The Perceived Occupational Benefits of Competing in Technical Collegiate Competitions

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The Perceived Occupational Benefits of Competing in Technical Collegiate Competitions

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education in Adult and Lifelong Learning

by

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ABSTRACT

Today’s workforce is more complex and demanding than ever before. In order to compete in today’s job market, students need to be equipped with complex problem solving skills and hands-on experience before graduation. While the formal classroom provides knowledge in basic skills and in some cases hands-on learning, this may not be enough to be competitive in industry. Students need to be engaged in practical situations in order to improve communication, acquire leadership abilities, and learn to work with others to solve problems and apply critical thinking skills. These skillsets are required by industry to be a productive employee in today’s market.

While it is possible for students to successfully enter the job market without participation in academic collegiate student clubs and organizations, research suggests that those that do engage in extracurricular student clubs and organizations have an advantage when it comes to entry level employment. In order to develop communication, leadership, critical thinking and problem solving skillsets, students must be engaged in activities outside the classroom.

Academic collegiate student organizations provide opportunities for students to explore activities outside the traditional classroom. Students participate in situations where they work with others to complete a common goal or task that may help them to develop skills desired by industry. By participation in academic student competitions, students are given opportunities to learn and apply leadership skills, problem solving, communication and critical thinking by applying classroom knowledge to situations and problems that they are likely to encounter in the workforce. The purpose of this study was to explore the perceived occupational benefits of participating in technical collegiate competitions, with an emphasis on the Collegiate Design Series, Baja SAE.
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CHAPTER 1: INTRODUCTION

Today’s workforce is more complex and demanding than ever before. In order to compete in today’s job market, students need to be equipped with complex problem solving skills and hands-on experience before graduation. While the formal classroom provides knowledge in basic skills and in some cases hands-on learning, this may not be enough to be competitive in industry. Emerson and Mills (2003) suggest that classroom assignments may not be enough preparation for students stating, “New engineering graduates are expected to possess an ever-expanding array of skills. Yet, classroom synthesis is not conducive to many of these proficiencies. Student professional societies can help cultivate valuable interpersonal, professional and technical skills through a variety of extracurricular activities” (p. 1).

Students need to be engaged in practical situations in order to improve communication, acquire leadership abilities, and learn to work with others to solve problems and apply critical thinking skills. These skillsets are required by industry to be a productive employee in today’s market. Carnevale and Smith (2013) recognize the need for these skillsets stating,

Fundamental changes in skill requirements in the US economic system have been due to the shift from the industrial era to the post-industrial era of the knowledge economy. The new knowledge economy that has emerged has replaced the rote skills of the assembly lines of yesteryear with flexible technologies and ‘high-performance work systems’ that rely on more skilled and autonomous workers. In an era of flexible production and service delivery systems and more rapid economic change, workers not only need better technical preparation, they also need sufficiently robust skills to adapt to changing requirements on the job. (p. 493)

While it is possible for students to successfully enter the job market without participation in academic collegiate student clubs and organizations, research suggests that those who do engage in extracurricular student clubs and organizations have an advantage when it comes to entry level employment. Eisner (2010) addressed the idea of universities developing a
dual transcript. In an article for *American Journal of Business Education*, she suggested that one part of the graduates’ transcript provide traditional course grades while the other part assess possession of relevant workplace skills like communication and leadership, which might be obtained through participation in extracurricular activities, jobs, or internships in which the graduates displayed critical thinking. In order to develop communication, leadership, critical thinking and problem solving skillsets, students must be engaged in activities outside the classroom. Academic collegiate student organizations provide opportunities for students to explore activities outside the traditional classroom. Students participate in situations where they work with others to meet a common goal or complete a task that may help them to develop skills desired by industry. Through participation in academic student competitions, students are given opportunities to learn and apply leadership, problem solving, communication and critical thinking skills by applying classroom knowledge to situations and problems that they are likely to encounter in the workplace. These competitions require students to synthesize knowledge, skills, and experiences learned in multiple academic and technical subject areas to address unique requirements associated with each respective competition scenario.

**Academic Collegiate Student Organizations**

Academic collegiate organizations continue to be a prominent component of colleges and universities. Finley (2018) defined academic clubs and student organizations as organizations that are based on an area of study. Finley states,

> These clubs can be a great benefit to a degree-seeker, because they allow you to connect with other students in the same major and often even to network with professionals from industries in which you plan to seek employment after graduation. Many national organizations maintain branches on college campuses and can grant access to otherwise out-of-reach internship and volunteer opportunities. (p. 2)
According to an article written for *topuniversities.com*, there are seven types of college student organizations in the United States. These include academic and educational organizations, community service organizations, media and publication organizations, political or multicultural organizations, recreation and sports organizations, student government organizations, and religious organizations. While there is a multitude of student organizations for students to choose from, research shows that participation in student organizations within the student’s academic area will provide them with additional skills needed to enter the workforce.

In a study conducted by Munoz, Miller and Poole (2016), experiential learning was noted as a method for attracting and retaining members in student organizations. The participants reported that they valued activities that involved professional development and contact with professionals in their academic discipline. Active participation in student clubs and organizations creates opportunities for students to get involved with campus activities, build personal and professional relationships, and become involved with the community. Many of these organizations will be a student chapter of a professional organization, providing students with the opportunity to not only get involved in specific departmental collegiate organizations, but more importantly participate in student organizations affiliated with professional organizations that provide collegiate competition opportunities along with other benefits for its student members.

The Society of Automotive Engineers (SAE) is a professional organization that encompasses student chapters at engineering and applied science colleges and universities. In order for students to compete in any SAE Collegiate Design Series (CDS) event, they must be affiliated with a student chapter of SAE and pay membership dues. This is not uncommon with professional organizations and offers a great benefit to students in terms of opportunities to gain experience in their chosen industry. Membership allows students to participate in professional
activities and competitions, receive publications, attend conferences, and network with future employers. Mata, Latham, and Ransome (2010) reiterate the importance of professional organizations stating,

Most students have little knowledge of professional organizations and their importance to career development. It is extremely important for faculty to encourage and promote professional membership. Faculty have a unique opportunity to educate students about professional organizations and facilitate membership by providing applications, organize conference travel, and generally serving as role models for involvement in professional associations. (p. 2)

Participating in professional clubs and organizations may have benefits similar to social organizations, such as social outings and networking with other students, but they also expose students to additional activities that will help them navigate through their degree in terms of professional opportunities. Examples include industry field trips, conference attendance, guest speakers, job shadowing opportunities and internships. In addition, many professional organizations sponsor collegiate competitions that provide students additional opportunities to explore the profession and use what they have learned during coursework to design/develop and build products or prototypes to compete against their peers. These competitions are typically judged by industry representatives, thus students gain valuable feedback from professionals in their field. This industry component gives students a comprehensive evaluation, by active members of industry, similar to what they will encounter in the workforce. Active participation in academic student organizations not only assists students in their education, but may also prepare them for behavioral based interviews that they may encounter upon graduation. It also provides students networking experiences with workplace professionals, who can serve as valuable resources in their collegiate work, as well as advocates for future internships and employment.
Nancherla (2008) said that “the most accurate predictor of future performance is past performance in similar situations” (p. 20). Behavioral-based interviews typically require the candidate to: describe a situation that they encountered or a task that they were to complete; the action that they took; and the results of the situation or task. Academic collegiate organizations allow students to gain behavioral based experiences that simulate industry practice. Students who participate in student organizations, especially those related to their field of study, gain valuable behavior based experiences that are not easily taught in traditional college courses. Emerson (2008) states,

Membership in student professional clubs is an integral part of many engineering students’ university experience. Through these clubs, students are presented with multiple opportunities to work in teams, improve communication skills, acquire leadership abilities and build strong camaraderie with their classmates. The fact that student chapters continue to thrive on college campuses, regardless of the cultural changes each decade brings, provides a strong indicator of the value and importance of these clubs. (p. 2)

**Competitive Professional Student Organizations**

Many professional organizations that represent academic programs such as mechanical engineering, automotive, technology/industrial education, business education, and the arts and sciences sponsor competitions that simulate situations that students will be exposed to upon graduation. These realistic competitions are what set professional student organizations apart from other academic student organizations that do not contain a competitive element. Competing in student competitions is another avenue for students to gain real-world experiences that will benefit them on their resume, when interviewing, and when entering the workforce. There are a number of professional organizations related to career and technical education that sponsor student collegiate competitions such as: SkillsUSA, Technology Education Collegiate Clubs of America (TECCA), Society of Automotive Engineers (SAE), and American Society of Civil
Engineers (ASCE) to name a few. What sets these organizations apart from other student organizations is their industry involvement. Companies or institutions recruiting in these disciplines are looking for the best candidates to fill positions and benefit their organizations. Participating students have the opportunity to demonstrate to industry what they have learned in their academic areas in a way that tests their knowledge and abilities. In competitions, students interact with industry representatives and receive constructive input from professionals in their field, while competing against students who are pursuing similar degrees. Additionally, these competitions require students to demonstrate to industry professionals what they have learned throughout their education by completing a task, building a prototype, or solving real-world problems similar to those found in their respective career field. Professional competitions are derived from actual scenarios and tied to the students’ academic field of study.

The type of competition and the timeframe in which the students have to prepare varies. Depending on the scope of the competition, students may compete individually or in teams. The intent is for students to apply knowledge and skills developed throughout their education, and pit their abilities against those of other students studying in similar programs. For example, students that compete in the SkillsUSA competitions usually compete individually, completing a skill or task related to their industry. Students that compete at SkillsUSA in the automotive service area work through industry-developed stations diagnosing and repairing automobiles. Their performance is monitored and judged by experts in the automotive industry. Carpentry students may be working off of a set of blueprints to build a simulated home, including all of the relevant components of an actual house. Nursing students demonstrate their knowledge completing tasks that they will encounter on the job and are evaluated by practicing professionals. SkillsUSA
competitors have prepared for competition by completing their coursework and laboratory activities at their college or university.

Other competitions may be team-oriented and require teams of students to use design briefs with detailed specifications to develop a product or design and build a prototype to address a consumer need. A few examples include: the concrete canoe competition sponsored by the American Society of Civil Engineers; the student steel bridge competition sponsored by the American Institute of Steel Construction; and a series of mobility-related design competitions (Collegiate Design Series) sponsored by the Society of Automotive Engineers. Regardless of the competition, the intent is for the students to work together to develop a solution to an industry relevant problem that tests their knowledge and skills against their peers, while being evaluated by practicing professionals. Hoff and Davis (2006) mention that,

Student participants get an opportunity to apply principles they are learning in school to solve real engineering problems. Further, students gain insight into the complexities involved when working within a team trying to solve a challenge within tight time and budgetary constraints. These types of challenges serve to motivate the students to dig deeper into their engineering education, in order to solve these very real problems. (p. 2)

**History of the Society of Automotive Engineers**

In the early 1900’s there was an abundance of automotive manufacturers worldwide. The need for a transportation governing body became evident as technology continued to advance and new developments were made. In addition, manufacturers needed an avenue to share ideas, gain technical support, and protect patents. The Society of Automotive Engineers (SAE) was established in 1905 due to the evolving needs of a technical society focused on the transportation industry. Since its inception, SAE international has continued to be the largest governing body for the transportation industry. Their purpose is to determine and set industry standards for the automotive, trucking, aviation, and railroad industries. (https://www.sae.org/about/history)
SAE has been committed to the support and development of Science, Technology, Engineering, and Math (STEM) programs. This commitment includes the development of “A World in Motion” which is a program used as a science supplement for students in kindergarten through eighth grade. This program incorporates STEM learning experiences into science and technology education programs through hands-on activities. Additionally, SAE has developed the Collegiate Design Series (CDS), which is a series of project-based competitions that give engineering and applied science undergraduate students an avenue to apply their education to a practical project or engineering problem. According to SAE International,

SAE International’s Collegiate Design Series (CDS) competitions take students beyond textbook theory by enabling them to design, build, and test the performance of a real vehicle and then compete with other students from around the globe in exciting and intense competitions. All CDS competitions prepare undergraduate and graduate students in a variety of disciplines for future employment in mobility-related industries by challenging them with a hands-on, team engineering experience that also requires budgeting, communication, project management, and resource management skills. Students also gain valuable exposure with recruiters from leading companies in the mobility industry to help land their first engineering job after graduation. (www.sae.org/attend/student-events)

Collegiate Design Series (CDS) competitions include: SAE Aero Design, AutoDrive Challenge, Baja SAE, SAE Clean Snowmobile Challenge, Formula Hybrid, Formula SAE, Formula SAE Electric, and SAE Supermileage. These CDS competitions are described briefly in the following paragraphs.

SAE Aero Design is a design competition in which students are challenged to design and develop a remote-controlled model aircraft. Students emulate the steps used by an aviation development company to develop a new aircraft. While on a small scale, the students have one academic year to design and build their working prototype aircraft, using skills learned through their engineering curriculum. It is common that students design their models using computer-
aided design and simulation programs prior to building and testing of a working model. Aero design exposes participants to the nuances of conceptual design, manufacturing, system integration and testing, including sales of the scaled prototype plane to potential manufacturers.

*Auto Drive Challenge* is a design challenge in which students design and build a computerized system that can be adapted to an existing vehicle allowing the vehicle to drive autonomously. The goal is to use automated driving mode to successfully maneuver through an urban driving course per established requirements.

*Clean Snowmobile Challenge* provides students the opportunity to enhance their engineering design and project management skills by re-engineering an existing snowmobile to reduce exhaust and noise emissions. Competition events include exhaust emission output, noise reduction, fuel economy, acceleration, vehicle ride and handling as well as the ability to start the engine in cold climates.

*Formula Hybrid, Formula SAE, and Formula SAE Electric* are similar competitions in which students conceive, design, fabricate, develop and compete with scaled versions of formula style race cars. The difference in each of the formula competitions is the powertrain used to propel the vehicles. *Formula SAE* uses an internal combustion engine; *Formula Hybrid* combines an internal combustion engine with electric motors; and *Formula Electric* uses only high voltage battery technology and electric motors as the powertrain for the vehicle.

*SAE Supermileage’s* engineering design goal is to develop and construct a single-person, fuel efficient vehicle while meeting all rule requirements. The vehicles are tested on a specially-designed course to determine which vehicle obtains the highest fuel economy. The goal of this project is to develop a prototype vehicle that is not only extremely aerodynamic, but also
incorporates a prototype engine and drivetrain capable of propulsion using limited amounts of fuel (https://www.sae.org/attend/student-events).

In each of these events, students are given a practical engineering problem or challenge to solve. It is up to the students to design, build, test and compete with an original prototype creation, based upon the rules provided by SAE. Competitions are usually problem-based, in which teams adhere to a set of rules designed by corporate representatives from the industry most closely associated with the competition. The students must use skills developed within their course curriculum to interpret the rules, brainstorm ideas and solutions, design, build, test and ultimately compete with their finished product. The timeframe for many competitions is one year, in which time students must organize their time, develop leadership roles, and essentially incorporate a small business in which to operate their organization. Student competitions allow the students to work in engineering groups to solve a practical problem or develop a new product simulating what would be expected of them in industry. Competitions allow the opportunity to practice what it takes to work in their profession without the risk of failure, or the loss of their job. Students gain valuable experiences in developing and using workplace and behavioral skills that industry believes are important for new employees. Gaining these experiences and skills gives these students a competitive edge over students not engaging in similar activities.

