PRESIDENT'S MESSAGE

STRATEGIC PRIORITIES

BONUS CONTENT - TECHNICAL ARTICLE
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OUTSIDE THE BOX

THE WORKFORCE CRISIS OF 2030 - AND HOW TO START SOLVING IT NOW

CLICK to watch Rainer Strack talk about “The Workforce Crisis of 2030 - and How to Start Solving It Now” presented by TED.

It sounds counterintuitive, but by 2030, many of the world’s largest economies will have more jobs than adult citizens to do those jobs. In this data-filled — and quite charming — talk, human resources expert Rainer Strack suggests that countries ought to look across borders for mobile and willing job seekers. But to do that, they need to start by changing the culture in their businesses.

Rainer Strack is a Senior Partner and Managing Director at the Boston Consulting Group, where he is the global leader of the HR topic. He has written numerous articles about human resources, such as on HR controlling and people business in 2005 and on demographic risk management and strategic workforce planning in 2008, both published in the Harvard Business Review.

Outside the Box will be a standing column designed to introduce new ideas and concepts from other resources and professions that may help stimulate a new way of thinking about total cost management. The views and opinions expressed are those of the authors and do not necessarily reflect the official policy or position of AACE International. We invite Source readers to send suggestions on other sources to editor@aacei.org.
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I am excited to share my second President’s Message with you and highlight some activities that the AACE Board of Directors and staff are working to deliver on your behalf. As I mentioned in my first President Message, we will constantly look to the future and implement ideas and strategies for the advantage of AACE International. In order to achieve our collective vision, we must have an energized and engaged membership. Regularly, we facilitate communication through membership surveys. Every few years a membership survey is conducted to gauge the changing viewpoint of membership and facilitate association strategic planning. This year’s membership survey identified four key process areas for research that were investigated by focus groups to plan, assess, and rank for strategic planning priorities.

The strategic planning process is very important as AACE is 59 years old. The needs of members, volunteers, and stakeholders have changed over time. It is imperative that our organization ensure we remain relevant and provide members with the best experience possible. To that end, we seek to engage membership and make it easier to connect; whether that is via email, the website, or on a mobile device. Based upon member feedback, a number of new initiatives have been identified and prioritized.

The second priority involves developing in-house course offerings in a modular format that includes quality educational and certification-based training programs for members and constituents that is available on-demand and virtual. This is also a key priority of the AACE Education Board. The goal is that the training will incorporate new technical guidance, including the TCM Framework and Recommended Practices from our Technical Board. This priority also reflects the continued commitment to update and improve the Skills and Knowledge series and study guides.

The third priority involves evaluating the Association brand and developing integrated and focused marketing strategies. Over 59 years, AACE has gone through three name changes. Originally named the American Association for Cost Engineering, our U.S.-based association needed to change in order to embrace our members from around the world. The name change to the Association for the Advancement of Cost Engineering demonstrated the global nature of the association. However, one more name change came approximately five years ago when the association formally changed again to AACE International with the tagline, “The Authority for Total Cost Management”. While AACE is “The Authority for Total Cost Management”, using this in...
the Association name is somewhat confusing. In order to ensure we remain relevant and to strengthen the AACE brand, we will be embarking on a brand exercise to develop a value, cohesive-based brand for AACE. As part of this process, we will be reaching out to members and stakeholders to get their feedback and opinion on AACE’s brand and the value that AACE provides to members.

Regarding marketing, we will expand our efforts to target major employers across multiple industries to educate about the benefits of AACE International. The AACE Past President’s council seeks to create an Ambassador program whereby senior project controls industry experts within AACE meet with key stakeholders and executives to highlight the corporate value proposition offered by AACE. Additionally, we plan to work more closely with the Schools of Construction Management and provide information and technical guidance to prepare students for careers in project controls.

The fourth priority is especially close to my heart as a key strategy for the future viability of the Association. We must innovate, attract, and embrace young professionals. We seek to engage young professionals and develop supporting programs to get them involved. Many ideas were brainstormed in this area; ranging from creating micro-volunteer opportunities, mentoring young professionals, encouraging recruitment at a section and regional events, and also partial sponsorship to attend either regional events or the Annual Meeting. The Board of Directors and the Young Professionals Committee will develop a cohesive program and plan for this strategic priority. If you have the same passion and wish to participate in this initiative, please contact me at: president@aacei.org.

As we move into our 60th year in 2016, we anticipate an invigorating and transformative year. We continually strive to raise the bar and provide members and constituents with great value for their membership. We urge you to actively welcome the change and embrace the future. We are soliciting feedback through the branding process. If you wish to provide feedback, please contact our Executive Director, Charity Golden, at cgolden@aacei.org. We would love to hear from you!

If you would like to contact our current president with questions or comments about The President’s Message please address your e-mail to president@aacei.org. To engage in other discussions, check out AACE International’s Online Forums at www.aacei.org/forums.
This June, Martin Darley, CCP, wrapped up a year of service as President of AACE and moved into the final year of the three year commitment that comes with being AACE President, starting out as President-Elect, serving as President, and concluding with a year as Past President.

Profiling his life and career, Darley says, “For many cost engineers this is still an accidental profession, or a secondary career path. AACE’s role is to continue to promote the profession to academia, industry, and the public.”

Darley is a native of the United Kingdom. Explaining how he became associated with AACE International, he says, “When I was leaving the UK 15 years ago, I was part of ACostE, a UK organization, and wanted to know how to remain engaged in “association” activity when I got to Houston. I was told to look up those “American Association of Cost Engineers!” I recently met some of that ACostE leadership in Washington, DC, and joked about that advice.”

Explaining why he has continued as an AACE member, he says, “Fortunately, I have had a long career, being a member of an Association of my peers keeps me anchored to my career. Through peaks and troughs of whatever industry you are in, you begin realize that there is great value in that.”

