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of the Requirements for the Degree of
Bachelor of Science in Industrial Engineering

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by
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1. Executive Summary
Sales Engineering is a popular career choice for many engineers coming out of university. Despite its continuing growth, many students lack the knowledge and preparation to be successful in the early years of their career. A small collection of sales engineering minors and student clubs are the only option for students interested in technical sales.

Using the DMAIC process, the senior project team went step by step to find and implement the best possible solution to better connect college students and the professional sales engineering industry. The team worked side by side with professionals in the industry and students with future aspirations in sales to define what the problem was and what the requirements of the project would be. Meetings with past Cal Poly alumni, now in the sales, were key drivers for research and support.

After a research period, the team found that creating a national society for students and young professionals with an attached national competition was the best way to promote sales engineering. The next goal for the team was to actually launch a national competition at Cal Poly and began laying the framework for building the national society.

As Industrial Engineers, the team used tools learned over the course of their college careers to gain an understanding of the complete process to define, measure, analyze, improve and then control the project. Project management and quality control was used in every step of the process to make sure tasks are on schedule and in-line with the ultimate goal.

While building the competition and national society, the team created a project plan, agenda, and budget in order for the competition to be replicable year over year. A survey was also created for participants post competition to gain feedback to be useful for future efforts. A social media platform, including a website and recruiting plan was built to help build growth of the society and the competition. All of the documents created from the project will be made available to future National Society of Sales Engineering officers and other Cal Poly Sales Engineering Club officers. These documents will be used as live documents to be updated every year.

In April, 45 students and 12 industry representatives participated in a two day competition at Cal Poly. A case study was created in partnership with industry to simulate selling a real life Cal Poly energy project. The competition was under budget and considered an overwhelming success according to the survey feedback.

The team completed the project by creating a three year plan for implementation of the society and appointed a national society chair at three universities. With that, the future looks bright for the National Society of Sales Engineers.
1.1 Introduction

Sales Engineering is a growing career for young engineering professionals. It represents a field mixed with engineering and business. It is acknowledged as one of the top 10 highest starting salaries in the engineering fields as well as a good alternative for those not interested in classic engineering job. Despite this, technical sales has little representation in universities around the country. Besides having a few stand alone clubs at select universities, an interested college student has a hard time finding the correct information about sales engineering or being able to develop the skills that most recruiters look for. They lack the knowledge of the sales process and the technical and soft skills needed in order to be successful. These missing tools lead to a misinformed and under qualified pool of new college graduates for technical sales and requires more training when actually hired and placed in a professional setting.

The missing representation also extends into the professional environment. With no professional organization like American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) or Institute of Industrial Engineers (IIE), sales engineering professionals lack an official organization for skills development and networking opportunities. This leads a lack of general post-academic skills development beyond sales seminars and individual effort. It also means there is no ethical standard or guidelines for sales professionals. From a recruiting standpoint, there is no formal listing of schools with sales engineering development programs or alumni groups to strengthen networking and bonding across the industry.

With the lack of an organization for both the academic student and the working professional, sales engineering cannot grow to the elevated status of many careers supported by other professional organizations.

The National Society of Sales Engineering (NSSE) and National Sales Engineering Competition (NSEC) has been a project both motivated and supported by the Sales Engineering Club at the California Polytechnic State University, San Luis Obispo for over five years. Despite the best efforts of many before the team, the idea had yet gain any traction until April 2015, when the first competition was held between three schools. Since then, it has been the club’s goal to create a national society and more robust sales engineering competition that will provide an umbrella organization and a signature event to a severely underrepresented technical career.

As Industrial Engineers, the team is focused on using the information learned about the complete process of designing and implementing a project to produce a high quality solution. Project management tools will be used in every step of the process to make ensure tasks are on schedule and in-line with the ultimate goal. Quality engineering will be used to measure success of the project, but will also be important as to analyze and improve stages of the project with statistical
evidence. The competition will require a large budget in order to support the potential scale, so engineering economic analysis will play a key role in helping the project be as efficient and controlled as possible with allocated funds. To aid with the creation of a national marketing strategy and member database, data management systems, human-layout interaction, and ergonomics will be used. All of these tools will be important in order to provide an engineered solution to the current proposed problem.

1.2 General Problem Statement
The sales engineering field lacks a focused national structure to bridge the academic and professional groups together. This leads to a lack of education, networking opportunities and skill development for all interested parties.

1.3 Background
The goal is to help create a bridge of communication between college students and professional sales engineers. As of now there is no formal communication between the industry and students, which is limiting the knowledge students can gain in the field before entering the actual work field. The team will analyze some alternative solutions, such as hosting a conference, creating an online network and training tool, or a sales minor. Due to previous work done by the Cal Poly Sales Engineering Club, an in depth study will look into the creation of a national society of sales engineers for college students across America. The National Society will act as a parent organization to other sales engineering clubs on campuses, providing the clubs with materials, skill training, and networking opportunities to give students the best opportunity to pursue and learn about the sales engineering field. The team hopes to emulate other professional organizations like the Institute of Industrial Engineers and the Society of Women Engineers in providing an organization that acts as a bridge between the student and the organization’s interest or field.

The Sales Engineering Club at Cal Poly was founded in 2009, by students interested in merging business and engineering. The club has continued to expand and currently has over 50 members and 9 industry sponsors. After establishing a stable club on campus, the officers looked to expand the club to a national level. There are existing sales engineering clubs at other universities across the country and Cal Poly wanted to create a network between them. In 2015, Cal Poly launched the idea of sales engineering at a national level by hosting a national sales engineering competition. The competition consisted of three schools: Cal Poly, University of Central Florida, and Iowa State University. Cal Poly had five teams of three students, the University of Central Florida sent one team of three students, and Iowa State sent two teams of three students. Each team competed in two technical sales case studies provided by industry companies. Along with the case studies, there were two guest speakers, a social event, and an
awards dinner. The top three teams were awarded monetary prizes. The competition sparked a network between three of the largest sales engineering clubs in the nation.

Cal Poly, being the host of the competition, has the goal in mind to create a National Society of Sales Engineering for colleges across America with annual National Sales Engineering Competition for collegiate students. This, once achieved, can then be used to expand into an organization for professionals by taking advantage of a growing alumni base.

The report below will organize the mandatory steps in order to assemble a National Sales Engineering Competition in following years, along with the beginning stages to create a national society.

2 Literature Review

2.1 Sales Engineering Profession
Sales Engineering is a growing profession in the United States. Once a career with positions open only for the manufacturing and hardware industries, it has now expanded to a wide range of different fields. These include consulting, agricultural equipment, system integration, industrial chemical and supplies, HVAC systems and services, industrial tooling, machines, and automation, biomedical machines and supplies, transportation, IT services, and energy and utilities.

According the Bureau of Labor Statistics (bls.gov), there were 69,900 sales engineering jobs in 2014. Over the next eight years projected growth is expected to be 7% a year. This is on par with the total engineering job growth and total occupation job growth in the United States. Though sales engineers can be found around the country, most sales engineering jobs are found in major
metropolitans with the largest concentration of engineers located in California, New York, and Illinois. (Occupational Employment Statistics (OES) Survey) The most popular sales engineering jobs are found in the software, manufacturing, electrical, and wholesale markets. This will be important to note because the goal is to expand the national sales engineering society around the nation with local chapters. These locations also give a focus on recruitment and marketing.

Sales Engineers have some of the highest wages in the country. The annual median wage for a sales engineer $96,340 but this varies greatly with industry and location. The highest engineering wages are found in software and electrical distribution sales with median salaries of $115,000 and $109,000 respectively. Many sales engineering jobs also incorporate commission or bonuses with drastically increase earnings in some industries. As a high earning profession, recruiting in sales engineering is fierce on both the college and professional level. The society will be able to help companies recruiting reach a greater audience with less resources being spread on students unprepared for technical sales. The high wages can also be used as a recruiting tool for joining the society for financially motivated students.

Sales engineering jobs usually require a bachelor degree or equivalent. According to careerinfonet.org, a job information survey sponsored by the Department of Labor, 82% of sales engineering jobs require at least an associate's degree, with most companies requiring a bachelor degree in an engineering field. This data shows the importance of creating a sales engineering organization at the university level, providing education and awareness for students interested in sales engineering from an early time in their engineering education. Since a vast majority of universities do not support a sales engineering program, an alternative in the form of a college club or organization should be considered. A climate review done in the research project Development of an Engineering Sales Program with Industry found that there is a direct need for more sales skills development in an engineering curriculum that is currently lacking on a national university level. This is supported by an article written by Dan Mcgraw, Grooming New Age Edisons, about how engineering college students are entering the workplace but becoming quickly ineffective due to their lack of business skills necessary for the real world. It is found

Figure 2 - Sales Engineering Wages
that entrepreneurial skills, crucial to a successful sales engineer, are not properly taught within the engineering curriculum. Instead recent graduates have to rely on quickly learning when they enter the first years of their careers. A survey of engineering employers also confirms the need for direct sales skills learning and awareness (The Case for Leadership Skills Courses in the Engineering Curriculum). In this study, 53 employers were surveyed and asked what professional skills were most important for a new college graduate to have. The study found that out of the 46 survey responses, a majority of employers felt that soft skills were just as important as the technical skills learned in common engineering courses. The ability to effectively communicate and solve problems was a common response from employers in a wide range of industries. Yet again, there is evidence of a need for focused soft skills training for students in engineering majors as seen in recording of the responses below.

Summary of Leadership Skills Survey Responses

- Practical application of engineering concepts (31 of 46)
- Ability to manage time effectively (33 out of 46)
- Ability to communicate effectively in written (including electronic) form (28 out of 46)
- Excellent verbal communication skills (29 out of 46)
- Ability to work effectively in a team environment (32 out of 46)
- Ability to use innovation in solving problems (28 out of 46)

Returning to the Development of an Engineering Sales Program with Industry climate review, the researchers found that there is a lack of a focused training program in colleges. While there are popular sales training programs like the Dale Carnegie and Sandler training programs, or internal sales trainings at companies like Trane, Oracle, or IBM, there are not many academic programs around the country that support sales engineering.

From the research by both the paper’s authors and the team’s research, Pennsylvania State University, University of Florida, Iowa State University, and University of Central Florida have sales minors. These programs blend engineering technical courses and business classes consisting of marketing, finance, and sales. The team also found a few universities with sales engineering clubs. Besides the universities listed above, Purdue and California Polytechnic State University at San Luis Obispo have especially robust clubs. By observing how these minors and clubs operate, the team can design an effective model for a university level sales engineering organization.