**Collegiate Design Series Baja SAE Competition**

All of the SAE CDS events are designed to challenge students to work in teams and use their education to solve engineering related problems similar to those they will encounter in industry. While each student competition contains similar challenges that require students to utilize skillsets developed throughout their collegiate degree program, the focus of this research will be on the student benefits of participation in the CDS event Baja SAE. The first Baja event
was held in 1976 at the University of South Carolina. It was patterned off of the famed Baja 1000 off-road desert race. Hoff (2006) describes Baja SAE stating,

The object of the competition is to provide SAE student members with a challenging project that involves the planning and manufacturing tasks found in introducing a new product to the consumer industrial market. Each team’s goal is to design and build a prototype of a rugged, single seat, off-road recreational vehicle intended for sale to the weekend off-road enthusiast. The vehicle must be designed to be safe, easily transported and maintained. It should be fun to drive and be able to negotiate rough terrain in all types of weather without damage. (p. 3)

There are three international Baja SAE events held in the United States each year. Each event limits the number of participants to 100 schools. Schools may register one competition entry per event. Due to the magnitude of each event, the locations change each year allowing different event organizers to host. Event hosts are participating universities or professional sections of SAE. The goal is to have the events spread out across the United States to allow for as many schools as possible to participate. Event registration is first come first served and is done via the internet in early October. Due to the popularity of the Baja event and its benefits to students, each event fills up quickly and includes a waiting list of teams wanting to participate but unable to register in time.

SAE provides student teams a detailed set of competition rules and point structure for the event, including base engineering and safety requirements. The team’s goal is to produce a design prototype for a fictitious manufacturing firm that wishes to build this sort of product for the consumer market. The vehicle is to be dependable, easily maintainable, and cost effective, while meeting the stringent rules developed by a national rules committee. Rule committee members are educators or engineering professionals that work in the all-terrain vehicle (ATV) industry. There are numerous sponsors from all aspects of the transportation industry who donate both financially and by volunteering their time to help organize and operate the events. However,
each event is primarily sponsored, organized and operated by SAE, Polaris, Honda, and Briggs and Stratton Corporation. Polaris and Honda are industry leaders in the engineering and production of off-road recreational vehicles. Briggs and Stratton Engine Corporation designs and manufactures small engines used on hundreds of products, such as lawn mowers, generators and construction tools and equipment. Polaris, Honda and Briggs and Stratton send a group of engineers to each Baja event to help with technical inspections, design judging, and engine tuning. Human resource professionals from transportation industries use this event as an opportunity to meet and potentially recruit engineering students from around the world.

Students work in teams to design, build, test and compete with their prototype vehicle. Each team uses the SAE Baja Rule Book with design parameters and specifications for an off-road prototype vehicle for a fictitious company. The fictitious firm is an off-road vehicle manufacturing company, similar to Honda or Polaris. They are looking for each team to design a vehicle to meet all specifications that theoretically could be manufactured in small scale production run of 4,000 units per year.

Team organization, funding, and organizational structure differ among competing universities. Team organization, whether part of a required curricular component of an engineering program or an extracurricular activity, determines the source of funding teams use for product development, equipment and travel expenses.

This event requires students to use what they have learned in the classroom and apply those skills to the development of a working prototype vehicle. Skills such as computer-aided design, component and material testing, machine tool processes, manufacturing methods and techniques, resource and project management, an operational understanding of vehicle systems
and teamwork are all components of a successful Baja program and the completion of a prototype vehicle.

Many engineering programs require students to complete a final project demonstrating competency of the concepts, knowledge and skills they have gained while in the program. Some universities use these engineering competitions as the student’s final project. Stover (2007) explains,

The student’s senior year involvement in the project is used as senior project or senior design credit in which they generally take on a more managerial role as lead engineers. In the course of their engineering education, our most involved students learn basic fabrication techniques, team and group project management, solid modeling and analysis techniques, and finish by producing, testing, and competing in a project that accurately reflects what they will come up against in real world engineering. (p. 1)

Engineering programs that use this competition as part of the student’s curriculum are usually internally funded by the university or program department. Many universities run their Baja programs as extracurricular clubs, thus allowing students the opportunity to apply their classroom knowledge to the development of a working prototype. Schools that offer this as an extracurricular activity are usually funded by outside support from industry sponsorship or alumni supporters, similar to a professional racing team.

Team organization for competitive student professional organizations varies depending on the size of the university, the number of active participants, and the competition. Like any organization involving multiple people with unique qualities, personalities and skillsets, team organization usually simulates a small business. Leadership is a fundamental component of any project and competitors must develop and incorporate a leadership team. Leadership positions may have many titles, including project manager, team leader, team captain, or president. It is the leader’s roll to determine goals, timelines, and accountability of the team in order to complete a
task, project or prototype in time for competition. Teams also require competent individuals to assist with leadership. These individuals assist leadership and may be responsible for different aspects of the organization such as prototype design, financial management, report development, resource acquisition and mentorship to team members. Team leadership can often be challenging, since leaders need to learn to negotiate with others, allocate resources, solve conflicts and mentor other members of the team.

Baja SAE events are composed of a four-day engineering design competition where student teams put their prototype vehicles to test against their peers from other universities around the world. Prior to the competition, each student team is required to submit a comprehensive engineering and design report, and a cost report, which are reviewed by the engineering judges. One of the main concepts of this competition is to produce a prototype vehicle that can be mass-produced for the consumer market and sold for a reasonable price. In the detailed cost report, students must document every weld, bend, part, or component used to manufacture the vehicle, just as required in industry.

Briggs and Stratton Engine Corporation sponsors the Baja events and provides each team with a new 10 horsepower engine. This enables each team to have a dependable engine, free of charge. The use of the same engine, without modification, ensures a true engineering design competition.

Each Baja event consists of a series of individual event competitions, which include sales presentations, technical inspections, design judging and vehicle testing on a variety of rigorous off-road courses designed to push the prototype vehicles to their design limitations. Students are required to give a sales presentation to a panel of volunteers posing as investors that are looking to invest in the manufacture of this type of vehicle. The teams must be able to convey why their
prototype meets or exceeds the specifications and thus should be chosen by this fictitious firm for production.

Team vehicles are inspected by practicing engineers from Honda who volunteer their time to ensure all of the specifications have been incorporated into the vehicle and it is safe for production. Teams that do not pass this inspection are allowed to modify their vehicle, based on recommendations by the technical engineers, and have their vehicle inspected again. All vehicles must pass the technical portion of the event with one hundred percent accuracy in order to continue on in the competition.

Design, function and ergonomics are also inspected by teams of professional engineers from Polaris. The competitors must justify to the judges their design and choice of components used in the manufacture of their prototype. The design judges quiz the team members over every aspect of the vehicle. They want to know the logic behind the design. This includes all of the systems of the vehicle including suspension, frame design, powertrain components, ergonomics, and any other design features that make their prototype vehicle superior to competitors.

The final safety check is the brake system. The vehicles must accelerate in a one hundred foot straight line and successfully lock all four wheels within a designated area. If the vehicle does not pass this test, the competitors must make modifications to the vehicle and continue to rerun this brake test until they pass. After the vehicles have completed or passed all of the technical inspections, they are allowed to continue to the operational testing or dynamic portions of the Baja event.

In addition to technical and design judging, the vehicles are put through extreme operational or dynamic testing to ensure that the prototype will hold up to the harsh environment of off-road use. The intent of all these inspections and tests is to simulate the processes that
industry must go through when introducing a new product to market. Thus, students are
emulating the tasks that they will be expected to perform in industry when introducing a new
prototype vehicle for the consumer market.

Endurance testing is the culminating event in which the student teams compete in a four-
hour endurance competition. The event is intended to determine if the prototype vehicles can
withstand severe use over an extended period of time. The endurance race is held on a two-mile
course similar to a motocross track and is intended to test the capabilities of the prototype
vehicles. The team receives points for each lap completed in the four hour time frame. If the
vehicle is damaged during the event, it is towed back to the paddock area and the team is allowed
to repair the vehicle. If time allows, the teams are allowed to return to the track to complete
additional laps. The overall winner of the competition is the team that performs well in all
aspects of the competition and accrues the most points. Awards are presented to the top ten
overall teams in addition to individual event winners.

Problem Statement

Since there are numerous benefits for students to engage in extracurricular activities and
community organizations, it is logical to assume that students who participate in competitive
professional organizations experience similar benefits. Articles such as *Using the SAE Collegiate
Design Series to Provide Hands-on Team Project Experience for Undergraduates* (Hoff, 2006) and
*Student Design Competitions in Undergraduate Education* (Kaiser and Troxell, 2005) describe the
academic and personal benefits of student participation in SAE CDS events. However, the intent of
this study is to quantify the impact or perceived occupational benefits of student participation in the
Society of Automotive Engineers Collegiate Design Series beyond the college experience.
In addition, SAE is interested in the perceived benefits of the Collegiate Design Series in terms of recruiting potential industry support for the associated events. These competitions are a great resource for industry when looking to hire the next generation of engineering and applied science graduates. This study could supply needed data to SAE that they could share with potential corporate event sponsors.

Lastly, active participation in the events by industry partners is an excellent avenue for recruitment. When an industry partner supports a CDS event, they have access to all of the students at the competition. This single recruitment event connects graduates from engineering and applied science programs all over the world to potential employers.

**Statement of the Purpose**

The purpose of this study was to examine the perceived occupational benefits to graduates that participated in the Society of Automotive Engineers (SAE) Collegiate Design Series (CDS), in relation to employment opportunities and career advancement. The specific CDS event used for this study is the Baja SAE competition.

**Research Question**

This study sought to explore the perceived benefits of competing in a collegiate technical competition by graduates who have entered the workforce. Specifically, the study investigates graduate’s perceptions of how participating in a collegiate competition benefited them in terms of initial employment and career advancement. Therefore, the research question that guided this study was:

Did participation in the Baja SAE CDS significantly contribute positively to graduates professional and personal lives? The following sub-questions were designed to answer the primary research question.
- To what degree did participants perceive participation in the CDS Baja SAE competition improve academic, technical, and applied skills?
- To what degree did participants perceive participation in the CDS Baja SAE competition benefit their employment opportunities?
- To what degree did participants perceive participation in the CDS Baja SAE competition benefit their career advancement?

Definitions

SAE – Society of Automotive Engineers International Professional Organization

CDS – Collegiate Design Series

Limitations

This study was limited to participants of the Collegiate Design Series Baja SAE Competition. It was also limited to perceptions by graduates who earned baccalaureate degrees at universities that participate in the Baja SAE competitions and whose graduates were willing to participate in the study. Contact was made with faculty advisors at universities that actively participate in the Baja SAE competitions. The researcher found through conversation that a need existed for this study, in order to increase awareness and support of student participation in technical competitions.

Delimitations

This study had a range of delimitations based primarily on career choices and current employment. This study concentrated on those alumni or graduates currently working in technical or engineering industries. However, it also includes data from alumni or engineering graduates who are currently working outside of the technical or engineering industries, but have been a participant of the Baja SAE CDS events.
Significance of the Study

This study has significance to higher education fields in engineering as well as applied technology programs in automotive and manufacturing. Understanding what students have to gain from competitive extracurricular activities may inspire universities to explore similar programs with competitive opportunities to their organizations. Research suggests that students that engage in competitive activities while in college have increased exposure to workplace readiness, interview preparation and applied skillsets.

Theoretical Framework

Experiential learning was used as the basis for this study. The concept of experiential learning has existed for decades. The idea behind experiential learning is that learning based on experience enables students to connect with real-world situations in a way that is fun, engaging, and, in many cases, employ skills that cannot otherwise be taught in a conventional classroom (Bobbitt, Inks, Kemp, & Mayo, 2000). Students learn how to solve problems, resolve conflicts, acquire time management skills, and socialize to complete a common goal. Kolb and Kolb (2005), state that experiential learning is based on six learning outcomes.

1. Learning is best conceived as a process, not in terms of outcomes. To improve learning in higher education, the primary focus should be on engaging students in a process that best enhances their learning.
2. All learning is relearning. Learning is best facilitated by a process that draws out the student’s beliefs and ideas about a topic so that they can be examined, tested, and integrated with new refined ideas.
3. Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world. Conflict, differences, and disagreement are what drive the learning process.
4. Learning is a holistic process of adaptation to the world. Not just the result of cognition, learning involves the integrated functioning of the total person – thinking, feeling, perceiving, and behaving.
5. Learning results from synergistic transactions between a person and the environment.
6. Learning is the process of creating knowledge. Experiential learning theory proposes a constructivist theory of learning whereby social knowledge is created and re-created in the personal knowledge of the learner. (p. 194)

McLead (2017) explains Kolb’s Experiential Learning Cycle as, “a series of experiences that takes place in order, but may start at any point in the cycle” (p. 411). These experiences include action, reflection, learning, and application. Experiential learning is the basis for lifelong learning. Munoz (2016) supports this by stating, “the underlying cause for intentions to be significantly impacted by these activities is that students expect great rewards from a student organization and thus motivates them to be active members” (p. 49). Experiential learning theory is the focus for this study in terms of participating graduates’ employment opportunities, professional advancement, and personal growth.
CHAPTER 2: REVIEW OF LITERATURE

This study sought to identify the perceived benefits of participating in technical collegiate competitions. Specifically, it examined the impact of participation in the Society of Automotive Engineers Collegiate Design Series Baja SAE event on graduates’ in terms of workplace readiness skill development, employment opportunities and career advancement.

In order to examine how participation in technical competitions affects individuals in terms of their professional and personal goals, a literature review was conducted. The literature for this review came from a variety of databases and related search engines from the libraries of the University of Arkansas and Pittsburg State University. The main databases used were Summons, ERIC, EBSCO, ProQuest, and Google Scholar. Refereed and peer reviewed literature were used extensively as primary resources. Secondary sources such as SAE’s website were used for background information and historical data. Most of the literature reviewed was less than 10 years old, unless it was of historical relevance. Effort was made to utilize journal articles and references from a variety of sources to further study workplace readiness, academic and technical student organizations, professional student organizations, and the Collegiate Design Series--Baja SAE. The literature review includes relevant research regarding the following topics:

- Workplace Readiness
- Professional Collegiate Clubs and Organizations
- Collegiate Student Technical Competitions (Baja SAE)

The research reviewed for this study concentrated on organizations within education, especially collegiate organizations with competitions, and skill sets associated with these technical-based competitions. To better understand the long-term personal and professional
impact of participation in student organizations’ technical competitions, literature related to this phenomenon was reviewed.

In the end, this research is intended to determine if participation in the Society of Automotive Engineering Collegiate Design Series Baja event enhances participants’ chances for employment and professional growth. Impacts or workplace readiness associated with professional organization and competition participation include but are not limited to leadership, professionalism, and personal growth.

