

CLOSING THE LOOP: DISSEMINATION OF ASSESSMENT RESULTS WITH DATA VISUALIZATIONS AND INFOGRAPHICS

Alicia Iriberry, Craig School of Business, California State University, Fresno, 5241 N Maple Ave,
Fresno, CA 93740, airiberri@csufresno.edu

Aimee Jacobs, Craig School of Business, California State University, Fresno, 5241 N Maple Ave,
Fresno, CA 93740, ajacobs@csufresno.edu

ABSTRACT

Business schools continuously improve their processes and assessment activities, but knowledge of results and processes can be difficult to disseminate. This business school's assessment process works well but fell short in two dimensions: 1) effectively disseminating results and findings, which often lead to the lack of process awareness and 2) effectively motivating and engaging faculty in the overall assessment process. The Assessment Team began an initiative utilizing visualizations such as Tableau dashboards and infographics to improve these shortcomings. This paper presents the outcome of using data visualizations for assessing core competencies in student learning for program improvement.

Keywords: Data visualizations, Data-driven decision making, Performance dashboard, Infographics, Assessment

INTRODUCTION

A business school in Central California is continuously engaged in assessment activities, but considered its current assessment process to have reached maturity. Therefore, during the current cycle, the focus switched to fostering closing-the-loop initiatives in order to strengthen the connection between assessment results and improvement actions. In particular, a performance dashboard (i.e., data visualizations) of the assessment results were created in Tableau to disseminate in an easy to understand graphical presentation to faculty. These visualizations created a closer connection between actions and results to ensure continuous program improvement.

The purpose of this initiative was the design and implementation of a performance management system (i.e., performance dashboard with visualizations) to ensure the prompt dissemination of assessment results to all faculty in the business school. The goals of this project were:

- a. To facilitate the collection, analysis, and summarization of assessment results
- b. To facilitate the dissemination of assessment results to faculty and other stakeholders
- c. To present assessment results in an easy-to-read-and-grasp format
- d. To support the implementation and documentation of improvement actions
- e. To foster faculty engagement in assessment and "closing-the-loop" activities

It was also important to incorporate the use of a web-accessible data visualization tool and infographic posters to facilitate the quick review, interactive analysis, and interpretation of results that would trigger and support the implementation of program improvement actions.

BACKGROUND

The Assessment Team implemented the current Business Administration (BA) Student Outcome Assessment Plan (SOAP), which has been in place since the 2014-15 academic year. The school of business' SOAP includes nine student-learning outcomes (SLOs) shown in Figure 1. Note, there are two SLOs for Global awareness. Three of the SLOs correspond to core competencies the University currently assesses, Oral Communication (SLO 6), Written Communication (SLO 7), and Quantitative Reasoning (SLO 8).

<p>Business Administration graduates will:</p> <ol style="list-style-type: none">1. <i>(KN)</i>: Have discipline specific knowledge<ul style="list-style-type: none">- SLO 1: Demonstrate comprehension of all functional areas of business (e.g., accounting, finance, marketing, organizational behavior, human resources, legal and social issues, information systems, etc.).2. <i>(IT)</i>: Make judgments utilizing business decision support and productivity tools<ul style="list-style-type: none">- SLO 2: Demonstrate the ability to make data informed judgments utilizing spreadsheets and other analytical tools and technology.3. <i>(TM)</i>: Work effectively with others<ul style="list-style-type: none">- SLO 3: Demonstrate the ability to work effectively with other people through effective teamwork practices and to contribute substantively to a group product.4. <i>(GL)</i>: Demonstrate an understanding and appreciation for global, cultural, and ethical values<ul style="list-style-type: none">- SLO 4.1: Demonstrate awareness of global business environments and cultural diversity in addressing business problems.- SLO 4.2: Apply often conflicting ethical theories to manage their behavior in business situations.5. <i>(XP)</i>: Demonstrate professional development with an applied experience in business<ul style="list-style-type: none">- SLO 5: Demonstrate professional career development as a result of at least one applied experience in business.6. <i>(OR)</i>: Meet core competency in oral communication<ul style="list-style-type: none">- SLO 6: Prepare and deliver a coherent, professional oral presentation on a business issue.7. <i>(WR)</i>: Meet core competency in written communication<ul style="list-style-type: none">- SLO 7: Demonstrate the ability to write a clear, concise, well-organized and properly framed analysis of a business issue.8. <i>(QR)</i>: Meet core competency in quantitative reasoning<ul style="list-style-type: none">- SLO 8: Demonstrate the ability to reason quantitatively
--