The society will begin focused on the university student. As seen from the table provided by the Department of Labor, close to 82% of sales engineering jobs require a college degree. By targeting individuals interested in the sales engineering at the university level, the team can garner interest and support in the early growth stages of the organization.

| Table 1 - Sales Engineering Education Levels |
2.2 Competition/Workshop Design

The structure of the first National Sales Engineering Competition was a two-day long event, with two case studies and two skills seminars. The goal of the case study was to give students the opportunity to develop their skills through experience and feedback. The case study was judged by a panel of judges with industry experience. Since this is a role-playing exercise, the improved competition needs to be aware of how to correctly connect students with the right roles in simulation. This means establishing set identities and rules of engagement with other role-players. One of the most effective ways role playing teaches sales skills is the element of randomness and surprise that comes when people assume roles previously unknown to them (Widmier). It enhances learning in situational awareness and responding to new inputs as quickly and creatively as possible (Widmier). To benefit the competitors to the greatest level, role play will need to be a vital part of the any educational event for sales engineering.

When planning a competition or conference, there are a few key points that will be important in order for participants to get the most out of attending. According to a pre-conference workshop on promoting agile learning, establishing these basic points will help create a framework in which to insert important details (Gary). The four key points are:

- Set a goal for the competition/conference
- Decide on what materials will be provided
- Create a detailed agenda
- Assign requirements of participants attending the competition/conference

These may seem like simple points, but it can be easy to get caught up in busyness of planning and forget about what is important. It is also important to not expect too much from the students attending the competition. Expect inexperience from the competitors and remember these are students, not professionals competing in the event (Gary).
2.3 Non Profit Organizational Design

Bruce R. Hopkins wrote in his book *Starting and Managing a Nonprofit Organization, A Legal Guide* that, “Being enthusiastic, imaginative and creative about establishing a nonprofit organization is one thing. Actually forming the entity and making it operational is quite another matter.” There are many steps in the long process of creating a non-profit organization. First, it is important to meet with a non-profit lawyer to discuss non-profit and tax exempt organizations. In order to qualify for a tax-exempt status non-profit organizations must have a reason and it is preferred the organization performs a public service and benefits the public (Hopkins). The National Society of Sales Engineering hopes to serve the public by educating college students on the sales engineering field, teaching the skills necessary for the field, and to create a network between the professionals and the students. At the beginning stages it is also important to create an initial checklist, something that can be reviewed as the process continues (Hopkins). In organizing the national society, it will be important to set up leadership roles, which will include a board of directors and officers. The National Society of Sales Engineers plans to have both a board of directors and officers.

The structure of the board of directors is very influential on the objective and subjective goals of the organization. According to a study on non-profit executive boards in Canada, it was found that organizations with a strict structure and guidelines were more effective in accomplishing their goals (Bradshaw/Murray/Wolpin). It will be important to find a good fit for the society organizational structure of the club, particularly the directors board who will have oversight of the society and ultimate authority on the short term and long term goals of the organization. A focus must be on the ability to walk the line between well set positions and authority, without sacrificing creativity and willingness to think beyond the role.

Once the organization is created there will need to be some sort of metric used to measure the performance of the organization (Zang/Wu). Whether it be number of student members, number of professional company sponsorship, or any other metric, one must be decided on early on in the creation of the organization to make sure the organization is following goals. Hong yu Zang uses a performance evaluation called Data Envelope Analysis in his evaluation of Non-profit organizations. This method may not be a great choice for a sales engineering society focusing on students because it will not be as data focused as some non-profit organizations. As goals of the society are finalized it will be at that time, where a metric must be decided on to measure the success of the organization. It is important the organization produces a quality product.

2.4 Quality (Surveys, Human Factors, and Ergonomics)
A project is measured by its success and a key measure is the quality. The possible alternatives of the project could be measured by a lot of quality metrics such as financial impact or test
scores, but the particular metric that will be used to gauge the competition’s success is customer feedback. The customer will be the students and the sponsors. A good way to get customer feedback are surveys. Surveys can vary greatly and must fit to the situation. Students will have a different survey from the sponsors. Arlene Fink’s, *How to Conduct Surveys: a Step-by-Step Guide*, steps through the important factors of creating a survey and asking the best questions. It also mentions how to analyze the responses from surveys. While statistical data has more of a black and white way of being analyzed, open-ended questions are more difficult, so a general guideline must be created before the survey is given out.

The main delivery of the competition participant survey will be via a dedicated website. In order to most effectively deliver the survey, the website must be user friendly and functional. There are many important tasks that must take place before information is launched onto the internet to a user, including functionality of the website. Gonzalez-Bañales writes in “Web Survey Design and Implementation: Best Practices for Empirical Research,” that user survey design is accomplished in five stages. The first step is planning the survey, where it is important to determine who will be taking the survey and what exactly the survey will be testing. The second step, writing the survey is where the actual survey is created. It is during this stage where it is important to focus on what type of response you are expecting and how the population will respond. Nobody likes long responses on a survey, so it is important to keep the tasks of the user relatively short and simple or they may not even respond to the survey. The third step, design of the survey is important because it will be the main impact on how people respond to the survey. At this stage it is important to make the survey user friendly and simple. The fourth step, sending the invitations is where it is decided who the survey will be sent to. It is important to keep the delivery process simple and is recommended to be sent out midweek for people to take. The final step is the data collection, which is where all the responses are taken and reviewed. The information collected should be used to make updates and improvements on the website. If people do not respond to the initial survey it is okay to send a follow up notification to get the best results possible. The team will follow this general process to get the most beneficial quality analysis out of the survey.

### 2.5 Project Management

A project is anything that has a specific objective with specifications, a start and finish date, has funding limits, and consumes resources (Kerzner). In order to successfully finish a project, it must be managed from the start. There are five main stages of a project (Kerzner):

1. Project Initiation - The problem is analyzed, possible solutions are assembled, and then the best solution is decided on. It was at this point the team recognized the benefits of and decided a National Sales Engineering Competition, along with a national society would be the best project to fulfill the given needs. Developing a blueprint early on, will allow for limited waste (Greer). By writing a blueprint early on, it allows for a “big
picture” to be painted for those involved. It will show the direction of the project with specific objectives and strategies to achieve the objectives. Developing a blueprint early on in the project process is will reduce false steps or directions, which will help the team stay on track and headed in the same direction.

2. Project Planning - The planning stage includes defining requirements and quality control aspects, along with determining the necessary resources needed. A key tool used in the planning stage is a Gantt chart. A Gantt chart allows the plan to be recorded and seen by others. By having a hard copy of the plan in Gantt chart it is more likely to encourage the assignments and tasks to all involved. A Gantt chart displays the project plan in great details and is easily analyzed by all levels of people involved. It also is an interactive project plan, which tracks progress and compares it to the predicted events. (Clark)

3. Project Execution - Execution of the National Sales Engineering Competition will take place April 22-23, 2016. The weekend will include directing and managing the events of the weekend and making sure the correct information is given out to competitors and sponsors. the team will work with all people involved to complete the project to the highest level.

4. Project Monitoring and Control - It is at this stage, where adjustments are made. What went well from the competition, and what could’ve gone better? It is also where a comparison between the actual competition and the predicted competition will be made. This stage will not benefit the 2016 competition, but will improve future competitions.

5. Project Closure - The closure is making sure steps and tasks have been finished. Three key metrics to measure success of a project include finishing on-time, under budget, and the customer is satisfied. The customer in the case of the Nationals Sales Engineering Competition will be the competitors (students) and sponsors (professionals).

2.6 Human Computer Interaction and Design

One of the best ways to connect with an audience and promote a cause is through the world wide web. In order to leverage the ability to connect to a tech savvy national audience by creating a website that is both informative and user friendly. To do this, the team will look to take advantage of recent research in user interface design.

In website development, the user experience and general interaction of the site is the deciding factor on the success of the website. Uttara Nerukar, a senior research associate at Infosys Technologies, wrote in his article, Web User Interface Design: Forgotten Lessons, that most website designers make the mistake of focusing too much on how to force information on the user. He explains that designers start out trying to find how to provide the user with the information that the website wants to provide to the user, rather than how to provide the information the user is actually looking for by visiting the website. In this light, it is important to
look to create a website that is user friendly not only with visuals and interactions, but with the ease of access to information as well.

Uttara Nerukar goes on to give a six step web design methodology to help design user centric interfaces.

1. Define the site mission and overall vision so that there are proof of goals and a general outlook for the functionality of the website.
2. Define who the audience is and why they are visiting your site. If necessary, separate the expected users into smaller groups as to focus on each group’s unique characteristics.
3. Define the specific tasks each user group is expected to perform on the website and why that task is important to the general goals for the site.
4. Design the page hierarchy and navigation paths that user groups are expected to follow and explore the navigation paths to ensure accuracy with group characteristics.
5. Optimize the titling, labels, and search capability of the site to help the user navigate confidently and expectedly.
6. Taking this approach to web design will ensure a complete, user-centered experience that will ideally make the developing site as successful as possible.

3.1 Design
3.1 Design Specifications

Before deciding on a solution, the team built a list of specifications, requirements, and constraints that will satisfy the proposed problem (Section 1.2). These values are supported by research from the project literature review and have been reviewed and discussed by the team while deciding on a solution.

3.2 Overall Problem Design Specifications

Requirements:

The first requirement of the project was the product must bridge the gap between the academic and sales engineering profession. This means installing some sort of system that will facilitate communication between the two groups. The second was to create a product or process that will supply knowledge to the students. One of the main problems with students who want to enter the sales engineering field is their lack of knowledge in the subject. Very few schools have a sales engineering class and even fewer have a sales engineering degree. Students need somewhere they can go to and develop skills and increase their knowledge before they going in to the work field. The third requirement was to create solution that will be focused on collegiate academia at the university level. As mentioned in Section 2.1.1, the majority of sales engineering jobs require a college degree, so the solution must provide for students at the university level, preparing for careers in the sales engineering field. The final requirement was to create a
solution backed and supported from professional level because the knowledge and experience will come from people who have experience in the field.