Coming from the UK, Darley’s initial experience with certifications was with the Royal Institution of Chartered Surveyors (RICS). He says, “I am Fellow of Royal Institution of Chartered Surveyors, as such I am a Chartered Quantity Surveyor, and a Chartered Project Manager.” However, he adds, “while there are elements of that organization that touch my industry, I had early in my career began to specialize in cost engineering, and to differentiate myself from property professionals.” Therefore, having become a Certified Cost Professional (CCP) results in his saying that, “AACE certification endorsed my cost engineering skills and knowledge.” In addition to obtaining his CCP with AACE, Darley notes that he has gathered several supplementary certifications and qualifications along the way, Value Engineering, Business Excellence, etc..., adding, “I also maintain company certifications necessary to carry out my job.” He refers to other knowledge gathered over his career years as having been from the “university of life.”

Darley says he believes in AACE and what the association offers its members. He sees the need to continually spread the word about AACE and try to ensure that those working in total cost management areas around the world learn of AACE, what membership benefits are provided and to be encouraged to join and become an AACE member. Therefore, talking about promoting AACE, Darley says he does this, “In everything I do.”

Darley is employed with Chevron as a Cost Engineering and Project Services (CEPS) Manager with the Chevron Project Resources Company (PRC) in Houston, Texas. Further explaining his job duties, he says, “I have two responsibilities: (a) deliver the project to a predictable cost and schedule; and, (b) develop organizational capability both internal and external to the company.” He adds, “My job description includes a requirement to build organizational capability. I do that through promoting cost engineering at every opportunity.” He says “helping others” is the most rewarding aspect of his job. He adds, “I have benefitted throughout my career from others helping me by being my coach, mentor, peer, or friend. Therefore, he sees the reward of helping others as simply paying back what he has received from others.

Having served as President-Elect, President, and now as Past President, involves a lot of time in addition to the normal challenges of a full time job and balancing work/life responsibilities. Darley says, “I achieve a work life balance by not differentiating between the two, so I am working or living 24/7 (LOL).” He says this is possible because, “I have tremendous support and understanding from my family, and my company. My wife has her own career and I try to reciprocate the support as much as is practical.” He continues, “With three grown up children and two grandchildren soon to be distributed across two continents and two states, family time is a challenging facet of my life. If, I get weekend time, my favorite pastime is to do nothing; chill ‘n’ grill on my deck by the pool with the dogs, and family.”

Asked if there was a defining moment in his life that made him decide to take the direction he has taken, he recalls when he was age 11, at a British Grammar school, and got his first A+. This was for a school project he did on the construction of the first supermarket in his home town. It was near his school and he says, “it was years before I got another A+. Nevertheless, this positive early rewarding experience involving construction helped influence his career path.

Darley says to list who most influenced his career direction, is a difficult question because there have been so many influencers. “If I was to pick one, it would be David Ridley, FRICS. He was partner of Faithful & Gould and first person to hire me. Back then they operated out of a small office in Stockton-On-Tees that used to be my family doctor’s former clinic. He was a Chartered QS, he never said no to any work challenge, to him everything was an opportunity,” recalls Darley.

In concluding his profile and thinking about what advice he would give those just entering cost engineering and TCM career paths, Darley says, “I am naturally biased. Cost engineering is a fantastic career and will present many wonderful opportunities. Get certified, build your networks, never stop learning. Life will change over time, and AACE will help you navigate through the transition points as you excel in your professional career.”

**Martin Darley served as AACE President in 2014-2015, and frequently delivered State of the Association updates throughout the year. He is shown above at the 2015 Annual Meeting in Las Vegas.**

**AACE President Julie K. Owen, CCC PSP, presents gifts to Martin Darley, CCP, at the 2015 Annual Meeting where Darley wrapped up his year of service as AACE President and moved into his final year on the Board of Directors, serving as Past President.**

**AACE Executive Director Charity A. Golden is shown at the 2015 Annual Meeting in Las Vegas presenting AACE President Martin Darley a bobble-head gift for his year of service.**
“Hold my calls ...
I’ll be at the AACE meeting in Toronto”

Celebrating Sixty Years of AACE Network with your peers!
Source magazine is initiating a new series this month, titled, "Meet the Board." In this month's article, you get to read about President-Elect John C. Livengood, Esq., CCP CFCC PSP FAACE.

"My life has been full of defining moments, but the most important for me and most people is the partner they choose. Caren and I have worked hard, had a great life, and now get to split our working time between Washington, DC, and San Francisco. I have been able to combine my architecture and legal training into a successful profession as a claims and schedule delay expert," explains Livengood.

His first real exposure to AACE International came when he wrote a technical paper for presentation as an AACE Transactions paper. He attended and presented at the 2002 Annual Meeting at the Doubletree Jantzen Beach Hotel, in Portland, OR. Prior to this, Livengood had been familiar with AACE's library on productivity in the late 1980s. After his first Annual Meeting attendance, it "seemed logical," for him to join and become an AACE member. He adds, "It seemed to be a great professional organization that dealt directly with schedule delay and claim (among other things)."

The President-Elect finds AACE certifications to be the most outstanding AACE product or service. He says he personally became certified as a Certified Cost Professional (CCP), Certified Forensic Cost Consultant (CFCC), and Planning and Scheduling Professional (PSP), because it seemed the logical thing to do and it has proven to be, "a great credential for work."

As networking opportunities are often cited by AACE members as one of the reasons they join the association, Livengood says, "I advocate regularly with construction professionals to promote AACE."

In addition to his support for AACE certifications, he says, "I also believe the educational material is first rate, only needing a better packaging to make it better known and more used." AACE recently hired a new Manager Education and work is progressing on moving educational content toward online learning modules. These have become the best practice presentation option for most associations and education providers.

Livengood is employed as a Managing Director with Navigant. As such, he says he, "runs projects associated with identification, development, analysis and avoidance of construction claims, usually as related to delay." Earlier in his career, he worked as an architect and then a construction attorney, prior to becoming a claims expert. He holds professional degrees and licenses in both areas.

He says the most rewarding aspect of his job with Navigant is that, "I get to work on large complicated projects." He believes establishing best practices for developing, analyzing, and avoiding construction claims is the most critical problem faced by people in his field. He has found that AACE is well equipped and suited to provide top quality professional resources in addressing these critical needs.