Figure 1: Program Goals

Every academic year, school of business assesses all nine SLOs and report results to the University's Assessment Director in the annual Assessment Report. Reviews and comparisons of the school of business SOAP with the SOAP of other colleges and universities show that the school of business Assessment Process had reached maturity as explained in the assessment measures section.

ASSESSMENT MEASURES

This school of business uses a variety of direct and indirect measures to assess each of the nine SLOs. The direct measures include written assignments, video recordings, business simulations, and exam questions. The indirect measures include survey questions. The direct measures are scored using rubrics and checklists that were internally developed by the school of business Assessment Team and multiple-choice question exams designed by core course coordinators. Assessment scores are entered into

spreadsheets that are submitted to the school of business Faculty Organization site or sent directly to the Assessment Coordinator electronically for further consolidation and analysis at the end of every semester.

The Assessment Team and/or course coordinators analyze, aggregate, and summarize data on each of the eight SLOs to identify the degree or level of outcome attainment. Summarized data and comparison with benchmark and target levels are interpreted, integrated, and documented in the school of business Annual Assessment report submitted to the University's Director of Assessment. The report is made available to all school of business faculty in the Faculty Organization site.

The assessment process as described works well. However, efforts were falling short in at least two dimensions: 1) effectively disseminating results and findings, which often lead to the lack of process awareness and 2) effectively motivating and engaging faculty in the overall assessment process. Falling short on these dimensions is known to be a deterrent to faculty engagement in assessment efforts and, ultimately, to stalled efforts for continuous improvements. Michelle Curtis [2, para. 5] writes:

“Transparency is key! If faculty are asked to put effort into assessment but are none the wiser about what their efforts result in, there is no incentive for them to put in any effort at all. By sharing results and how you are using that data for continuous improvement, you might give faculty new insight to the importance of assessment and how it benefits their students, programs, and the institution as a whole.”

Similarly, Provezis [5] highlights that both sharing assessment data and ensuring data is “digestible” fosters interest in assessment results, triggers improvement action discussions, and ensures faculty involvement. By creating a system that supports the dissemination of assessment results, this project addressed the two dimensions in which the school's assessment process fell short and the issues that will foster continuous improvement

PERFORMANCE DASHBOARDS

Performance dashboards as defined by Eckerson are “multilayered applications built in a business intelligence and data integration infrastructure that enables organizations to measure, monitor, and manage business performance more effectively” [3, p.10]. He explains that performance dashboards allow people to:

- Monitor critical business processes and activities using metrics of business performance that trigger alerts when potential problems arise.
- Analyze the root cause of problems by exploring relevant and timely information from multiple perspectives and at various levels of detail
- Manage people and processes to improve decision, optimize performance, and steer the organization in the right direction.

Among the various benefits of performance dashboards, increasing motivation and delivery of actionable information coincide with the goals of this project. Eckerson states “by publicizing performance measures and results, performance dashboards increase the motivation of business people to work harder in the areas being measured” [3, pp. 8- 9]. He continues, “performance dashboards provide actionable information—data delivered in a timely fashion that lets users take action to fix a problem, help a customer, or capitalize on a new opportunity before it is too late.”