**Constraints:**

The final solution will initially be constrained by finances from Cal Poly Sales Engineering Club and will expand with the funding of sponsors. At this point, finances are limited to funds allocated from the Cal Poly Sales Engineering Club. For this reason, a budget and expense plan must be created to responsibly manage the funds. In 2015, the competition expenses equaled $5,500. With an increase in size of the competition, the budget will be $10,000. This budgetary number is what the Cal Poly Sales Engineering Club has allocated to be spent based off of savings earmarked for a national sales engineering competition saved by the club from sponsor donations over the past three years. The estimated expense report can be found below in Table 2. A majority of the expenses go towards housing for all teams, the final awards/dinner, and prize money for the winners.

**Table 2 - 2015/2016 Actual vs. Estimated**

<table>
<thead>
<tr>
<th></th>
<th>2015 NSEC Actual Costs</th>
<th>2016 NSEC Estimated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels</td>
<td>$ 960.00</td>
<td>$ 3,975.00</td>
</tr>
<tr>
<td>Friday Dinner</td>
<td>$555</td>
<td>Friday Breakfast</td>
</tr>
<tr>
<td>Saturday Breakfast</td>
<td>$ 185.00</td>
<td>Friday Lunch</td>
</tr>
<tr>
<td>Saturday Lunch</td>
<td>$ 370.00</td>
<td>Friday Dinner</td>
</tr>
<tr>
<td>Saturday Dinner</td>
<td>$ 1,905.00</td>
<td>Friday Social Event</td>
</tr>
<tr>
<td>Saturday Social</td>
<td>$ 350.00</td>
<td>Saturday Breakfast</td>
</tr>
<tr>
<td>Marketing</td>
<td>$ 450.00</td>
<td>Saturday Lunch</td>
</tr>
<tr>
<td>Transportation</td>
<td>Volunteers</td>
<td>Saturday Dinner</td>
</tr>
<tr>
<td>Student Prize Money</td>
<td>$ 1,500.00</td>
<td>Marketing</td>
</tr>
<tr>
<td><strong>TOTAL COSTS</strong></td>
<td><strong>$ 6,275.00</strong></td>
<td><strong>Transportation</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voluntees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Student Prize Money</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Gifts</td>
</tr>
<tr>
<td><strong>TOTAL COSTS</strong></td>
<td><strong>$ 11,769.84</strong></td>
<td></td>
</tr>
</tbody>
</table>

Location has potential to be a major constraint for the project on the national scale. In order for the project to be successful on a national scale, the location of a proposed final solution must be easily accessible for travel and provide resources and manpower at an educational level. As mentioned above, Cal Poly Sales Engineering will be financing a majority of the project and because of this the best location for the first competition will be in San Luis Obispo, California. Cal Poly Sales Engineering Club also has one of the largest sales engineering clubs in the nation with a large amount of professional sponsorship. San Luis Obispo is a centralized location for all the sponsors and has easy access for out of state competitors with flights into Los Angeles, San Francisco, and San Luis Obispo.

**Overall Project Specifications:**
The Cal Poly Sales Engineering officers have been meeting and interacting with club sponsors for the past five years to find a solution for expanding sales engineering to a national level. A large part of the team’s research has been from working with professionals in the industry to find out what is missing and how to improve the level of skill for sales engineers fresh out of school. The following are specifications as defined by industry professionals:

1. Trane, the initial sponsor of Cal Poly Sales Engineering Club, sponsor of the first national sales engineering competition, believes it is important to have an annual opportunity for students to gather and interact with industry leaders. From these talks the team came to the conclusion that either a conference or competition would greatly benefit students, along with professionals. A conference would give students a great opportunity to learn and hear from professionals, while interacting with other students. However, after researching conferences and learning opportunities, the team came to the conclusion a competition with role playing would give students the best learning experience. To bridge the gap between students and professionals the competition will be coached and judged by professional sales engineers. This will give students the opportunity to display their skills and then have them critiqued by somebody who has been successful in the field.

2. Air Treatment Corporation, a strong supporter of the first national competition, believed that a potential solution should expose students to real life sales in the closest way possible. They strongly supported a format where students would be under pressure to make decisions in a case study format.

3.3 The Need

A user base or “customer” needed to be defined in order to have a population in which to fit the solution too. By determining these users and their characteristics, a solution can be created to closely fit the proposed solutions to satisfy the needs of the users.

Student
The solution needs to provide a place for the student interested in sales engineering to come to for training, education, and job opportunities. It should provide a way for students to reach out to similar students and professionals for networking and professional opportunities as well as find like minded student peers

Professional
The solution should provide an organization where professional sales engineering can find similar professionals, continual training and learning opportunities, and job postings.

Organization
The solution should provide a focused talent pool and expanded recruiting network for organizations in need of sales engineers. It also should provide an opportunity to help train future sales engineers by connecting with the student.

3.4 Alternative Solution Analysis
The team used a few different quality analysis tools to rank and rate different alternative solutions to the proposed problems. As seen below, a root cause analysis was created to collect the alternatives into a simple format based off potential benefit and cost. These alternatives were then judged in a Multi Criteria Decision Analysis (MCDA) tool with weighted criteria based off of location accessibility, cost, networking outreach, skill training, and growth potential. These complete results of this analysis is included in the appendix, but the alternative solutions of creating a national society with an attached national sales competition were selected after consideration of the total scores.

Table 3 - Root Cause Analysis

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Alternative Solution</th>
<th>Benefit</th>
<th>Cost</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bridge the gap between the academic and the professional</strong></td>
<td>National Society</td>
<td>High</td>
<td>High</td>
<td>Umbrella organization with regional chapters</td>
</tr>
<tr>
<td></td>
<td>Online Social Network</td>
<td>High</td>
<td>Low</td>
<td>Online database and professional social networking site</td>
</tr>
<tr>
<td><strong>Supply knowledge about sales engineering to students</strong></td>
<td>National Conference</td>
<td>Medium</td>
<td>High</td>
<td>Comprehensive event with keynote speakers, trainings, and showcases</td>
</tr>
<tr>
<td></td>
<td>National Competition</td>
<td>High</td>
<td>Medium</td>
<td>Case study competition judged by sales professional</td>
</tr>
<tr>
<td></td>
<td>Online Training Course</td>
<td>Low</td>
<td>Medium</td>
<td>Comprehensive sales training (Sandler)</td>
</tr>
<tr>
<td></td>
<td>Sales Engineering Minor</td>
<td>High</td>
<td>High</td>
<td>Structured academic program for engineering students</td>
</tr>
</tbody>
</table>
3.5 National Sales Engineering Competition
In order to achieve the first requirement of this project, the team needed a way to connect students with professionals. To accomplish this the team looked to have a situation to involve students with professionals. Possibilities for interaction include mentorship programs, seminars, job shadow programs, internship programs, and social events. If this would’ve been the only requirement the team could have easily gone with one of the possibilities previously listed. However, the team also needed to find a way to develop student skills and have a system installed in which was backed by professionals. A National Sales Engineering Competition for students, which was ran and judged by professionals would allow for the opportunity to fulfill all of the requirements. This possible solution was come by after surveying professionals in the sales engineering field, along with communication with past officers in the sales engineering club. One of the best ways to develop skills and learn is by experience in role play (Widmier). The competition will give students the opportunity to role play in a competitive atmosphere and then be judged and critiqued by professionals. In order to bridge the gap between students and professionals it is important to have a continuous flow of communication. For this reason, the competition would need to be an annual event.

Due to the constraints currently faced by the team and sales engineering clubs, California Polytechnic, San Luis Obispo is the only school with the resources to host the event. For this reason, the first two years of the event will be hosted at Cal Poly.

The date and location of the event must be decided on early in the year. It is important to check the date with any potential sponsors and academic schedules of possible schools. Preparing and planning early on in the academic year is very important to success of the event. Once a date and location are decided on, it is time to start recruiting schools and professionals in the industry. The recruitment process is long and filled with failures, but it must start early on in the year to find as many schools and professionals possible. Past chairs have found success reaching out to sales engineering, business engineering and ASHRAE clubs across the country.

<table>
<thead>
<tr>
<th>Level</th>
<th>WBS Code</th>
<th>Element Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSEC Marketing</td>
<td>1.0</td>
<td>Marketing</td>
</tr>
<tr>
<td>1.1</td>
<td>Create Materials</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>Create Agenda</td>
<td></td>
</tr>
<tr>
<td>1.1.2</td>
<td>Create Flyers and Posters</td>
<td></td>
</tr>
<tr>
<td>1.1.3</td>
<td>Create Website</td>
<td></td>
</tr>
<tr>
<td>1.1.3.1</td>
<td>Buy NSSE Domain name</td>
<td></td>
</tr>
<tr>
<td>1.1.3.2</td>
<td>Survey Alumni for Content</td>
<td></td>
</tr>
<tr>
<td>1.1.3.3</td>
<td>Interview past participants for testimonials</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Establish Contacts</td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>Email Previous Schools</td>
<td></td>
</tr>
<tr>
<td>1.2.2</td>
<td>Email New Participating Schools</td>
<td></td>
</tr>
<tr>
<td>1.2.2.1</td>
<td>Email Sales Engineering Minor Chairs</td>
<td></td>
</tr>
<tr>
<td>1.2.2.2</td>
<td>Email Sales Engineering Clubs</td>
<td></td>
</tr>
<tr>
<td>1.2.2.3</td>
<td>Email NOBE and Business Engineering Clubs</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Email Previous Participating Schools</td>
<td></td>
</tr>
<tr>
<td>1.3.1</td>
<td>UCF and Iowa State</td>
<td></td>
</tr>
<tr>
<td>1.3.2</td>
<td>Alumni</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>AMA Competition</td>
<td></td>
</tr>
<tr>
<td>1.4.1</td>
<td>Create Competition Guide</td>
<td></td>
</tr>
<tr>
<td>1.4.2</td>
<td>Select Judges</td>
<td></td>
</tr>
</tbody>
</table>

A second goal of the competition is to bridge the gap between students and professional sales engineers. This goal is accomplished by recruiting industry professionals to help judge and sponsor the event. The interaction between students and professionals provides valuable experience for the students. Professionals will lead and judge the case study during the competition, along with speak at two of the sales skill seminars.
The agenda of the competition is a weekend long event. It will include one case study and two sales skill seminars. Students will compete in teams of three. The case study will be a real life sales simulation with multiple steps along the way, finished with a final presentation. To further develop relationships between fellow students and professionals, the competition will have a social event and a final dinner/awards.

For this reason, a budget and expense plan must be created. In 2015, the competition expenses equaled $6,275. With an increase in size of the competition the budget will be $10,000. A majority of the expenses go towards housing for all teams, the final awards/dinner, and prize money for the winners. Teams will be scored throughout the case study based on their performance. First place will be awarded $750. Second place will be awarded $500. Third place will be awarded $250.