As noted in the introduction to this profile, Livengood explained that meeting and marrying his spouse, Caren, is what he considers the defining event of his life. The couple have been married since 1977. Caren teaches landscape architecture at AAU in San Francisco. Wikipedia, the free online encyclopedia, says, "The Academy of Art University (AAU), formerly Academy of Art College, is a privately owned for-profit art
school in San Francisco, California, United States. It was founded by Richard S. Stephens in 1929, and is now owned by the Stephens Institute. It has over 18,000 students, and claims to be the largest privately owned art and design school in the United States. It is one of the largest property owners in San Francisco, with the main campus located on New Montgomery Street in the South of Market district.”

John says he and his wife, “spend our non-work time exploring SF and California.” Discussing their family, he says, “my oldest child is married, lives in Philadelphia and is getting his MBA from Drexel. They have a new puppy. My second son lives in Washington and works for IBM as a project manager on TSA contracts. My daughter (youngest) is a pastry chief for the Willard Hotel in Washington.”

Preparing to become President of AACE at the 2016 Annual Meeting in Toronto, Livengood is willing to share his AACE and career experience with the next generation of younger professionals who are just joining AACE. He says, “Cost professionals in construction stand at an important time, one where our skills in predicting, estimating, planning and controlling costs, including time-costs is needed more than ever. We should be proud of our work and look to make our work better understood and widely acknowledged.”

Shown above Past President Martin Darley, CCP, presents AACE Fellow membership to President-Elect John C. Livengood, Esq., CCP CFCC PSP FAACE, at the 2015 AACE Annual Meeting in Las Vegas.

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Caren and John Livengood are shown above exploring Yosemite National Park in their new home state of California. On October 1, 2015, the park will commemorate the 125th anniversary of its establishment. First protected in 1864, Yosemite National Park is best known for its waterfalls, but within its nearly 1,200 square miles, you can find deep valleys, grand meadows, ancient giant sequoias, a vast wilderness area, and much more. Yosemite National Park is set within California’s Sierra Nevada mountains. It’s famed for its giant, ancient sequoias, and for Tunnel View, the iconic vista of towering Bridalveil Fall and the granite cliffs of El Capitan and Half Dome.
Becoming a **Certified Cost Professional** is a proven way to enhance your value to employers and clients by providing an impartial endorsement of your knowledge and expertise.

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ne way to measure the quality of a certification program is to evaluate its accreditation status. There is a common misconception about certification and accreditation, in that most people use these terms interchangeably. However, there is a distinct difference. Certification is an extensive evaluation of a person or artifact to measure an acceptable competency against an established standard or required skills and knowledge. Accreditation is an extensive evaluation of a certification organization or program by a neutral third party to ensure established industry standards and guidelines are met. Simply put, accreditation is a form of certification for the certifying organization, requiring conformance with standards of validity, reliability, and impartiality.

There are three major accreditation bodies established to address the accreditation needs for certifying organizations: The National Commission for Certifying Agencies (NCCA), American National Standards Institute (ANSI), and The Council of Engineering and Scientific Specialty Boards (CESB). All three offer comparable standards, guidelines and criteria, but only one is industry specific: CESB. NCCA and ANSI are applicable to all professions and industries, whether it is healthcare or personal training, whereas CESB is focused solely on engineering and scientific industries. For this reason, AACE International has chosen to achieve and maintain accreditation of its certification program with CESB, due to their concentration of engineering and scientific certification programs, which is much more compatible with the mission and vision of AACE International.

The Council of Engineering and Scientific Specialty Boards (CESB) is an independent, voluntary membership body created for its member organizations that recognize, through specialty certification, the expertise of individuals practicing in engineering and scientific fields. Its creation on April 24, 1990, was the culmination of organizing work by volunteers from among the 130 attendees (23 organizations represented) who participated in the April 1988 National Conference on Engineering Specialty Certification.

As an accrediting body, CESB provides basic criteria and guidelines for the establishment and operation of specialty certification programs for engineers, technologists, technicians, and related scientific professionals, and serves as a recognizing body for organizations that certify individuals in the United States and internationally. They also exist to provide representation of its members in communications, and when appropriate, in negotiations with public and private agencies, groups, and individuals with respect to matters of common interest. CESB is governed by the members through actions at its annual meeting and through an elected executive committee. The member boards of CESB are not-for-profit organizations operating certification programs.

AACE International is proud to achieve CESB’s accreditation for the Certified Cost Technician (CCT), Certified Cost Professional (CCP), Certified Estimating Professional (CEP), and Planning and Scheduling Professional (PSP) credentials. Similarly to the recertification process each certificant must complete every three years in order to maintain their AACE credentials, the CCT, CCP, CEP,
EVP and PSP programs must themselves undergo periodic re-review for reaccreditation by CESB.

Maintaining the accreditation status of these programs assures that our certification process and related operations conform to accepted standards and best practices in the engineering and scientific specialty community and the credentialing industry. It also enhances the value of AACE credentials, by demonstrating they have successfully completed a rigorous application and examination process that has been reviewed and found worthy by an independent third party. The CCT, CCP, CEP, EVP, and PSP credentials administered by AACE International meet the high standards for accreditation by CESB.

For more information about CESB accreditation, please contact the certification department at certification@aacei.org or visit the CESB website at www.cesb.org.

**USING PERSONALITY STYLES TO GET MORE FROM YOUR EMPLOYEES**

*Bob Phibbs*

Employers have tried everything to get employees to become the employee they are looking to hire. Many try to hire the natural born salesperson. That doesn’t really work because they are few and far between, but by leveraging their personality styles, their innate abilities will help them be the employee you want them to be.

Everyone can sell. In fact, each of us is selling every day—even if we never call it that. Once you understand the four personality styles, you can train your employees to connect with customers quickly by understanding that everyone has a dominant personality style.

- **Driver**, like Gordon Ramsay, where it is all about them being the best, smartest, and known as a decision maker. The downside is they can be seen as inflexible and always trying to close. Any villain you see in a movie is usually a Driver.
- **Analytical**, like Spock on Star Trek, who is logical and has a detailed system to process information. Their Achilles’ heel is that they can come off cold and uncaring. Surgeons, CPAs, and most craftspeople, are usually an Analytical personality.
- **Expressive** is like the character Jack in the movie Titanic who tries a lot of things, is easily bored, and has unbridled enthusiasm. They are also the least likely to be found in retail these days. Why? Because on a beautiful day they’ll probably call in sick.
- **Amiable** is by far the most common personality you’ll find in stores. Amiables possess a strong desire to be liked and learn about others without sharing many details of their own lives. The downside is that they don’t stand out or make demands, and it takes a lot to make them visibly upset, so you never know when they are considering quitting.

