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The Value of the Global Supply Chain & Operations Management Capstone Consulting Course on Graduates Careers

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THE VALUE OF THE GLOBAL SUPPLY CHAIN & OPERATIONS MANAGEMENT CAPSTONE
CONSULTING COURSE ON GRADUATES CAREERS

By

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Submitted in Partial Fulfillment
of the Requirements for
Graduation with Honors from the
South Carolina Honors College

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Thesis Summary

The University of South Carolina's Global Supply Chain & Operations Management [GSCOM] program in the Management Science Department has witnessed incredible growth and success throughout its first ten years as a major in the Darla Moore School of Business. The crown jewel of the GSCOM program is the Capstone project, a consulting course offered for program seniors. This thesis paper examines the value of the Capstone program through analysis of results from a graduate survey. The survey was administered to graduates from the 2013-2017 classes, and aims to capture the value that Capstone had on the first year of each graduates' career through salary enhancement, on the job performance, career preparation, and other characteristics. Survey data were collected from graduates who participated in the capstone project as well as graduates who took an alternate course. Analysis results demonstrate that that the Capstone program does add value to graduates careers through enhanced job-performance, career preparation, skillset, knowledge base, and salary.

Section I: Introduction to the Global Supply Chain & Operations Management Program and Thesis

Ten years ago, faculty at the Darla Moore School of Business noticed a gap that the business school currently did not fill. Supply Chain and Operations Management is a continuously growing field as businesses expand and continue to expand both domestically and internationally. Because of this expansion, companies have a greater need for supply chain, operations, and logistics professionals. Moore School faculty realized that they possessed students who could meet the demand of an industry in need of talent. The Global Supply Chain & Operations Management major within the Management Science department was born to prepare graduates for these needed management science roles. “The mission of the Moore School’s Global Supply Chain & Operations Management undergraduate track is to produce students with advanced knowledge and practical applied experiences in twin competencies of operations and business process improvement and global supply chain design, analysis and improvement” (GSCOM Track). Graduates that complete the program are prepared for careers in manufacturing, production, purchasing, quality control, consulting, and numerous fields requiring supply chain and operations management competencies. The program coursework consists of classes focused on: Lean Six Sigma methodologies, strategic sourcing, logistics and distribution, service operations management, supply chain modeling and optimization, business re-engineering process improvement approaches, as well as various other skill-sets. At the culmination of students’ GSCOM curriculum, seniors have the opportunity to participate in the Capstone consulting project course, the APICS [The Association for Supply Chain Management] course, or both. The program has experienced profound success, as it is currently ranked 7th in

the nation by Gartner's research on top undergraduate supply chain programs in the US, and is the only undergraduate program of its kind to offer students an opportunity to earn an industry sponsored Lean Six Sigma Green Belt Certification during their undergraduate career (GSCOM Track).

As the ten-year anniversary of the birth of the GSCOM program approaches, it is an opportune time to measure the value-add impact of the program on its graduates. To capture this value, I conducted a survey and administered it to graduates of the GSCOM program. Each graduate participated in one or both of the senior experiences offered in the program - the Capstone consulting course and the APICS course. My hypothesis is that the Capstone course offers value to graduates careers through enhanced job-performance, career preparation, skillset, knowledge base, and salary. I used the survey to accept or reject my hypothesis by comparing the results of graduates who participated in Capstone, APICS, and both programs. After analyzing the results, it is apparent that the Capstone program adds value to graduates careers.

Section II: Part I: The Capstone Project Course

The Capstone Project is a semester-long, full immersion experience in which students work with a team of about 4-5 peers led by a project mentor, one of the program's esteemed professors, to work as student consultants for a partner company. Partner companies team with The Operations and Supply Chain Center of the Moore School to assign student teams projects to work on for one entire semester. The Sonoco Products Company, "a \$5 billion global provider of consumer packaging, industrial products and packaging supply chain services" (Sonoco), is the

industry sponsor that works with The Operations and Supply Chain Center to certify and award Lean Six Sigma Green Belts to Capstone participants. Sonoco fulfills a critical role to the success and rigor of the program. A few of the partner companies that work with the GSCOM program are well-known, diverse, and successful companies including Delta Airlines, BMW, Textron, Siemens and Continental Tire, to only name a few.

Because of the consulting nature of the course and a finite supply of partner companies, the Capstone Project Course has limited capacity for only select GSCOM seniors. At the culmination of their junior year, students who are interested in applying to the course submit an application to the GSCOM department to review overall GPA, GPA specifically in the GSCOM program courses, career plans after graduation, and an essay on why the student desires to participate in the program. GSCOM faculty review applications during the summer and notify admitted students at the beginning of August before classes resume for the fall semester. Students that either are not admitted into the Capstone course or simply do not wish to take the class have the opportunity to enroll in the APICS course, the alternative senior course discussed in *Section II: Part III*.

The goal of the Capstone course is to allow students the opportunity to earn a Lean Six Sigma Green Belt Certification. The University of South Carolina is the only university with a program to offer students the ability to earn an industry sponsored and validated Lean Six Sigma Green Belt during their undergraduate career. The majority of professionals that did not have the opportunity to participate in USC's GSCOM program must work to earn this certification during their careers when they have attained many years of experience. This is one of the many value add opportunities of the GSCOM program to be discussed. In order to obtain the certification through the Capstone project, each student must successfully complete and contribute to their

respective Capstone projects, pass the Sonoco Green Belt exam with at least 80% accuracy in one try, and present their projects to the Sonoco Products Company Lean Six Sigma Champion for project approval. The primary goal of the Six Sigma certification is to validate individuals who possess the skills to identify opportunities for improvement or defects in a business process and eliminate them. A lean six sigma green belt is able to begin and manage lean six sigma projects, has lean six sigma expertise, and able to provide training to lower-level employees (What is Lean).

Part II: Project Approach: Lean Six Sigma and DMAIC

During the semester, the student teams clock hundreds of person-hours to produce Lean Six Sigma solutions for the company while following a prescribed project roadmap, the DMAIC project process. DMAIC is an acronym for: Define, Measure, Analyze, Improve, and Control. Each word defines one of five stages of the process. The *Journal of Achievements in Materials and Manufacturing Engineering* delineate each phase as: “*Define* by identifying, prioritizing and selecting the right project; *Measure* key process characteristics, the scope of parameters and their performances; *Analyze* by identifying key causes and process determinants; *Improve* by changing the process and optimizing performance; *Control* by sustaining the gain” (Sokovic). The goal of following the DMAIC process is to determine opportunities for improvement and implement practical solutions which will result in significant business improvement and financial savings.

It is imperative to gain a clear understanding of what Lean Six Sigma means to understand the significance of a Green Belt certification. Lean Six Sigma is a combination

approach to implement both Lean and Six Sigma during to eliminate waste, or “muda,” and reduce defects to 3.4 or less per million in a process. Lean aims to create value for customers by eliminating unnecessary wastes in a process, while six sigma aims to eliminate variation in a process which in turn reduces defects. Together, Lean and Six Sigma form a powerful toolset to solve problems and make processes as efficient as possible (What is Lean). Six Sigma is based on a statistical concept that defective items can be minimized by maintaining 6 standard deviations, “6 sigmas,” between the process mean and its upper and lower specification limits. Six Sigma can be viewed as a means of efficiently solving a problem. Six Sigma aims to reduce the amount of defective products manufactured or services provided, resulting in increased revenue and greater customer satisfaction (What is Lean). Organizations that utilize Lean Six Sigma will streamline their processes and enable themselves to do more with less, thereby reducing costs.