**Research Area One: Workplace Readiness**

The literature review examines a wide spectrum of workplace readiness research related to skills that today’s employers seek. Although some workplace readiness skills could be considered academic and developed through regular coursework, many workplace readiness skills are not taught in a traditional academic setting. In a study conducted in 2006, Casner-Lotto and Barrington describe basic knowledge skills as those acquired in classroom coursework and applied skills as those that enable new employees to use the basic knowledge acquired in school to perform in the workplace. Casner-Lotto and Barrington (2006) state:

Basic Knowledge refers to (1) basic skills – *English Language (spoken), Reading Comprehension, Writing in English, and Mathematics,* and 2) other academic subjects: *Science, Government, Economics, Humanities/Arts, Foreign Languages, and History/Geography.* These are the basic skill and knowledge areas normally acquired in school. Applied skills refer to those skills that enable new entrants to use the basic knowledge they have acquired in school to perform in the workplace.

Applied skills include those based on cognitive abilities such as *Critical Thinking/Problem Solving,* as well as more social and behavioral skills such as *Professionalism/Work Ethic.* Some of the other applied skills, such as *Oral Communications* and *Teamwork/Collaboration,* combine abilities and social skills. (p.15)

Tymon (2013) suggests that there are many definitions of workplace or applied skills, and different terminology used to describe these skills. A common thread for most of these
definitions includes communication, as well as interpersonal and teamwork skills. Casner-Lotto (2006) explicitly defines applied skills as:

1. **Critical Thinking/Problem Solving** – Exercise sound reasoning and analytical thinking; use knowledge, facts, and data to solve workplace problems; apply math and science concepts to problem solving.
2. **Oral Communications** – Articulate thoughts, ideas clearly and effectively; have public speaking skills.
3. **Written Communications** – Write memos, letters and complex technical reports clearly and effectively.
4. **Teamwork/Collaboration** – Build collaborative relationships with colleagues and customers; be able to work with diverse teams, negotiate and manage conflicts.
5. **Diversity** – Learn from and work collaboratively with individuals representing diverse cultures, races, ages, gender, religions, lifestyles, and viewpoints.
6. **Information Technology Application** – Select and use appropriate technology to accomplish a given task, apply computing skills to problem-solving.
7. **Leadership** – Leverage the strengths of others to achieve common goals; use interpersonal skills to coach and develop others.
8. **Creativity/Innovation** – Demonstrate originality and inventiveness in work; communicate new ideas to others; integrate knowledge across different disciplines.
9. **Lifelong Learning/Self Direction** – Be able to continuously acquire new knowledge and skills; monitor one’s own learning needs; be able to learn from one’s mistakes.
10. **Professionalism/Work Ethic** – Demonstrate personal accountability, effective work habits, e.g., punctuality, working productively with others, and time and workload management.
11. **Ethics/Social Responsibility** – Demonstrate integrity and ethical behavior; act responsibly with interests of the larger community in mind. (p. 16)

Today’s graduates face high employer expectations when it comes to interviewing for limited jobs in a competitive market. Colleges and universities work hard to prepare graduates for employment. While academic concepts such as reading, writing, math and science are taught, the practical application of those concepts may not be incorporated into the classroom and these applied skills are what employers are seeking. For example, Ruder, Stanford, and Gandhi (2018) agreed that while employers emphasize the importance of workplace or soft skills, “the development of these skills is lacking in the typical college classroom, thus forcing employers to
provide additional training in those areas” (p. 29). While students learn content pertinent to their area of study in the classroom, they must also obtain workplace readiness skills to be competitive and successful in today’s job market. Such skills as problem solving, teamwork, and critical thinking can be derived from classroom activities that use problem based approaches. Participation in academic and professional clubs and organizations is perhaps a way for students to develop the workplace skills employers are seeking.

Eisner (2010) recognized that today’s college graduates are entering into an uncertain job market where skillsets are continually changing. It should also be noted that graduates are in direct competition with experienced workers that are already familiar with and using workplace skills. For these reasons, not only do educators need to incorporate more workplace skills into their classrooms, they also need to update their course content in order to meet the needs of the ever changing job market.

Paschall (2014) addressed the skills necessary for dental assistants to be successful in the 21st century in an article written for Dental Assistant. She mentioned several areas in which dental assistants can improve their skillsets. Paschall suggested that employees need to be flexible. They need to be willing to make changes that will benefit their company, even if those changes are difficult to execute. Employees must have strong communication skills. They need to have an understanding of what needs to be done and have the ability to articulate goals and instructions clearly in order to effectively communicate with others. She mentioned that people skills are a must for all professionals stating, “Every time you speak with patients and answer their questions, you are effectively giving a presentation” (p. 4). Paschall mentions that mediation and conflict resolution skills are a necessity when working with patients and staff. Lastly, Paschall discussed the importance of productivity. Regardless of the profession, being
prepared for the job you are currently doing as well as mentally preparing for what is ahead can and will increase productivity for everyone connected to the job as well as the employee. Paschell (2014) refers to this as, “keeping one step ahead” (p. 4).

With these workplace skills in mind, job seekers must identify what they have to offer to the company and be confident in their skills in order to set themselves apart from others. Carnevale (2013) supported this when studying workplace basics in regard to what employees need and what is being sought after by employers upon graduation. Carnevale stated, “In general, the demand for specific academic and vocational skills has been augmented with a growing need for general skills – including learning, reasoning, communicating, general problem-solving skills, and behavioral skills” (p. 493).

There seems to be a discrepancy in what skills graduates feel they have acquired and what is reported by human resource managers tasked with hiring graduates. Matsouka and Mihail (2016) surveyed 178 graduates and 29 human resource managers to determine if there was indeed a discrepancy between graduates’ perceptions and what human resource managers were actually experiencing in the hiring process. They found a large gap in the graduates’ perceptions of the skills they had when compared to what the human resource managers reported. Matsouka (2016) wrote:

Soft skills such as emotional intelligence, learning orientation, teamwork, and flexibility are among the key skills that companies are looking for in graduates. The greatest differences in the perceived importance of skills between graduates and employers are in relation to emotional intelligence, goal setting and professionalism, although graduates believe that they have acquired the soft skills they will need. There are also substantial differences in perceived competencies, with the largest deviations relating to emotional intelligence, professionalism and leadership skills, which graduates consider they have while employers contend that these skills are lacking. (p. 323)
In a report aimed at studying employability skills, Nisha and Rajasekaran (2018) reviewed several studies that researched employers’ expectations of graduates in terms of workforce skill development and where in the college curriculum these skills were being taught. The study highlighted oral communication, written communication, non-verbal communication, teamwork, attitude, motivation, problem solving, critical thinking, and presentations as expected workplace skills necessary for employment. They believed that employability skills should be incorporated into classroom activities. “Assignments, which include communication with others, in class presentations, working in groups, leadership development, time management, interpersonal relationships, and guiding students through an interview process, would force students out of their comfort zone and groom them in preparation for employment” (p. 34). The study concluded that in many cases, a total rewrite of course curriculum should be completed to incorporate practicing identified employability skills. In some cases, they suggested new courses should be added to the curriculum that focused only on workplace and employability skills.

Tymon (2013) studied different levels of education and the incorporation of workplace skills and noted, “All groups and years mentioned embedded activities such as presentations, group work, and meeting deadlines, designed to develop skills/attributes such as communication, confidence, teamwork, and self-management” (p. 851). This research supports other studies, such as that of Casner-Lotto (2006) in that their findings showed that group activities are important to the development of workplace skills and should be included in the curriculum as much as possible.

In a similar study, Rasul, Rauf, Manso, Yasin and Mahamod (2013) incorporated a mixed method approach to their research by using quantitative and qualitative measures to examine 107 manufacturing employers’ perceptions concerning needed workplace skills of today’s graduates.
They found that employers felt that communication skills were the most important for students entering the job market. Employers stated that not only do employees need to be able to read and write, they also need to be able to explain complex systems in a manner that is easily understood. In addition, the employers stressed listening skills as equally important in communication, as it is required to effectively receive feedback and understand the requirements of their job.

The second most important skillset, according to the study by Rasul, Rauf, Manso, Yasin and Mahamod (2013), was the student’s ability to solve problems. They stated, “An employee with sound problem solving skills could demonstrate good creative/innovative, decision making, problem solving and reasoning skills” (p.246). In a response to the open ended questionnaire, one of the employers stated, “Employees who can evaluate alternative ideas thoroughly and recommend solutions are the ones we want” (p. 246).

In terms of informational skills, the 2013 study revealed that employers looked for employees that demonstrated planning and organizational skills in order to learn independently on their own, manage their time wisely, and prioritize their daily activities. Teamwork was another area in the study found to be important to employers. Employers mentioned that graduates must be able to participate and cooperate with others by providing information and contributing suggestions and ideas to the team as well as sharing their personal knowledge and skills. Technological skills were also noted as being especially important as most everything is operated or affected by technology. Computer skills are a must in today’s industrial climate for technology is continuously changing, and employees must keep up with those changes in order to retain efficiency, especially in manufacturing. The study also included entrepreneurial skills as important for graduates. The authors found that employers stated that they no longer only relied
on management to make decisions, but they expect all employees to be involved with the
decision making process and take initiative in the business.

All of the employers in the study emphasized leadership in today’s industrial
environment as crucial to the success of the business, summarizing that employees must be able
to lead and motivate others, resolve conflicts and take responsibility for their actions and those
on their team. Lastly, the study explored personal characteristics of employees. The employers
surveyed all agreed that regardless of academic achievement, employees must be honest and hard
working. They should be able to conduct themselves in a professional manner at all times, be
open to and able to adapt to change, and have loyalty to their company. Rasul (2013) stated,
“Employers clarified that industry needs flexible workers who are able to face any challenges in
the workplace while working with various races, cultures and languages and be willing to
cooperate with others” (p. 249). The research suggested that the results could be used as a guide
for instructors to incorporate employability skills into their curriculum.

The literature review also identified research that explored where in the academic realm
these skills are developed. Many of these skills mentioned were or could be taught through group
activities and problem based assignments. Others stated that these skills were developed and
applied through participation in student clubs and organizations. Interestingly, each study
seemed to come to a similar conclusion as to needed workplace skills, regardless of the academic
area or the activity in which they were acquired. Casner-Lotto (2006) states, “The results of this
study leave little doubt that improvements are needed in the readiness of new workforce entrants,
if “excellence” is the standard for global competitiveness” (p. 11).

A study conducted by Desai, Berger, and Higgs (2016) surveyed 32 college instructors to
determine what methods of teaching critical thinking skills in their courses were perceived most
effective. The study’s focus was to determine what classroom assignments and activities yielded the most critical thinking skills among their students. The study included a series of example assignment categories including project-based, case studies, brain storming activities, and even basic reading assignments. Almost half of the respondents indicated that project-based assignments develop the highest level of critical thinking among their students. Respondents did not find the other assignment categories as influential in the development of critical thinking skills, with no respondents perceiving reading assignments as developing critical thinking skills.

The Desai, Berger, and Higgs (2016) study highlighted the need for critical thinking assignments to be incorporated into all curriculums. An emphasis was placed on using project-based learning, since these types of assignments yield higher critical thinking skills. The survey also asked the respondents to rate what specific skills students needed in their content area before entering the workforce. These areas included inquiry, problem solving, creative endeavors, analysis, and decision making. Of these areas, over half of the respondents rated the students’ ability to solve problems and develop questions as the most important skill that students could possess upon graduation, with analytics coming in slightly below. The other categories were very low in comparison, leading the researchers to believe that critical thinking skills among graduates in terms of problem solving and analysis were the most important in gaining employment.

The positive effect of problem-based assignments is supported by a study by Gurses, Dogar, and Geyik (2015). The study included a pretest/posttest format, in which 31 undergraduates participating in a problem-based teaching experiment increased their understanding of concepts and improved test scores. They concluded that problem based
assignments increased students’ attitudes toward the subject and those attitudes extended past the classroom and into their daily lives.

A similar study conducted by Rosenberg, Heimler, and Morote (2012) surveyed 532 participants using a triangular approach to determine what skills were required to be successful at all levels in today’s workplace. Of these participants, 343 were graduates employed in industry, 92 were faculty members and 97 were human resource managers. There were eight competencies evaluated by each group and then a three way comparison was made to determine which competencies were considered the most important to each group as it related to gainful employment. The skills included in the survey were literacy and numerical; critical thinking; management; leadership; interpersonal; informational technology; systems thinking; and work ethic. The survey was structured with questions about each category as follows: five covered numerical and literary skills; six explored critical thinking skills; five measured leadership skills; four measured management skills; six explored interpersonal skills; and there were seven questions each on information technology, systems thinking, and measurement of work ethic. The results of the study revealed many categories that the graduates, faculty, and human resource managers did not agree on in terms of importance.

Graduates scored leadership skills and work ethic as the most important skills needed for job performance, rating these skillsets higher than the perceptions of both the faculty and human resource managers. The graduates felt that they gained leadership skills in college at a greater level than the faculty felt was delivered and that human resource managers have witnessed with incoming employees. Graduates reported that they felt prepared in the category of literacy and numerical skills, which was completely opposite faculty and human resource managers who perceived that graduates fell short in this skillset.
All respondents felt that interpersonal skills were important for job performance; however, graduates rated this area higher than both faculty and human resource managers. The results also indicated that human resource managers felt that management skills were lacking in new hires. Their ranking for the management category was considerably lower than that of faculty and graduates. Each respondent essentially scored evenly in the categories of critical thinking, systems thinking, and information technology leading the researchers to believe that these areas are not of concern. Overall, the study concluded that graduates are lacking in work ethic skills, and faculty may need to address this issue in their courses. Human resource managers concurred that work ethic is a problem with entry level employees.

Nilsson (2010) addressed the issue of employability skills in a study of 20 engineering technology students. The results were similar, as he concluded that “Employability contains different dimensions such as the actual competence of the individual, formal qualifications gained through educational activities, hard technical vocational employability skills, and soft skills, including transferable meta-competence, interpersonal skills” (p. 544).

A study conducted by Corbett, Kezim, and Stewert (2010) surveyed 93 graduates that had participated in a sales video, team-based activity. The purpose of the study was to determine graduates’ perceptions of the project as an effective tool for teaching the sales process in a management/marketing course. The researchers were trying to determine if the development of a sales video as a group project improved students’ understanding of the sales process. Groups consisted of four to five randomly selected members. Additionally, the researchers were interested in determining if participating students’ critical thinking and management skills increased as a result of developing a product (sales video) from concept to completion. They used statistical analysis of the means and standard deviation to determine if a correlation existed
between group-based activities and effectively learning the sales process. The survey results showed completion of this team-based activity was beneficial to the graduates that participated. Over half of the graduates reported the development of the sales video increased their learning of each of the stages in the selling process. Nearly all of the participants agreed participation in this project was a positive experience and an effective instructional technique in understanding the process or stages of selling a product. Corbett, Kezim, and Stewart concluded team-based activities promote active student involvement and can be a useful tool to improve student performance. The project helps to reinforce the steps required to develop a product from conception to completion in terms of planning, design, development, completion and critical analysis of the final product. In addition, the researchers noted participation in this type of hands-on activity increased student’s critical thinking skills, and their ability to improve ones’ self. This was considered beneficial to the participants for their product was evaluated by their peers as well as faculty.

