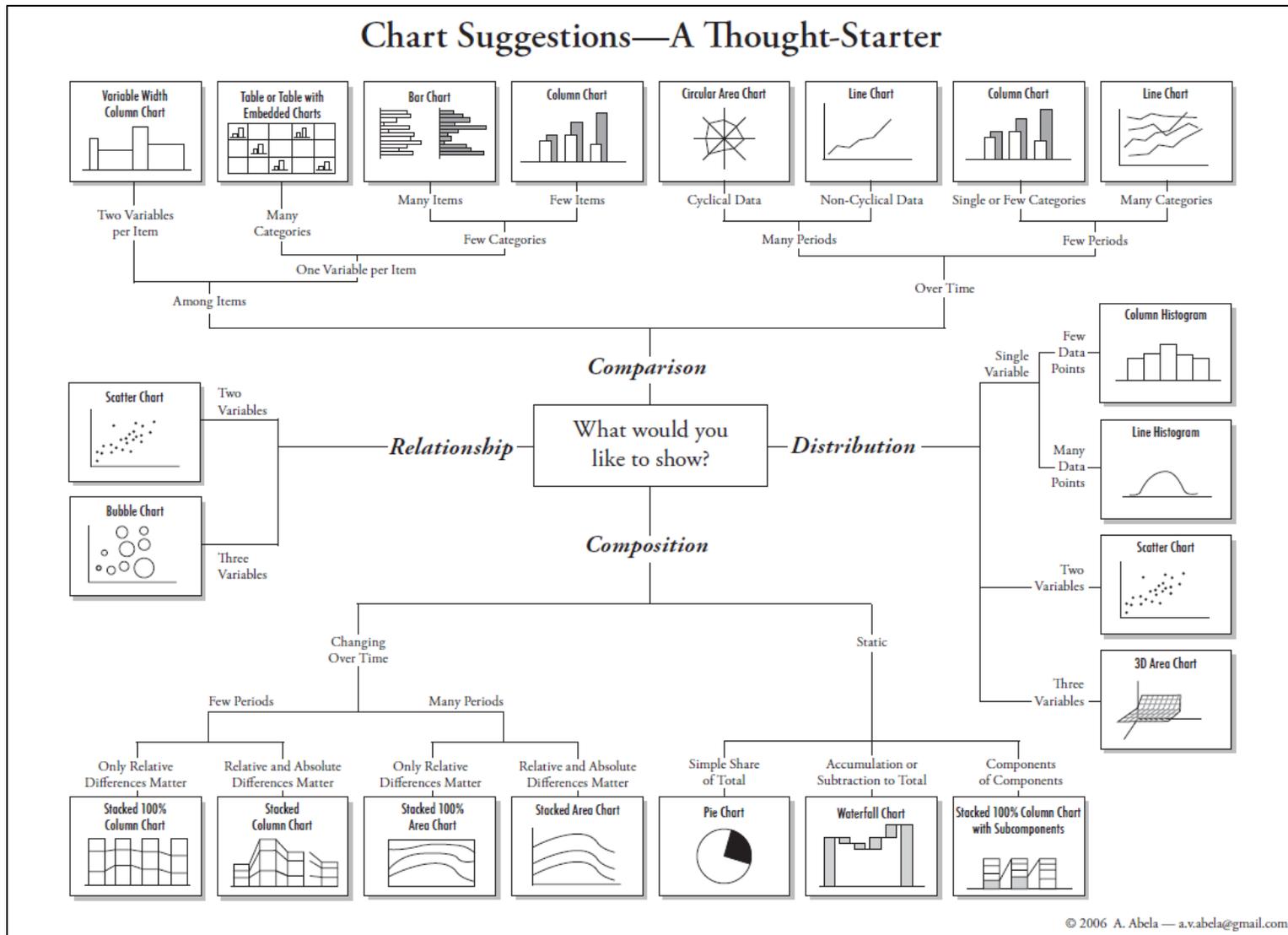


Figure 8: Chart Suggestions – A Thought-Starter

Example:

The Kentucky Community & Technical College System's Office of Research and Policy Analysis produces [Occupational Wage and Demand Matrices](#) (Figure 9) for the overall state and for regions within the state, with breakouts for key industries for each. The bubble chart is able to convey lots of valuable information in an easy to comprehend format, helping workforce professionals identify professions that are in-demand, growing, and that pay well. The chart shows wages on the x-axis, change in employment on the y-axis (to indicate growth), number of average annual openings via the bubble size, and whether or not the workforce system has a program supporting that occupation via color. Users are able to scan quickly and identify which occupations they should be focusing on and how they can refine their program offerings.¹⁸

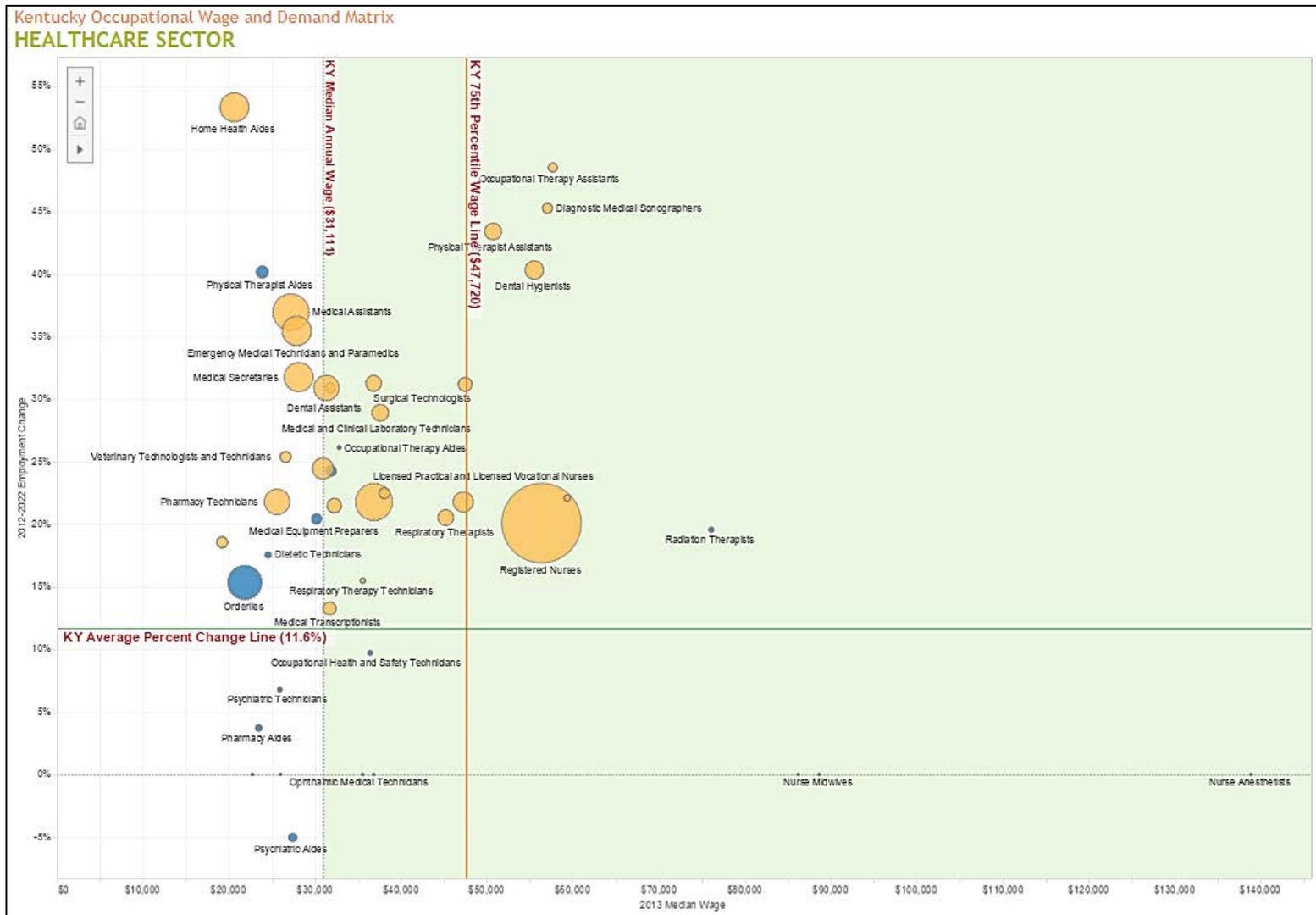


Figure 9: Kentucky State Occupational Wage and Demand Matrix, Healthcare Sector (July 9th, 2015)

VI. Operationalization

The value of a talent supply and demand dashboard is in how it is used to drive action. To this extent, an integral part of developing a dashboard is developing the processes by which it will be used. Considerations should include:

- Who is making decisions that can benefit from the information on the dashboard?
- How to best socialize the dashboard to potential users?
- What training is needed for users to understand the dashboard functionality and measure definitions?

Often, organizations will find that holding meetings with agency leadership (or program management, depending on the policy questions it addresses) which coincide with the updating of the dashboard will facilitate conversation on and usage of the dashboard. Typically, the dashboard will be distributed shortly before the meeting in order to give stakeholders time to analyze and investigate current performance. Then, a meeting will be held in which the dashboard drives the agenda and leaders have time to discuss past performance and future plans.