A project plan helped track current progress for the national sales engineering competition. This checklist is designed to be a map for future competitions and can be generalized for schools across the country but is currently being used of the Cal Poly competition

Project Plan
A list of tasks was created so as to help competition planners see the necessary steps to build a successful competition over the course of a year. Estimated task lengths and deadlines were given for accountability and help with planning. Some notes and a completion tab were included to give background and helpful hints for the planner. The overall goal of this plan is to provide a step by step process for setting up the competition. A planner could use this a map as they progressed through planning and make sure they did not leave anything too important out.

It can also serve as a way to establish an initial set of tasks that can be modified to fit the competition needs. The plan is simple enough to be replicated outside of the university of Cal Poly and for many different competition formats
<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task</th>
<th>Task Length</th>
<th>Deadline</th>
<th>Notes</th>
<th>Completion (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assign NSSE Chairs</td>
<td>1 week</td>
<td>Spring 2015</td>
<td>Helps to have previous experience with the competition</td>
<td>Y</td>
</tr>
<tr>
<td>2</td>
<td>Assign Date for Competition</td>
<td>2 weeks</td>
<td>12/31/2015</td>
<td>Watch out for Spring Break and finals for semester schools. Spring has worked well. Check w sponsors before soliciting.</td>
<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>Assign Location of Competition</td>
<td></td>
<td>12/31/2015</td>
<td>Cal Poly</td>
<td>Y</td>
</tr>
<tr>
<td>4</td>
<td>Create Budget w/ planned expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Create Marketing Material (Flyer/Agenda)</td>
<td>4 weeks</td>
<td>1/31/2016</td>
<td>Include Information Packet and date/time details.</td>
<td>Y</td>
</tr>
<tr>
<td>6</td>
<td>Create/Update Website</td>
<td>4 weeks</td>
<td>12/31/2015</td>
<td>Now the website is created it will just need to be updated every year. Pictures, news, events, etc.</td>
<td>Y</td>
</tr>
<tr>
<td>7</td>
<td>Create sign-up for teams on website</td>
<td>1 week</td>
<td>12/31/2015</td>
<td>google forms have worked well</td>
<td>Y</td>
</tr>
<tr>
<td>8</td>
<td>Recruit schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Step 1 of Recruiting: Reach out to schools who competed in previous competition</td>
<td>6 months</td>
<td>3/20/2016</td>
<td>Iowa State - 2015, 2016 UCF - 2015, 2016 ASHRAE Clubs are good place to reach out. SEC sponsors are also willing to help. Ask if they have any interns, who would want to compete.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Step 2 of Recruiting: Contact existing clubs such as ASHRAE and NOBU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Step 3 of Recruiting: Contact friends at schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Step 4 of Recruiting: Ask sponsors to send emails out to their interns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Create case study w/ industry help</td>
<td>6 months</td>
<td>3/20/2016</td>
<td>2015 - 2 case studies 2016 - 1 case study Get the sponsors help</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Create agenda for Competition</td>
<td>2 months</td>
<td>3/20/2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Assign professionals to speak at a seminar if you choose to have one</td>
<td>1 month</td>
<td>3/20/2016</td>
<td>Recommend having a seminar. Students come to learn as well as compete.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Purchase hotel rooms for competitors</td>
<td>2 days</td>
<td>3/1/2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Figure out transportation in SLO for competitors</td>
<td>2 weeks</td>
<td>4/10/2016</td>
<td>SLO saeride, shuttle service</td>
<td></td>
</tr>
</tbody>
</table>
3.6 National Society of Sales Engineers

After research of design alternatives regarding the competition, the team found that most of the design alternatives such as conferences, competitions, case studies, etc were supported by a parent organization. These parent organizations are supported by industry and students as the home for their targeted profession or trade. This can range from providing job opportunities and networking to professionals to sponsoring student clubs and organizations. After this research, the team concluded that building the framework for a national society for sales engineers would be in the best interest for the continuity of the competition and the strengthening of the sales engineering profession in general.

To gain insights into successful national organizations the team looked into well popular organizations such as the Society for Women Engineers (SWE), the Institute of Industrial Engineers (IIE), and the American Society of American Heating, Air Conditioning, and Refrigeration Engineers (ASHRAE). These organizations provided the team with examples of successful organizational structures, club rules and regulations, and competition or conference ideas that the team could use for the new society.

A general list of steps was then created to supplement the work with the competitions and began the building of the national society:

Launch of National Society of Sales Engineers (NSSE)
- Meet with lawyer about non profit ID and associated paperwork
  - Create Charter Statement, Organizational Structure, etc..
- Create NSSE Charter
- Mission of the society
- Rules and Regulations for individuals, member schools, and sponsor companies
- Financial rules such as sponsorship levels, yearly budget review, and fully allocated cost chart
- Structure of Management
  - Voting Board of Directors (Alumni, Professionals, Faculty, NSSE Director)
  - Student Management Positions
    - Director (Also on Board)
    - VP of Operations
    - VP of Finance
    - Chair of NSEC
    - Chair of Sponsor Relations
    - Chair of Member School Relations
    - Marketing and Outreach Chair
    - Alumni Chair
- Create NSSE marketing materials and strategy (website, posters, mailers, social media presence)
- Create Sales Pitch (presentation for companies and schools)

The focus on the society for this year will be mainly creating the paperwork and establishing the general rules and regulations for the future. The national competition will be used as the premier event to garner interest and commitment from other sales engineering clubs from around the country. the team will also use the competition and its potential success as a selling point for interest companies in corporate sponsorship.

3.7 Three Year Plan for General Implementation of NSSE and NSEC

The following three year plan was created as a brief overview of goals to be completed by the Cal Poly NSSE team. The goals for each year was deemed feasible by the representatives of the three largest sales engineering clubs in the country: Cal Poly Sales Engineering Club, Iowa State Sales Engineering Club, and University of Central Florida Society of Sales Engineers.

- **Year One (2015):**
  - Select team of students to head a research study for the feasibility of a national sales engineering competition.
  - Research includes event type, student and university involvement, professional interest, and financial allocation.
Create a small pilot competition involving multiple schools and industry representatives.

Survey participants and record observations.

**Year Two (2016):**
- Building a stronger and larger competition format with more student and company involvement. Create a competition format will serve as a better standard for future competitions and will encourage growth for the society by student involvement.
- Host the improved second competition at Cal Poly.
- Build an association or society that operates independently of each club but that is wholly supported by college clubs and sponsor companies. This organization connects the sales engineer professional to the student interested in sales engineering for the purpose of intellectual growth, career and internship recruitment, and networking.
- Create a set of rules and guidelines for member clubs and establish a charter for the national level society.

**Year Three (2017):**
- Launch the official National Society of Sales Engineers with three member chapters.
- Move the national competition to another host school.

### 4.0 Methods

After careful consideration of project goals, constraints, and design alternatives, the team settled on hosting a national competition as the best way to begin building a national sales engineering presence. With this decided, the process began to design a competition to be held at Cal Poly in late April of 2016 with all of the necessary recruiting, case creation, and project management to be undertaken during the Cal Poly school year prior to the event.

### 4.1 Competition Participants and Event Schedule

**Team Structure**

In order to closely simulate a real world sales environment, the case study is designed to be a team competition. This would allow individuals to collectively work together to solve the proposed problem as is seen in most sales engineering companies. A team case study also allows for an expanded number of competition participants, who can gain exposure to sales engineering.
It also would put less potential stress on the individual student, who would have the reassurance of a team when building the solution.

Arbitrarily, the team size is set at three students. According to research by sociologists Richard Hackman and Christopher Vidmar, the optimal team size is 4.6 participants, with teams of three being the most successful in large academic environments, such as the competition’s case study. The teams of three would also fall in line with team building specialist Mike Volpe’s inbound marketing strategy (Building an Inbound Marketing Team). That is, each member would take a part in converting a stranger to a customer by using three stages: convert, attract, and close. With teams of three, each member could align themselves with one of the three stages. This also aligned well the competition design, as detailed later in this section.

**Competition Recruiting**

In order to meet the goal of building a national presence, the team created a recruiting strategy that would encompass the entire country. To narrow the recruiting scope, targets were set on universities with established technical sales programs or classes, sales engineering student clubs, or business-focused engineering clubs. Using a marketing packet created by the team, email blasts were sent to all schools that would fall into the focus. These emails would be followed by follow up phone calls to club advisors, sales engineering professors, or department chairs that would serve as the champions at each school. The team also attempted to establish contact with presidents of student engineering clubs in order to gauge general student interest of the competition at the school and use them as a resource for recruiting students. The most success in finding schools with either established sales engineering minors or sales engineering clubs. These schools had students already highly motivated to begin a career in technical sales and had the financial resources from their universities to come to Cal Poly. By partnering with two large sales engineering clubs at Iowa State and the University of Central Florida, The team was able to recruit a large amount of talented teams to Cal Poly from those schools. Local Cal Poly recruitment of teams came from the Sales Engineering Club at Cal Poly. Using more mass emails to club members and engineering departments as well as class talks and personal relationships, the team was able to easily recruit teams from Cal Poly to take part in the competition.
Professional Involvement

The team utilized strong relationship with the Cal Poly Sales Engineering Club and its alumni as well as internship experiences to recruit sales professionals for the competition. The first established a relationship with Trane and Air Treatment Corporation, two leaders in the HVAC market in California and both of which had already strong interest in sales engineering at the university level. With these two companies on board, the team was able to utilize their resources and expertise in order to help build the case study. Sales professionals from DMG Corporation and Schneider Electric, along with two technical sales professors from Cal Poly committed to aid with judging and mentoring for the competition. These professionals were used in a variety of ways during the weekend. As detailed later, the professionals served as mock customers and judges during the case study, mentors for the participants, and technical resources for product questions.

Competition Event Schedule

The competition date was set for April 22-23, 2016. This was found to be the optimal time due to Cal Poly’s quarter system schedule and other semester schools final schedule. This allowed teams to not miss any major academic events at their universities and give enough time to complete a two day case study.

Figure 4 - Daily Schedule

The schedule was designed to be a full two day event that included case study events, technical and sales learning opportunities, and networking social events. Most of the day was spent at Cal Poly, taking advantage of the expansive HVAC Lab and classroom spaces. A strong emphasis on building relationships between each school and individuals. Social activities such as bowling and a banquet dinner allowed teams to mingle with the sales professionals outside of the competitive environment and began building future connections for their professional careers.