In an effort to increase students’ employability skills, some universities are developing courses focusing on soft skills employers found lacking in their graduates. Such courses include lessons for improving written communication and oral presentations; teamwork and problem solving exercises; use of presentation technology; and workplace ethics. Holter and Kopka (2001), professors at Towson University in Maryland, developed such a course in workplace skills. They learned, while piloting the course, that traditional teaching methods were not adequate for achieving course goals. Traditional lecture methods were replaced with a team-teaching approach. Lessons required students to demonstrate their knowledge through presentations, rather than complete tests of knowledge based on memorization. All students were required to participate in group assignments and engage in teamwork and problem solving.
activities. At the conclusion of the pilot course, students self-reported the following: improvement in their presentations skills; increased writing and computer literacy; and a better understanding of teamwork in order to complete problem solving activities. Students agreed these improved skillsets were beneficial in other courses.

**Research Area Two: Professional Collegiate Clubs and Organizations**

This section of the literature review addressed the perception that participation in clubs and organizations builds professional characteristics relevant to employment and advancement within an individual’s career, and their desire to engage in civic activities while in college and later as an employed professional. The literature review concentrated on professional clubs and organizations that were connected to business and industry. Bush, Buhlinger, and McLaughlin (2017) supported this idea in an article written for *American Journal of Pharmaceutical Education*, where they mentioned how important student organizations are in the promotion of student professional development, and how critical it is for institutions to help support and facilitate student organizations on campus.

The literature suggests a common theme in regards to participation in professional student clubs and organizations in terms of engaging students in experiences to develop core workplace competencies needed in today’s workforce. Roulin and Bangerter (2013) addressed the motivating factors associated with student participation in extracurricular activities in college. Due to the competitive job market for graduates entering the workforce, the study found that recruiters are looking for a variety of measures beyond academic achievement to screen potential employees. Their research noted that resumes are used to document knowledge, skills, abilities, and other personal characteristics to recruiters, through listings of education and job-related or non-job-related experiences. They surveyed 197 undergraduate and graduate students
to determine what motivated them to participate in various extracurricular activities, campus student clubs, and organizations. This led researchers to determine what type of job-related or non-job-related extracurricular activities are most important for giving one a competitive edge in the job market.

The Roulin and Bangerter (2013) study looked at two reasons for participation, which they termed intrinsic/internal motivation and extrinsic/external motivation. Those participating for intrinsic/internal purposes did so solely because they were interested in the activity, or for enjoyment. Those participating for extrinsic/external motivational reasons were looking to obtain positive job related experiences and professional attributes to give them an advantage in initiating a job search. They noted that it is possible for students to engage in activities for both types of reasons, simultaneously. Participation can be out of interest or enjoyment (i.e. intrinsic), and have positive effects in terms of future career opportunities, networking and resume building (i.e. extrinsic). Additionally, the research found that students were more apt to be involved with extrinsic/external activities if they were related to a course in which they received credit for participation. The authors wrote,

Students’ associations and volunteering activities often operate in organizational structures and often include roles and responsibilities for their members, and a hierarchy with leadership positions. Such activities resemble actual business activities more than sports or artistic activities. Some students may thus engage in such activities because they expect them to be rewarded on the job market. (p. 874)

Often student clubs and organizations are considered a capstone activity within an area of study or as part of a course. Svacina and Barkley (2006) researched the effect participation in Agriculture Future of America (AFA) collegiate student organizations had on graduates entering the workforce. In particular, the perceived advantages those participants reported in relation to workforce readiness. The authors state, “The AFA believes that there is an ‘AFA Advantage’
where former AFA participants have an advantage over their peers when entering the workforce due to their involvement with AFA. Likewise, employers who hire former AFA participants may have an advantage because these new hires possess the skills needed to enter the workplace, allowing fewer company resources to be focused on employee training” (p. 49).

The Svacina and Barkley study consisted of 116 young professionals working in the agricultural industry. The study focused on core competencies established by the professional Agriculture Future of America organization as bases for research. These competencies included interpersonal communication, critical thinking, writing skills, experience in general business management, analytical skills, cultural and gender awareness, and oral communication. The respondents self-reported that participation in AFA gave them an advantage over non-participants in relation to oral presentations, economic and business concepts, cultural differences, and interpersonal/critical thinking skills. In terms of analytical and writing skills, the participants did not believe that they had an advantage over their non-participating peers. Based on the survey results, the authors concluded that there is an advantage to participating in AFA, because students develop the competencies specifically identified and sought by industry.

Professional student clubs and organizations allow students an opportunity to network with industry personnel in ways that are not possible or not really feasible in a traditional classroom. Barber (2005) addressed the importance of student chapters and the benefits of professional engagement, especially guest speakers. In an article for American Business Women’s Association, she suggested that listening to experts in the field was invaluable because they covered issues that were never addressed in the classroom.

In a study conducted by Tchibozo (2007), 119 graduates were surveyed about their transition from higher education to the workforce. The study analyzed data to determine possible
correlations in relation to length of time each graduate searched for employment, the type of employment gained, and the length of time each graduate held their entry level positions. The study explicitly looked for a correlation between graduates’ participation in social activities, athletics, or student organizations, and the impact those activities had on ability to find employment. According to the author, “students are involved in two types of extra-curricular activities while attending college: employment to support their education, and leisure or social activities” (p. 37).

Over half of the graduates surveyed reported that they were involved in extracurricular activities in college. Of the graduates involved in extracurricular activities, slightly less than half reported extracurricular involvement at a leadership level. While all of the respondents gained employment upon graduation, the study reported that graduates who participated in extracurricular activities entered the workforce at higher levels with increased job security. The study went on to say, “As compared with graduates who were involved in extra-curricular activities, those who did not participate were almost three times more likely to begin their careers as office employees rather than as managers” (p. 46). Three quarters of the respondents reported that they reached management positions within a three year period. However, those that participated in leadership activities reached management positions in a much shorter time frame.

The study reported that the type of extracurricular activity played a part in the type of entry level position, as well as playing a part in the time it took graduates to find permanent jobs in large firms. Graduates that participated in student organizations or social and civic activities reported finding employment in larger companies than those that only participated in sports. In conclusion, there is a statistical relationship between extracurricular activity and entry level employment. The type of organization, the degree of involvement, and the length of time of
participation has a definite influence on the type of job obtained by graduates and the level in which they enter the workforce. The author concluded that “these results emphasize the strategic potential of extracurricular activities for students and graduates wishing to improve their transition to the labor market” (p. 55).

In a similar study, Foubert and Urbanski (2006) surveyed 307 undergraduate students in a longitudinal study. The group was tested at the beginning of their sophomore year and again at the end of their senior year. Using time spent participating in clubs and organizations as the variable, the study sought to explore measurable differences between the groups in regard to “establishing and clarifying purpose, educational involvement, career planning, lifestyle management, cultural participation, academic autonomy, and mature interpersonal relationships” (p. 175). The Multivariate Analyses of Variance (MANOVA) was utilized to measure the results of both the sophomore and senior groups. The researchers found that compared to students who did not participate in organizations, sophomore students were more “psychosocially” developed if they were present at a meeting, joined an organization, or were leaders of an organization; the senior students’ data reflected similar results. Compared to students who only attended a meeting, the students who led or joined an organization experienced more development. Students who participated in organizations reported more developmental growth in academics, cultural involvement, career plans, and their life’s purpose.

Foubert and Urbanski found a significant positive relationship between personal development and involvement in organizations for both samples. However, researchers noted that developmental growth occurring in senior students only pertained to developing clarity and creating purpose in their lives, while the sophomores’ developmental growth consisted of not only their ability to understand and create purpose in their lives, but to also become more
independent. This might suggest that by the time they are seniors, students have already
developed their sense of autonomy. This research is supported in an article written by Mausolf
(2014), in which the author explains her personal beliefs concerning participation in clubs and
organizations while in college stating, “Joining the academic department’s student club can be a
marvelous and enriching experience for many students during higher education. Today,
whenever I reflect upon the skills that promote success in our field, things like organization,
communication, networking, flexibility, politicking, and so many others, my gratitude for that
opportunity continues to grow” (p. 44).

Munoz, Miller and Poole (2016) surveyed 242 undergraduate students and used linear
regression analysis to determine if experiential learning was a determining factor in students’
decision to participate in a professional student organization. They theorized that experiential
learning may be a motivating factor in whether or not students decided to participate. The
research suggested that if students perceived professional value in terms of future employment,
they were more inclined to be active participants in an organization. In conclusion, they found
students perceived great benefits in development of professionalism, leadership, and
management skills, as a result of participating in an organization’s job shadowing activities.

Initially, students noted that contact with professionals on the job or at organizational
events assisted in developing their networking skills, which could lead to future employment
opportunities. Secondly, students reported that participation in professional student organizations
enabled them to interact with faculty, explore career opportunities and participate in professional
activities that would enhance their resume. Students reported that they liked having the ability to
work on projects within a safe environment that would enhance their professional skills without
having to worry about grades or the prospect of losing a job. In terms of experiential learning,
the research found a student’s return on their investment was the main factor in their
determination to become an active member or not. If students did not believe that they would
reap great rewards, they chose not to be involved. Munoz, Miller and Poole (2016) concluded,
“the students must believe that there is a great chance that their efforts will lead to attaining the
outcome that is relevant to them (expectancy), if they perform as expected that a greater reward
may be achieved (instrumentality), and that the actual outcome is attractive to them (valence)”
(p. 49-51).

Hackman and Wageman (2007) commented on leadership skill development within
college students, in an article published in American Psychologist. They proposed that if students
are allowed to work on real world problems or projects based on real world experiences with the
guidance of faculty, they will naturally develop leadership skills. Stating, “only to the extent that
leader development programs take on the considerable challenge of providing such settings are
they likely to be helpful to leaders both in developing their own learning habits and in providing
models for those they lead to pursue their own continuous learning” (p. 47).

Clubs and organizations give students an avenue for exploration within their area of
expertise beyond the university level. This provides them exposure to their chosen academic
field of study. This exposure may lead graduates into civic roles and responsibilities they may
not have considered prior to their participation in a professional collegiate club or organization.
Hall (2012) stated, “student-based organizations offer another approach to promote learning
communities above and beyond particular curricular or classroom approaches. Not only can they
create connections among students with shared disciplinary or professional interests on a single
campus, but also offer the possibility for creating connections to larger communities beyond an
institution” (p. 71).
Longo, Fitzgerald, and Anderson (2017) addressed a similar aspect of organization participation. In an article published in *Peer Review*, they explain that academic programs that involve community interaction within course curriculum aide in leadership development and organizational skills. They stated, “By infusing civic engagement within academic majors on campus, students gain valuable experiences that prepare them to connect the responsibilities of citizenship with their future careers” (p. 31).

Smith and Chenoweth (2015) examined perceptions of leadership qualifications or development among graduating seniors. They surveyed 149 respondents using t-tests to compare students that were involved in student organizations against those students that were not. The areas of study included leadership traits such as: confidence, honesty, optimism, persistence and responsibility. Leadership behaviors or skills included people skills, role modeling, dealing with stress, dealing with failure, evaluating others talents, resolving conflicts, communicating clearly, working effectively in teams, listening skills, developing a vision, executing a vision, innovative ideas for change, and motivating others.

The results revealed that students who participated in academic student organizations perceived themselves as higher in terms of leadership traits, compared to those that did not participate. In addition, students that participated in student organizations self-reported themselves as possessing stronger people skills; being better role models; possessing a greater ability to effectively cope with stress and accept failure; being good at conflict resolution; able to communicate more clearly; possessing above average teamwork skills; and being better at listening. Longo (2017) agreed, stating colleges and universities need to “recognize that the most powerful learning goes beyond texts and involves real-world problem solving and the ability to take risks and be open to change” (p. 34).
In other research conducted by Witt, Witt, and Clark (2012), 119 undergraduate students from four different majors within a family and consumer science program were surveyed to determine their reasons for participating in professional student associations within their university. The questions asked in the study pertained to the following developmental skills needed to make a smooth transition from education to the workforce. These included skills in socialization, service, resume building, leadership, networking and academic qualifications. They found a majority of the students in the major (48%) cited access to networking as the main reason for participation. Socialization and resume building came in second (41%) as a reason for participation. Researchers were alarmed that leadership ranked as the least important reason for participation within the entire group. This indicated that students were less likely to be involved in leadership roles within the student organization. “The students in this study derive many benefits from their participation in student professional organizations; however, they may be missing out on developing and furthering their leadership skills by not taking on more active roles in running organizations” (p. 36). The results did confirm that there was an agreement among all of the majors that it would be important to continue professional membership after graduation. The study revealed participation in professional student organizations allowed students the opportunity to interact with others, challenge their thinking skills, and create an avenue for community service. In addition, students indicated benefits also included professional development in terms of networking skills; being able to apply what they learned to real-life situations; and indicating their membership on their resume.

Bush (2017) supported this research by stating, “At the institution level, student organizations can also provide a number of benefits, including, but not limited to, fostering
alumni engagement, creating strategic relationships with professional organizations, and complementing student skill development provided in the curriculum” (p. 53).

Participation in clubs and organizations on campus helps students develop working relationships with their peers, instructors, and other professionals related to their course of study. In addition, participation helps students become aware of their own personal traits and how they fit into society. Elkins, Forrester & Noel-Elkins (2011) studied student involvement in several campus programs including intramural sports, community programs, conference attendance, student clubs and organizations, Greek activities, and spiritual-based organizations. They surveyed 330 undergraduate students using a quasi-experimental design to identify correlations between student participation in campus programs in relation to their sense of community. The study found students that were actively involved with campus organizations reported having a greater perceived sense of community as opposed to those not involved in campus organizations.

They concluded that students who were involved in campus organizations had a higher awareness of community involvement, as well as higher awareness of the history and traditions of their university. These findings are consistent with research conducted by Wright and Claire (2017) in which they looked into the reasons that students were involved in professional student organizations. They studied the American Association for Family and Consumer Sciences (AAFCS) and why students decided to participate in this organization. Based on responses from questionnaires, students reported their main reason for involvement was to learn more about their field of study. They indicated participation gave them an avenue for networking, community service opportunities, interaction with the faculty, and the possibility of job training. The students also felt that “they can have a positive impact on social problems and that they can make a difference in their community” (p. 55).
The benefits of involvement in professional student organizations was supported by Witt (2012), who implied participation may help students in their transition from school to work while developing lifelong benefits within their chosen careers. Hall (2012) reiterates this stating,

In summary, student-based organizations should be recognized as a viable and important form of learning communities. They bring like-minded students together to spend more time engaged in career-relevant activities. In doing so, they represent a powerful additional source of career-relevant information and personal development for students, while also providing them with valuable hands-on leadership and service experience that augments what they can acquire within classroom settings. Furthermore, there is a proliferation of student organizations at every institution and within almost every discipline. They therefore warrant academic attention to determine how to help students get the most out of these formative experiences. (p. 82)

Evidence of the importance of student organizations is supported by a study conducted by Evans, Sherman, and Evans (2001) that looked at the components necessary in developing a successful student collegiate organization. In their research, they surveyed 114 student leaders of American Society of Civil Engineers (ASCE) student chapters, representing 23 different schools. They stated, “The task of being a leader is one of the toughest and most rewarding aspects of chapter membership as leadership requires one to mature both personally and professionally” (p. 68). They also added that “Today’s engineering firms are not looking for students who can make the grades, but for students who are motivated and willing to accept challenges outside the classroom” (p. 68). In essence, the authors acknowledged the need for students to participate in chapter leadership positions in order to put them ahead in terms of employment opportunities. In an article written for *New Directions for Youth Development*, Wheeler and Edlebeck (2006) stated, “Leadership is about learning, listening, dreaming, and working together to unleash the potential of people’s time, talent, and treasure for the common good” (p. 89).