Those employers who master personality styles are able to have meaningful conversations that value both the customer and the employee. And that leads to higher productivity. But first you need to leverage their innate abilities.

- If your employee is predominantly a Driver, their number one goal is to get something finished. You need to help them round off those gruff edges and reduce the chance they can come off as arrogant.
- If your employee is predominantly an Analytical, you need to train with a clear system of A to B to C, so engaging a customer isn’t scary and makes sense. Be prepared to answer each of their many questions.
- If your employee is predominantly an Expressive, you want to harness their fun. You would not want to try to train them like an Analytical and rain on their parade. Use their easily distracted interests and enthusiasm for new items as a sparkplug for the rest of your crew.
- If your employee is predominantly an Amiable, they’ll want to get along with no conflict. Teaching them how the other three personalities operate can show them how to avoid frustration and conflict. Understand that they are the least likely to be natural born salespeople and most afraid of engaging strangers—so be patient.

Here are the dos and don’ts of training your employees by personality style:

- There are no good or bad personality types—we all have elements of each. And while the Driver and Expressive have the highest risk tolerance, it does not mean that they are the only ones who can sell. That’s because personality types feel comfortable with people who can talk to them the way they like to be talked to.
- So an Amiable selling to an Amiable, with proper training can sell just as much as a Driver—sometimes more.

The varying personality types that comprise your staff need to be handled in a very specific, tailored manner. By understanding the unique motivators of Drivers, Analyticals, Expressives and Amiables, you can begin to better manage your retail sales and customer service employees.

Not sure what your own personality style is? Take a free personality quiz here: [http://www.retaildoc.com/take-the-personality-quiz](http://www.retaildoc.com/take-the-personality-quiz)

**ABOUT THE AUTHOR**

Bob Phibbs is the CEO of *The Retail Doctor*, a New York consultancy. As a speaker, sales consultant and author of *The Retail Doctor’s Guide to Growing Your Business*, Bob has helped thousands of businesses since 1994.
Belkis Rodriguez, CEP is a successful senior cost estimator who started to take her first steps in project controls in the oil and gas industry in Venezuela. She was born in one of the first oil-field camps in Lagunillas, western Venezuela. She graduated with a Bachelor of Science in Civil Engineering degree in 1989. She immediately began her career in a government department for civil infrastructure in Maracaibo; but as she wanted to follow her dad’s steps in the oil and gas industry, she quickly accepted a position as a civil engineer designing hydraulic structures in Lagunillas. A few years later, she wanted to complement her design experience with site experience and accepted a position as an earthworks supervisor with Petroleos de Venezuela S.A. (PDVSA).

It wasn’t until 1996 that an opportunity came up in PDVSA to work as a cost estimator for the different onshore and offshore infrastructure projects for Maracaibo Lake. It was her mentor in PDVSA (Haydee de Trujillo) who pushed her in 2000 to participate in the first IPA meeting in Virginia (USA), on behalf of PDVSA. Later, in 2002, she participated in her first AACE Annual Meeting in Washington, DC, and had a taste of the different areas within project controls. Those experiences let her expand her knowledge of cost engineering. Inspired by her mentor, she decided to work toward a master of science degree in project management. At the same time, she started teaching cost estimating at University Rafael Belloso Chacin’s Project Controls’ Certification Program.

In 2004, after finishing her MSc, she decided to explore new horizons in the US and Canada. In 2006, she was hired as a cost estimator by ConocoPhillips and transferred to Calgary, Canada. She was lucky to find another mentor at ConocoPhillips (Graciela Garcia) who guided her first steps abroad from Venezuela. There, she became a member of AACE in 2006, and became an AACE certified Cost Estimating Professional (CEP) in 2011. She continued leveraging her project management expertise by getting the PMP (Project Management Professional) certification in 2014. In her years as a successful senior cost estimator, she has developed and reviewed cost estimates for oil sands’ mega proj-

Being a member and participating in the Annual AACE Meetings has been a way to share knowledge and keep me updated in my area of expertise. It has allowed me to learn what other companies are doing in cost engineering. It’s also a perfect forum for networking opportunities.
In the future, I’m planning to participate more actively in the Women in Project Controls Committee.

Men and women communicate differently. Both genders have been known to be frustrated by these differences. We do share one true objective when we speak, and that is to be heard. All of us have something of import to convey. As the speaker you are hoping that you can influence and shift your peers.

So how do women lead? Women frequently build rapport first and then follow with a keen sense of the bottom line. The art of building rapport achieves two primary things. First off bonding with your peers creates a sense of camaraderie. This provides a platform for building trust. Trust is crucial if your colleagues are going to consider partnering with you. Secondly and equally important, vetting your ideas allows for a robust discussion. From here you discover alternate views. This is an inclusive style of communication. There is a significant difference in telling others what should be done versus establishing a platform for collaborative input.

Men and women need to appreciate that both genders are neurologically wired in distinct ways. From a business perspective this difference is an important strategic device. Both styles of communication when understood and respected increase the likelihood of driving towards profitable outcomes. Determining a course of action involves a SWAT analysis and ensuring you have everybody on board. Extensive data supports the notion that companies that encourage diversity of thought outperform those that don’t.

Here’s what’s critical. Being told to follow the leader doesn’t necessarily translate into genuine followership. Troops may move along, but they may be doing so in a blind fashion. Leaders may appear to agree on the surface, but in reality proceed with their own course of action.

Creating a platform for diversity of thought involves much more than having diverse thinkers at the table. That’s the easy part. Leaders need to do more than just understand how vital this is for their organization. They need to take a proactive stand and serve as a lightning rod for disruptive thinking.

It is about extracting key lessons from female leaders playbooks. Based upon neurological wiring women naturally start with fostering an environment that encourages other views. Women ask for input, women ask great questions, and women encourage being challenged not for the art of debate but rather to advance thinking.

Women in the short term appear as though they are meandering or take the long route to get to where they hope to land. Contrary to popular belief this approach is more expedient. This style increases the likelihood of teams working collectively with shared goals rather than acting as siloed contributors.