Agenda:

Friday - April 22, 2016
- 9:30am - Team/Professional Sign-ins
  - Location: Cal Poly Bldg. 192 Rm. 220
  - Coffee and Water available
- 10:00am - 10:30am NSEC 2016 Introduction Presentation
  - Location: Cal Poly Bldg. 192 Rm. 220
- 10:30am - 11:30am HVAC Lab Tour
  - Location: Cal Poly HVAC Lab
  - Ken Miller - Controls
  - Brian Burg, John Jackiewicz - HVAC equipment
- 11:30am - 12:00pm Lunch
  - Location: Cal Poly HVAC Lab
  - Urban Cafe Sandwiches and Drinks available
- 12:00pm - 2:00pm Case Study Meeting #1
  - Location: TBD
- 2:00pm - 5:00pm Michael Zwick Sales Training Seminar
  - Location: Cal Poly Bldg. 192 Rm. 106
- 5:00pm - 5:30pm Dinner
  - Location: Cal Poly Bldg. 192 Rm. 220
  - Old San Luis BBQ and drinks available
- 7:00pm - 9:00pm Bowling Social Event
  - Location: Pismo Bowl - 277 Pomeroy Ave, Pismo Beach, CA 93449
4.2 Case Study

Cal Poly Energy Project Case Study
In partnership with Trane, the team created a sales simulation to model a sales process from the introductory meeting to final sales pitch. Based off an energy project using Cal Poly facilities, teams had to navigate the different stakeholders at Cal Poly facilities in order to obtain a final presentation meeting and sell their customized solution to Cal Poly.

Format
Participants had to navigate through three sales meeting with fictional Cal Poly facilities employees (played by judges):
Plant Supervisor – Bill Smith
Director of Facilities – Matt Elliott
VP of Facilities and Operations – Tim Williams

The case study was broken into three meetings:
Meeting #1: Discovery
● Customer attendees: Bill Smith
● Goal – Discover what the opportunity is.

Meeting #2: Information Gathering
● Customer attendees: Bill Smith and Matt Elliott
● Goal – What does Cal Poly need? How will Cal Poly make a decision?

Meeting #3: Present Results
● Customer attendees: Matt Elliott and Tim Williams
● Goal – Cal Poly agrees to go forward with project.

Each meeting had specific goal for the team to strive for during the meeting. After the meetings conclusion, judges would come out of character for feedback and to provide the learning moments of each meeting.

Material
A custom case study was created for the competition.
It included:
● A Participant Case Study Packet
  ○ Includes general Cal Poly and equipment information, the current scenario, and general meeting goals
● An Actor Case Study Packet
  ○ Includes participant case study information as well as in-depth instructions on how to run each meeting, potential strategies, and learning moments.
• Cal Poly HVAC Equipment Background Information
  ○ Includes all relevant info on Cal Poly energy equipment with sizes, locations, and other relevant specifications to be used strategically by teams
• Final Sales Proposal
  ○ Given to teams after the second meeting. The proposal provides an entire list of potential sales options for the customer with pricing and incentives. Teams were instructed to use this to build a final proposal within the presentation.

*Full case studies provided in the Appendix*

### 4.3 Judging

*Judge Make-up*

The case study was judged by teams of professionals from Air Treatment Corporation, Trane, DMG, and Schneider Electric as well as two Cal Poly Sales Engineering professors. The range of experiences, from junior account managers to current sales managers and retired executives, allowed each judging team to have a wide range of skills and background to draw from. Because of that, the teams were also split by experience and company in order to take advantage of such range.

*Competition Scoring Rubric*

*Figure 5 - Scoring Rubric*
A judging rubric was created to create a clear and replicable standard of scoring throughout the case study. The competition was scored out of 350 points, with the first two meetings being scored out 100 points and the third meeting totaling 150 points. Each section built into the rubric focused on grading the entire meeting, from competitors standard meeting etiquette to subject knowledge and preparation. A team meeting all criteria in a section could score up to 20 points. Before the competition began, a prejudging meeting was held with all the judges in order to establish a standard from which to score. Since sales presentation judging can be a very subjective matter, it was important that all judges agreed upon a predetermined level of grading.

Judging Feedback

Each meeting was designed to be about 30-45 minutes long. This included a 10 minute feedback session where the judges responded to the participants meeting with critiques on how they did. This was a valuable way for participants to take something away from each meeting beyond a numerical score. It also allowed the competition playing field to be returned to a level point after each meeting, ensuring that no team wandered too far away from the case study design.

4.4 Training

Three different trainings were incorporated into the competition to add an education dimension to the competition and to ensure that all competitors entered the competition on a relatively even playing field.
**Technical Training**

*HVAC and Energy Lab Walkthrough and Product Demo*

Before the initial case study, all of competitors were introduced to general building energy knowledge in the Cal Poly HVAC Lab. Led by professionals from Trane, this hour and a half training walked through the general heating and cooling process, relevant equipment, and why central plants are important to campuses at Cal Poly. A portion on controls, energy management, and current industry trends was also included. As an added twist to the competition, the professionals included hints on potential sales solutions and things to look out for in the case study. Teams that listened carefully to the training could use that information to gain a leg up on the rest of the competition. A question/answer session at the end allowed competitors to ask the professionals any questions about the equipment or the industry in a stress-free environment before the rigors of the competition.

**Trane Sandler Training Process**

In coordination with Trane and Cal Poly SEC, a professional sales training for the participants took place during the late afternoon of the first day. Led by the lead sales trainer for Trane, this four hour training introduced the Sandler sales system and modern technical sales strategies. The Sandler sales training system is a well-known sales system used by some of America’s largest technical companies. It has helped create a well defined set of sales engineering skills and techniques to use while making a technical sale. The training used during the competition focused on finding customer needs through asking the right questions; a basis for the competition case studies.

The timing of this training during the competition was important. Placed after the first case study, it allowed to teams to regroup after seeing their successes and failures during the first case study meeting and apply the new knowledge gained from the sales training. This was intended to give teams that struggled during the first case study an opportunity to rebound and now apply newfound sales knowledge.

**Brian Burg Sales Training**

Hosted by Brian Burg, a sales engineer and alumni of Cal Poly, this training was held the morning of the second day of the competition. An experienced sales engineer, Brian focused his presentation on real world sales situations and personal skills and experiences that have led to his success. Designed to contrast with the rigid sales training from the afternoon before, this training was more informal and relaxed. Participants were able to ask more questions about basic sales skills and meeting etiquette, while hearing stories from about Bryan’s past experiences.

**4.5 NSSE Interest Meeting**

During the competition, the team hosted a National Society of Sales Engineering info session for any interested participants and sponsors. The purpose of this meeting was to generate interest in
the national society and began a discussion on toward what’s needed from each participating university and company. The session was attended by representatives from each university and a few sponsors and professors. The format of the meeting was a brief presentation of the history of Cal Poly SEC had been working on for the national society and what the future plans were followed by a round table discussion between all the meeting participants about how to create the society with help from each university or sales engineering club.

**Figure 6 - NSSE Past, Present, and Future**

<table>
<thead>
<tr>
<th>NSSE</th>
<th>Last year</th>
<th>This year</th>
<th>Next Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition Participants</td>
<td>29</td>
<td>45</td>
<td>70</td>
</tr>
<tr>
<td>Sponsors</td>
<td>Air Treatment</td>
<td>Air Treatment</td>
<td>Across Multiple Industries and multiple university sales engineering clubs</td>
</tr>
<tr>
<td></td>
<td>Brian Burg</td>
<td>Brian Burg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cal Poly SEC</td>
<td>Schneider Electric</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cal Poly SEC</td>
<td></td>
</tr>
<tr>
<td>Schools</td>
<td>Iowa State, UCF, Cal Poly</td>
<td>Iowa, UCF, Cal Poly, Arkansas State, UCSB</td>
<td>Florida, SDSU, UCLA, USC, Purdue, Texas, Wisconsin, NOBE Organization, Texas A&amp;M, RPI, LSU</td>
</tr>
<tr>
<td>Society</td>
<td>Establish National Presence</td>
<td>Establish Chapter Interest</td>
<td>Create the National Society</td>
</tr>
</tbody>
</table>

4.6 Post Competition Reviews

**Judges Meeting**

After the final case study, the three NSSE chairs and the 10 sponsor judges met to discuss the competition. The purpose of the meeting was find the successes and failures of the weekend while there were still fresh in the judges minds. Held in an open forum format, the NSSE chairs posed a few questions to the judges who responded and discussed between themselves. The goal of this meeting was to begin building towards the future by immediately critiquing the past competition.

**Participant and Judge Survey**

An online survey was distributed to all participants of the competition the following week after the competition. With seven fill in the blank responses and 12 multiple choice responses, the survey was designed to have each participant have an opportunity to express themselves by
written response or select predefined answers. This mixture of questions also allowed the team to find data to use for statistical analysis in order to build better future competitions and find the most successful parts of the current competition.

5.0 Results

2016 National Sales Engineering Competition
The competition consisted of 15 separate teams. All 15 teams competed in the three leg case study. Each team received a score for each part of the case study and the team with the highest cumulative score after the three parts won. First place was won by a UCF team, second place was won by a Cal Poly team, and third place was won by a different UCF team. The team was very impressed with all competitors and the level of seriousness they brought to the competition.

Judges
Judges ranged from industry leaders in HVAC to industry leaders in power and controls to Cal Poly professors with experience in the technical sales industry. The total number of judges equaled 12. The large number allowed for two judges to sit in on every meeting to role play and judge. The judges also gave feedback to the competitors after every leg of the competition to teach them what they did well and what they could’ve done better. Each judge was awarded a score sheet to follow, but was difficult to find consistency between judging groups. These problems are highlighted in the competition quality below.

5.1 Competition Quality
In order to fulfill the goals of the project, the team thought it was necessary to get direct feedback on the competition. The project had two main clients: the students and the professionals acted as judged.
The first feedback was attained in a meeting directly after the competition completion. All ten judges met with the three NSSE Chairs and discussed positives and negatives of how the competition was ran. The notes from that meeting can be viewed in the table below, which also includes possible solutions discussed at the meeting. The main reason for the meeting was to review the competition and find out where the main issues were, along with key highlights to ensure the competition satisfies the wants of future participants.