The review of literature pertaining to the impact clubs and organizations had on students’ revealed common themes implying participation increases student exposure and develops
skillsets needed to make a smooth transition from education to industry. The literature noted that all clubs and organizations can help to develop workplace skills. However, those organizations tied directly to the students’ major and had professional chapter affiliation allowed for more professional exposure. Therefore, student participants gain exposure to professional activities, mentoring opportunities, and association conferences giving them insight into, exposure and experience in their chosen field. Those who belong to professional organizations related to their careers experience higher job prestige, earn more, and have higher life and job satisfaction (Brooks, 2007).

**Research Area Three: Collegiate Student Technical Competitions (Baja SAE)**

This section of the literature review addressed the perception that participation in professional student clubs and organizations that compete on a national or international level enhances workforce skills beyond those developed in other, non-competitive student organizations. Students whose organizations compete may develop additional skillsets as these competitions typically mirror actual real-world situations, including professional evaluation from industry representatives. This involvement allows students the opportunity to explore industry-related activities in the context of a college course or organization, thus providing experience in virtually every workplace scenario without the fear of failure. Many studies have been conducted on the benefits of student organization participation in terms of professional development and workplace skills. However, there is limited research as to what additional benefits students may gain by participating in organizations that compete against other students or institutions. While there are many student organizations that have a competitive element, the literature review was focused only on technology/technical professional clubs and organizations that contain a
competitive element related to engineering, including the Baja SAE collegiate student design
competitions.

In a study conducted by Taylor (2006), 1138 secondary students involved in the
Technology Student Association (TSA) were surveyed. Descriptive and inferential statistics
were used to determine if a correlation existed between student participation in TSA competitive
events when compared to their perceived development in the areas of technology literacy and
workforce development skills. Taylor found the majority of the students self-reporting
participation in TSA competitions did increase their awareness of what technology is and how it
affects society as well as increased their ability to solve technological problems. Her research
found 88.4% felt they developed problem solving skills, while 83.2% stated their teamwork
skills were improved by their participation in TSA competitions. Approximately 75% of all
participants felt they had developed leadership skills, as well as math and science skills, as a
result of competing in technical competitions. Additional skillsets, including understanding rules
and specifications, development of design skills, creativity, and working with their hands, all
ranged in the 90th percentile for all respondents. Lastly, 81.6% believed their communication
skills were enhanced because of their experiences. Taylor concluded participants perceived their
involvement in TSA activities and competitions resulted in increased motivation to work to their
full potential; increased technological literacy; and benefits for them in their future careers.

Alfeld, Hansen, Aragon, and Stone (2006) conducted a similar longitudinal, quasi-
experimental study in which they surveyed 1797 high school students over a one year period.
Surveys were administered at the beginning of the year and again at the end. The participants
included students involved in career and technical organizations; those involved in
technical/technology programs without a student organization component; and general students
not involved in any technical/technology-related course. The research aimed to find a correlation between these groups in relation to academic engagement and motivation, civic awareness, employability skills, and workforce related skills including leadership, competition, professional development, and community service activities. The research found participation in career and technical student organizations did not increase a student’s desire to continue their education or engage in civic endeavors. However, the study did find that those students participating in career and technical student organizations with a competition element showed enhanced academic engagement, employability skills, leadership and civic involvement. They mentioned,

Competitive events serve to test both technical and non-technical job related competencies. Many of these events integrate academic knowledge into industry-developed problem scenarios. Preparation for competitive events provides hands-on experience in different trade, technical and leadership fields; develops job-related technical skills and competencies; offers recognition to participants; and serves to ensure business and industry involvement in career and technical education programs. In fact, contests are often run with the help of industry, trade associations, and labor organizations, and test competencies are set and judged by industry. (p. 123)

Thus, the research demonstrates a positive correlation exists between the participation in career and technical student organizations and the development of workplace skills.

Research conducted by Hoff (2006) investigated the benefits of participation in a student chapter of the Society of Automotive Engineers. Of the 148 alumni respondents, 44% were not members of SAE. Their reasons for lack of involvement ranged from non-interest, busy with school work, involvement in other extracurricular activities, to lack of awareness of the opportunities provided by membership in SAE. Many of the respondents stated they would have participated in the organization if it had been part of a course of study or if participation in the events were tied to course credits. Although elective, there still would have been additional motivation to join. Many mentioned they were unaware of the benefits of membership, and
wished the organization would have encouraged faculty to mention participation in class. Of those alumni responding, 56% stated they were members of the organization, but 72% of those members stated they were not active in the chapter. The research did reveal 28% actively involved felt the experience strengthened their perception of the university and the program, as well as prepared them for their careers. Those participating in the Collegiate Design Series, as part of the SAE chapter experience stated advantages such as a hands-on opportunity to learn or teach others; application of concepts learned in the classroom; networking with upper classman and industry; and job opportunities. The researchers concluded those actively participating in the SAE collegiate chapter and its associated events believed their education was enhanced. There was indication the university also benefited from active involvement, as the experience level of participants was higher than those not participating. This led to increased employment for participants upon graduation. Emerson (2003) reiterated this benefit to the university stating, “Student performance at competitions, whether local, regional, or national can generate employer interest and improve a school’s academic reputation” (p. 5).

A study conducted by Reimer, Ali, and Abro (2011) surveyed 45 student members of competitive teams associated with SAE and the American Society of Civil Engineers (ASCE). The exploratory research looked to see if there was a correlation between student participation in competitive events and the development of entrepreneurial mindsets or skills. They noted that “the learning experience gained from the students’ participation in SAE and ASCE senior project teams go far beyond the traditional engineering discipline” (p. 3). Over 50% of respondents reported increased leadership skills due to their involvement with senior projects. More than 75% indicated they received opportunities for innovation. However, the results were inconclusive in terms of entrepreneurial skills. The researchers hypothesized that this may be due to students not
fully understanding the concept of entrepreneurial mindset. When researchers explained the concept after the fact, students stated that due to the nature of the projects, they all developed entrepreneurial skills, as they had to imagine a solution to design a product, fundraise to complete the project, build the product and market the product for competition. Overall, the teams created individual businesses in order to complete the project from concept to completion, so in fact developing an entrepreneurial mindset. The researchers summarized their study by stating,

The competitive senior project experience has proven that the value added to the students’ professionalism as engineers is clearly obtained through the project experience. Furthermore, as a result of this, the entrepreneurial mindset is being created and fostered the process. The entrepreneurial skills are nurtured and developed during this exercise. Leadership quality is enhanced through the building of teams, budgetary structures and risk management processes. (p. 11)

Schuster, Davol, and Mello (2006) addressed specific benefits and challenges that students face when participating in intercollegiate design competitions in an article written for American Society for Engineering Education. They suggest, “Student design competitions are a fantastic experience for students. Good designers have real experience and confidence that can only come from designing, building, and testing real hardware” (p. 2).

Benefits described by the authors include the ability to follow a schedule, advanced communication, understanding budgetary restraints, manufacturing methods, ordering materials and shipping timeframes, and complete documentation of all aspects of the project including competition specific reports. Additionally, authors mentioned that the increase in fabrication, research and life-long skills obtained by students participating in student design projects make them attractive to future employers. In contrast, the authors explained that working on these project-based design competitions has a tendency to distract the students from their education
and classroom assignments. There is a yearly timeframe in which the students have to design, build, test and compete. Many of the competitions are scheduled during or near final exam week; thus, students are missing school or cramming for exams while preparing for competition. This leads to sleep deprivation and could be a safety issue, especially if the students are traveling to the event. Many students will forgo an A in a class, or let classwork suffer in order to complete the project and make it to competition. The authors, who are clearly experienced in student organizations and competitions, explained that many of the issues related to project-based learning and competitions could be addressed by faculty reorganizing the structure of their teams.

Every university approaches these types of engineering design competitions differently. Some use it as a senior capstone course, in which the students work on the project in class and receive course credit, thus reducing the students’ course load. Others operate as an extracurricular club or organization in which participation is strictly extracurricular and voluntary. The advantage to the latter is that underclassmen are usually involved and this creates continuity from one year to another, especially if students continue their participation over consecutive years. The authors suggested another hybrid model which combines components of both the other models. This hybrid program model is organized as a club so that underclassman can be involved. They use senior projects, based on a course, to do advanced design and experimental component testing for the team to use at competition. The author’s concluded that student design competitions are a unique opportunity to allow students to take what they have learned and apply that knowledge into a real-life application, just as they would in industry. Although the benefits outweigh the challenges, faculty advisors need to be cognitive of time constraints and other issues students-endure when working on competitive projects.
Kaiser (2005) further examined the importance of student design competitions in a case study exploring the use of engineering design competitions as part of the senior capstone curriculum. They described several benefits of student participation in design competitions, exploring the evaluation process, professional development, real world experience, student motivation, and critical and innovative thinking. However, Stover (2007) stated, “These individuals must have time, energy, drive, motivation, backing, and ability both within the facility in which they operate as well as within their own mindset to successfully get through an intensive project as presented” (p. 12).

Students and faculty tend to become close, thus faculty members become a biased judge when it comes to evaluation of student projects. Design competitions provide an outside objective means of evaluation for the event judges do not have a personal stake in the project. They are basing their decisions on what the students present as well as evaluating each team’s performance compared to the other teams in the competition. This simulates real world engineering practices as most engineers will work in teams to complete a project with specific criteria that is to be presented to a customer. Typically, the customer will not be included in the design process and is only concerned with the final product. Kaiser (2005) suggests, “Design competitions can be viewed as an external ‘customer’ requesting a product that performs certain functions. The customer is available for clarifications, etc. But the contractor (i.e., the students, faculty advisor, etc.) is largely isolated from the customer similar to the way most real design projects work” (p. 2).

In terms of motivation, the design competition emulates real world experience for the students have no idea what other teams are producing; thus, there is the increased desire to produce a product that will outperform all others at the event. Lastly, because the students are on
a timeline with limited resources, they are forced to find the best and most cost effective solutions to each problem acquired from the project. This also mirrors real world engineering practices, as all customers are searching for the best product at the lowest cost. The authors conclude that by integrating design competitions into the curriculum as a capstone course, they can effectively guide students in all aspects of the design and development process without the outside pressures students experience during an extracurricular activity of this magnitude.

International exposure is a unique element to participating in professional collegiate design competitions. Due to the increased exposure of many of these competitions, universities from around the world are coming to the United States to compete. In addition, many countries, including Brazil, Korea, Mexico, South Africa, India, and China have developed similar competitions, including Baja SAE. This gives students an opportunity to interact with competitors from different cultures, opening up a new avenue for international educational opportunities for students across the globe. It also allows the opportunity for U.S. students to compete abroad. This fits into university engineering requirements to expose students to a global marketplace. Hallbach and Gordon (2009) mentioned, “Most engineering graduates tend to be uneducated when it comes to foreign culture and customs” (p. 2). Participation in international technical competitions allows students cultural exposure, interaction with foreign teams, and experiences that they may not have gained in a traditional classroom.

Summary

The literature acquired for this review indicated a definite need for workplace skill development. Workplace readiness skills are not being taught in traditional courses to the extent that industry is demanding. It is evident students need to be immersed in an activity that allows for creativity, leadership, problem solving, and hands-on experience in order to develop skills
necessary to be competitive in today’s workforce. Education must identify and assume responsibility for the development of curriculum to address the gap in workplace skills students need to possess upon graduation. Regardless of the student organization, it is likely that participating students will gain valuable developmental experience in workplace skills necessary to be competitive in the job market. However, those that participate in organizations incorporating a competitive element will be ahead of their peers due to the nature of the competitions and the value added by industry involvement. Technical competitions develop a whole new level of workplace skills as most of these competitions require the students to address real-world problems and compete against their peers in an event evaluated by industry professionals.
CHAPTER 3: METHODOLOGY

Introduction

This chapter describes the methodology used for the collection and analysis of the data in this study. Development of the survey instrument will be described as well as the process for testing the validity and reliability of the survey instrument. It will also identify the population, data collection methods, data analysis, and description of the variables.

This descriptive study used a quantitative research design to investigate graduates’ perceptions of the occupational benefits received by participation in the Society of Automotive Engineers Baja competition in terms of workforce readiness, employment opportunities and career advancement. The population consisted of graduates from automotive or engineering programs who competed in the Baja event while completing their degree.

Population

The population for this survey came from universities participating in the Collegiate Design Series. Graduates earning a four-year degree in Automotive or Engineering who participated in Baja were asked to participate in the study. Pittsburg State University has been competing in this event since 1992 and has well over 300 graduates that participated during their university experience. In addition, the University has hosted this international competition event four times in the last eight years which has allowed the researcher to develop contacts for faculty representatives from many other additional universities, all of whom have agreed to assist in disseminating the survey instrument to the target population.

Approval by the University of Arkansas’s Institutional Review Board (IRB) was requested on December 17, 2018 and granted on January 16, 2019. Authorization was requested for up to 500 respondents. A copy of the approval letter can be found in Appendix A.
**Instrumentation**

The survey instrument was developed and made available through an online provider, Survey Monkey. The survey instrument consisted of 14 questions and the data was analyzed using the Statistical Package for Service Solution software known as SPSS. The survey instrument used in this study was adapted from the 18-item Perceived Value of Certification Tool (PVC Tool©) developed by the Competency and Credentialing Institute (CCI). The PVCT was developed to determine perceived value of certification among perioperative nurses; however, since its development in 2003, the instrument has been administered to over 25,000 people including nursing staff, safety professionals, and administrative assistants (www.cc-institute.org/research/research tools). Permission to use the modified PVCT for this research was granted on November 30, 2018. A copy of the permission is located in Appendix B.

Statements and questions from the PVCT were modified to fit the automotive and engineering professions and to specifically address research areas in this study. The survey began with a group of academic, technical, and applied skillset statements directly related to participation in the Collegiate Design Series, Baja events, which mirror workplace readiness skills developed from themes that emerged in the literature. In the second question, participants were asked to respond to statements relating to initial employment opportunities based on their participation in Baja competitions. The third question of the survey asked the respondents to answer statements that related to their career advancement and professional growth. Demographic information was modified slightly to address the survey audience. Changes were made when needed to adapt the question or statement to reflect participation in the Baja SAE competition.
Validity

The survey instrument used in this research was a modified version of the PVCT, thus rendering the historical data regarding the validity and reliability of the instrument invalid. To determine validity, a panel of experts was formed consisting of the Collegiate Program Manager of SAE International, two professors in the Technical Education and Workforce Development program at Pittsburg State University, one external research professional and five graduates of the Automotive Technology Department at PSU. Panel members were asked to read through the survey instrument, determine if the wording and the meaning of the questions were easily understood, and to make recommendations to add, delete, or modify items.