According to “The Evolution of Lean Six Sigma” in the *Emerald Insight* journal, “The foundation of the lean vision is still a focus on the individual product and its value stream (identifying value-added and non-value added activities), and to eliminate all waste, or muda, in all areas and functions within the system – the main target of lean thinking. Seven forms of waste have been identified: over-production, defects, unnecessary inventory, inappropriate processing, excessive transportation, waiting, and unnecessary motion.” Defined by the same article, “The term ‘Six Sigma’ refers to a statistical measure of defect rate within a system. Underpinned by statistical techniques, it presents a structured and systematic approach to process improvement, aiming for a reduced defect rate of 3.4 defects for every million opportunities, or Six Sigma” (Pepper, 2010) As mentioned before, a reduced defect rate is the product of eliminating variation in a process.

Part III: The APICS Course

The APICS course is offered as either an alternative or supplement to the Capstone Course. Students who do not wish to participate in a consulting experience, do not qualify for Capstone, or specifically want to work towards a CPIM certification enroll in the APICS course. CPIM certification is earned through the The Association for Supply Chain Management. The certification is recognized as one of the “premier certifications for internal supply chain business operations” (Certified, 2018). “The APICS course focuses on the design and management of systems that coordinate information and material flows within and between firms in a supply chain. It addresses planning basics, system alternatives, and advanced value stream synchronization. This course covers the topical material required by four of the five modules of the APICS Certified in Production and Inventory Management (CPIM) Program” (Mize, 2017, pg. 2-3).

Section III: Part I: Survey

When most adults reflect on their senior year of college, they do not recall spending countless hours and working late into the night to solve a problem for a Fortune 500 company. This is not the case for Capstone graduates. Because of this unique opportunity offered to GSCOM students, I wanted to define if Capstone added value to graduates careers during the first year post graduation compared to the APICS course. I defined this value-add to be the areas of: Job performance, job preparedness, skillset,

employment rate post-graduation, happiness related to opportunity to use skills/abilities from the GSCOM program during the first year career, organization commitment to development and training, overall career satisfaction, and salary. During the fall semester, I participated in the Capstone project and through this experience I crafted survey questions based off of value that I gained from the experience to analyze if previous participants of the program also gained the same value. I approached GSCOM professors to edit and add to my list. In December, I conducted the survey to graduates of the GSCOM program who participated in Capstone, APICS, and both courses. The responses were astoundingly positive and spoke to the quality of the programs and the immense value add potential to graduate careers.

I developed the survey questions by brainstorming what I believed graduates wanted in a first year career and how I defined my own success in the workplace. Once I created a rough draft of questions, I interviewed about ten peers in the GSCOM program and asked them how they defined on the job success and what they were looking for in a career post-graduation. After these two steps I presented my list to my thesis director, one of the Operations and Supply Chain Center professor, to edit and make additions to my list of questions. Once I had a final set of questions, I designed the survey so that I could differentiate between graduates of the Capstone program, APICS program, and graduates of both programs. This was a crucial design step to ensure I could compare and contrast the responses of specific program graduates. I administered the survey to 398 graduates and received 118 total responses. 65 respondents participated in the Capstone program, 33 in the APICS program, and 20 respondents participated in both Capstone and APICS. Survey participants were first asked if they participated in Capstone, APICS, or both programs. When the participants chose an option, they were directed to a set of questions

specific to their program of choice. For the Capstone questions, survey respondents answered the following questions on a 5 point scale ranging from strongly disagree, disagree, neutral, agree, strongly agree. I chose to use a likert scale because it is user friendly, non-intimidating, and “makes the assumption that attitudes can be measured” (Simple Psychology) The survey questions are as follows: .

Scale 1-5 (1= Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

- I applied specific Lean & Six Sigma concepts to complete work deliverables during my first year after graduation
- Participating in Capstone enhanced my performance during the first year of my career after graduation
- I felt more prepared in my role after graduation because of my Capstone experience; I use specific tools in my career that I learned from my Capstone experience
- Considering other first year co-workers/peers who have similar organizational roles/responsibilities, but did not complete the GSCOM program, I feel better prepared to accomplish my job tasks
- My Capstone experience played an important role in helping to secure employment after graduation.

Open Ended

- What aspect of your Capstone experience was the most valuable experience? (Examples could include “developing process simulations using modelling software, client facing experience, implementation of LSS [Lean Six Sigma] concepts, etc.)
- Were there any skills that you did not learn in your Capstone experience that would have benefited your first year role after graduation?

Graduates of the APICS program answer parallel questions in relation to their program on the same strongly disagree to strongly agree scale.

- Participating in APICS enhanced my performance during the first year of my career after graduation
- I felt more prepared in my role after graduation because of my APICS experience
- I use specific tools in my career that I learned from my APICS experience
- I am more competent in my role than my coworkers during my first year on the job after graduation because of my APICS experience
- My APICS experience played an important role in helping to secure employment after graduation.

Open Ended

- What aspect of your APICS experience was the most valuable for your first year after graduation
- Were there any skills that you did not learn in your APICS experience that would have benefited your first year in your role after graduation?

Survey participants who participated in both Capstone and APICS answered the same questions as above in regards to their Capstone and APICS experiences, respectively. Every survey participant answered the following questions on a 1-5 scale (1=Very Unhappy, 2=Unhappy, 3=Neutral, 4=Happy, 5=Very Happy).

- How happy are you with your opportunities to use your skills/abilities from the GSCOM program during your first career after graduation
- How happy are you with your organization's commitment to professional development during your first career after graduation

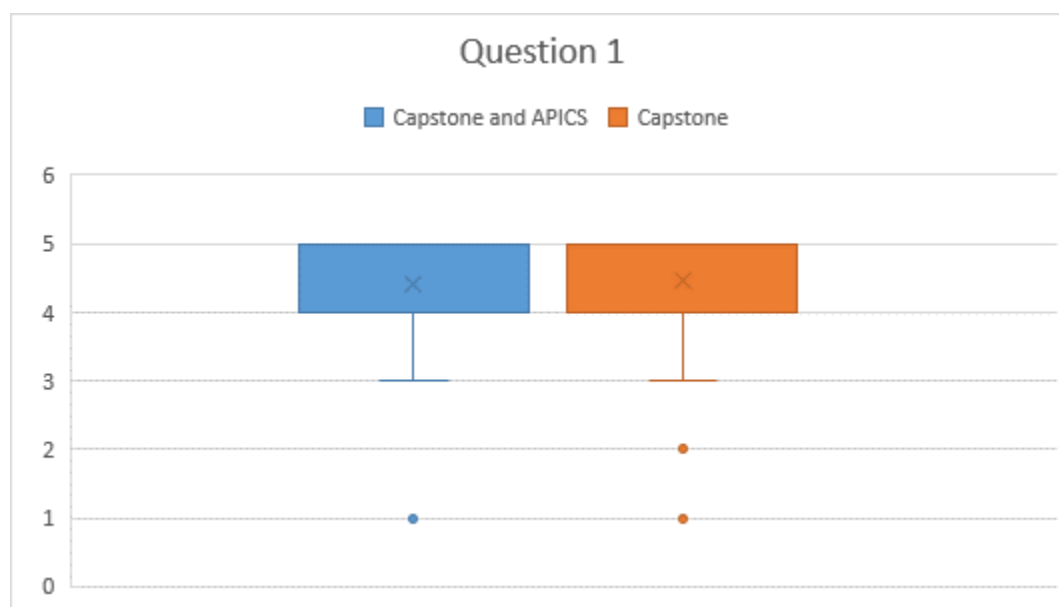
- How happy are you with your company-paid general training during your first career after graduation
- How overall satisfied are you with your first career after graduation
- What is your salary range (Answered on a scale of \$30,000-40,000, \$41,000-50,000, \$51,000-60,000, \$61,000-70,000, \$71,000-80,000, \$80,000+)
- Did you participate in an internship during college (Yes/No)
- What industry did you enter after college
- What company and position did you enter into after college
- What is your gender (Female, male, prefer not to say, other).