Lessons learned from female leaders you ask? First determine your ask. Do you have a concise and cogent business case? Once that’s well articulated you then require strong influencing skills.

Female leaders take time to understand the motivation of each of their peers and team members. They do this by "suggesting" an approach. This paves the way for open and transparent dialogue. The premise is that everybody at the table should have a point of view and many of these perspectives have merit. Together and collectively the approach is then shaped.

The net result is each member has contributed and now owns substantial piece. This ensures greater accountability and investment.

The choice is yours. You can impose your views or you can facilitate dialogue. Women generally excel at this. Ensuring that a results driven approach is balanced with true partnering enables both male and female leaders to present with a highly competitive advantage.
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The AACE Career Center helps streamline your hiring process with unmatched exposure for job listing and, higher quality candidates. Because AACE members are among the most skilled and best trained total cost management professionals in the world, the AACE Career Center offers a highly targeted pool of exceptional talent, which is an asset to your business.

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About AACE International
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Promoting the planning and management of projects, programs, and portfolios, AACE International is the largest organization serving the entire spectrum of project management professionals. AACE International is industry independent, and has members in over 80 countries.

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Keerthi Vivek Sundaresan, CCT, is originally from Coimbatore, India. As a teenager, he was fascinated with learning programming languages and this fueled his passion to pursue information systems to solve business problems. He attended PSG College of Technology, a world-class engineering college in Coimbatore, India. While at PSG, he studied production engineering and obtained his bachelor’s degree.

He began his career as a software developer for Cognizant Technology Solutions, a fortune 500 information technology company. Soon after, he had the opportunity to lead over four major software development projects in India, the United States, and China. After seven years, he decided to pursue his master’s degree. He moved to Canada and obtained a master’s in business administration from the University of Calgary. While pursuing his master’s, he also developed an Android Application “Oil Handbook” that provides useful financial, project management and engineering tools for the oil industry. This application is currently used by over 7,300 users globally.

With a strong background and passion in project management, Keerthi was naturally interested in project controls. Ultimately, the potential for business transformation through strategic project management and execution motivated Keerthi to get into project controls. Post MBA, he had the opportunity to get mentored by a project services manager at Chevron Corporation. Keerthi currently works as a cost analyst for brownfield and maintenance projects at ConocoPhillips, Canada.

Keerthi has been an AACE International member since 2013. In 2014, he completed his Certified Cost Technician (CCT) certification. He values his AACE membership as it provides access to high-quality technical materials and in-depth applications for key cost engineering concepts. Keerthi says, ‘the bi-monthly journal and publications are a reservoir of knowledge on industry-wide best practices and innovative solutions in project controls.’ He enjoys networking and meeting leaders and experts in this field and learning from their experiences.

Keerthi advises others to take advantage of the opportunities available through AACE International. He says, “Each day in life should be an opportunity to learn, innovate, contribute and collaborate with highly motivated and talented individuals. AACE provides such an opportunity through resources of mentorship, networking and continuous learning.”
Simplifying Cash Flow Analysis to Be an Effective and Manageable Tool

Jake Ortego, PE and Antonio Fratangelo, CCP

Abstract: Because of the perceived complexity, many construction projects often abandon tracking actual cash flow as a tool to monitor and trend progress. There is a belief that the initial cash flow curve ceases to represent an accurate model of the project as changes are made to the project scope and schedule. Many small to medium size projects may not have the technical resources to perform a detailed cash flow analysis, and therefore they only use a basic S-curve as their model.

This article will discuss three simplified, yet dynamic, concepts of cash flow modeling that can be applied to construction projects to help make the cash flow tool more accurate and possibly more manageable. These concepts are:

- Discussion of dynamic equations to model cash flow curves for major cost categories.
- Stacking of major cost category cash flow curves to build the base curve.
- Adjusting the cash flow curves to account for changes at the summary level.

It is the intent that these approaches may allow cash flow analysis to be a useful and manageable tool for a wide range of construction projects.

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The Problem

Cash flow projections can be a useful tool in understanding a project’s progress and can be a major factor in identifying potential risks on a project. Hyung Park, Seung Han, and Jeffery Russell, in an article titled, “Cash Flow Forecasting Model for General Contractors Using Moving Weights of Cost Categories” that was published in the October 2005 ASAE Journal of Management in Engineering, these authors say, “Cash is the most important of a construction company’s resources [6].” However, cash flow models are often not created, or their use is abandoned early in projects, particularly when projects begin having changes to scope and schedule. One of the most prevalent reasons for abandoning cash flow models is a lack of project control professionals in certain major construction industries. Trained and experienced professionals are common on industrial, utility, and large...
government projects; however, they are a rarity in health care, higher education, hospitality, commercial, retail, and residential sectors. As more general contractors seek to reinvent themselves as construction managers, the project controls professional is often overlooked as an integral part of the project team. The result is that forecasting and projections are typically left to the project manager and tracking is delegated to a clerk level position. Creating and using cash flow models can be daunting to someone without the proper experience. Additionally, many contractors believe that the cash flow model is only for the benefit of the owner, and are reluctant to make it part of their controls unless it is specifically requested. However, cash flow models can be very useful for the contractor to understand the health of his or her firm and the potential project risks.

Cash Flow and Construction

Cash flow on a construction project is not the same as operating cash flow, which is a typical operation in many businesses. In construction, cash flow is typically a model that shows the planned and actual expenditures for the project for each month over the duration of the project. A cash flow model may be used to help plan the level of funding needed at a discrete point in time. It may be used as a tool to provide input and validation for the schedule performance and cost performance indicators. It can also be used for input on the project forecasting and trending. Analysis of the deviations from planned cash flow can be used by the entire project team in conjunction with schedule analysis, or as a stand-alone tool, as an early indicator of potential risks. The results can be used to determine if and when corrective action may be needed. In a white paper by Mark Chen, titled, “ABC of Cash Flow Projections,” the question is asked “… is the project truly ahead of schedule or headed toward the inevitable final cost overrun if the actual spending is too fast? Conversely, when the actual spending is too slow, is the project behind schedule or is it expected to achieve a budget underrun?”[2].

