ISE Senior Design
Performance Measurement System

Ritt Dhar, Harsha Jonnavithula, Bristol Lewis, Dylan Orrell

VT | COLLEGE OF ENGINEERING
GRADO DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING
Virginia Tech.

Company Background

- Areas of focus for the ISE program at Virginia Tech include operations research, manufacturing, human factors, and management systems
- Ranked the 4th best undergraduate program by US News and the World Report
- Senior Design program has four key stakeholders: students, project sponsors, faculty advisors, and the teaching team

Problem Statement

Our project is a continuation of a previous senior design team, which conducted preliminary work.

- Evaluation of program performance is not comprehensive
- Lack of formal performance indicators and visual management
- Key processes are not documented sufficiently
- Significant variability across program

Objectives

Document the senior design process flow via swimlane charts	Conduct a comprehensive organizational assessment to define KPIs measuring the success and effectiveness of the SD program
Develop a manual of standard operating procedures	Develop a dashboard visualizing KPIs to track and evaluate progress

These objectives allowed us to Identify recommendations for program improvement
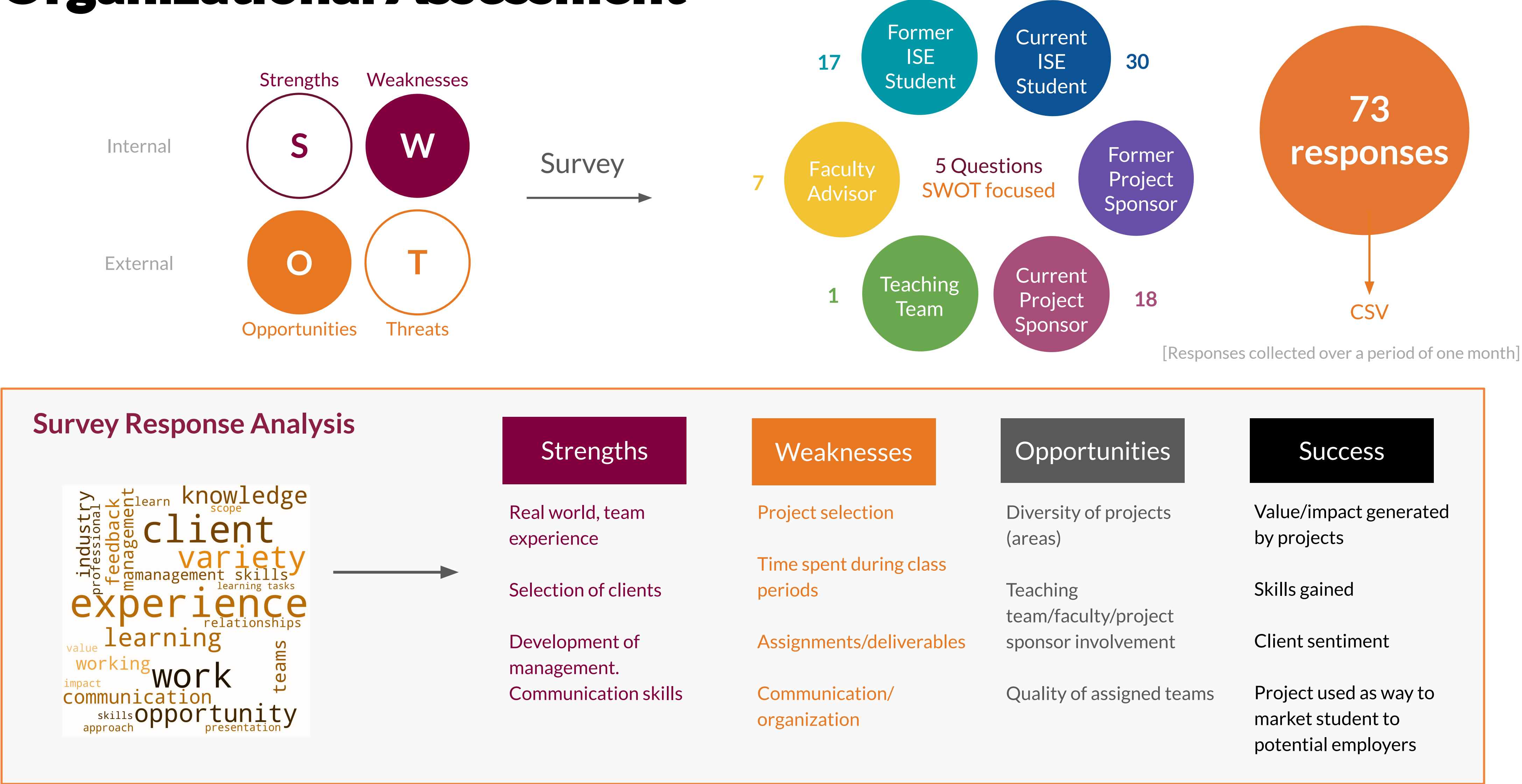
Data Visualization Tool