Reliability

The original instrument developed by the Competency and Credentialing Institute has a reported Cronbach’s Alpha reliability rating higher than .90 (http://www.ccinstitute.org/research/research-tools; Gaberson, Schroeter, Killen, and Valentine, 2003; Sechrist and Berlin, 2006). The modified survey instrument for this research was tested for validity using a group of twenty PSU automotive graduates who were asked to complete the pilot survey. These data were collected and used to calculate a Cronbach’s Alpha for internal consistency. A reliability coefficient was calculated for each of the three sections of the survey instrument. Section one scored a reliability rating of .863, section two and three each scored a rating of .906. Therefore, a range of .863-.906 for the 36 statements included in this research was determined. According to Nunnally (1967), a .80 coefficient is commonly used. This is also in agreement with the literature regarding previous reliability findings with the PVCT and is acceptable for this study.
Data Collection

The method for collecting data for this study was through the use of an online survey tool, Survey Monkey. Due to the fact that the majority of the participants have been out of school for a number of years, accurate contact information for PSU graduates was not readily available; thus prospective participants came from a variety of locations. The researcher collected email contacts from students and faculty advisors at four international Baja events. In addition, social media (Facebook) was used to acquire accurate email contacts of graduates from PSU. Posts were also made to four separate Facebook pages including the researchers’ personal page, the PSU department of automotive, CDS Alumni, and Baja SAE. The post stated the purpose of the research and made a request for email contact information if the recipient was willing to participate. A copy of this message is included in Appendix C.

Once contacts were collected, an email was sent explaining the purpose and importance of the study. Respondents were informed that participation in this study was completely voluntary and no risks were associated with it. All information collected will remain anonymous and confidential. Respondents also received a description of the research and why it was conducted. The email also informed the participants as to the approximate time needed to complete the survey, a link to the survey instrument, and thanked the participants in advance for their assistance in the research. Completion of the survey acted as consent for participating in the study. A copy of the implied consent email can be found in Appendix D. Finally, a final follow-up email was sent thanking all participants and alerting those that had not yet responded that the survey would be ending on January 30, 2019. A copy of the email can be viewed in Appendix E.
Data Analysis

The Statistical Package for Service Solution software (SPSS) was used to analyze the data collected during this study. The first three questions on the survey instrument were designed to address each individual research area. Respondents were asked to report their degree of agreement or disagreement on a 5-point Likert scale. This data was analyzed as interval data and reported using means and standard deviation. Demographic information such as participation as a course, participation in a club, gender, and employment information was analyzed as nominal data and reported using frequency and percentage. Lastly, level of education, salary range, years since graduation and number of years in industry data was analyzed as ordinal data and reported using frequency and percentages. A copy of the survey instrument can be found in Appendix F.

Description of Variables

There are several variables that have been identified in this study. They include the degrees earned, career path, salary earned, and current position. In terms of the degrees earned, it was anticipated that respondents would hold a bachelor’s degree; however, there are a number of master’s degrees that compliment an automotive or engineering degree such as a Masters in Science, Masters in Business Administration (MBA), or a Masters in Engineering. Graduate degrees often offer higher starting salaries in the technical industries and improved career advancement. Role in industry, time in the industry, and current position, are all variables that speak to employment opportunities and career advancement. Due to the nature of the research topic, participants may work in a variety of different industries. Many of the respondents are employed in automotive or diesel related industries; however, since the Baja competition is primarily an engineering design competition, this increases the number of industries in which many of the respondents might be employed. In terms of salary, this variable is expected to be
fairly high for employment because these industries typically require specific engineering or related skillsets.
CHAPTER 4: FINDINGS

Introduction

This chapter describes the process of analyzing and reporting the data collected from the survey instrument described in Chapter 3. The purpose of this study was to examine the perceived occupational benefits to graduates that participated in the Baja SAE Collegiate Design Series. The study investigated graduates’ perceptions of how participating in a collegiate competition benefited them in terms of initial employment and career advancement. Research participants included graduates who had participated in Baja SAE as undergraduate students in automotive or engineering programs from the United States, Canada and Mexico. These participants responded to requests seeking past Baja alumni. Only those that responded to this request were invited to participate in the study and were surveyed between January 17th and January 30th, 2019 via the online survey administrator Survey Monkey.

The survey consisted of 14 questions, with the first 3 addressing perceptions specific to the three research questions that were associated with academic, technical, and applied skills, initial employment opportunities, career advancement and professional growth. Respondents were asked to indicate their degree of agreement or disagreement for each statement using a 5-point Likert scale in which 5 represented a strong agreement, 4 indicated agreement, 3 was no opinion, 2 indicated disagreement and 1 represented a strong disagreement. The responses were treated as interval data and described using means and standard deviation. Interpretation of the data collected for questions 1-3 was based on a range of agreement/disagreement where Strongly Disagree is represented from 1 to 1.49, Disagree is represented from 1.5 to 2.49, No opinion is represented from 2.50 to 3.49, Agree is represented from 3.50 to 4.49, and Strongly agree is represented from 4.50 to 5. The range of agreement is illustrated in Figure 4.1.
Questions pertaining to demographical information such as participation as part of a required course, participation as part of a student organization, gender, and employment were treated as nominal data and reported as frequencies and percentages. Additional demographics including years since graduation, level of education, number of years in industry, and approximate gross salary were treated as ordinal data and were also reported as frequencies and percentages.

A total of 319 surveys were sent to prospective participants with 145 respondents completing the survey. To address the limitations and delimitations of the study, all of the respondents were targeted based on participation in the Baja SAE competition. In addition, respondents were primarily baccalaureate graduates from automotive or engineering programs. The study concentrated on those graduates working in technical or engineering industries, but it also included data from individuals that participated in Baja, but chose other professions.

Analysis of perceptions

Each of the three perception questions were reported individually and written as represented on the survey instrument followed by the analysis in a table. All three research questions are discussed using this format. The remaining survey information will be reported in demographical groups including education and employment information.
Research Question One.

In terms of academic, technical, and applied skills, participation in Baja SAE …

Question 1 asked the respondents about perceptions regarding participation in Baja pertaining to development or application of academic, technical, or applied skillsets. Workplace developmental skills are basic requirements for entry level employees and this question explored a variety of those industry preferred skills. The question consisted of twelve statements and respondents were asked to choose the extent to which they agree or disagree with each statement using a 5-point Likert scale. Responses for question one are summarized in Table 4.1.

Table 4.1

Academic, Technical and Applied Skills (n =145)

<table>
<thead>
<tr>
<th>Statement</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved my manufacturing skills</td>
<td>4.75</td>
<td>0.56</td>
</tr>
<tr>
<td>Increased my leadership skills</td>
<td>4.61</td>
<td>0.68</td>
</tr>
<tr>
<td>Enhanced personal confidence in my technical abilities</td>
<td>4.58</td>
<td>0.56</td>
</tr>
<tr>
<td>Improved my communication skills</td>
<td>4.58</td>
<td>0.67</td>
</tr>
<tr>
<td>Increased my ability in regards to creative thinking and innovation</td>
<td>4.54</td>
<td>0.65</td>
</tr>
<tr>
<td>Enhanced my decision making skills</td>
<td>4.43</td>
<td>0.73</td>
</tr>
<tr>
<td>Improved application of my academics</td>
<td>4.39</td>
<td>0.78</td>
</tr>
<tr>
<td>Increased my ability to resolve conflicts</td>
<td>4.34</td>
<td>0.79</td>
</tr>
<tr>
<td>Improved my time management skills</td>
<td>4.33</td>
<td>0.79</td>
</tr>
<tr>
<td>Increased my work ethic</td>
<td>4.29</td>
<td>0.87</td>
</tr>
<tr>
<td>Increased my research abilities</td>
<td>4.21</td>
<td>0.86</td>
</tr>
<tr>
<td>Improved my ability to obey rules</td>
<td>3.83</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Note: 1 = Strongly Disagree, 2 = Disagree, 3 = No Opinion, 4 = Agree, 5 = Strongly Agree

Of the responses collected, all respondents indicated a higher range of agreement with the statement “Improved my manufacturing skills” ($M = 4.75, SD = 0.56$). The statement “Improved
my ability to obey rules” reported the lowest range of agreement ($M = 3.83, SD = 0.99$).

Respondents agreed or strongly agreed with all twelve statements listed in question one.

Variability, reported as standard deviation was low indicating that the respondents all agreed in their perceptions that participation in Baja increased their academic, technical and applied skills.

**Research Question Two.**

In terms of *initial employment opportunities*, participation in Baja SAE …

Question 2 asked the respondents about perceptions regarding participation in Baja relating to “Initial employment opportunities”. The question was directed at perceptions that participating in Baja as a student increased the respondent’s workplace skillsets in order to increase entry level employment. The question contained eight statements and respondents were asked to choose to the extent to which they agree or disagree using a 5-point Likert scale.

Responses are summarized in Table 4.2.

**Table 4.2**

*Initial Employment Opportunities (n = 145)*

<table>
<thead>
<tr>
<th>Statement</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased my teamwork skills</td>
<td>4.74</td>
<td>0.52</td>
</tr>
<tr>
<td>Increased my problem solving skills</td>
<td>4.57</td>
<td>0.62</td>
</tr>
<tr>
<td>Increased my critical thinking skills</td>
<td>4.53</td>
<td>0.65</td>
</tr>
<tr>
<td>Enhanced my professional credibility</td>
<td>4.52</td>
<td>0.65</td>
</tr>
<tr>
<td>Aids in gaining employment</td>
<td>4.49</td>
<td>0.81</td>
</tr>
<tr>
<td>Improved my interpersonal skills</td>
<td>4.34</td>
<td>0.71</td>
</tr>
<tr>
<td>Improved my presentation skills</td>
<td>4.22</td>
<td>0.77</td>
</tr>
<tr>
<td>Increased my overall interview skills</td>
<td>4.11</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Note: 1 = Strongly Disagree, 2 = Disagree, 3 = No Opinion, 4 = Agree, 5 = Strongly Agree
Respondents reported more agreement with the statement “Increased my teamwork skills” \( (M = 4.74, SD = 0.52) \), than with any other statement. The statement “Increased my overall interview skills” reported the lowest range of agreement \( (M = 4.11, SD = 0.93) \).

Respondents agreed or strongly agreed with all of the eight statements indicating that Baja participation did increase their perceptions as to their ability to gain initial employment.

**Research Question Three.**

In terms of *career advancement and professional growth*, participation in Baja SAE …

Question 3 asked the respondents about their perceptions regarding participation in Baja relating to “Career Advancement and Professional Growth”. Respondents were asked to what degree they perceived participation in the CDS Baja SAE competition benefited their career advancement. The statements pertained to professional growth and their perceptions as to whether participation in Baja was a contributing factor. The question contained 16 statements and respondents were asked to choose the extent to which they agree or disagree using a 5-point Likert scale. Responses are summarized in Table 4.3.
Table 4.3

Career Advancement and Professional Growth (n = 145)

<table>
<thead>
<tr>
<th>Statement</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases overall professional growth</td>
<td>4.58</td>
<td>0.65</td>
</tr>
<tr>
<td>Improves my project management skills</td>
<td>4.51</td>
<td>0.64</td>
</tr>
<tr>
<td>Increased my cooperation with others</td>
<td>4.32</td>
<td>0.71</td>
</tr>
<tr>
<td>Increased my ability to adapt to change</td>
<td>4.30</td>
<td>0.80</td>
</tr>
<tr>
<td>Increased my tolerance/patience with others</td>
<td>4.30</td>
<td>0.82</td>
</tr>
<tr>
<td>Increased my ability to compromise</td>
<td>4.25</td>
<td>0.71</td>
</tr>
<tr>
<td>Improved my ability to delegate</td>
<td>4.20</td>
<td>0.80</td>
</tr>
<tr>
<td>Improved industry relationships</td>
<td>4.20</td>
<td>0.96</td>
</tr>
<tr>
<td>Increased awareness for self-improvement</td>
<td>4.16</td>
<td>0.80</td>
</tr>
<tr>
<td>Improved my self-discipline</td>
<td>4.16</td>
<td>0.81</td>
</tr>
<tr>
<td>Increased my ability to meet expectations</td>
<td>4.15</td>
<td>0.77</td>
</tr>
<tr>
<td>Improved my self-awareness</td>
<td>4.12</td>
<td>0.80</td>
</tr>
<tr>
<td>Improves my self-efficacy</td>
<td>4.10</td>
<td>0.86</td>
</tr>
<tr>
<td>Increased my ability to negotiate</td>
<td>4.06</td>
<td>0.90</td>
</tr>
<tr>
<td>Improved my financial management skills</td>
<td>3.66</td>
<td>1.04</td>
</tr>
<tr>
<td>Improved my stress management</td>
<td>3.59</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Note: 1 = Strongly Disagree, 2 = Disagree, 3 = No Opinion, 4 = Agree, 5 = Strongly Agree

The population agreed or strongly agreed with all of the statements. The respondents rated “Increases overall professional growth” the highest ($M = 4.58$, $SD = 0.65$). The statements “Improved my financial management skills” ($M = 3.66$, $SD = 1.04$) and “Improved my stress management” ($M = 3.59$, $SD = 1.03$) were the lowest reported, but still fell in the agree category.

Based on the results, population perceived that participation in Baja did indeed increase career advancement and professional growth.
Analysis of Demographics

Survey Questions 4-8

The next 5 questions on the survey instrument asked respondents about demographic items including participation as a required course, participation as part of a student club or organization, gender, number of years since graduation and highest level of education. The responses are summarized in Table 4.4.

Table 4.4

Demographics

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation part of a required course?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14</td>
<td>9.7</td>
</tr>
<tr>
<td>No</td>
<td>128</td>
<td>88.3</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
<tr>
<td>Participation part of a student club or organization?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>121</td>
<td>83.4</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>9.0</td>
</tr>
<tr>
<td>Missing</td>
<td>11</td>
<td>7.6</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
<tr>
<td>What is your gender?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>8.3</td>
</tr>
<tr>
<td>Male</td>
<td>123</td>
<td>84.8</td>
</tr>
<tr>
<td>Missing</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 4.4

Demographics (continued)

<table>
<thead>
<tr>
<th>How many years has it been since you graduated?</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 years</td>
<td>44</td>
<td>30.3</td>
</tr>
<tr>
<td>3-5 years</td>
<td>30</td>
<td>20.7</td>
</tr>
<tr>
<td>6-10 years</td>
<td>23</td>
<td>15.9</td>
</tr>
<tr>
<td>11-15 years</td>
<td>19</td>
<td>13.1</td>
</tr>
<tr>
<td>16-25 years</td>
<td>14</td>
<td>9.7</td>
</tr>
<tr>
<td>26-30 years</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Missing</td>
<td>13</td>
<td>8.9</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>

What is the highest level of education you have completed?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not Graduate</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>98</td>
<td>67.6</td>
</tr>
<tr>
<td>Master Degree</td>
<td>34</td>
<td>23.4</td>
</tr>
<tr>
<td>Doctoral Degree</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Missing</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Question 4 asked respondents to indicate whether or not participation in Baja was part of a required course. The number of participants who reported no was 128 (88.3%) and only 14 (9.7%) reported yes that it was part of a required course. Note: Three respondents (2.0%) did not complete this question.