Cash flow can be used as a practical cross-check against planned resources and billed resources. The results can often answer the question of is it realistic for a certain level of cost to be expended during a period, given the amount of labor resources and incoming material. Cash flow can also go beyond the confines of the physical project. Contractors can use the model to help determine their potential billings against receivables. The firm that is providing funding can use it to help analyze their financing position and optimize their funding draws.

In short, cash-flow can be a useful tool for the entire project team. However, the cash flow model must be both realistic and manageable in order to be truly effective.

Why is Cash Flow Analysis Not Created or Abandoned?

There are a few reasons why cash flow models are not created. One is not understanding its usefulness. Another is the time and effort needed to develop one. A third reason is that many people are intimidated by the algebraic equations needed for proper analysis. When cash flow models are created, they can quickly become outdated because of three primary reasons. First, they are overly simple or summary oriented. A basic curve may be good for a preliminary forecast, but will be less effective as a performance tool. The

Figure 1 – Cash Flow Curve Comparison Between Standard Deviation and a Sine Equation
second reason is that they are too complex. A very complex model based on finite schedule activities or resource loading can quickly become out-of-date because of the time it may take to update and track the actual cash flow. The third and most likely reason, is that the model no longer reflects the actual forecast and progress of the project because of changes in the total budget and duration.

One of the fundamental challenges in creating a cash flow curve is in generating the baseline monthly distributions and subsequent S-curve. The distributions are typically based on a traditional bell curve, using either a standard deviation approach or a sine function. Figure 1 shows a comparison of the distributions based on these equations.

Figure 1 uses the following equation for standard distribution:

\[
\text{Distribution } (y) = \frac{1}{\sqrt{2\pi \sigma^2}} e^{-\frac{(t-\mu)^2}{2\sigma^2}}
\]

Equation 1

\( y = \) Periodic Distribution – This is the Y axis value.
\( \sigma = \) Expected Standard Deviation - Set to 0.04 for figure 1
\( \mu = \) Mean (or mid point) – Set to 50 for figure 1
\( t = \) Specific point in time of the project as a percentage of the total duration (X axis)

Figure 1 uses the following equation for the Sine function

\[
\text{Distribution } (y) = A \sin(2\pi ft + \phi)
\]

Equation 2

\( y = \) Periodic Distribution – This is the Y axis value.
\( A = \) Amplitude – Set to 1 for figure 1
\( f = \) Frequency - Set to 0.5 for figure 1
\( \phi = \) Offset – Set to 0 for figure 1
\( t = \) Specific point in time of the project as a percentage of the total duration (X axis)

Both equations have two primary variables that can be used to control the curve beyond the X-axis variable of time. The starting points for these variables require another set of equations and are often just predicted or estimated to save effort. Both equations require experience in applying the math and proficiency with the analytical software used to build the model. Either curve can be an acceptable starting foundation, given the correct setting of the parameters.

Equations 1 and 2, along with their resulting curves may seem daunting to individuals not accustomed to using this type of math. However, they require significantly less effort than resource loading a schedule. There have been a number of S-Curve models that have been created using historical data. These models can also be used to develop a cash flow projection. However, the contribution model needs to be representative of some of the key project characteristics including industry, complexity, size, duration, geography, and execution type. Finding a model that fits these factors can be difficult.

A common approach taken by construction firms is to build their cash flow model based on one unified curve, to distribute all of the costs across the project duration. This may result in a decent summary level estimate. But, it suffers from several critical flaws. Primarily, it oversimplifies a very complex set of conditions that result in actual costs. This means that any given period or periods in the high level curves may not even be close to the actual costs. Additionally, these curves quickly become outdated as the project conditions evolve and changes are introduced. Tracking costs against an outdated curve will only result in an incorrect representation of the project. A unified equation also ignores the condition that some aspects of the project are easily predictable and do not have any type of distribution curve. For example, many insurance costs occur at very distinct points in the project. Another example is that general conditions are typically consistent each month with smaller distributions at the beginning and end of the project. Additionally, using only one curve for the project makes it difficult to adjust for potential accelerations or planned schedule lags in the project.

Refined Approach to the Curve

The creation of an accurate and manageable cash flow model depends on the amount of time that is dedicated to the task. Table 1 shows different levels of cash flow that can be used to suit the resource availability.

The level of detail should increase as the project’s total value, duration, and complexity increase. Design, land acquisition, and other consulting phases may also be added depending on who is performing the cash flow analysis. For example, a typical construction manager may not be responsible for these phases as part of the project scope work, while a design builder or joint venture manager may have this responsibility.

<table>
<thead>
<tr>
<th>Complexity</th>
<th>Level of Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most Simplified</td>
<td>One equation for all costs</td>
</tr>
<tr>
<td>Basic Detail</td>
<td>Separate equations for core/shell, MEP and finishes</td>
</tr>
<tr>
<td>Moderate Detail</td>
<td>Separate equations for site work, civil/structural, MEP and finishes</td>
</tr>
<tr>
<td>Moderate Detail</td>
<td>Separate equations for site work, foundations, structural, skin, HVAC, piping, electrical and finishes</td>
</tr>
<tr>
<td>Advanced Detail</td>
<td>Separate equation for all major CSI codes used</td>
</tr>
<tr>
<td>Complex</td>
<td>Detailed cash flow that ties to the schedule</td>
</tr>
<tr>
<td>Most Complex</td>
<td>Detailed cash flow that ties to the schedule and resource loading</td>
</tr>
</tbody>
</table>

Table 1 – Comparison of Example Cash Flow Model Details
There are a number of equations, in addition to the standard deviation and sine equations, which can be used to model distribution and cash flow. These include the Sigmoid, Hermite, Gompertz or Richards equations. Each of these has varying levels of complexity and control. One of the most challenging aspects of applying any of these equations is the ability to easily set time constraints. For that purpose, the Poisson Distribution Equation can often be an effective solution, by allowing the results to be set to regular periodic intervals. The Poisson Distribution Equation is expressed for cash flow as shown in Equation 3:

\[
\text{Distribution (y)} = \frac{(\lambda^k e^{-\lambda})}{k!}
\]

Equation 3

\(y\) = Periodic Distribution – This is the Y axis value.

\(\lambda\) = Set to the expected point in time (or period) for the greatest occurrence of cost. As the number increases, the peak moves later in the duration.