Figure 7 - April 23, 2016: Judges and NSSE Chair Review Meeting Notes

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Well designed case study and didn't rely too heavily on technical knowledge. It is</td>
<td>1. CONSISTENCY - The main problems judges had was consistency across (scores</td>
</tr>
</tbody>
</table>
important the case study is created to test sales ability and skills with a little technical background. It is important to keep in mind the students aren't HVAC professionals and have never put together a full chiller sale before. It is tough to understand the overall solution, so the case study should be focused on beginner level technical skills.

and information). A score of an 85 to one judge could have been very different than an 85 to another judge. Second, teams met with different judges and didn’t know what information was given to the students by previous judges. This caused problems because assumptions were made with both parties and led to confusion. It was agreed still best to have students meet with different judges because this allowed them to learn from more people and get different experiences.

<table>
<thead>
<tr>
<th>2. Large professional involvement is key. Draws interest from many students and gives them the best opportunity to learn the most.</th>
<th>2. 2016 was heavily reliant on HVAC. Don't want this to become a HVAC competition/club, but that is currently where the best relationships are. Utilize your connections, but look to grow the diversity of the industries involved.</th>
</tr>
</thead>
</table>

### Possible Solutions

1. Weight every judge's score based off of their average. So compare one team’s score to the other scores that judge gave out. Before every meeting have the teams and the judges briefly go over what they know and what was told to them in the previous meeting. Or have a large meeting with all competitors after the completion of each round of meetings to go over what information they should have at this point in the competition process.

### Survey Feedback

In order to have a continuous improvement the team sent out surveys to the judges and competitors about 5 days after the competition. Each were asked a series of multiple choice and free response questions about the competition, what they liked, didn't like, and where improvements could be made. Below is a small portion of responses received from the surveys. A total of 14/45 (31%) of students responded to the participant survey and 2/12 (17%) of the judges responded to the judge survey. These responses will be taken and used to improve future competitions. The team has made the survey responses available to all of next year's Cal Poly Sales Engineering officer board, who if necessary can share with other schools in helping create a better solution for the growing sales engineering education and field.

**Participant Survey**
Overall, a majority of the participant responders enjoyed the competition and at least thought the organization was acceptable. From the comments, 4/11 (37%) of the responses critiqued how the competition was judged and scored. Further in the survey, a more direct question was asked about the judging. These results showed that half of the respondents found that the judging was not clearly outlined in the initial directions. Many of the following comments spoke on the consistency of the judging, since the teams were rotated through the judges after each meeting. This meant that some judges could be scoring teams differently than other judges. In the real world, sales engineers will be working
with many different people on sales such as the case study, but for the fairness of the competition, alternative scoring methods must be analyzed in order to ensure accuracy and fairness at all times.

The greatest indicator of the success should be if students found this a worthwhile event, an educational and professional investment, and worthy or returning for. As the survey results show, most students are considering returning for a competition next year. On top of that, all responding students found the competition to be a worthy investment of both their time and money. This is especially significant as many schools came the week before their finals, sacrificing study time in order to attend an event on the other side of the country.

Judge
Both judges who responded to the survey also felt the same about the competition. One mentioned that it is the best university event he has seen in the industry. The judges also felt that while it was a great event, some fine tuning needed to be done for the judging. They felt that informational packet given to the judges was too long. This stems from the competition focusing too much on the technical aspects and needing to be more free-form. Both judges agreed the case study could become lighter with more focus on the art of the sale.
Considering the nature of the event, numerical quality tools were hard to implement when considering user satisfaction. To still gain meaningful feedback on the quality of the competition, a general survey question gauged participant feedback on the overall event. Of the responses, 100% of the participants thought positively of the event. This response indicated that continuing the event year over year is an acceptable option moving forward.

5.2 Financial Analysis

Financial funding for the competition ended up being solely contributed from the Cal Poly Sales Engineering Club. It was important the team came up with a plan to how the money would be spent. As previously mentioned, the rough budget for the competition was $10,000. The Cal Poly Sales Engineering Club was able to afford this event because it has been in the plans for many years and a conscious effort was made to save specifically for an event on the national level. Professional companies have shown an interest to financially invest in the national competition and even in the national society, which will be necessary to continue to improve the competition and possibly evolve into a national society.

With the allocated $10,000, the team constructed an estimated financial plan for the complete competition. This plan included every possible expense for the weekend from the large expenses, such as hotels all the way to purchasing plates and napkins. The complete financial plan can be viewed below in table Table 5.
Table 5 - Cost Comparison

<table>
<thead>
<tr>
<th>2016 NSEC Estimated Costs</th>
<th>2016 NSEC Actual Costs</th>
<th>% Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels</td>
<td>$3,975.00</td>
<td>Hotels</td>
</tr>
<tr>
<td>Friday Breakfast</td>
<td>$240.00</td>
<td>Friday Breakfast</td>
</tr>
<tr>
<td>Friday Lunch</td>
<td>$440.00</td>
<td>Friday Lunch</td>
</tr>
<tr>
<td>Friday Dinner</td>
<td>$600.00</td>
<td>Friday Dinner</td>
</tr>
<tr>
<td>Friday Social Event</td>
<td>$590.00</td>
<td>Friday Social Event</td>
</tr>
<tr>
<td>Saturday Breakfast</td>
<td>$240.00</td>
<td>Saturday Breakfast</td>
</tr>
<tr>
<td>Saturday Lunch</td>
<td>$480.00</td>
<td>Saturday Lunch</td>
</tr>
<tr>
<td>Saturday Dinner</td>
<td>$2,475.44</td>
<td>Saturday Dinner</td>
</tr>
<tr>
<td>Marketing</td>
<td>$1,029.40</td>
<td>Marketing</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td>Volunteers</td>
</tr>
<tr>
<td>Student Prize Money</td>
<td>$1,500.00</td>
<td>Student Prize Money</td>
</tr>
<tr>
<td>Professional Gifts</td>
<td>$200.00</td>
<td>Professional Gifts</td>
</tr>
<tr>
<td>Extra Costs</td>
<td>$-</td>
<td>Extra Costs</td>
</tr>
<tr>
<td><strong>TOTAL COSTS</strong></td>
<td><strong>$11,768.84</strong></td>
<td><strong>TOTAL COSTS</strong></td>
</tr>
</tbody>
</table>

The actual expenses ended up being slightly different from the estimated plan. The final expenses for the competition can be seen below in Table 6. Part of the marketing pitch to schools across the nation was that all expenses would be taken care of once the teams arrive in San Luis Obispo, which included lodging, food, and transportation to all events. As can be seen in the table, roughly one-third of the money spent was on the lodging for teams. Lodging, along with prize money for the winners ended up being about one-half of the total expenses. The National Competition was composed of students and professionals, and the team believes there is value in the competition for both parties. For this reason the team looked at how much the competition cost per person involved. The total cost of the event ended up being $10,867.68. 45 students and 12 professionals were involved in the weekend long competition. So, the team came to the conclusion that the competition cost per person involved ended up being $190.66. Fortunately, Cal Poly Sales Engineering Club had the funding to support a competition with 57 people involved. However, at the rate of $241.50 per student it will be important to find more parties to financially invest as the competition continues to grow.
Table 6 - Actual Cost Analysis

<table>
<thead>
<tr>
<th></th>
<th>Competitors Attended</th>
<th>Professionals Attended</th>
<th>Total People Attended</th>
<th>Cost/Student</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast #1</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$3.32</td>
<td>$149.50</td>
</tr>
<tr>
<td>Lunch #1</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$11.56</td>
<td>$520.00</td>
</tr>
<tr>
<td>Dinner #1</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$9.33</td>
<td>$420.00</td>
</tr>
<tr>
<td>Social Event #1</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$13.11</td>
<td>$560.00</td>
</tr>
<tr>
<td>Breakfast #2</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$11.56</td>
<td>$700.00</td>
</tr>
<tr>
<td>Lunch #2</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$10.98</td>
<td>$404.27</td>
</tr>
<tr>
<td>Dinner #2</td>
<td>45</td>
<td>12</td>
<td>65</td>
<td>$51.68</td>
<td>$2,325.44</td>
</tr>
<tr>
<td>Student Awards</td>
<td></td>
<td></td>
<td></td>
<td>$1,500.00</td>
<td></td>
</tr>
<tr>
<td>Professional Gifts</td>
<td></td>
<td></td>
<td></td>
<td>$340.00</td>
<td></td>
</tr>
<tr>
<td>Marketing Costs</td>
<td></td>
<td></td>
<td></td>
<td>$830.00</td>
<td></td>
</tr>
<tr>
<td>Extra Costs</td>
<td></td>
<td></td>
<td></td>
<td>$129.99</td>
<td></td>
</tr>
<tr>
<td>Lodging Costs</td>
<td>45</td>
<td>45</td>
<td>90</td>
<td>$77.74</td>
<td>$3,498.48</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>45</strong></td>
<td><strong>12</strong></td>
<td><strong>57</strong></td>
<td><strong>$241.50</strong></td>
<td><strong>$10,867.68</strong></td>
</tr>
</tbody>
</table>

In order to repeat the competition next year, money will be a constraint. At the minimum, to repeat an exact competition of 2016, the NSSE chairs will have to raise $10,987.22. This number is based on the cost of the 2016 competition and expected inflation rates for the upcoming year. However, with a goal of increasing the competition size more money will be necessary. Possible donors can be found at established Sales Engineering Clubs across the country, along with professional companies looking to help.

5.3 Discussion

Design Success

The team, along with the competitors and judges thought the design was a success. The format of the competition will need slight changes going forward to improve, but the current design was successful. It is a repeatable design, with an affordable cost that satisfies the customer.

Accurate Forecasts

The cost of the competition was above the original budget set by Cal Poly Sales Engineering Club by 8.68% or $867.68. However, the actual cost was below the planned costs for the competition. The reason the numbers were originally higher than the allocated $10,000 from Cal Poly Sales Engineering Club was because the team initially thought potential monetary donations from professional companies would be received to supplement the $10,000. Cal Poly Sales Engineering allowed the team to go slightly over the original donation because it didn’t want money to be a deciding issue for companies to be involved. It was more important to the team and Cal Poly Sales Engineering club that the companies sent experienced sales engineers to help instead of money. The final cost per person for everybody involved in the competition equaled $190.66 and if considering student participation only, the individual cost was $241.50.