Successful dashboard meetings will typically:

- Assign a single owner to each measure
- Require each owner to come to the meeting prepared to address 3 topics:
 - Drivers of the current level of performance on the measure
 - Actions underway that will affect the performance on the measure
 - Resources needed to improve or maintain the performance on the measure
- Focus discussion on actions that need to be taken
- Come out of the meeting with a clear plan and assigned owners of actions

VII. Sustainability

Even a well-designed dashboard can fall into disuse if there is not a clear and explicit plan for sustaining it. A sustainable dashboard will need:

- Owners assigned to manage each measure, who are responsible for:
 - Understanding the calculations and data behind it
 - Monitoring for potential data quality issues
 - Regularly updating the dashboard for their measure
- A detailed plan for regularly updating the dashboard with timing on when each step should be completed
- To be incorporated into onboarding procedures, so that new employees and leaders will be trained on the functionality of the dashboard and measure definitions
- A periodic review amongst key stakeholders to evaluate the usefulness of the dashboard and recommend changes.

A well-managed talent supply and demand dashboard will likely evolve over time as the needs of the state and workforce change. Stakeholders may even find that they no longer need a particular dashboard, and should periodically ask themselves whether they are still deriving value from the dashboard, or if they are just updating it because that is what they've always done.

VIII. Appendix

Example:

The San Diego Workforce Partnership publishes a [dashboard](#) (Figure A1) including multiple measures. For some of the measures, the dashboard provides the equivalent measure for two peer cities in order to provide reference points.¹⁹