\(k\) = Periods – Months or weeks can be used for construction cash flow (X-Axis)

What makes the Poisson equation useful for cash flow is that the results are based on discrete periods. Typical construction cash flow is measured monthly to coincide with the billing of the contractors and vendors. The most complex part of this equation is the factorial term “\(k!\)”. Although factorials are a relatively simple concept, they may be a challenge to write an equation for in an analysis software program. Most of the software programs have a function to account for this term. In MS Excel, this function is “FACT().”

The premise of the proposed analysis is to create a curve to each of the major direct cost categories, general conditions, insurance, and multipliers. Direct cost is being defined as any cost not part of general conditions, insurances, sureties (bonds), or multipliers. Multipliers are defined as any value that is based on the total value of other portions of the work, including overhead/profit, fee and taxes, when applicable. Although insurances and sureties are based on other values, they typically occur at finite points in time.

For an example, we will use the “Moderate Detail” level for a $100M project with a 12-month duration. The first step is to set the parameters of when each major activity will start and stop. From here, a basic table can be set up with the core values of each, as shown in Table 2.

In Table 2, the periods are numerical months and the start/stop phase is easily seen. The expected mid-point is defined as shown in Equation 4.

\[
\text{Mid Point} = \frac{(\text{Stop Month} - \text{Start Month} + 1)}{2}
\]

Equation 4

The “1” has to be added to the equation to account for the first period occurring between zero and one. Equation 4 was applied to every cell in Table 2 with a logic function set to make the month zero if it was before or after the planned duration. The next step is to prorate the budget for each phase to the values in the table. The reason for this is that the total numbers for each phase shown in Table 2 do not add up exactly to one. As the number of periods increases, they will approach one. The proration fix is simply to divide any given period/phase value by the total values for the phase. This can be multiplied by the phase budget to get the period distribution. Assume, for example that our civil/structural budget is $10M. Then the monthly distribution for month two would be as shown in Equation 5.

\[
\text{C/S Month 2 Distribution} = \frac{10M \times (0.21/0.88)}{1,464,308}
\]

Equation 5

Table 3 shows this concept applied to the items from Table 2.

For display purposes, Table 3 is shown in millions. Figure 2 shows the resulting cash flow of the direct costs after they have been prorated.
Note that only the direct cost items are based on the distribution. The other items have distribution as shown in Figure 4.

Figure 3 shows the totals from the example compared with a similar distribution and curve based on the standard distribution equation as shown in Equation 1.

The distribution based on the method used in Figure 3 represents a more accurate forecast than using one unified distribution curve, while not being as cumbersome as tying the cash flow to the detailed project schedule. Note how the example curve is not as smoothly distributed as the basic S-curve.

Applying this method to the other levels of detail simply becomes a function of adding more rows to the direct costs. Allowances and contingency may be the hardest items to model as they tend to not have a linear relationship to the project schedule. Either applying them as a multiplier, or as a straight line, are both acceptable.

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Conditions</td>
<td>These values are distributed evenly across the project. There can be some taper on either end of the project that is typically seen with longer durations.</td>
</tr>
<tr>
<td>Insurance and Sureties (Bonds)</td>
<td>These values were added at the beginning of the project to match when the cost typically occurs. In some cases, certain insurances may be billed on a monthly basis. There are also distinct instances when there are rebates or refunds that occur at the end of the project.</td>
</tr>
<tr>
<td>Overhead and Profit (OHP)</td>
<td>This is based on an agreed upon rate applied to the line items above. There are some circumstances where the OHP is applied differently or is an agreed lump sum value to be evenly distributed. The application of this line should match the agreements.</td>
</tr>
<tr>
<td>Tax</td>
<td>Although not on this example, taxes should be applied as required by the state where the work is being performed. In some cases, this number is part of the direct costs. In other cases (like Arizona), this value is a function of the total bills.</td>
</tr>
</tbody>
</table>

| Table 4 – Distribution Notes on Items That are Not Direct Costs |
approximations unless information exists that can help refine these values. Contingency may also be applied with a heavy front end loading for unforeseen conditions and a heavy back end loading for scope misses as the project nears completion. This would leave the middle months with a lower value.

Tracking against the cash flow now becomes a function of comparing the monthly total invoices to the cash flow value or comparing the phase totals. In either case, the typical cash flow performance analysis (as described in other AACE publications) can be performed. It is recommended that three groups of data be tracked, which include the baseline forecast, the current forecast, and the actual cash flow. The baseline forecast and the current forecast will be identical until changes occur on the project.

**Dealing with Changes**

The first challenge of using cash flow curves is to create and set up the baseline curve. The second challenge is tracking against the baseline. The third and perhaps greatest challenge is adjusting the curves for changes. Changes can be complicated as they do not occur on any set schedule and they can cover multiple cost categories. Finally, they may be executed well before or well after the change has already occurred. The project forecast will be less accurate when changes are not addressed. The funds used for changes can skew the actual cash flow curve and result in potentially misdiagnosed results. Leaving the changes off of both the cash flow forecast and actual tracking can also be problematic as changes can affect how the base funds are spent.

The focus of this article is to provide approaches that simplify the cash flow tool, while still maintaining some level of accuracy. The first step in adjusting the cash flow forecast is to group changes into the major categories shown in Table 5.

“Major Global” changes that require re-estimating, scheduling and phasing will require that the cash flow also be

<table>
<thead>
<tr>
<th>Change Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Global</td>
<td>These are so large that it is likely the whole curve will have to be rebuilt.</td>
</tr>
<tr>
<td>New/Separate Phase</td>
<td>These changes are executed to add another independent piece of scope to the project. It is possible that they could have their own cash flow line item or their own independent cash flow.</td>
</tr>
<tr>
<td>Major Schedule Impacting</td>
<td>These are changes that add significant time – greater than a month. This also could require that the cash flow phases need to be revisited.</td>
</tr>
<tr>
<td>Non-Schedule Impacting</td>
<td>These are changes that have a minor impact to the schedule even if they have significant dollar adjustments.</td>
</tr>
</tbody>
</table>

**Table 5 – Change Types of Cash Flow Adjustments**
adjusted as well. This becomes an exercise in rebuilding the cash flow as described earlier in this article. For all other adjustments to the cash flow, it is recommended that the baseline curve be preserved for reference.