The quality of the competition was as expected. It was a professional, but fun event to bring the educational and professional fields of sales engineering together. The quality was confirmed by the customers (professionals and students).
Customer Satisfaction
After all competition events came to a close, the team believe the theory that a national sales engineering competition was the best way to solve the problem at hand. Throughout the weekend of the competition multiple people came up to NSSE Chairs and mentioned how great of an event it was and how they were learning a lot. The quality surveys passed out to the judges and competitors solidified the success of the event. The event was able to spread knowledge to the future of sales engineering, while creating a network between students across the nation and professionals in the industry.

Future
The problem is far from being solved, but the competition resulted in a good first step. The national society meeting that was held during the weekend was very important to the next steps. Professionals who sat in on the meeting gave great input, along with support to help get the society off the ground. UCF and Iowa State committed to have officer positions in their sales engineering clubs next year focused solely on creating the national society. Previously, Cal Poly was the only club in the nation with such a position. Based off of the results of the competition the team believes next year the National Sales Engineering Competition should be able to increase student involvement by another 50%. This is based off of the potential interest from other universities that were unable to attend the competition this year. By continuing to build these connections for future years, especially with other organizations such as ASHRAE or the National Organization of Business Engineers, the competition participant count will be able to grow. This means between 65-70 student competitors. A similar jump was made between the first and second annual national competition. The team believes the competition will be able to involve at least one more field of technical sales, whether it be software, biomedical, or any other technical field. Industry diversity will be important in expanding going forward. As far as a national society, the team believes the right steps have been set in place, but there is still a decent amount of time before the goal will be a reality. The team thinks it is not too far of a stretch to think the national society can be formed by the end of 2017. With the groundwork laid and a network created expanding to three time zones, future NSSE Chairs will need to take it the next level with increased research into the legal field of creating a non-profit national society.

Problems
Future problems could arrive when it comes to somebody physically running the national society. Societies such as the Society of Women Engineers have headquarters, where somebody is paid to organize and work for the society. When it comes to this point, a sales engineering society would have to heavily increase sponsorship and donations to financially support a similar system.
6.0 Conclusion

Problem
The sales engineering field lacks a focused national structure to bridge the academic and professional groups together. This leads to a lack of education, networking opportunities and skill development for all interested parties. Students enter the industry with poor training and knowledge of technical sales, causing extra costs towards training for hiring companies. Professionals do not have a peer support network or the opportunity for ongoing skills training. Companies spend extra recruiting costs without a network to help group students interested in sales engineering.

Objective
As students studying industrial engineering with experience in sales engineering, the team believes it is best fit to create a solution to the problem in sales engineering. It was important to design a solution that satisfied both students and professionals. The team wanted to design a solution that would connect both groups, while creating opportunities for students to gain knowledge in the sales engineering field.

Solution Approach
When taking into consideration both the students and the professionals, the team thought it was important to get feedback from both sides. the team had numerous meetings with sponsor companies, alumni, and current sales engineering club students to find out where the gaps were and what possible solutions could be implemented. Past Cal Poly Sales Engineering Club officers experimented with possible ideas on the national level, so it was important to meet with these alumni and learn why some ideas were successful, while others were not. The final design was decided on by agreement with sponsors and sales engineering officers that this was the best way to get a sales engineering going on a national level.

Results
- The most important results of the design was the feedback received from the customers.
- The objective of the project was met, but is not done. The project is a three year project and the first two years have been completed, while reaching the goals of the first two years.
- The designed solution is a repeatable design, which means future years will be able to take what has been created here and build on it.
- The solution satisfies the needs of both students and professionals by giving students an opportunity to learn while connecting the professionals to some of the best young talent interested in their field.
- The main difficulty of this project was communication. There are so many different parties involved, so it can be difficult to get everybody on the same page.
- Planning and deadlines are important to keep the project on track.
- If the team were to repeat the project, it would be important to make sure to focus the academic recruiting more. A more centralized focus on existing business engineering or any schools with clubs similar to sales engineering would be necessary. Early on in the recruiting process, the team reached out to department chairs at different schools, which
led to many different failures. It is important to find students who have some sort of technical, but business mind.

- One other main change would be in the format of the scoring. The judging and scoring system worked, but could be improved. If the project were to be completed again more work would need to be focused on the scoring of the competition to find better consistency.
- Socially, the project brought together people ranging from their freshman year of college to industry leaders ready to retire. This wide range of people from many different parts of the country were able to come together based off one similarity, being sales engineering, and enjoy a weekend together creating networks they may keep the rest of their professional lives.

**Sustainability**

The purpose of this report and associated project documents is to ensure the continual success of NSSE and NSEC. The team has developed a framework for future growth by building the organizational design and processes for the society and competition. These documents can be used by anyone involved in the future to help build upon NSEC 2016’s successes.

An important move towards the sustainability of the competition was the appointment of NSSE chairs at each university involved in the competition. These student chairs will be the champions for NSSE and NSEC at their respective universities and help continue building a national presence. A strong Cal Poly NSSE board has already been established to begin building next year’s competition and potentially launch the society. For the future, a professional board of sales engineers will also be appointed to help connect student leadership to the professional level and provide oversight of general society activities.

Another important part of sustainability of the competition will be covering potential growth financially. As seen in the table below, we can obtain a view of the growth rate of NSEC year over year comparing amount of students, cost per student, and club donation. This information can be used to build a strategy for financially supporting on going growth for the competition.

<table>
<thead>
<tr>
<th></th>
<th>Amount of Students</th>
<th>Cost per Student</th>
<th>Club Donation</th>
<th>Sponsor Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>27</td>
<td>$207.70</td>
<td>$5607.90</td>
<td>-</td>
</tr>
<tr>
<td>2016</td>
<td>45</td>
<td>$241.50</td>
<td>$10,867.68</td>
<td>$100</td>
</tr>
<tr>
<td>% Change</td>
<td>+ 60%</td>
<td>+ 16%</td>
<td>+ 52%</td>
<td>-</td>
</tr>
</tbody>
</table>
An endowment plan must be created in order to move reliance away from Cal Poly Sales Engineering Club funds and share burden of the cost of the competition among competing universities and sponsor companies. The three options below were considered for implementation as the competition grows in participants. While each option has its merits, option C was selected by the NSSE chairs as the most viable for implementation. This mixed model will support both ongoing participant growth by implementing a per student fee for participating schools and clubs (and potentially students) as well as support from a direct NSSE fund. A sponsor fee will also supplement these per person fee and began building a sponsor base. With this endowment plan NSSE can continue to be built up for future sales engineers.

**Endowment Plan**

<table>
<thead>
<tr>
<th>Option</th>
<th>Club Fee</th>
<th>Sponsor Fee</th>
<th>NSSE (Currently Cal Poly SEC) Fund</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option A</td>
<td>$50 per student</td>
<td>$150 per student</td>
<td>$50 per student</td>
<td>$250 per student</td>
</tr>
<tr>
<td>Per Student</td>
<td>Fees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option B</td>
<td>$250 per club</td>
<td>Title Sponsor - $4000 Gold - $2000 Silver - $1000 Bronze - $500</td>
<td>$2000</td>
<td>Potential to go over budget due if population grows Greater sponsor recruiting required</td>
</tr>
<tr>
<td>Lump Sum</td>
<td>Donation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option C</td>
<td>$50 per student</td>
<td>Title Sponsor - $4000 Gold - $2000 Silver - $1000 Bronze - $500</td>
<td>$100 per student</td>
<td>Variable for student growth Allows for sponsorship from industry</td>
</tr>
<tr>
<td>Mixed Fees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The team is very proud of the National Sales Engineering competition that has been created. The process had many ups and downs, but a lot was learned throughout the process. A great competition and long line of networks have been created in a format that will be around for a long time. The industrial engineering knowledge provided the team the ability to not only design, but manage a product with high quality. The team is excited about the future and witnessing how the project continues to grow, along with opportunities to help as the team transitions from the academic to the professional side.
7.0 Works Cited

*Building an Inbound Marketing Team.* By Mike Volpe. Inbound 2014 Conference. 12 May 2016.


8.0 Appendix

*National Society of Sales Engineers Logo*

*National Sales Engineering Competition Logo*

*Website: nationalsocietyofsalesengineers.org*
## Multi-Criteria Analysis Tool

<table>
<thead>
<tr>
<th>MCDA</th>
<th>Criteria</th>
<th>Accessibility (Location)</th>
<th>Cost</th>
<th>Networking Outreach</th>
<th>Skill Training</th>
<th>Growth Potential</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weights</td>
<td></td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Bridge the gap between the academic and the professional</td>
<td>National Society</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Online Social Network</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Supply knowledge about sales engineering to students</td>
<td>National Conference</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>National Competition</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>17</td>
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<tr>
<td></td>
<td>Online Training Course</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>14</td>
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<tr>
<td></td>
<td>Sales Engineering</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Minor</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>10</td>
<td></td>
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<td>-----------------------</td>
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<td></td>
</tr>
<tr>
<td>Sales Engineering Certificate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Case Study

Actors Copy
NSSE Case Competition Main Setup – Cal Poly SLO

Potential Actors:
Plant Supervisor – Bill Smith
Director of Facilities – Matt Elliot
VP of Facilities and Operations – Tim Williams

FACTUAL INFORMATION:

Customer Background:

Full name: California Polytechnic State University
Referred to as: Cal Poly
Location: San Luis Obispo - about 230 miles south of San Francisco, 200 miles north of Los Angeles, 10 miles from the Pacific Ocean
Affiliation: Part of the 23-campus California State University system
Emphasis: Comprehensive undergraduate education, combining technical and professional curricula with the arts and humanities
Guiding philosophy: Learn by Doing
President: Jeffrey D. Armstrong

Stats
Student body: Roughly 20,186 (Fall 2014)
Faculty (including part-time): 1,303 (Fall 2014)
Staff (approx., including part-time, hourly and management, Fall 2014): State, 1,508;
Student-to-Faculty Ratio (Fall 2009) 19:1

Academics
Programs offered: 64 bachelor's, 32 master's, one doctorate of education in association with UC Santa Barbara, 68 minors, 14 credentials
Total bachelor's degrees (1942-2014): 117,301
Total master's degrees (1951-2014): 11,115
Terms: Four 11-week quarters per year
Accredited/recognized programs: 30

SUSTAINABILITY IN
FACILITIES & OPERATIONS
Sustainability is not only a subject of teaching and research but also a principle that, in balance with other core values, guides campus planning, operations and maintenance. Cal Poly continues to demonstrate a strong commitment to advancing sustainable practices and to track and report progress.