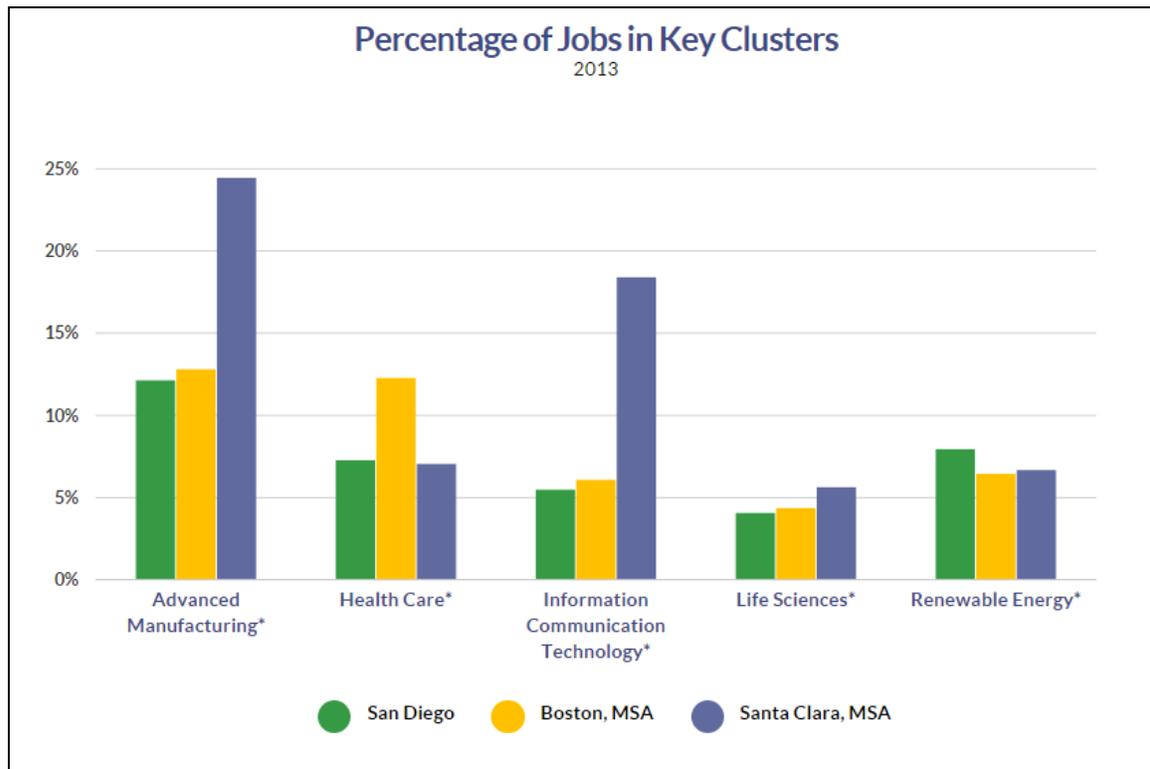


Figure A1: San Diego Workforce Partnership Dashboard (June 9th, 2015)

Example:

Maine’s Center for Workforce Research and Information’s [dashboard](#) (Figure A2) puts unemployment numbers into context by putting them side to side with labor force participation rates and pre-recession numbers. It additionally breaks the measures into age brackets, letting users grasp the variance within different sub-populations.²⁰

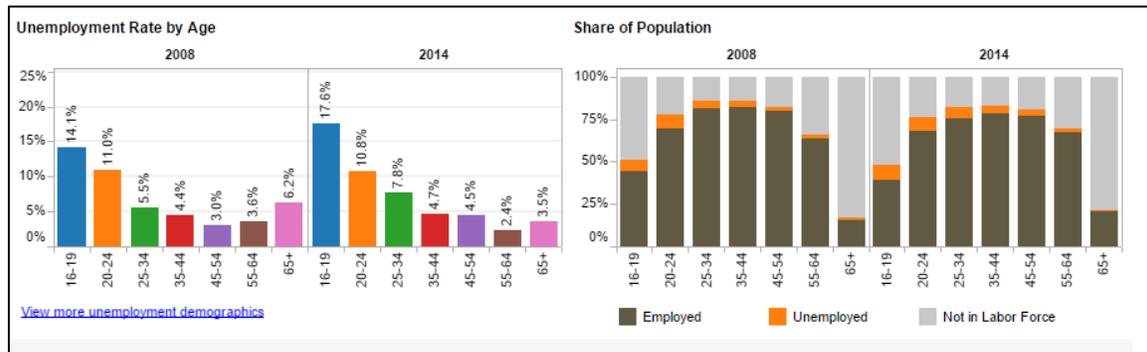


Figure A2: Maine’s Center for Workforce Research and Information Dashboard (June 9th, 2015)

Example:

The South Dakota Board of Regents (SDBOR) has launched a series of [dashboards](#) (Figure A3) related to the state’s higher education system. One of the dashboards, the Graduate Placement Dashboard, provides an interactive view of how graduates of the state’s universities are faring in the labor market. Users can see what percent of graduates have found employment, what their average annual wages are, what state they are working in, and information on other relevant indicators. Users can filter to the level of detail that they are interested in, including by graduation year, university, and major, and also hover over different pieces in order to find out more information. Additionally, the dashboard has several notable findings listed above it, ensuring that users take away key points that the dashboard owners have identified.²¹

Notable findings include:

- Over the last five years, more than 17,000 Regental degree completers have chosen to stay in South Dakota to work or pursue further education.
- Regental graduates entering the South Dakota workforce earned an estimated median wage of \$36,603 over the first year after graduation.
- The "health care and social assistance" and "educational services" industries have been leading employers of Regental graduates over this period.