Tool	Sustainability	User-Friendly	Causal Relationships	Data Storage	Collaboration
Google Sheets	✓	✓		✓	✓
Excel	✓	✓		✓	✓
tableau				✓	✓
Python			✓	✓	✓

Google Sheets was used because of its sustainability and the user-friendly aspect of it. The learning curve for Excel is not as steep as other tools and it does not change as much as other tools, ensuring its use for years to come Since Google Sheets is a collaborative version of Excel, we decided it was the best tool to execute our dashboard.

Organizational Assessment

	Strengths	Weaknesses
Internal	S	W
External	O	T
	Opportunities	Threats

Survey →

We conducted an organizational assessment using a SWOT analysis-based survey with the following results.

- Former ISE Student: 17
- Current ISE Student: 30
- Faculty Advisor: 7
- 5 Questions SWOT focused
- Former Project Sponsor
- Teaching Team: 1
- Current Project Sponsor: 18
- **73 responses** → CSV

[Responses collected over a period of one month]

Survey Response Analysis

Strengths	Weaknesses	Opportunities	Success
Real world, team experience	Project selection	Diversity of projects (areas)	Value/impact generated by projects
Selection of clients	Time spent during class periods	Teaching team/faculty/project sponsor involvement	Skills gained
Development of management. Communication skills	Assignments/deliverables	Quality of assigned teams	Client sentiment
	Communication/ organization		Project used as way to market student to potential employers