Part II: Survey Results

When participants entered the survey, they either selected that they only participated in Capstone, participated in both Capstone and APICS, or only participated in APICS. Each set answered the same questions, but the question was framed towards Capstone or APICS. Participants who selected both Capstone and APICS answered questions related to both program. The survey analysis compares the results between the three groups through box-and-whisker plots to analyze the response rate of strongly disagree, disagree, neutral, agree, and strongly agree to each question.

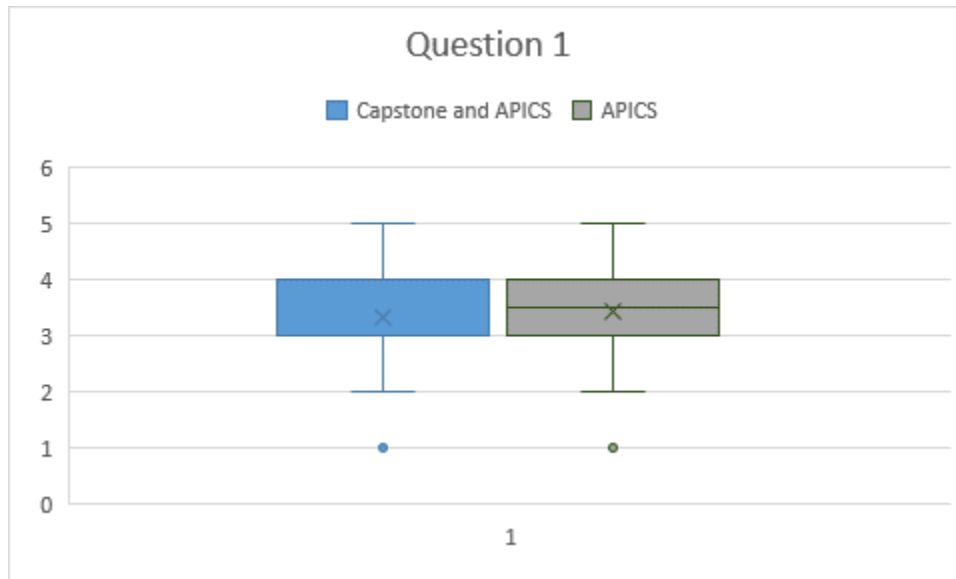
Question 1 (Capstone): Participating in Capstone enhanced my performance during the first year of my career after graduation.

75% of Capstone respondents reported that they agreed or strongly agreed with the statement. 75% of Capstone graduates of both programs also reported that they agreed or strongly agreed with the statement. The lower 25th quartile for both groups were neutral or agreed with the statement, with a few minimal disagree or strongly disagree responses for both.

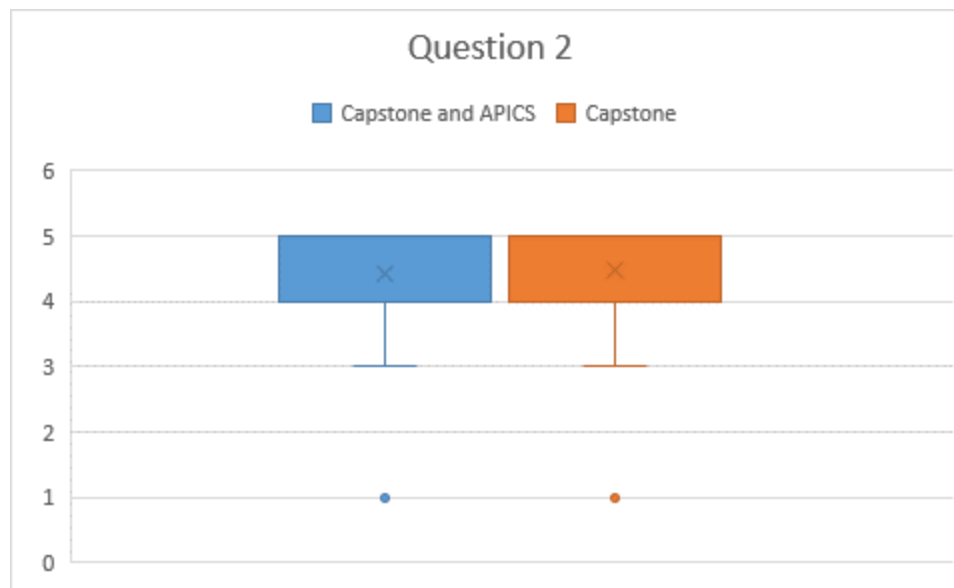


Question 1 (APICS): Participating in APICS enhanced my performance during the first year of my career after graduation.

APICS graduates and APICS graduates of both programs responded in the same pattern, with the majority of participants responding between neutral and agree, with both quartile 1 and 4 reaching to disagree and strongly agree.



Question 2 (Capstone): I felt more prepared in my role after graduation because of my Capstone experience.

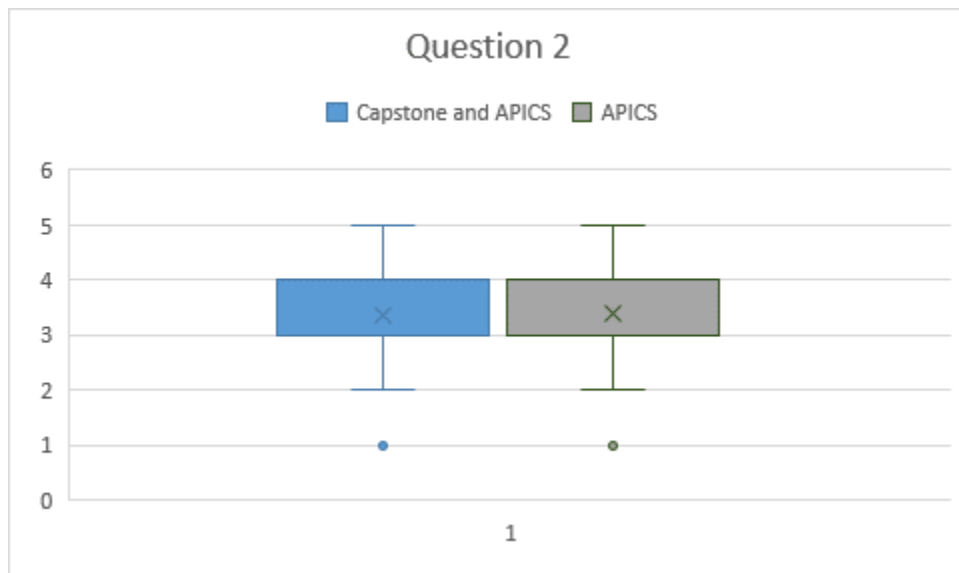


All Capstone graduates except for one reported that they were neutral or above, with the top three quartiles of respondents either agreeing or strongly agreeing with the statement.

Capstone graduates who participated in both programs also reported neutral or above, with the top three quartiles of respondents either agreeing or strongly agreeing with the statement.

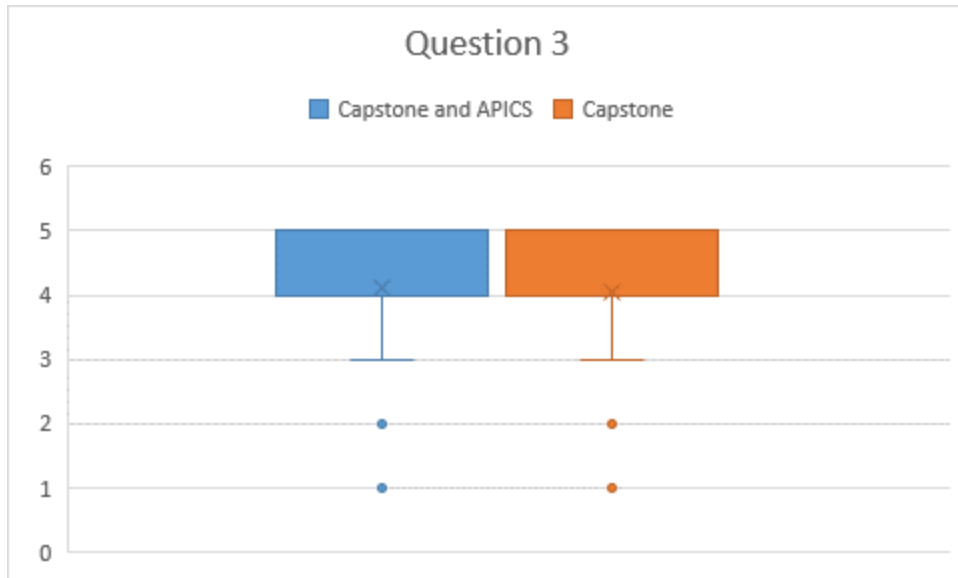
Question 2 (APICS): I felt more prepared in my role after graduation because of my APICS experience.