Few [4] and Yigitbasioglu et al. [6, p. 44] offer similar definitions. Yigitbasioglu and Oana narrow the definition of dashboard design and implementation stating that dashboards are “visual and interactive performance management tool[s] that displays on a single screen the most important information to achieve one or several individual and/or organizational objectives, allowing the user to identify, explore, and communicate problem areas that need corrective action”.

Further, Yigitbasioglu, et al.[6] investigate the cognitive benefits in their review of dashboards in performance management. From a cognitive viewpoint, dashboards, or more generally, visualizations enhance awareness and understanding and capitalize on human perceptual capabilities. In other words, decision-making is improved through the cognitive process of transforming visualizations into meaning and sense-making. The researchers also discuss the capability of dashboards to reduce information overload by providing various concepts and applications in a single packaged solution. In particular, it is helpful to follow design principles and minimize the information first presented to the user in a drillable format to reveal additional information. Research conducted by Ali et al. [1] also suggests visualizations allow us to interpret and find meaningful patterns easier with additional benefits of a reduced burden on IT, time-savings, increased ROI, providing self-service capabilities to end-users, improved collaboration, better ad hoc data analysis, and improved decision-making.

Given the benefits of using performance dashboards in decision making and performance improvement, using such a tool in this business school’s effort seems a proper fit. Hence, an examination of suitable visualization tools was conducted. Ali et al.’s [1] investigation of the benefits and challenges of data visualization tools reveals that the visualization tool should minimize latency and provide an interactive component. A comparison of tools based on these factors determined that Power BI, Excel 2016, and Tableau had the most desired features in a visualization tool with all three lacking an ‘Open Source’ feature. However, Excel’s API is necessary to perform more robust data mining and visualization. Additionally, Power BI was found to be slow compared to Tableau and has size limitations for workbooks. Therefore, Tableau was chosen because it was found to have the desired features, the University has a Tableau license, and the developer is already familiar with the tool.

METHODOLOGY

The process of building the Assurance of Learning Tableau Visualizations (AoL Viz) followed a traditional system analysis and design methodology. This section will further discuss the steps of system analysis, system design, and system implementation.

System Analysis

The faculty members who participated in this project are the subject matter experts in the current assessment process. They have both collaborated in writing the SOAP and the Assessment Report in previous years, so the first stage in the process, system analysis, was completed promptly. User and systems requirements were known, and deliverables were clear.

System Design

The design of the AoL Viz was an iterative process. Several Tableau sheets were created and presented for feedback, this feedback, in turn, provided input for changes and adaptations to the Tableau sheets. In parallel, the team graphic designer created the layout and style for the complete data visualization dashboard.

System Implementation

The project team consolidated the assessment data collected by instructors into sets of MS Excel spreadsheets. As expected, this consolidation was time consuming since files required cleaning and reformatting to make them suitable to load to Tableau. Once the example sheets were reviewed and agreed upon, the sheets were integrated into a Tableau dashboard. Finally, the dashboard was published to the Tableau Server and the link to the AoL Viz was distributed for further review. To meet one of the goals for the current cycle's initiatives, an Infographic of the SLOs (Figure 2) was designed and posted to walls in faculty and student areas in the building as a constant visual aid and reminder of our program goals.



Figure 2. Program Goals Poster

Last, to enforce the proper documentation of the improvement actions that instructors have implemented in their courses as a result of analyzing assessment results, a survey was created. The

survey was deployed to all Faculty on September 14, 2018. This information was consolidated and presented as closing-the-loop activities in the Assessment Report.

RESULTS

The AoL Viz shows, for each SLO, assessment graphics with assessment results, benchmark scores and target, and a brief description of the method used to assess the SLO. The nine SLOs are represented in the visualization. Figure 3 shows examples of a visualization depicting the results of the core competencies of two goals.

After the visualizations were created, the Assessment Leader, brought the output to different school committees for confirmation of the accuracy of the visualizations. Later, the visualization outputs were discussed with course coordinators as feedback for improvement. An example visualization of Goal 2 and 8 is shown in Figure 3.