Understanding sustainability in campus operations requires an appreciation of the scope and complexity of this university. In achieving its primary mission of educating nearly 20,000 students each year, Cal Poly operates and maintains more than six million square feet of buildings, stewards thousands of acres of land, houses more than 7,000 students on campus, employs more than 2,000 faculty and staff, and provides administrative, safety, health, recreational, commercial, food service and many other support functions. Assessing sustainability in this context demands a whole systems perspective and the recognition that many interrelated variables affect the use of campus resources. The best approach to gauge changes in such a complex system is to focus on certain key indicators – variables that are clearly linked to sustainable practices and outcomes and that can be measured by a consistent methodology over time. Cal Poly recognizes that practicing sustainability is an ongoing endeavor. Many undertakings – such as building more on-campus housing, upgrading older facilities with high-efficiency water and energy features, or installing new energy-conserving infrastructure – all take years to plan, fund and implement. Furthermore, external factors such as weather and the economy can significantly affect resource use apart from any program specifically undertaken by the university. And, of course, budget constraints pose challenges to the pace and scope of certain sustainability efforts. Thus, analyzing trends in indicators is more meaningful than their status at any particular point in time. Cal Poly adopted several sustainability indicators and monitors the related data and trends.

Cal Poly has focused on 6 key initiatives to track progress:
- Energy Use (we will focus here for this simulation)
- Transportation
- Water Resources
- Land Use and Development
- Greenhouse Gases
- Solid Waste and Recycling

In 2014 Cal Poly again participated in a statewide Demand Response Program to curtail electrical use during times of peak load. In addition to 1 megawatt of peak load that has been shifted to off-peak use by completion of the Thermal Energy Storage (a storage system that allows for cold chilled water to be stored and utilized as needed by the facility) system at the Central Plant, Cal Poly was able to reduce load by as much as 900 kW when called upon by the utility, achieving an average of 200 percent of its commitment.

Even though Cal Poly has lead its peers in energy efficiency for years, a large opportunity for improvement still exists.

FICTIONAL SITUATION: based on a different higher education facility

Situation:
Cal Poly has recently (5 years prior) completed an upgrade of their HVAC infrastructure on their core campus buildings. That upgrade added a central cooling plant as well as Direct Digital Controls on all the attached buildings. The $15M project was performed by a competitor. Your company (Advantage HVAC and Energy [AHE]) has built a relationship with the facilities personnel since the installation and you now service all the equipment (which was manufactured by your company) in the central plant, but your competitor still services the controls (which was manufactured by them).

During a recent visit to the central plant, AHE, discovered that Cal Poly was adding buildings to the central plant and would be short of cooling capacity and need a new 900T Centrifugal Chiller added to meet the load.

**Notes:** (previous conversations between the account team and Cal Poly)
- Account team had recognized that competitor’s control sequence wasn’t properly optimized and could have significant savings it upgraded
- Account team previously spoke to Cal Poly about energy related projects that could be self funding
- Cal Poly was not interested when AHE spoke about these options previously
- Cal Poly had only shown interest in doing project work with your competitor and only viewed you as an equipment supplier and servicer

Competitor = Central Coast ESCO

**Opportunity:** (Actors only information)
1st Approach – Supply a chiller
After hearing about the shortage of chilled water for the new building the account team tries to sell a new chiller.

2nd approach – Supply and install a chiller
After hearing about the shortage of chilled water the account team tries to not only supply the chiller by also install it.

3rd approach - Overall Comprehensive Solution via Performance Contract
After hearing about the chiller and knowing about the controls issues the account team decides to position and sell a comprehensive upgrade of the controls and adding a chiller to match the new optimization strategy.

**Meeting number 1: Bill Smith only (Actors only information)**

Bill is the plant supervisor and focused on adding the chiller only. He doesn’t care if AHE replaces the chiller or not, he just needs a new chiller. Bill isn’t responsible for energy savings but has heard recent discussions about Cal Poly’s goal to reduce energy usage, but this is above his pay grade. Account team would have to uncover Bill’s belief that the control system is difficult to use AND that it’s inefficient to make an effective pitch of approach 3.

Bill needs to challenge the account teams to make a compelling case to sponsor a meeting for the comprehensive solution otherwise Bill will only sponsor approach 1 or 2.
Listing of items that may be of interest to Bill

- **Reliability**
  - Up time important for Bill’s job
- **Chiller Efficiency**
  - Would like to buy a premium efficiency chiller vs standard but doesn’t know it’s an option
- **Current Controls System**
  - Difficult to use
- **Comfort**
  - Paramount.

**Learning Moment**

1. There are multiple solutions. Personnel who are not involved in initial meetings can have a strong influence on the outcome of a project. Example – initial customer has own buying motivations but others within the organization may have a difference perspective.

2. Teams should be prepared to discover what areas interest the customer. If they come in with one approach and it does not align with what the customer believes is a priority they will fail. Be prepared for multiple scenarios and actively listen to the customer.

**Debrief** – Provide synopsis of learning moments. If the account team fails to effectively uncover and gain buy-in for approach 3 then provide information about approach 3 to set the stage for the following meeting.

**Meeting Number 2: Bill Smith and Matt Elliot (Actors only information)**

Bill has sponsored the account team to meet with his boss Matt to discuss the Comprehensive Project. Matt is skeptical about AHE’s understanding of Cal Poly’s needs but Bill has convinced him that AHE is “on to something”.

**Goal for the account team –**

1. Discover Matt’s motivation and gain support for presentation with Matt and Tim
2. Get Matt to share Tim’s motivations
3. Receive enough information to build an effective presentation to Tim and Matt

Matt is responsible for the utility bill and reliability of the central plant
Matt’s boss – Tim isn’t at the meeting but Matt knows what Tim cares about.

Listing of items that may be of interest to Matt

- **Reliability**
  - Up time important
- **System Efficiency**
  - He is thinking about the entire utility bill not just the chiller or controls
- **Budget concerns**
  - Reduction in utility bills allows him to meet other budget demands
● Comfort
  ▪ Paramount.

Listing of items that may be of interest to Tim
● Strategic Initiatives
  o Energy Use index reductions
    ▪ 300 KW/Year
  o Greenhouse Gas reductions
    ▪ 700 Metric Tons/Year
● Long term facility needs

Learning Moment
1. Many people in the organization will have different buying needs/desires. To effectively present a final solution, they must understand all desires of those involved in the buying decision.

Debrief – Provide learning moment synopsis. If the account team fails to effectively uncover Tim’s financial or strategic initiative goals please provide them.

Provide technical project handout to teams to use for their presentation.

Meeting Number 3: Matt Elliot and Tim Williams(Actors only information)

Matt has sponsored the final presentation on the comprehensive solution.

Goal for the account team –
1. Create a compelling presentation for executive audience
2. Demonstrate AHE’s capabilities
3. Gain buy-in with Tim for the comprehensive solution
4. Demonstrate strong understanding of the project
5. Demonstrate strong presentation skills
6. Effectively handle questions as they arise

Learning Moment
1. Presenting to an executive audience is more about the business impact than the project’s technical merit
2. How you present is just as important as what you present

Debrief – Provide learning moment synopsis. Provide the team with coaching around presentation skills, presentation construction, and content.

Notes:
Actors will come out of role after the simulation is delivered (usually 10-20 minutes) and offer feedback. They can also come out of role to keep a team from going down the wrong path or making an egregious error.
Executive Summary

AHE proposes to install multiple Energy Efficiency Measures (EEMs) at CAL POLY. The following EEMs would reduce the campuses operating cost by installing a new high efficiency chiller at the campus, optimizing the central plants controls, and implementing several other energy saving measures listed below. All of the EEMs would combine to create a large amount of operational savings. The following tables show the measures proposed and their respective energy savings, incentive, and financial impacts.

Table of Savings:

The following tables summarize the existing baseline and measure cost, energy savings and incentive per measure including solution codes. This section describes the complete project including the campuses, the savings for each individual campus can be seen immediately after.

Totalized Savings

The following table summarizes the total energy savings for the complete project

<table>
<thead>
<tr>
<th>Solution Code</th>
<th>Solution Description</th>
<th>kWh Savings (kWh/yr)</th>
<th>kW Savings (kW/yr)</th>
<th>Energy Cost Savings ($/yr)</th>
<th>Measure Cost ($)</th>
<th>Total Incentive ($)</th>
<th>Simple Payback (yr)</th>
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<tbody>
<tr>
<td>AC-98022</td>
<td>New 900 Ton Chiller</td>
<td>148,042</td>
<td>-8.74</td>
<td>17,765</td>
<td>612,589</td>
<td>35,530</td>
<td>32.5</td>
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<tr>
<td>AC-32109</td>
<td>Chiller Staging</td>
<td>88,747</td>
<td>71.11</td>
<td>10,650</td>
<td>291,306</td>
<td>21,299</td>
<td>25.4</td>
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<tr>
<td>AC-74984</td>
<td>CWP VFD</td>
<td>119,512</td>
<td>33.19</td>
<td>14,341</td>
<td>67,500</td>
<td>28,683</td>
<td>2.7</td>
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<tr>
<td>AC-39548</td>
<td>CT Optimization</td>
<td>14,701</td>
<td>113.82</td>
<td>1,764</td>
<td>37,877</td>
<td>3,528</td>
<td>19.5</td>
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<tr>
<td>AC-25431</td>
<td>CW Reset</td>
<td>0</td>
<td>0.00</td>
<td>-</td>
<td>24,987</td>
<td>-</td>
<td>-</td>
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<td>AC-15987</td>
<td>CHWS Reset</td>
<td>11,798</td>
<td>0.00</td>
<td>1,416</td>
<td>45,287</td>
<td>2,831</td>
<td>30.0</td>
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<td>AC-59267</td>
<td>CHW DP Reset</td>
<td>29,382</td>
<td>12.12</td>
<td>3,526</td>
<td>17,413</td>
<td>7,052</td>
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<td>AC-96957</td>
<td>Critical Zone Reset</td>
<td>693,597</td>
<td>-20.26</td>
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<td>515,296</td>
<td>166,463</td>
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<tr>
<td>AC-64388</td>
<td>Optimum Start/Stop</td>
<td>20,408</td>
<td>204.64</td>
<td>2,449</td>
<td>67,854</td>
<td>4,898</td>
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<tr>
<td>Total</td>
<td></td>
<td>1,126,188</td>
<td>405.88</td>
<td>135,143</td>
<td>1,680,109</td>
<td>270,285</td>
<td>17.9</td>
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