For APICS participants, only the top 25th quartile strongly agreed with the statement, with the median percentiles reporting that that they were neutral or agreed with the statement. APICS graduates of both programs responded in the same pattern.



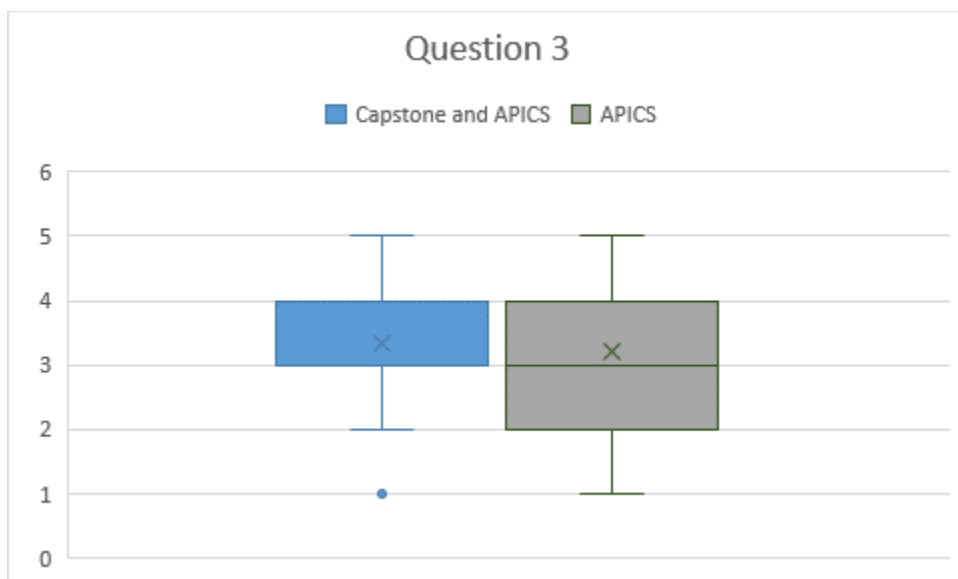
Question 3 (Capstone): I use specific tools in my career that I learned from my Capstone experience.

Nearly 100% of respondents were neutral, agreed, or strongly agreed with the statement. There were six respondents recorded that disagreed and strongly disagreed with the statement. Capstone graduates who participated in both programs followed the same pattern.



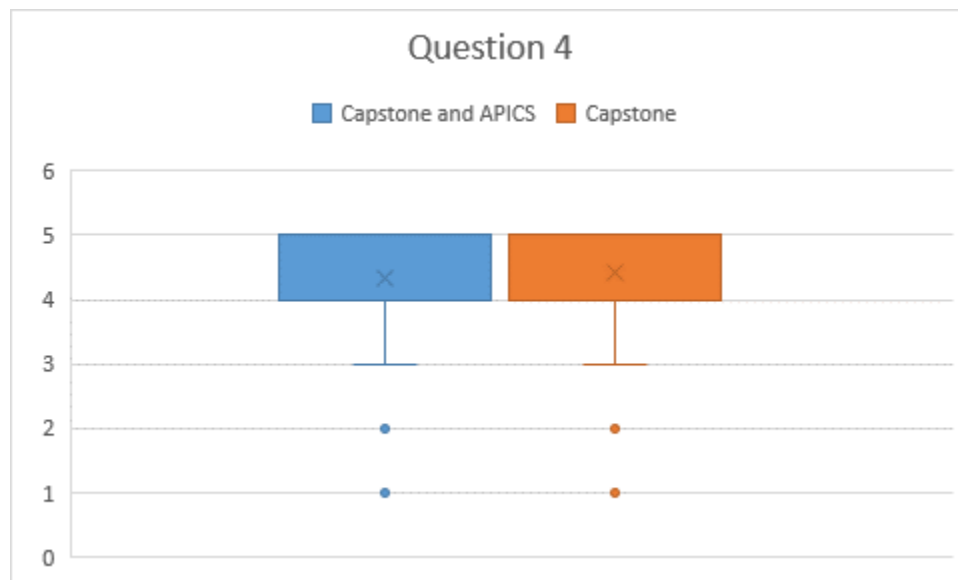
Question 3 (APICS): I use specific tools in my career that I learned from my APICS experience.

For APICS only graduates, the median response was between disagree and agree, with the first and last quartiles ranging from strongly disagree to strongly agree. The median response was neutral. Interestingly, when APICS graduates who also participated in Capstone were asked the same question, the median quartiles were neutral or agreed with the statement; with the outer quartiles ranging from disagree to strongly agree with an outlier who strongly disagreed.



Question 4 (Capstone): My Capstone experience played an important role in helping to secure employment after graduation.

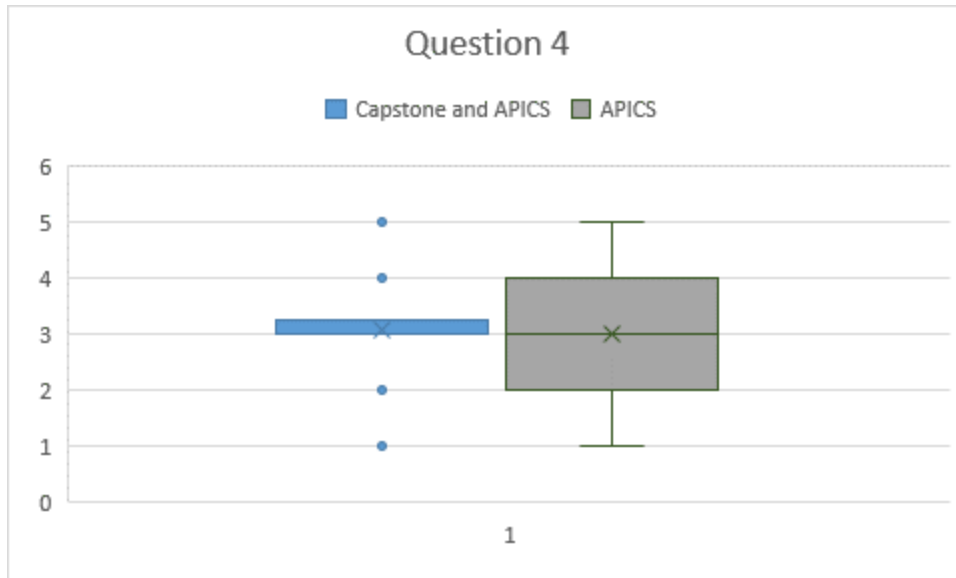
Capstone graduates overwhelmingly responded positively to this statement, with the top three quartiles ranging from agree to strongly agree. Capstone graduates of both programs also responded positively with the top three quartiles ranging from agree to strongly agree. The median values for the two groups both centered close to agree.



Question 4 (APICS): My APICS experience played an important role in helping to secure employment after graduation.

APICS graduates did not have the same overwhelming positive response. Only the top whisker recorded a strongly agree response. Furthermore, the first quartile of both groups reached strongly agree, contrastingly to Capstone respondents' lowest quartile reaching neutral.