SDBOR Graduate Placement Dashboard

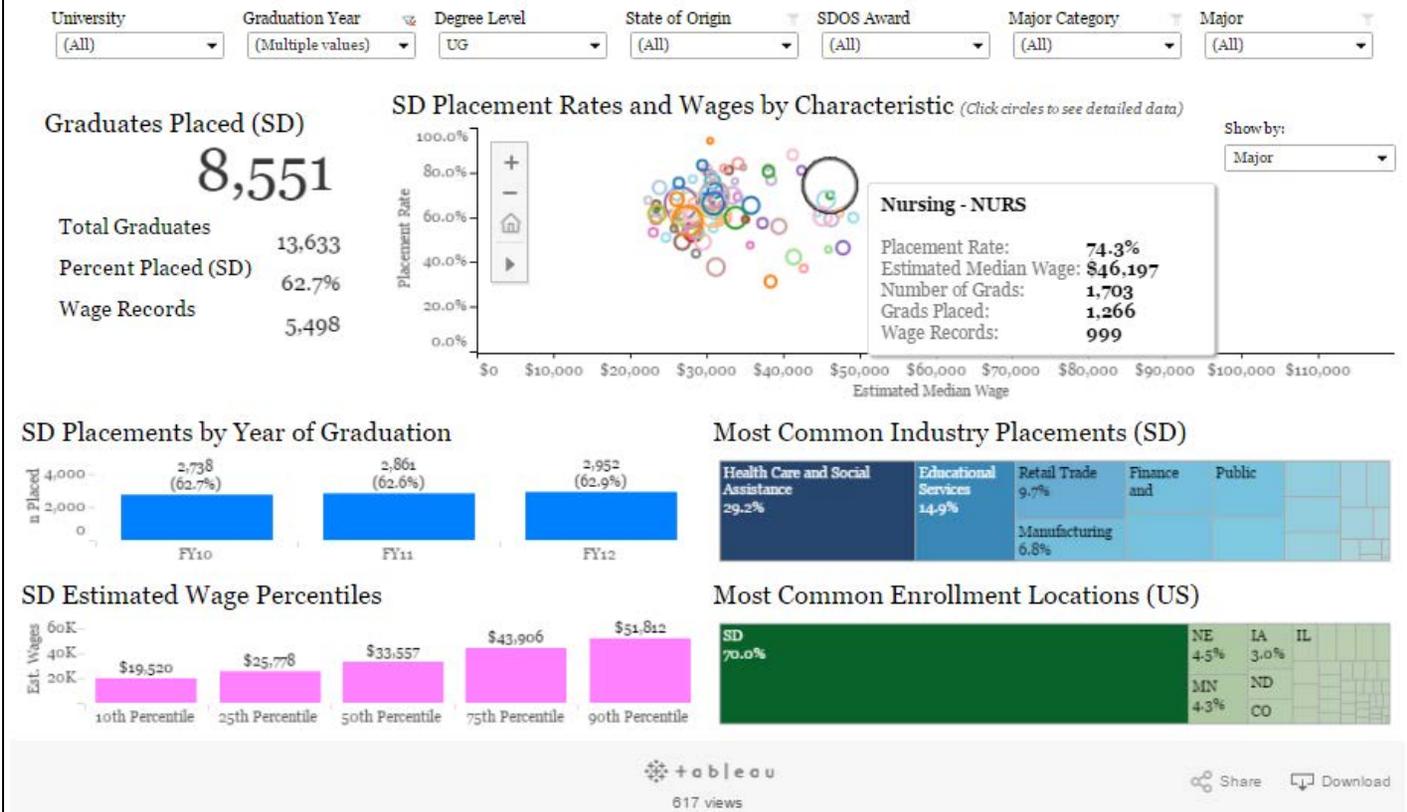


Figure A3: SDBOR Graduate Placement Dashboard (June 9, 2015)