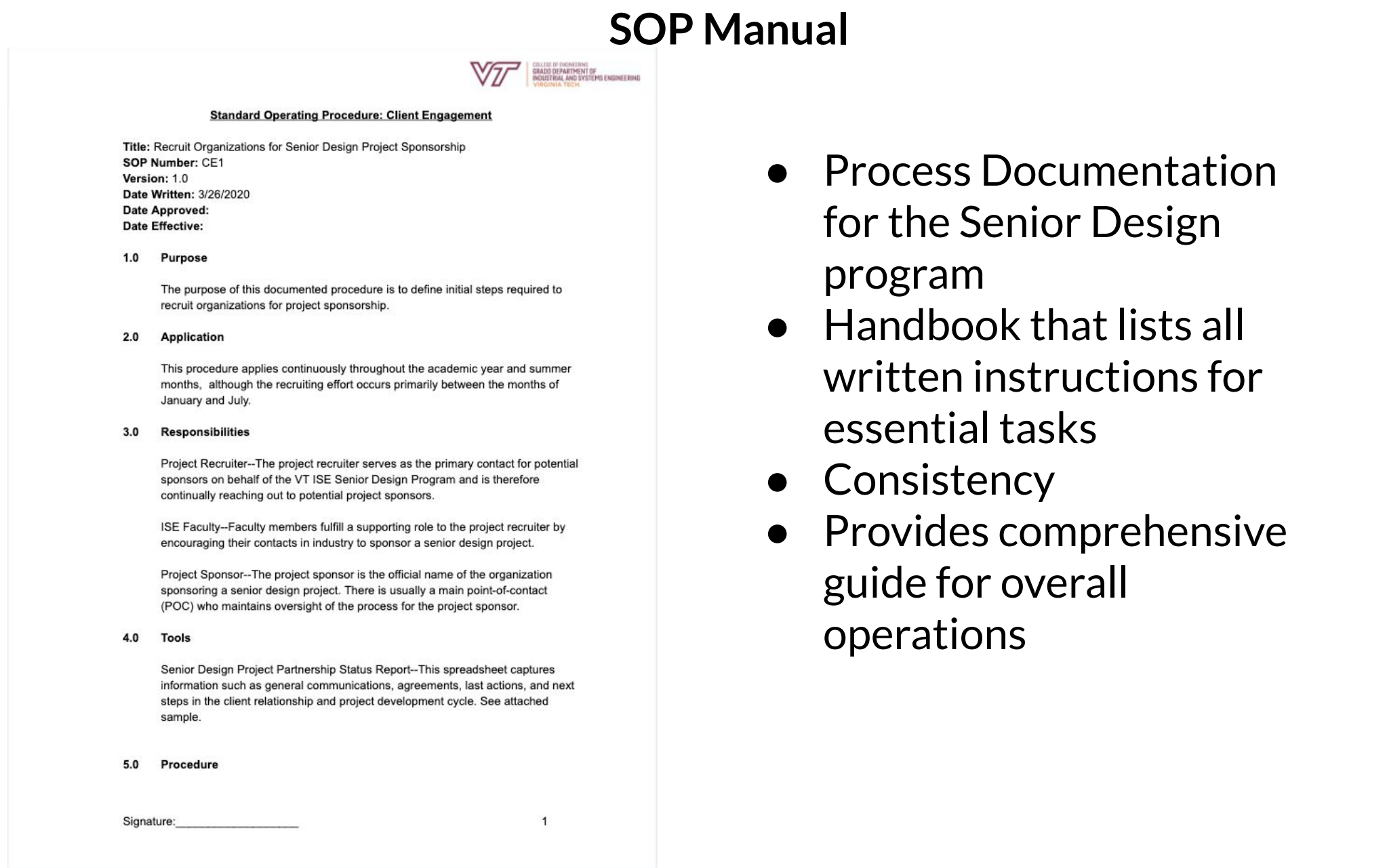## Key Performance Indicators

Student Learning & Experience
1. Student Satisfaction with Faculty Advisor
2. Student Satisfaction with Peers
3. Student Satisfaction with Course
4. Student Satisfaction with Project

Client Engagement & Satisfaction
1. Client Satisfaction with Student Team
2. Client Satisfaction with Recruitment and Administrative Processes
3. Percent of Repeat Project Sponsors
4. Client Engagement with ISE Department

Program Operations
1. Project Focus Distribution
2. Business Sector Distribution
3. Distribution of Client Size
4. Total Revenue
5. Ratio of Projects to Clients
6. Ratio of Projects Needed to Projects Submitted