Graduates of both programs centered around neutral that APICS played an important role in helping to secure employment after graduation, with no real pattern of response outside of neutral.



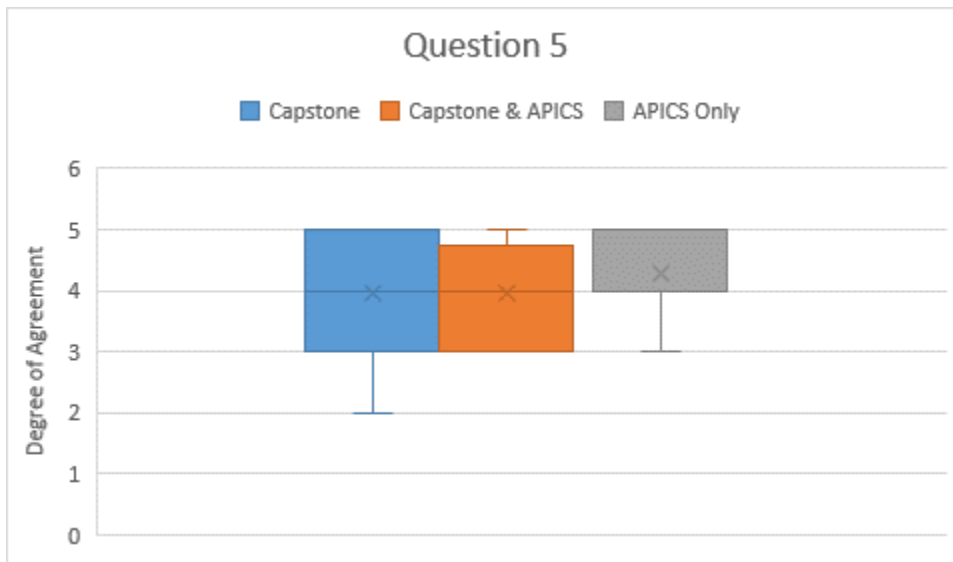
Section IV: Career Satisfaction

The following four questions were asked to all survey participants regardless of program participation to collect data on career satisfaction during their first year after graduation:

Question 5: How happy are you with your opportunities to use your skills/abilities from the GSCOM program during your first career after graduation?

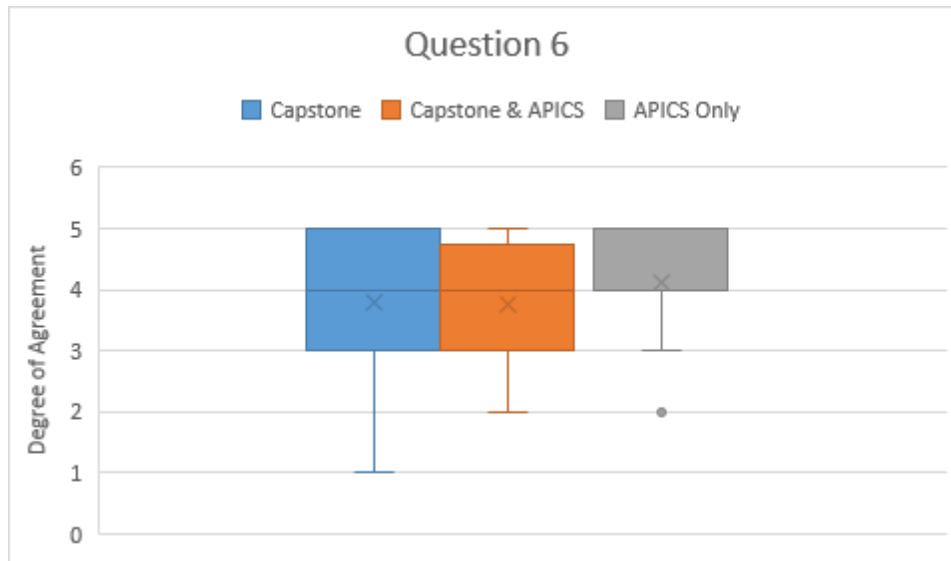
Graduates who participated in Capstone and APICS median response value was agree and approximately 75% of the response agreed and strongly agreed with the statement.

Graduates who only participated in APICS median centered slightly above agree, and approximately 75% of respondents strongly agreed with the statement, with the lower 25% ranging from neutral to agreeing with the statement.



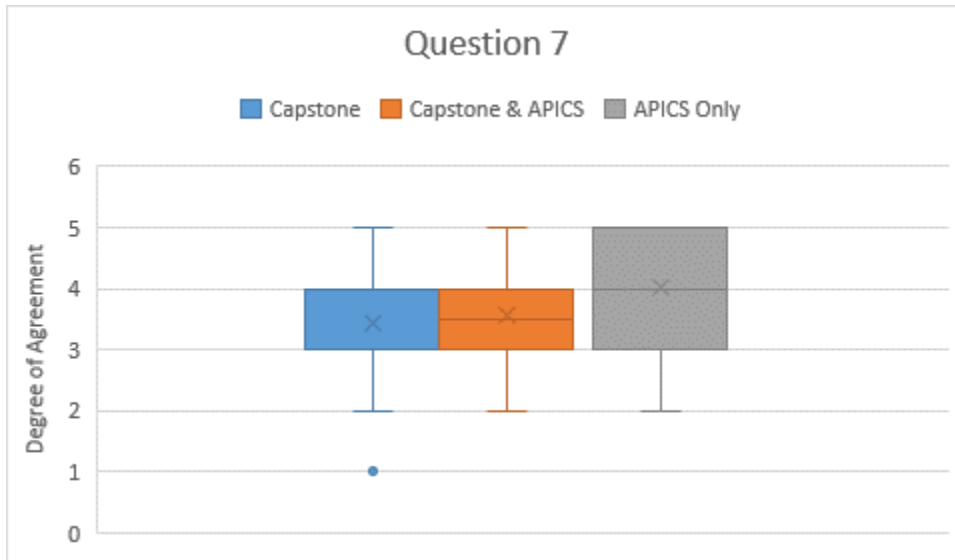
Question 6: How happy are you with your organization's commitment to professional development during your first career after graduation?

Capstone only participants and participants of both programs responses centered their median response near “agree”, with the 2nd and 3rd quartiles ranging from approximately neutral to strongly agree. APICS only participants also had a median response near agree, with the 2nd, 3rd, and 4th percentiles ranging from agree to strongly agree.



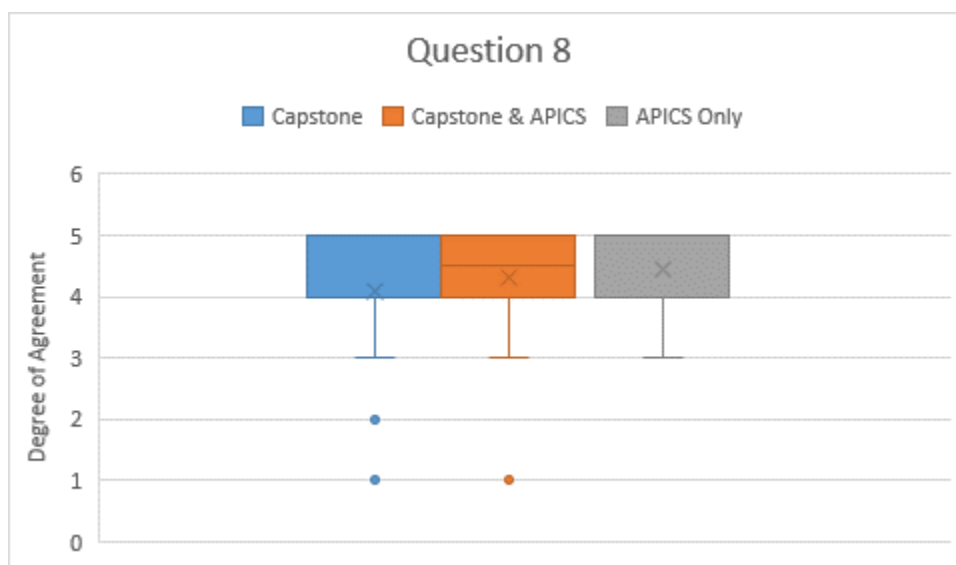
Question 7: How happy are you with your company-paid general training during your first career after graduation?