Table A1: IBM Center for the Business of Government Data Visualization Resources²²

Data Visualization Resources
<ul style="list-style-type: none"> ▪ Chartsnthings is a personal blog run by a staffer from the <i>New York Times</i> graphics department. Available at chartsnthings.tumblr.com. ▪ A highly useful resource for the public sector is Dataviz: Improving Data Visualization for the Public Sector, from the United Kingdom's Oxford Consultants for Social Inclusion and Communities and Local Government. Available at www.improving-visualisation.org. ▪ Datavisualization is a news resource for data visualizations at datavisualization.ch. ▪ Eager Eyes at eagereyes.org is a blog by Robert Kosara, a researcher and analyst at Tableau Software; the site contains excellent information and honest evaluations of techniques and a useful feature showing acceptance rates for papers and presentations at visualization conferences. ▪ Webdesignerdepot. Fifty great examples of data visualization can be found at www.webdesignerdepot.com/2009/06/50-great-examples-of-data-visualization. ▪ Freegovinfo.info is a quick visualization primer for data.gov that provides a list of resources for public sector visualizations. Available at freegovinfo.info/node/2610. ▪ FlowingData is the website by Nathan Yau, author of one of the best books on visualization, <i>Visualize This: The FlowingData Guide to Design, Visualization, and Statistics</i>. Available at flowingdata.com. ▪ HowTo.gov's Data Visualization and Infographics in Government is an excellent resource, providing a one-hour webinar by public sector employees on how they created visualizations as well as PowerPoint slides from their presentations. Available at www.howto.gov/training/classes/data-visualization-and-infographics. ▪ Information is Beautiful, run by a self-described data journalist. Funded by sales of data visualizations in the form of posters, images, and books with examples separated into categories (health, people, thought, science). This site is clearly more focused upon visualization as art rather than data analysis. However, it still contains excellent examples of data visualization at work. Available at www.informationisbeautiful.net. ▪ Information Aesthetics is a weblog that collects projects considered important or original; the focus is on design at infosthetics.com. ▪ Information design is a resource for design professionals with a focus on information design at www.informationdesign.org. ▪ Kaggle.com is a competition site for data analysis and visualizations at www.kaggle.com. ▪ Visualcomplexity.com focuses on resources on the visualization of networks. Available at visualcomplexity.com. ▪ Visualizing.org presents itself as a "community of creative people making sense of complex issues through data and design, hosting competitions, sites for posting data sets and featuring visualizations." Users can create accounts and join the community to share resources and space. Available at www.visualizing.org.

Table A2: IBM Center for the Business of Government Data Visualization Tools²³

Tools for Data Visualization

General Tools

Spreadsheets. The most basic charting tool is the spreadsheet; numerous examples are available (Microsoft Excel, Google Docs Sheets, etc.) These can be manipulated if the user also has the data and can be cut and pasted into other documents or converted into images for use on the web.

Chart Chooser. Now at Juice Labs, this tool allows users in Excel or PowerPoint to select the most appropriate kind of chart for their data. Available at labs.juiceanalytics.com/chartchooser/index.html.

Datawrapper. Datawrapper is an open source tool developed by ABZV to create embeddable charts for the web, mainly for the use of journalists. To create more customization for charts, services are available for a fee; users may also install a version of the server for themselves. Without charge, data can be copied and pasted online (or a CSV file uploaded) then a chart type selected, some options selected, and titles added. By registering on the site, users are then enabled to embed the chart on their own site.

Google Chart Tools API. Used to make charts out of data located on a user's own server, not on Google servers. Relies on some coding but extensive examples of coding for numerous kinds of charts are available for use. New features are also available.