Figure 3. AoL Viz

Improvement Actions

Improvement actions were outlined based on deficiencies for each goal. A couple of examples of improvement actions, Goal 2 and Goal 8, are detailed in this section.

In an effort to improve the results of Decision-Making with IT (Goal 2), Instructors emphasized the importance of a) building a decision support system where input variables are easily adjustable and output variables are automatically updated and b) providing a clear written interpretation of results by all students. Students are now required to suggest possible courses of actions and select the most viable option to recommend. Effect of these actions resulted in an increase in scores in the Interpretation category from 62 percent to 75. Additionally, having a write up allowed more evidence to assess students' ability to interpret results after using the decision support tool. With more evidence to assess, assessment results were more accurate and on target. Other courses including Statistics and Accounting have incorporated the use of software to solve problem such as Excel and JMP. Furthermore, a Spreadsheet Modeling course was created to address data decision making while improving Excel proficiency.

Quantitative Reasoning (Goal 8) is an area where additional improvements have been made to increase the benchmarks and targets already being met. The school requires students to take one Quantitative Analysis, and two Statistics courses as part of the curriculum. The course coordinator, a faculty member, meets with all instructors to discuss assessment results so that improvements can be discussed and implemented. The tight coordination across sections has proven successful and benchmarks and targets are exceeded consistently. One initiative is to offer an elective Lab held by a faculty member and student tutors for students in these courses. Students receive help understanding concepts discussed in class and solving practice exercises. Another initiative is an extensive set of studying materials and videos for students that are available on the Learning Management System. More recently, instructors are using textbook publisher materials and quizzes to provide further practice for students. New faculty teaching these courses are actively using classroom technology like Excel and JMP for analysis and OneNote and Kahoot to enhance classroom learning. OneNote is used as electronic whiteboard, so students have immediate access to class notes and to problem solutions discussed in class.

CONCLUSION

The initiative of Assessing Core Competencies in Student Learning and Using the Results for Program Improvement was successful in 1) effectively disseminating assessment results and 2) effectively motivating and engaging faculty in the overall school assessment process.

The project team developed the Assurance of Learning Viz, a system that will be instrumental in disseminating results and engaging faculty participation. The AoL Viz presents current and historical assessment results and allows interactive review and data analysis.

Additionally, AoL Viz will facilitate the production of comparative reports and annual reports to the University's Assessment Director and to the AACSB Accreditation Board. The AACSB accreditation team had access to the Assurance of Learning Viz, during their visit in early 2019. The AACSB extended the accreditation for the school in June, 2019 through 2025.

The project team anticipates that the dissemination of assessment results will foster discussion and trigger the implementation of formal actions to improve the Business Administration program and curriculum. This visualization will support future assessment and reaccreditation efforts.

REFERENCES

- [1] Ali, S. M., Gupta, N., Nayak, G. K., & Lenka, R. K. (2016, December). Big data visualization: Tools and challenges. In *2016 2nd International Conference on Contemporary Computing and Informatics (IC3I)* (pp. 656-660). IEEE.
- [2] Curtis, M. (2016). Getting Faculty “On Board” with Assessment. Available at <https://www1.taskstream.com/blog/getting-faculty-on-board-with-assessment/>
- [3] Eckerson, W. W. (2010). *Performance dashboards: measuring, monitoring, and managing your business*. John Wiley & Sons.
- [4] Few S. (2006). *Information dashboard design, the effective visual communication of data*. First Edition. O'Reilly Media, Inc.
- [5] Provezis, S. (2011). Augustana College: An Assessment Review Committee’s Role in Engaging Faculty. Available at <http://www.learningoutcomesassessment.org/documents/AugustanaCollegeCaseStudy.pdf>
- [6] Yigitbasioglu, .O and Velcu, O. (2012). A Review of Dashboards in Performance Management: Implications for Design and Research. *International Journal of Accounting Information Systems*, 13, 2012, 41-59