All survey groups fourth quartile reached strongly agree, so this is a positive source of feedback for the GSCOM department overall. Capstone only participants and Capstone & APICS participants median quartiles centered between neutral and agree, while APICS only participants top three quartiles ranged from agree to strongly agree.



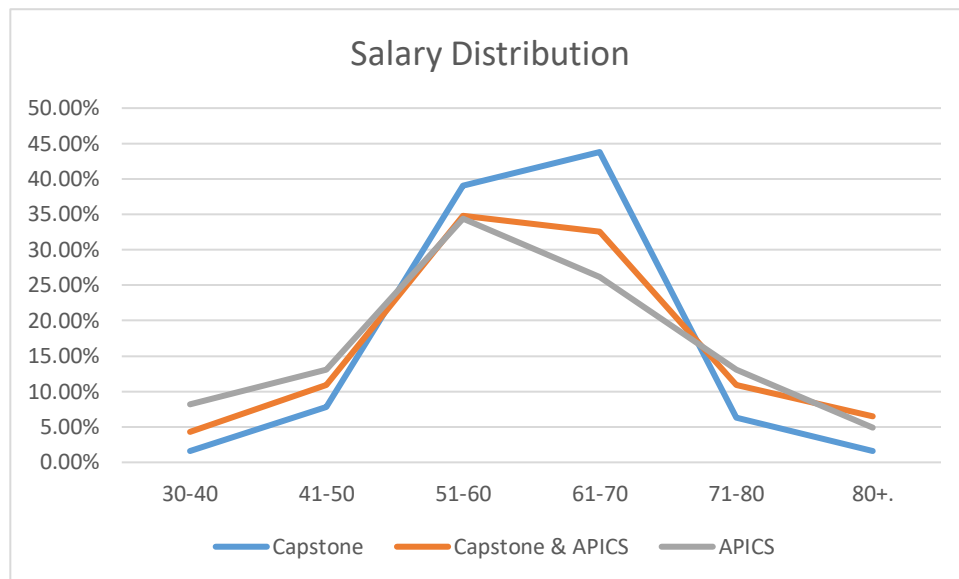
Question 8: How overall happy are you with your first career after graduation?

On a positive note for the entire GSCOM program, the top three quartiles for all three groups ranges from agree to strongly agree, with the lowest quartile beginning at neutral.



At the end of the survey, Capstone graduates were asked, “What aspect of your Capstone experience was the most valuable experience? (Examples could include creating Process Models, client facing experience, implementation of LSS concepts, etc.)” Overwhelmingly, the most common response was the aspect of client facing experience. Graduates found that real-world consulting experience was the most translatable skill gained from the experience.

Section V: Salary Analysis



Based on the salary responses, I composed a bell chart displaying the percentage of respondents in each salary range (thousands of dollars). The graph displays that the largest percentage of Capstone graduates earn between \$61,000-70,000 dollars per year during their first year after graduation. The majority of Capstone graduates in this category entered into the manufacturing, consulting, and finance industries. The majority of graduates who participated in

both Capstone & APICS earn between \$51,000-70,000 after graduation. The majority of Capstone & APICS graduates in this category entered into the manufacturing industry. The majority of APICS graduates earn \$51,000-60,000 dollars. These graduates mainly entered into the manufacturing industry. All three groups are represented in each range, with outliers in extreme categories. It should be noted that external factors including additional majors, geographic area, and other professional fields potentially skew some results of the salary analysis.

According to Payscale.com, the national average salary for an APICS CPIM certified professional ranges from \$54,185 for a Buyer role to \$91,809 as a Supply Chain Manager. The national average for a Lean Six Sigma Green Belt certified professional ranges from \$65,324 as an Industrial Engineer to \$82,365 as a Quality Manager. The range of salary levels reflects this national mean, therefore the majority of GSCOM graduates are effectively being placed into roles that reflect their abilities in the salary earned.

The top earners in each category by industry are as follows:

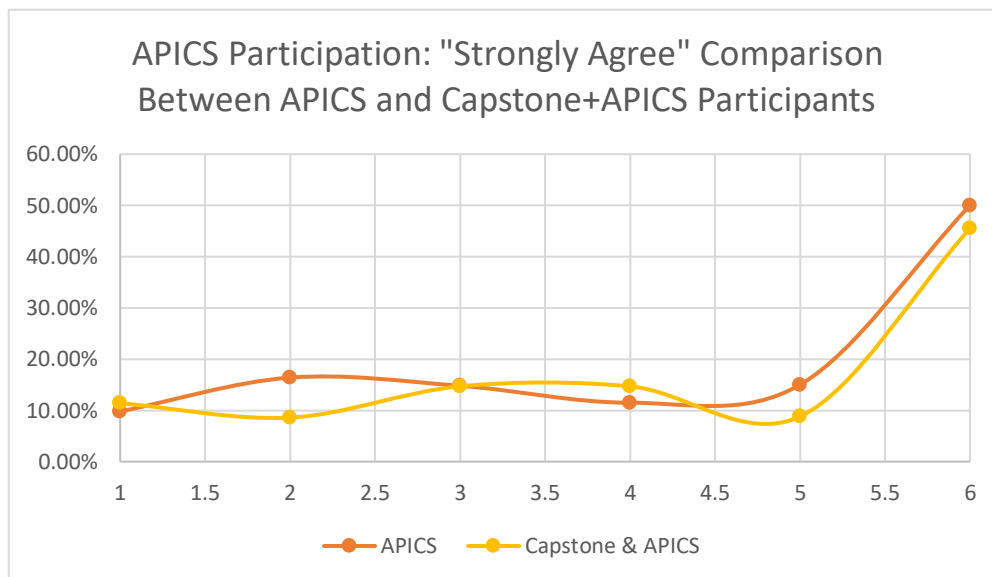
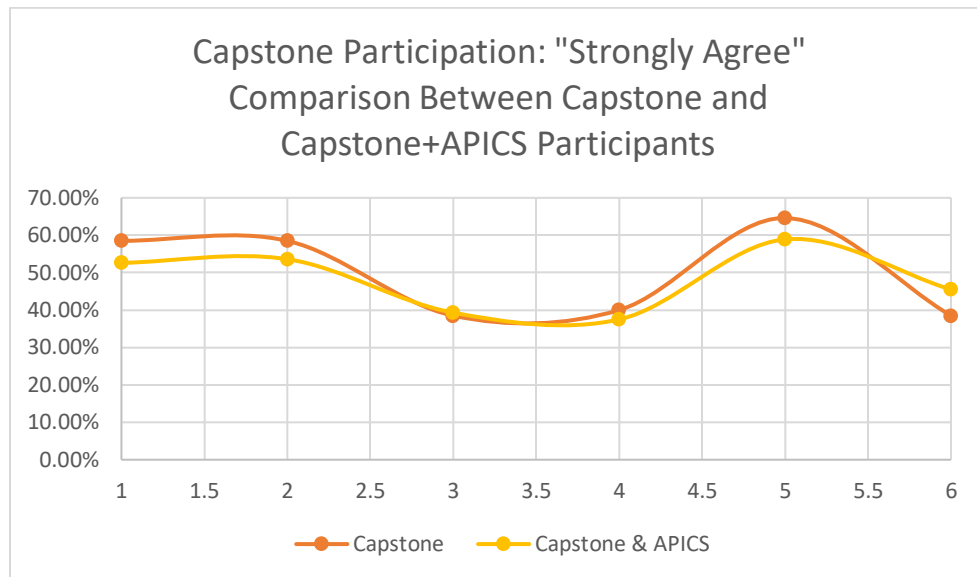
- APICS: Consulting, Sales, Defense Contracting
- Capstone: Consulting, Manufacturing, Service, Law School
- Capstone and APICS: Consulting, Manufacturing, Finance