Google Fusion Tables. Google Fusion Tables (www.google.com/drive/start/apps.html#fusiontables) is a relatively new Google tool that was created specifically to allow collaborations, share, and visualize data; it is a self-contained application designed to work with data stored on its own servers. It is found under Google Drive and is still listed as experimental. The app is also available for the Google Chrome browser. Users can combine tables of data, upload their own data, embed visualizations in Google Sites, and even open and view data in Google Earth. While uploaded data sets are moved to Google servers, they are not made public.

HighCharts. HighCharts provides interactive JavaScript codes for interactive charts with numerous chart options and chart types. For personal or non-profit projects, the download is free; government agencies can purchase relatively inexpensive licenses. Available at www.highcharts.com.

ICharts. A dedicated data visualization tool with pricing plans that vary with the types of data that can be used as well as the types of features available. See www.icharts.net.

JavaScript InfoVix Toolkit. This free code library provides wonderful-looking demos with their accompanying code so that users may learn about using the system. Users would have to be comfortable with some level of Javascript programming, as they are expected to change the existing code to create their own visualizations. Available at philogb.github.com/jit.

Many Eyes. Many Eyes is a browser-based, experimental IBM tool. It enables the user to create and post many kinds of charts and a few map opportunities. It is also easy to use. Once data or visualizations are posted to Many Eyes, however, they are public. See www-958.ibm.com/software/data/cognos/manyeeyes.

Tableau Public. Tableau Public is free data visualization software that is easy to use to make sophisticated and powerful interactive charts or maps with a limited variety of data types; these can then be posted online on Tableau's servers. The Public version matches up with other versions available for a fee that allow users to use additional data types and to host their own servers. Tableau also allows an easy way to create interactive dashboards.⁶

Timeline. A widget that helps the user to create timelines. Originally created as part of an Andrew Mellon Foundation project, it is now maintained by the open source community. Available at www.simile-widgets.org/timeline.

R. R is an open-source statistical programming language that produces excellent, publication-quality graphics. There are numerous versions and add-ons available by searching online, since

anyone can take R and make their own changes. It is also surprisingly easy to learn. See www.r-project.org/ for the R Project site which provides a wide variety of information about R.

Socrata. Socrata is a vendor tool that is its own platform, including dataset management, charting and mapping tools. It is notable at this time for its use by the group of big cities referred to as the G7 which are collaborating together on open data and using Socrata to host their Open Data portals.

Visualize Free. A browser-based tool much like Many Eyes where users can bring their data and upload it on their site or use some of their data and then with their tool, create an interactive visualization. Available at visualizefree.com/index.jsp

Visual.ly is both a tool and a site for designers and analysts and companies to find one another and work together on infographic projects. See visual.ly.

Specialized Tools

Three other tools, BetterWorld Flux, City Forward, and Gapminder World, are available on sites that come with specific kinds of data, urban and global, respectively. The visualizations created here automatically on the provided data are designed to educate users about the issues in specific policy areas.

BetterWorld Flux. BetterWorld Flux was created for the World Bank Open Data Apps for Development Competition; users cannot upload their own data but data about national development are provided for them to explore. Available at www.betterworldflux.com.

City Forward. Created by IBM, City Forward is a collection of data sets for each of over 100 cities (and some countries) around the world; the data are from the U.S. Census or other sources. Users choose a city, choose the data indicator they want to view, and then click a button to create the visualization. Users can also add features like titles and descriptions and can now upload their own data. Visualizations created by others are also available. See cityforward.org.

Gapminder World. Gapminder World is a nonprofit developed to promote sustainable global development and the achievement of the United Nations Millennium Development Goals. It uses the tool formerly known as Trendalyzer to allow a user to manipulate data supporting those goals and available on the site in graphs that are already created. After manipulations, graphs created can be shared as long as Gapminder is cited. Over 500 global indicators are available on the site; this data can be downloaded in Excel format, viewed, or used to create visualizations. See www.gapminder.org.

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- ²² Ganapati, *The Use of Dashboards in Government*.
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