Visibility & Impact
1. Median Project Financial Impact
2. Percent of Projects Outside of Region
3. Number of Teams Competing in External Conferences and Competitions
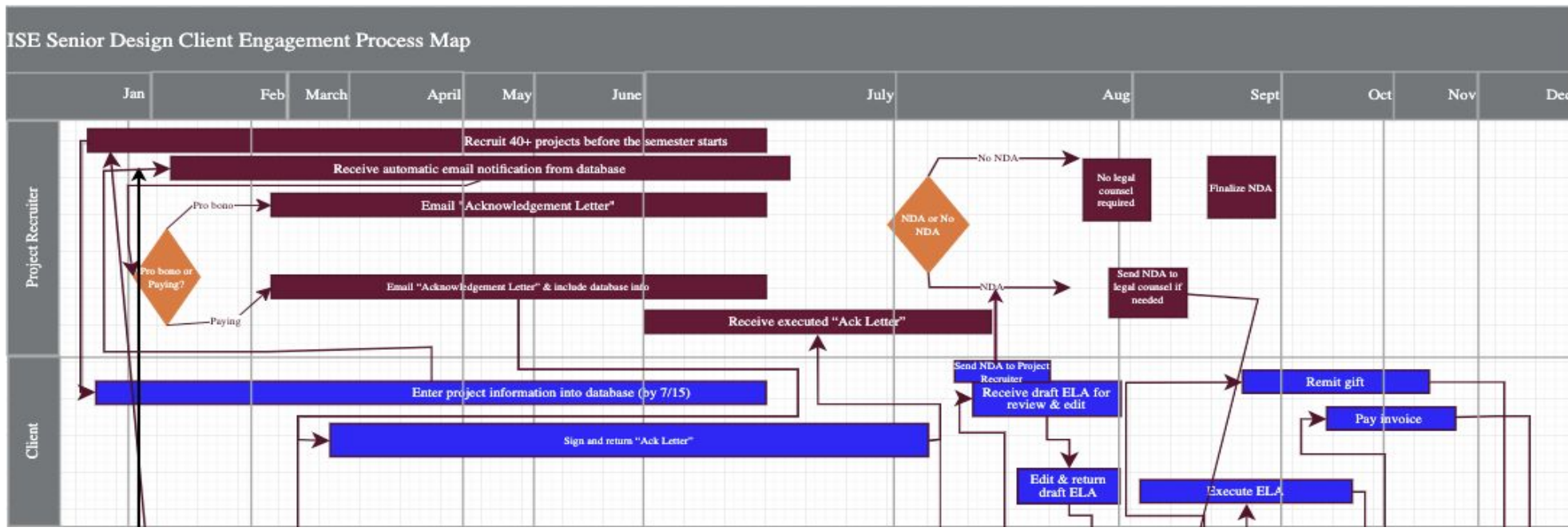
Dashboard Visualizations
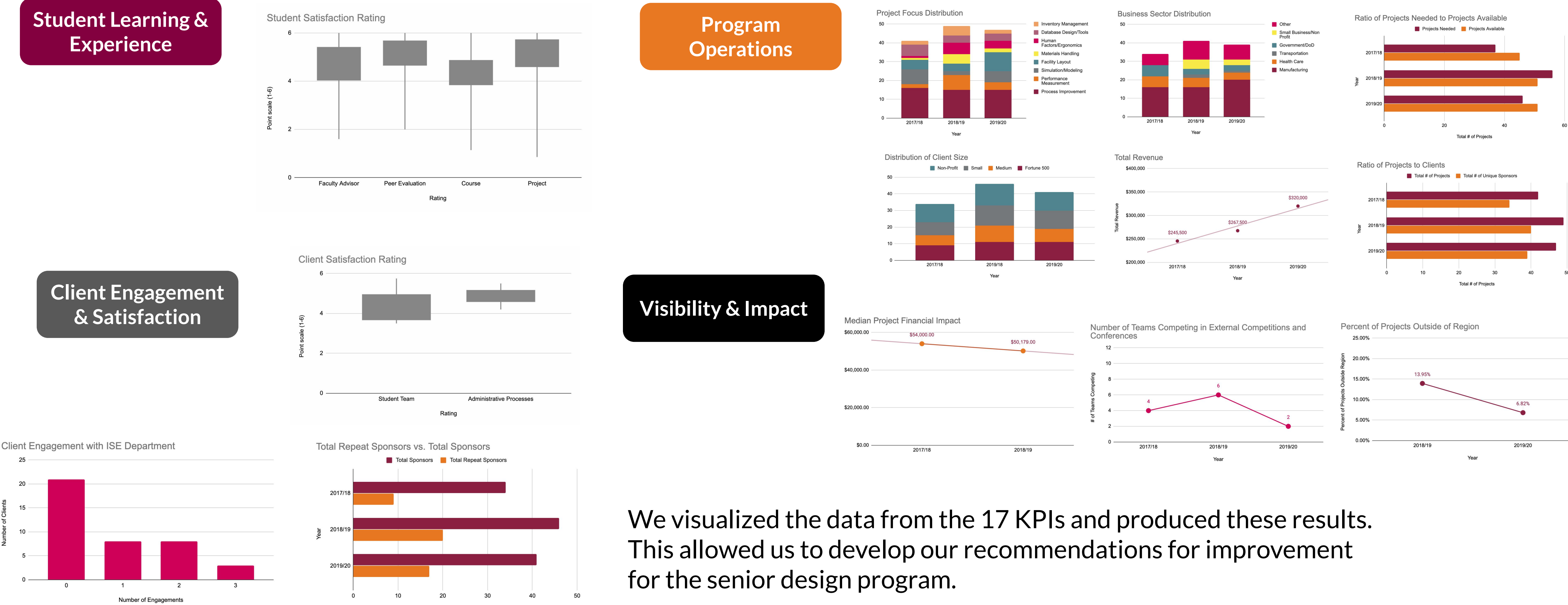
We visualized the data from the 17 KPIs and produced these results. This allowed us to develop our recommendations for improvement for the senior design program.

Process Documentation

SOP Manual

- Process Documentation for the Senior Design program
- Handbook that lists all written instructions for essential tasks
- Consistency
- Provides comprehensive guide for overall operations

Swimlane Charts

We interviewed 15 people and revised the 2019 team's swimlane charts by updating content, adding additional stakeholders, documenting key processes, and adding tasks related to the day of symposium.

Recommendations

Student Learning & Experience
- Evaluate current use of class time.
- Improve faculty advisor alignment with assigned project topics.
- Identify ways to boost accountability and better distribute tasks and workload amongst team members.

Client Engagement & Satisfaction
- Identify the difficulties clients are facing in regards to communication relating to the financial status of a project.
- Work with clients to establish their criteria for a proper ROI and improve communication in regards to perceived project and team progress.
- Actively seek and inform clients of opportunities to be involved in other areas of the ISE department outside of senior design.
- Identify reasons why clients no longer want to sponsor senior design projects to allow for more repeat sponsors.

Program Operations
- Increase the diversity of projects so there is a larger non-manufacturing sector presence.

Visibility & Impact
- Recruit more projects located outside of the region.
- Improve methods used for quantifying project impact.
- Showcase more senior design projects at external conferences and competitions.

Impact

- Sustainable dashboard visualizing KPIs
- Process documentation
- Recommendations for improvement

Improve stakeholder experiences	Track and evaluate progress, impact, and growth of the program	Standardize the senior design process