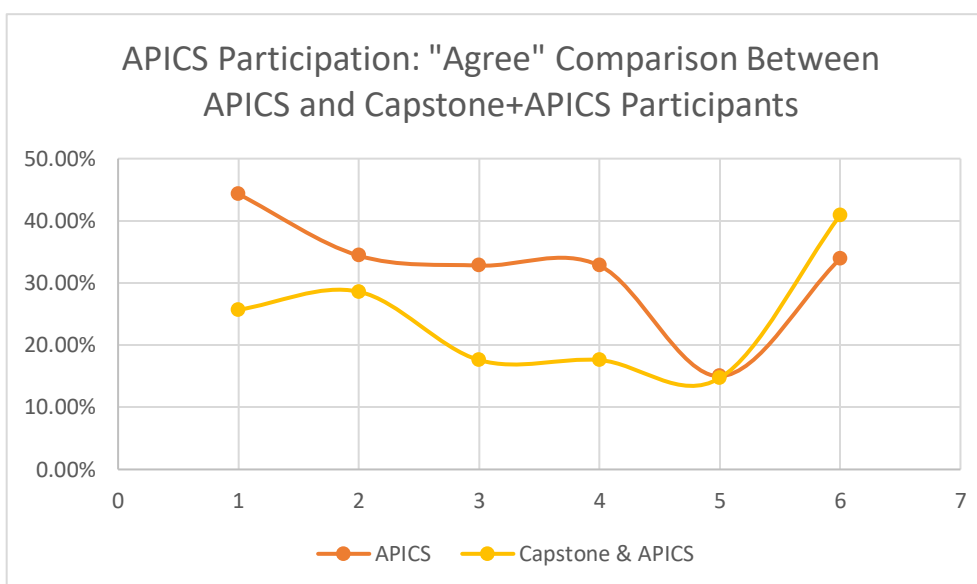
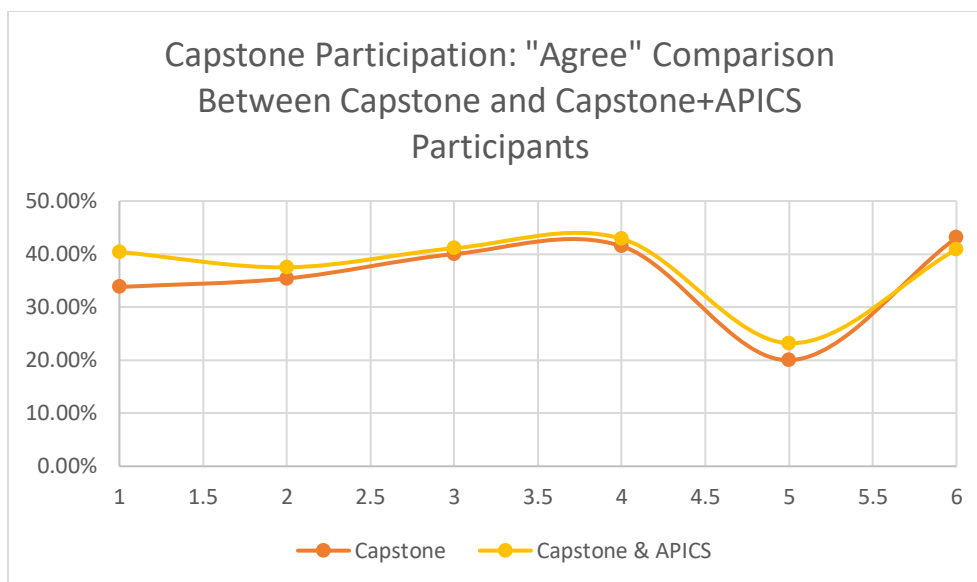
Conclusion

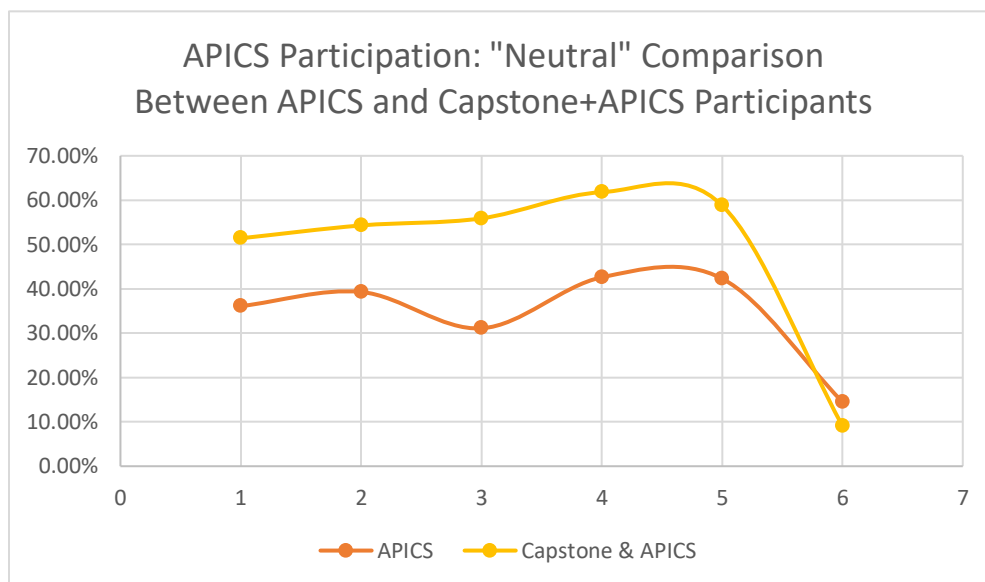
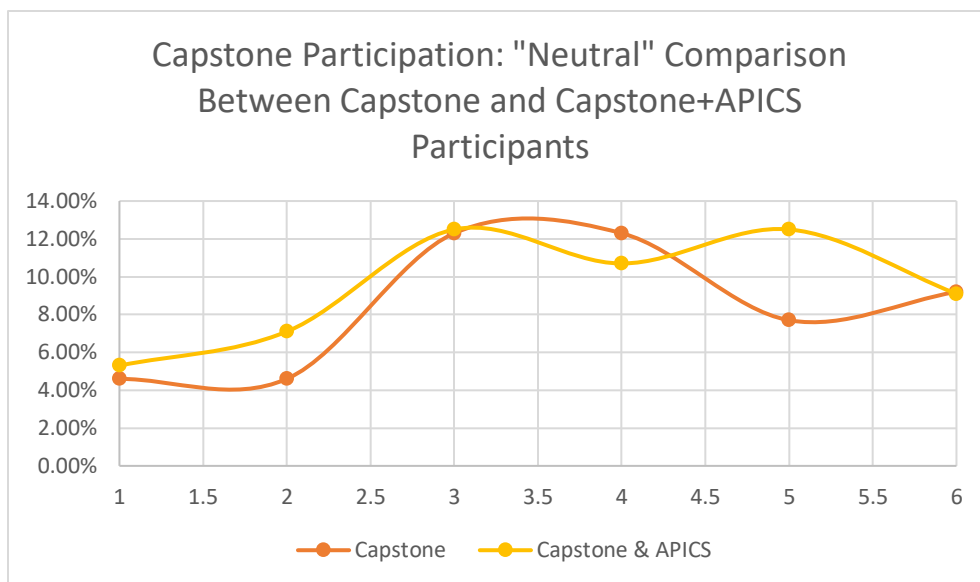
The Capstone program does add value to graduates' careers. This value is materialized in job-performance, career preparation, skillset, knowledge base, and salary enhancement. After analysis of questions 1-4, survey results indicate that Capstone graduates agree or strongly agree at a higher rate than APICS graduates that participation in Capstone enhanced their performance during their first year after graduation, Capstone helped them to feel more prepared in their role after graduation, Capstone provided them with specific tools they use in their first year career, and Capstone played an important role in securing employment for after graduation.