Question 5 pertained to whether participation was part of a student club or organization. Of the respondents, 121 reported participation as part of an organization (83.4%) while the remaining (9%) of respondents stated that it was not part of a student organization. Note that eleven respondents (7.6%) did not complete this question.
Question 6 asked respondents to indicate their gender; over 80% were male. The population reported 123 males (84.8%) and only 12 females (8.3%). Note that ten respondents (6.9%) did not complete this question.

Question 7 pertained to the number of years since the respondent graduated. Of the responses collected, 13 (8.9%) did not respond. The largest group reported 1-2 years since graduation \((n = 44, 30.3\%)\). The second largest group reported 3-5 years since graduation \((n = 30, 20.7\%)\). The third largest group reported 6-10 years since graduation \((n = 23, 15.9\%)\). The remaining groups reported 11-15 years \((n = 19, 13.1\%)\), 16-25 years \((n = 14, 9.7\%)\) and 26-30 years \((n = 2, 1.4\%)\).

Question 8 focused on level of education attained. The Bachelor’s degree was earned more than any other education level for the entire population \((n = 98, 67.6\%)\), followed by Master’s degree \((n = 34, 23.4\%)\). Two respondents indicated earning a Doctoral degree \((n = 2, 1.4\%)\), while one respondent indicated that they did not graduate \((n = 1, 0.7\%)\). Note, 10 respondents (6.9%) chose not to answer this question.

**Analysis of Employment**

**Survey Questions 9-14**

Questions 9-14 pertain to employment. Respondents were asked about their past and current employment experience, years spent in the automotive or engineering industry, type of industry employed, role in their perspective industry, future career plans and approximate gross salary. Responses are summarized in Table 4.5.
Table 4.5

*Employment*

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you currently (or previously) employed in an automotive or engineering related field?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>112</td>
<td>77.2</td>
</tr>
<tr>
<td>No</td>
<td>22</td>
<td>15.2</td>
</tr>
<tr>
<td>Missing</td>
<td>11</td>
<td>7.6</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
<tr>
<td>How many years have you worked in the automotive or engineering field?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 years</td>
<td>41</td>
<td>28.3</td>
</tr>
<tr>
<td>3-5 years</td>
<td>28</td>
<td>19.3</td>
</tr>
<tr>
<td>6-10 years</td>
<td>27</td>
<td>18.6</td>
</tr>
<tr>
<td>11-15 years</td>
<td>16</td>
<td>11.0</td>
</tr>
<tr>
<td>16-25 years</td>
<td>15</td>
<td>10.3</td>
</tr>
<tr>
<td>Missing</td>
<td>18</td>
<td>12.5</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 4.5

Employment (continued)

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive Corporate</td>
<td>17</td>
<td>11.7</td>
</tr>
<tr>
<td>Automotive Sales</td>
<td>7</td>
<td>4.8</td>
</tr>
<tr>
<td>Diesel/Heavy Equipment Industry</td>
<td>21</td>
<td>14.5</td>
</tr>
<tr>
<td>Insurance Industry</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Construction</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Mining Diesel and Heavy Equipment</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Recreational/Off Road Industry</td>
<td>6</td>
<td>4.1</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Engineering</td>
<td>37</td>
<td>25.5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>16</td>
<td>11.0</td>
</tr>
<tr>
<td>College, University, Adult Education</td>
<td>8</td>
<td>5.5</td>
</tr>
<tr>
<td>Other Education Industry</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Computer and Electronics Manufacturing</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Scientific or Technical Services</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Missing</td>
<td>15</td>
<td>10.3</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 4.5

*Employment (continued)*

<table>
<thead>
<tr>
<th>Role</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Management</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Middle Management</td>
<td>31</td>
<td>21.4</td>
</tr>
<tr>
<td>Administrative Staff</td>
<td>5</td>
<td>3.4</td>
</tr>
<tr>
<td>Support Staff</td>
<td>38</td>
<td>26.2</td>
</tr>
<tr>
<td>Training Professional</td>
<td>18</td>
<td>12.4</td>
</tr>
<tr>
<td>Consultant</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>Researcher</td>
<td>20</td>
<td>13.8</td>
</tr>
<tr>
<td>Self-Employed/Partner</td>
<td>5</td>
<td>3.4</td>
</tr>
<tr>
<td>Missing</td>
<td>14</td>
<td>9.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>145</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Which of the following best describes your future career plans?

<table>
<thead>
<tr>
<th>Plan</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Plans to Change Careers</td>
<td>63</td>
<td>43.4</td>
</tr>
<tr>
<td>Looking for a different position within current industry</td>
<td>44</td>
<td>30.3</td>
</tr>
<tr>
<td>Looking for a position outside current industry</td>
<td>18</td>
<td>12.4</td>
</tr>
<tr>
<td>I plan to retire</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Missing</td>
<td>17</td>
<td>11.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>145</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
Table 4.5

Employment (continued)

<table>
<thead>
<tr>
<th>What is your approximate gross salary?</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 49,999</td>
<td>14</td>
<td>9.7</td>
</tr>
<tr>
<td>50,000-59,999</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>60,000-69,999</td>
<td>21</td>
<td>14.5</td>
</tr>
<tr>
<td>70,000-79,999</td>
<td>31</td>
<td>21.4</td>
</tr>
<tr>
<td>80,000-89,999</td>
<td>15</td>
<td>10.3</td>
</tr>
<tr>
<td>90,000-99,999</td>
<td>8</td>
<td>5.5</td>
</tr>
<tr>
<td>100,000-109,000</td>
<td>8</td>
<td>5.5</td>
</tr>
<tr>
<td>110,000-119,000</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>120,000+</td>
<td>22</td>
<td>15.2</td>
</tr>
<tr>
<td>Missing</td>
<td>12</td>
<td>8.2</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Question 9 asked the respondents if they were currently employed or were previously employed in an automotive or engineering related field. The population consisted of 134 responses with 11 respondents missing data \( (n = 11, 7.6\%) \). Of the population, more than three-fourths \( (n = 112, 77.2\%) \) indicated that they currently or had previously worked in automotive or engineering fields. A small percentage of the respondents \( (n = 22, 15.2\%) \) reported never working in either automotive or engineering related industries.

Question 10 asked respondents to indicate the number of years they have worked in the automotive or engineering field. The largest group reported 1-2 years of employment \( (n = 41, 28.3\%) \). The second largest group reported 3-5 years of employment \( (n = 28, 19.3\%) \). The third largest group reported 6-10 years of employment \( (n = 27, 18.6\%) \). The remaining groups were
fairly close reporting, 11-15 years (n = 16, 11.0%), 16-25 years (n = 15, 10.3%). Note, there were several that did not complete this question (n = 18, 12.5%).

Question 11 asked respondents to indicate which category best described the industry in which they work. Due to the nature of the study, respondents could be working in a variety of different industries. Multiple answers were allowed for this question so percentages reported are a percentage of responses, not a percentage of respondents. The population reported more responses for “Engineering” (n = 37, 25.5%), followed by “Diesel/Heavy Equipment” (n = 21, 14.5%). “Automotive Corporate” (n = 17, 11.7%), and “Manufacturing” (n = 16, 11.0%) were very close in terms of percentages. The remaining categories were much smaller ranging in frequency and percentage. “College, University and Adult Education” (n = 8, 5.5%), “Automotive Sales” (n = 7, 4.85), “Recreational/Off Road Industry” (n = 6, 4.1%), “Insurance” (n = 4, 2.8%), “Scientific or Technical Services” (n =4, 2.8%), “Agriculture” (n = 3, 2.1%), “Other Education Industry” (n = 3, 2.1%), “Mining Diesel and Heavy Equipment” (n = 2, 1.4%), “Construction” and “Computer Manufacturing” tied for the lowest category each indicating (n = 1, 0.7%). Note: 15 respondents did not complete this question (n = 15, 10.3%).

Question 12 asked respondents to indicate the category that best described their role in industry. Of the respondents, “Support Staff” was the largest group (n = 38, 26.2%). The second largest group consisted of “Middle Management” (n = 31, 21.4%). “Researcher” (n = 20, 13.8%), “Training Professional” (n = 18, 12.4%) and “Consultant” (n = 10, 6.9%) were fairly close indicating that several of the respondents are employed in education related fields. “Administrative Staff” and “Self-Employed/Partner” were the same, both equaling (n = 5, 3.4%). The lowest reported category was “Upper Management” (n = 4, 2.8%). It should be noted that
several respondents did not complete this question \((n = 14, 9.7\%)\). This may be due to the fact that they believed that their role in industry did not match any of the categories represented.

Question 13 inquired about future plans for the respondents. Just under one-half of the respondents in the population \((n = 63, 43.4\%)\) indicated they have no plans for a career change, followed by respondents looking for a different position within the same industry \((n = 44, 30.3\%)\). The smallest group of respondents reported that they planned to retire \((n = 3, 2.1\%)\). The remaining respondents indicated that they were looking for a position outside of their current industry \((n = 18, 12.4\%)\). This questions also had missing data \((n = 17, 11.8\%)\) indicating that these respondents may be unsure as to their future career plans.

Question 14 asked the respondents to indicate their annual salary range. The reporting income varied for the population. This may be due to experience levels, number of years in industry, and the industry in which the respondents work. The highest frequency level of income reported was $70-$79,999 \((n = 31, 21.4\%)\) followed by $120,000 or more \((n = 22, 15.2\%)\) and $60-$69,999 \((n = 21, 14.5\%)\). The lowest percentage of the respondents indicated a salary range of $110-$119,000 \((n = 4, 2.8\%)\). The remaining respondents reported their income range as $80-$89,999 \((n = 15, 10.3\%)\), less than $49,999 \((n = 14, 9.7\%)\), $50-$59,999 \((n = 10, 6.9\%)\), $90-$90,999 \((n = 8, 5.5\%)\), $100-$109,000 \((n = 8, 5.5\%)\). There were several respondents that did not complete this question for they may not have felt comfortable reporting their salary range \((n = 12, 8.3\%)\).

**Summary**

This chapter described the data collected regarding perceived benefits of participation in Baja SAE and the analysis used to report the findings. A target population was determined by responses from participants through social media postings and email correspondence. The
chapter summarized the first three perception questions separately and reported them with means ($M$) and standard deviation ($SD$). Analysis of the questions regarding Demographics (questions 4-8) were grouped together and reported as were Employment (questions 9-14). Each was reported using frequency and percentages. Trends, commonalities and differences were highlighted in the narrative and further described using tables.
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

The motivation for this research was to explore the perceived occupational benefits of competing in technical collegiate competitions. The specific collegiate competition that was used for this study was the Collegiate Design Series Baja SAE. This quantitative descriptive study identified and analyzed perceptions of participants who are primarily working in automotive and engineering fields. However, due to the nature of the competition and all of the activities that are required of a Baja team, it is possible that participants may have been from disciplines other than automotive or engineering, but still participated in Baja as a student. The goal was to identify workplace skill development resulting from participation and if these skills enhanced entry level employment, career advancement and professional growth. This chapter will report the perceptions of the population for the first three perception questions, demographical information and work experience.

An electronic survey instrument was administered through the online provider Survey Monkey to collect the data. Statistical analyses were performed using the statistical SPSS software. In addition to the research questions below, respondents were asked questions regarding demographics, education and employment. Respondents were asked to identify the extent to which they agreed, disagreed with, or had no opinion regarding statements relating to the following research questions.

Research Question 1: To what degree did participants perceive participation in the CDS Baja SAE competition improve academic, technical, and applied skills?

Research question 2: To what degree did participants perceive participation in the CDS Baja SAE competition benefit their employment opportunities?
Research question 3: To what degree did participants perceive participation in the CDS Baja SAE competition benefit their career advancement?

Respondents for the survey were initially contacted through direct contact at Baja events, participating school’s faculty advisors and social media posts. Potential participants were asked to contact the researcher directly through email if they were willing to participate in the study. An email list was compiled based on email responses from former Baja members stating that they would like to be involved in the research. Out of 319 surveys sent, a total of 145 surveys were collected, analyzed and reported. The survey instrument was modeled from the Perceived Value of Certification Tool developed by the Competency and Credentialing Institute (CCI). Permission to modify and use the PVCT for this research was requested and granted on November 30, 2018 (Appendix B). It consisted of 14 questions, with the first three addressing the three research areas. The remaining questions explored data about Baja participation, education and employment information.

Conclusions

Research question 1: In terms of perceived occupational benefits of participation in Baja specific to academic, technical and applied skills, the population agreed with the statements given. The standard deviations for all statements in this research area were less than 1.00, indicating that the population was essentially close in their perception that Baja participation did indeed increase workplace skill development. Improved skills in manufacturing, leadership, technical abilities, communication and creative thinking and innovation were exceptionally high.

The review of literature pertaining to workplace skills led the researcher to conclude that universities prepare graduates adequately in entry-level technical skill competences, but perhaps not in interpersonal skills necessary for everyday interaction in the workforce. In order to address
this issue, many institutions are incorporating integrated lessons in teamwork and problem solving, as well as communication and presentation skills. Some are even adding workplace specific courses to the curriculum to address these deficiencies. However, for students to learn these skills, they must be involved in activities that immerse them into situations where they apply these skillsets. This confirms prior research highlighting the need for reasoning, communicating, general problem solving, critical thinking and presentation skills to be included in assignments and incorporated into all curriculums (Carnevale, 2013; Casner-Lotto, 2006; Eisner, 2010; Nisha, 2018; Tymon, 2013). There is a distinct difference between basic knowledge skills, those acquired in classroom coursework, and applied skills, referring to the application of basic knowledge to successfully perform in today’s workforce.

Research Questions 2 and 3: The population agreed with all of the statements concerning the perceived occupational benefits of participation in Baja in terms of initial employment opportunities, career advancement and professional growth. Each statement pertained to a specific skillset, personal improvement or professional development. The population agreed with the statements that participation increased teamwork, problem solving, critical thinking, interpersonal skills, presentation and overall interview skills. Additionally, the respondents agreed that Baja participation enhanced their professional credibility and aided in gaining initial employment.