Furthermore, Capstone graduates are more likely to earn a higher salary than GSCOM graduates who did not participate in Capstone per salary results analysis. Finally, questions 5-8 regarding career satisfaction reveal that GSCOM graduates of both programs on average are happy or very happy with their organization's commitment to professional development, company-paid general training, opportunities to use their skills and abilities, and overall happy with their first career after graduation. The GSCOM faculty should be very proud and pleased with such a positive response for both Capstone and APICS programs regarding career satisfaction.

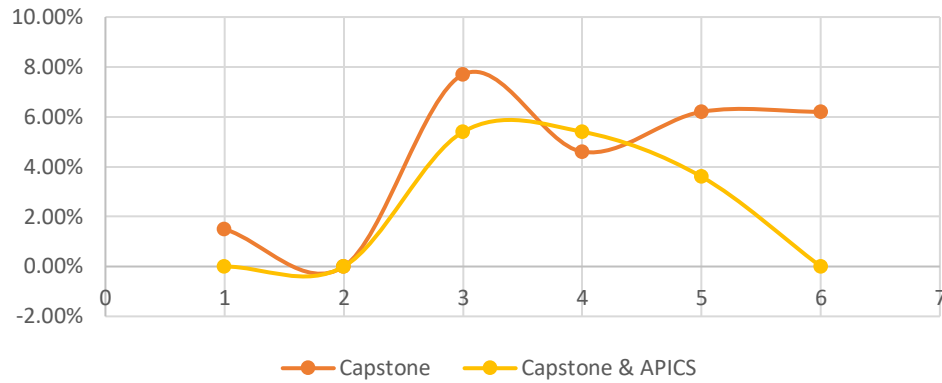
I hope my thesis has honored the Global Supply Chain & Operations Management Program at The University of South Carolina. As a graduating senior, I smile as I look back over my four years of education and opportunity at USC and specifically in GSCOM. My Capstone experience gave me confidence, tools, and experience I can carry with me to my next journey as a Consultant for Deloitte & Touche. I am thankful for my professors, mentors, and family for supporting me in my endeavors and preparing me for my professional career to the best of their ability.

Charts for Reference

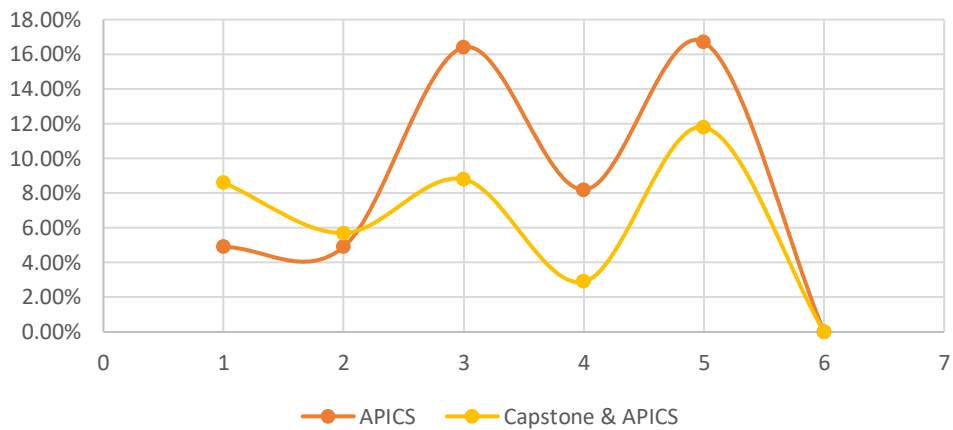


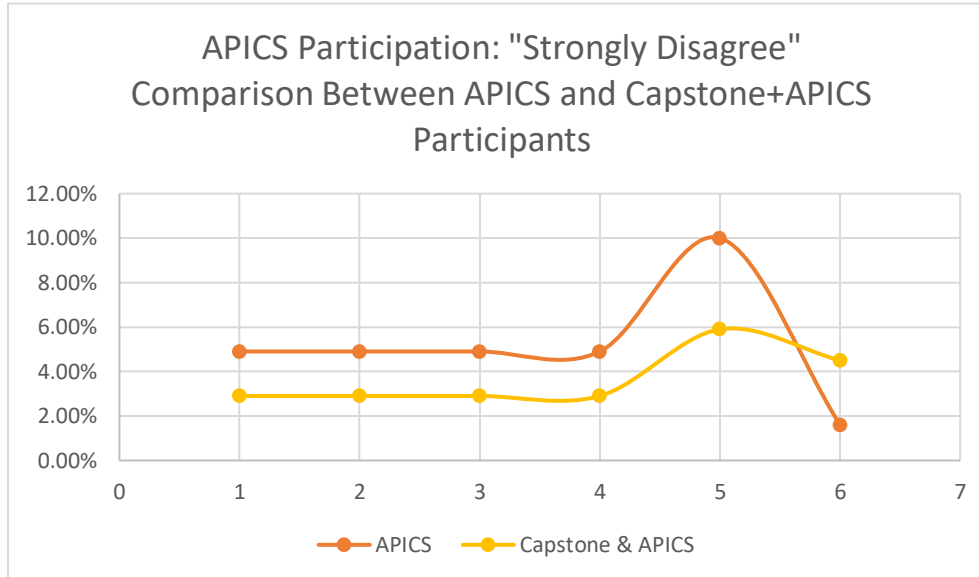
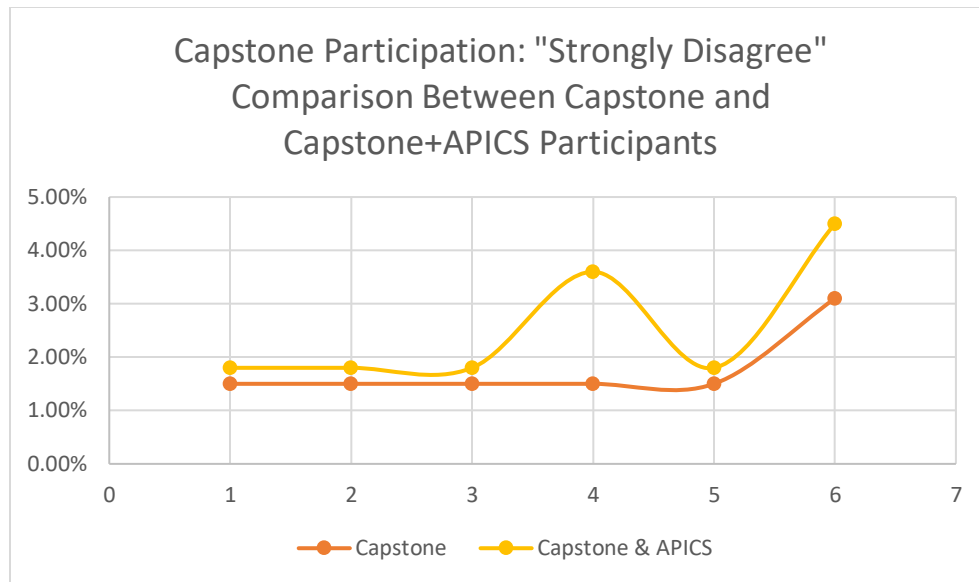


Capstone Participation: "Disagree" Comparison
Between Capstone and Capstone+APICS
Participants



APICS Participation: "Disagree" Comparison
Between APICS and Capstone+APICS Participants





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