The population also perceived that experiences gained by participating in Baja had helped them in their professional careers in many areas including project management, cooperation with others, adaptability, tolerance and patience, ability to compromise and delegate, and overall awareness of one’s self. The standard deviations for the majority of the statements were less than 1.00, thus variability of the group was very close indicating overall agreement that Baja
participation assisted with initial employment opportunities, career advancement and professional growth. Statements about improved financial management skills and stress management reported a standard deviation slightly over 1.00, with respondents in general agreement. Financial management may have been lower depending on the structure of the Baja program and if the student dealt with the financials of the team. This confirms prior research suggesting that experiential learning takes place when students participate in professional student clubs and organizations. This participation may enhance the development of core workplace competencies needed in today’s workforce. Participation may enhance personal and professional characteristics relevant to initial employment opportunities and promote continued development of these competencies throughout their career (Bush, 2017; Foubert, 2006; Hall 2012; Kolb, 2005; Longo, 2017; McLead, 2013; Munoz, 2016; Roulin, 2013; Tchibozo, 2008).

Conclusions from the first three questions indicated that there is significant evidence that participation in Baja enhances students’ ability to develop or improve upon workplace readiness skills. These skills continue to develop as individuals enter the workforce, thus building on and expanding the skillsets and experiences gained while participating in a student club or organization. Workplace development skills may be magnified if a student engages in a professional student organization, with a competitive element, that is tied to their chosen profession. This may be due to the nature of the project and the fact that students must work together to complete a complex project that emulates real world practice.

The findings of this study support the research of Alfeld (2006). Alfeld found that those students that participated in career and technical student organizations with a competition element showed enhanced academic engagement, employability skills, leadership and civic involvement. Behavioral based interviews are becoming more prevalent for entry level
employees. Employers are seeking employees that possess not only basic academic knowledge, but also have acquired applied skills based on cognitive abilities. Nancherla (2008) alluded to the fact that future performance is predicted by past performance in similar situations. This research helps to support this by reporting perceptions of graduates and the fact that participation allowed them the opportunity to gain life experiences, which they may draw upon during interviews.

Demographic and education questions 4-8.

This section of the survey analyzed demographical information pertaining to whether participation was part of a required course, a student organization, gender, years since graduation and level of education. Of the respondents, (88.3%) indicated that participation was not part of a required course. This question may have been misunderstood. Participation may not have been tied to a required course, but it may have been part of a capstone class. So, a better question may have been if participation was part of a senior design course or senior project. Most of the respondents indicated that participation was part of a student club or organization (84.4%). This could have been a higher percentage due to the fact that in order to compete, the students are required to be a SAE student member. However, it did indicate that there are some universities that have student membership in SAE without a formal SAE student organization.

Generally, respondents identified themselves as Male (84.8%), with (8.3%) reporting they were Female. This was to be expected, for STEM education has historically been male oriented. However, I was hoping that the percentage of females would have been larger due to the push for STEM education in elementary, middle, and high school programs. In terms of years since graduation, the majority of the respondents (66.9%) reported being out of college for 1-10 years. This is an accurate representation for the target population was derived from interaction at recent competitions, and social media posts. Facebook was the social medial format used and
there may have been potential participants that do not use social media and did not receive the request for participation. In terms of education, 67.6% indicated earning a Bachelor’s degree and 23.4% reported continuing their education and completing a Master’s degree. This may have been because the majority of the target population would have been completing a Bachelor’s degree in automotive or engineering related fields. However, there may have been students from other academic programs involved, if participation was not part of a senior project. Two respondents indicated that they had completed doctoral degrees, and one indicated that they did not graduate.

Questions 9-14 explored information concerning employment. Most respondents identified themselves as currently working or having worked in automotive or engineering fields (77.2%) for 1-10 years (66.2%). When asked to describe their current job, the largest groups (36.5%) identified themselves as “Engineering” or “Manufacturing” followed by 26.2% indicating “Diesel/Heavy Equipment” and “Automotive Corporate”. Additionally, (47.6%) indicated that they held positions in “Middle Management” and “Administrative Staff”, with (43.4%) having no plans to change careers and (30.3%) looking for a different position within their current industry. The final survey question asked respondents to report their current annual income. The population reported the highest number of responses for $70-$79,999 (21.4%) followed by $120,000 or more (15.2%). The third highest salary range reported was $60-$69,999 (14.5%).

**Recommendations**

The research revealed that the perception of the occupational benefits of competing in technical collegiate competitions in terms of academic, technical and applied skills, initial employment opportunities, career advancement and professional growth do exist. However, the
research did reveal that these skillsets are most prevalent with students that participated in a professional student organization related to their major, even if it did not contain a competitive element. It did become evident through the literature of past studies that those students that were actively engaged in professional student organizations reported advanced applied skillsets required by industry as compared to students that did not actively engage in extracurricular professional organizations. This could be due to the fact that membership in professional student organizations allow students unique opportunities within their area of study which would not otherwise be possible. Although, there are many variables that could be researched, some suggestions for further research include.

- Research into other professional student organizations that do not contain a competitive element. Exploring if there is indeed an advantage to students that participate in organizations that compete in terms of workplace readiness skills.

- Research into other professional student organizations that include student competitions, technical or not, such as Family and Consumer Sciences, Students in Free Enterprise, and Arts and Sciences.

- Research regarding the perceived benefits of competing in technical collegiate competitions from the employers’ perspective. Studies have revealed the benefits of student participation in professional organizations, but this research is not specific as to whether the organization contained a competitive element, and if the competitive element increases workplace readiness skills.

- Research regarding the perceived benefits to companies that support technical collegiate competitions is regards to return on investment. What do these
companies gain by their involvement due to the monetary and time commitments by industry required to make these competitions successful.

Summary

This quantitative, descriptive study was designed to identify perceptions regarding the occupational benefits of competing in technical collegiate competitions. The problem statement indicated the lack of research in the area of workplace readiness skills and professional development associated with student participation in technical collegiate competitions. The purpose statement generalized the Society of Automotive Engineers Collegiate Design Series as the area of study, specifically Baja SAE, and the research questions focused the research into specific areas of applied academics and workplace developmental skills. A literature review was conducted and revealed common themes regarding a correlation of preferred workplace skills and where in the college curriculum these skillsets are being developed. The research indicated that the skills that employers require are not necessarily being taught in traditional courses. Additionally, research suggests that students who engage in student organizations, especially professional student organizations tied to their degree have increased opportunities of developing the applied skillsets desired by industry. The survey instrument was administered from January 17, 2019 through January 30, 2019 to graduates that participated in Baja as a student from participating schools across the United States, Canada and Mexico.

In general, participation in Baja SAE is perceived to be beneficial to students while completing their degree requirements. Participation is perceived as an avenue to increase both academic and applied skillsets needed to be successful in industry. Participants perceive that Baja not only assisted with initial employment opportunities but has also allowed them to draw
upon those experiences and apply them to their current careers, both personally and professionally.
REFERENCES


To: Trenton James Lindbloom
From: Douglas James Adams, Chair
       IRB Committee
Date: 01/16/2019
Action: Exemption Granted
Action Date: 01/16/2019
Protocol #: 1812165701
study Title: The Perceived Occupational Benefits of Competing in Technical
            Collegiate Competitions

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MI-KG Building, 5-2208, or irb@uark.edu.

cc: Kit Kacirek, Investigator
November 30, 2018

Hello Trent,

Thank you for reaching out about using a modified version of the PVCT in your research. CCI has allowed researchers to do this in the past, and we desire to continue supporting researchers in a wide variety of fields who are studying certification and similar professional development activities. However, we are currently seeking guidance from our legal counsel on updated terms and procedures for modification of the PVCT.

Still, please feel free to proceed with your research with the understanding that you will be able to use a version of the PVCT. More details to come. Let me know if you have any questions or concerns.

I’ve also left a voicemail at your office number.

Best,
Carissa

Carissa L. Homme, PhD
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Competency & Credentialing Institute
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Appendix C

Social Media Post

In search of graduates that have participated in Baja SAE

Will you please help with my dissertation research?

The Perceived Occupational Benefits of Competing in the Society of Automotive Engineers Collegiate Design Series Baja Competition

Purpose Statement
The purpose of this study was to identify the perceived occupational benefits of competing in technical collegiate competitions. Specifically, to examine the perceived benefits to graduates that participated in the Society of Automotive Engineers (SAE) Collegiate Design Series (CDS), in relation to employment opportunities and career advancement. The specific CDS event used for this study is the Baja SAE competition.

Survey Instrument
This will be a quantitative study and email will be used to contact the participants. The instrument will be delivered online via Survey Monkey. The survey will be 15 questions and take approximately 10 minutes to complete. If you are a graduate that participated in Baja during your college experience and would be willing to participate in this anonymous research project, please send an email to tlindbloom@pittstate.edu

Thank you so much for your help with this project. It is my hope that this project may assist other schools with their Baja programs as well as SAE in terms of recruiting sponsorship for future Baja events.

Sincerely,
Trent Lindbloom
Pittsburg State University
Automotive Technology
Pittsburg, Kansas
tlindbloom@pittstate.edu 620-249-9547
Appendix D

Initial email sent to prospective participants

The Perceived Occupational Benefits of Competing in Technical Collegiate Competitions

Invitation to Participate
You are invited to participate in a research study about your perceived occupational benefits from your participation in Baja SAE while completing your undergraduate degree. You are being asked to participate in this study because you were a student participant in the Baja SAE collegiate design series competition.

Purpose of this Research Study
The purpose of this study is to identify the perceived occupational benefits of competing in technical collegiate competitions. Specifically, to examine the perceived benefits of those that participated in the Society of Automotive Engineers (SAE) Collegiate Design Series (CDS), in relation to employment opportunities and career advancement. The specific CDS event used for this study is the Baja SAE competition.

Participant Actions
Participation will require you to complete an anonymous online survey about your experience and your perceived benefits acquired by your participation. This survey will take fifteen minutes or less to complete. All information will be kept confidential to the extent allowed by applicable State and Federal law. I will be storing this on a password protected computer and the survey is conducted through Survey Monkey. I will not have access to personal information. Participants will not be identified by name and this is completely voluntary and anonymous.

At the conclusion of the study you will have the right to request feedback about the results. You may contact the Principal Researcher, Trenton James Lindbloom, tlindbloom@pittstate.edu

You have the right to contact the Principal Researcher listed below for any concerns that you may have.

Thank you for your participation in this research study!
Sincerely,

Trenton J. Lindbloom

Compliance Officer:
Ro Windwalker, CIP
Institutional Review Board Coordinator
Research Compliance
University of Arkansas
109 MLKG Building
Fayetteville, AR 72701-1201
479-575-2208
irb@uark.edu

I have read the above statement and have been able to ask questions and express concerns, which have been satisfactorily responded to by the investigator. I understand the purpose of the study as well as the potential benefits and risks that are involved. I understand that participation is voluntary. I understand that significant new findings developed during this research will be shared with the participant. I have been given a copy of the consent form. I agree to continue with participation in the Perceived Occupational Benefits of Competing in Technical Collegiate Competitions survey. Completion of this survey indicates that you agree for your responses to be used in this research.
Appendix E

Final email sent to prospective participants

Hello Baja SAE Alumni

I am conducting research for my dissertation on the perceived occupational benefits of participation in the Baja SAE competition. You are being contacted because you were a student competitor in Baja SAE. **If you have already been contacted about this research project and have already completed the survey or do not wish to participate, please disregard.** If you were a Baja participant I would like your input. The survey is short, and will take a maximum of 15 minutes to complete. The following information describes the study and the link to the survey is at the bottom. Thank you in advance for your assistance in my research. This survey will conclude at 5 pm central time Wednesday, January 30, 2019.

Thank you for your participation in this research study!

Sincerely,

Trenton J. Lindbloom

https://www.surveymonkey.com/r/lindbloom-baja-benefits
Appendix F

Survey Instrument

The Perceived Occupational Benefits of Participating in the Baja SAE Competition

Please indicate the extent to which you agree, disagree, or have no opinion regarding the following statements.

1 = Strongly Disagree, 2 = Disagree, 3 = No Opinion, 4 = Agree, 5 = Strongly Agree

1. “In terms of academic, technical and applied skills, participation in Baja SAE…”
   a. Increased my research abilities
   b. Improved my communication skills
   c. Improved application of my academics
   d. Improved my manufacturing skills
   e. Improved my ability to obey rules
   f. Enhanced personal confidence in my technical abilities
   g. Increased my work ethic
   h. Improved my time management skills
   i. Increased my ability to resolve conflicts
   j. Increased my leadership skills
   k. Enhanced my decision making skills
   l. Increased my ability in regards to creative thinking and innovation

2. “In terms of initial employment opportunities, participation in Baja SAE…”
   a. Aids in gaining employment
   b. Enhanced my professional credibility
   c. Increased my overall interview skills
   d. Improved my presentation skills
   e. Improved my interpersonal skills
   f. Increased my problem solving skills
   g. Increased my critical thinking skills
   h. Increased my team work skills
3. “In terms of career advancement and professional growth, participation in Baja SAE…”
   a. Increased my ability to adapt to change
   b. Increased my ability to compromise
   c. Increased my ability to negotiate
   d. Increased my tolerance/patience with others
   e. Increased my cooperation with others
   f. Improved my self-discipline
   g. Improved my self-awareness
   h. Improves my self-efficacy
      (the ability to exert control over one’s own motivation, behavior, and social environment)
   i. Increased awareness for self-improvement
   j. Improved industry relationships
   k. Improved my ability to delegate
   l. Improved my financial management skills
   m. Improves my project management skills
   n. Improved my stress management
   o. Increased my ability to meet expectations
   p. Increases overall professional growth

4. Was your participation in Baja SAE part of a required course?
   Yes
   No

5. If No, was it part of a student organization or club?
   Yes
   No

6. What is your gender?
   Female
   Male

7. How many years has it been since you graduated?
   1-2 years
   3-5 years
   6-10 years
   11-15 years
   16-25 years
   26-30 years

8. What is the highest level of education you have completed?
   Did not graduate
   Associate Degree
   Bachelor Degree
   Master Degree
   Doctoral Degree

9. Are you currently employed (or previously employed) in an automotive or engineering related field?
   Yes
   No
10. How many years have you worked in the automotive or engineering industry?
   - 1-2 years
   - 3-5 years
   - 6-10 years
   - 11-15 years
   - 16-25 years
   - 26–30 years

11. Which of the following categories best describes the industry you primarily work in?
   - Automotive Corporate
   - Automotive Sales
   - Diesel/Heavy Equipment Industry
   - Insurance Industry
   - Construction
   - Mining Diesel and Heavy Equipment
   - Recreation/Off Road Industry
   - Agriculture
   - Engineering
   - Manufacturing
   - College, University, and Adult Education
   - Primary/Secondary (K-12) Education
   - Other Education Industry
   - Computer and Electronics Manufacturing
   - Scientific or Technical Services

12. Which of the following best describes your role in industry?
   - Upper Management
   - Middle Management
   - Administrative Staff
   - Support Staff
   - Training Professional
   - Consultant
   - Researcher
   - Self-employed/Partner

13. Which of the following best describes your future career plans?
   - I have no plans to make a career or position change
   - I am looking for a different position within my current industry
   - I am looking for a position outside of my current industry
   - I plan to retire

14. What is your approximate gross salary?
   - Less than 49,999
   - 50,000 – 59,999
   - 60,000 – 69,999
   - 70,000 – 79,999
   - 80,000 – 89,999
   - 90,000 – 99,999
   - 100,000 – 109,999
   - 110,000 – 119,999
   - 120,000+