The “New/Separate Phase” category is a function of adding new lines to the cash flow model and forecast. The “Major Schedule Impacts” can be divided into two subcategories. The first is the impact to the project duration itself. For this, the cash flow months in Table 2 can be adjusted. The second part is for the actual value of the changes. This portion of the changes and the non-schedule impacting changes can be applied to the forecast in the same manner. The most accurate and time consuming method is to attempt to forecast each change. The challenge with this is in capturing each change and its unique time line to the project. This level of effort is more likely going to result in abandoning the cash flow tool rather than using it.

A more simplified approach is to adjust the remaining months of the cash flow by the value of total changes posted during the current month. The following example builds upon the data from the original example in Table 3. The method of distributing the cash flow for this

<table>
<thead>
<tr>
<th>Name</th>
<th>Change Value</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Direct Costs</td>
<td>6.63</td>
<td>10.35</td>
<td>13.85</td>
<td>14.87</td>
<td>13.28</td>
<td>9.77</td>
<td>6.11</td>
<td>3.32</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Baseline Total</td>
<td>7.35</td>
<td>11.18</td>
<td>14.79</td>
<td>15.85</td>
<td>14.20</td>
<td>10.59</td>
<td>6.81</td>
<td>3.93</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td>Ratio of monthly dist to remaining costs</td>
<td>8.4%</td>
<td>13.1%</td>
<td>17.5%</td>
<td>18.8%</td>
<td>18.6%</td>
<td>12.3%</td>
<td>7.7%</td>
<td>4.2%</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>Monthly Change Distribution</td>
<td>0.84</td>
<td>1.31</td>
<td>1.75</td>
<td>1.88</td>
<td>1.68</td>
<td>1.23</td>
<td>0.77</td>
<td>0.42</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Adjusted Forecast</td>
<td>21.88</td>
<td>34.37</td>
<td>50.91</td>
<td>68.64</td>
<td>84.52</td>
<td>96.34</td>
<td>103.92</td>
<td>108.27</td>
<td>110.00</td>
<td></td>
</tr>
<tr>
<td>Ratio of monthly dist to remaining costs</td>
<td>22.3%</td>
<td>23.9%</td>
<td>21.3%</td>
<td>15.7%</td>
<td>9.8%</td>
<td>5.3%</td>
<td>1.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly Change Distribution</td>
<td>-</td>
<td>-</td>
<td>3.34</td>
<td>3.58</td>
<td>3.20</td>
<td>2.35</td>
<td>1.47</td>
<td>0.80</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Adjusted Forecast</td>
<td>21.88</td>
<td>34.37</td>
<td>50.91</td>
<td>75.56</td>
<td>94.64</td>
<td>108.81</td>
<td>117.87</td>
<td>123.02</td>
<td>125.00</td>
<td></td>
</tr>
<tr>
<td>Ratio of monthly dist to remaining costs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3.96</td>
<td>2.91</td>
<td>1.82</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Monthly Change Distribution</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Adjusted Forecast</td>
<td>21.88</td>
<td>34.37</td>
<td>50.91</td>
<td>75.56</td>
<td>98.60</td>
<td>115.69</td>
<td>126.56</td>
<td>132.70</td>
<td>135.00</td>
<td></td>
</tr>
</tbody>
</table>

Table 6 – Proration of Changes to Adjust Cash Flow Examples (SM)

Figure 4 – Comparison of the Example Results to the Standard Distribution Curve (Basic S)
example was to prorate the total changes during a selected example month over the remaining baseline cash flow profile of the direct costs for the remaining months. Large change values were used so that they would show up more clearly on an adjusted graph as shown in Figure 4. Note that this level of change would be problematic on a project of this size and duration.

The results of the cumulative S-curves are shown in Figure 4. The actual cash flow can be shown with the forecast and baseline for analysis purposes. As with the example changes, this cash flow has been exaggerated so that it shows up on the figure.

There are other methods that could be used to distribute the change value including a straight line distribution or a bell curve distribution. The proration method was selected for the example to suggest that the expenditure of changes would probably follow the natural course of the project. This is likely to be true in real world examples, where the change values are not as large as the example. Regardless of the exact method of distribution, the result of adding the changes to the remaining months helps to adjust the cash flow tool to reflect the adjustment in the cash flow plan.

**Conclusion**

In certain construction industries, cash flow modeling and tracking is a part of the standard project control metrics. In many other construction industries, cash flow is often oversimplified, forgotten, or avoided, for both its perceived complexity and misunderstood value as a management tool. The methods in this article offer an approach to creating a manageable cash flow tool that can be dynamic over the course of the project. The methods also provide a scalable approach that offers increased accuracy over a unified S-curve for the project without having to tie the cash flow model to the detailed schedule line items. This approach may be applied to a variety of project types, sizes, and industry. With a manageable cash flow model, project teams can further refine their analysis, trending, and tracking of construction projects.

**REFERENCES**


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This year PayScale reports on salary data for alumni of a total of 1,519 schools, broken down by the following degree levels:

- Associate degrees (468 institutions)
- Bachelor’s degrees only – alumni who go on to receive advanced degrees NOT included (1,034 institutions)
- Bachelor’s degrees, including alumni who go on to earn advanced degrees (1,062 institutions)
- Graduate degrees (417 institutions)
- Master’s degrees (372 institutions)
- PhDs (66 institutions)
- MBAs (233 institutions)
- JDs (51 institutions)*

PayScale also reports on salary data for alumni with the following majors and degree levels:

- 142 majors at the associate level
- 319 majors at the bachelor’s level
- 288 graduate-level degrees (master’s, PhD and MBA)

Associate, Bachelor’s and Graduate Schools

There’s a new school this year topping the list for bachelor’s-only graduates, ranked by alumni mid-career median salary. SUNY-Maritime College, a small public college in New York State, reported a median mid-career alumni income of $134,000 per year, beating Harvey Mudd College by $1,000. Harvey Mudd has held the top spot for the last two years. SUNY-Maritime College still comes out on top for median mid-career salary of bachelor’s graduates when we include those who go on to earn advanced degrees.

Graduates of Emory University’s School of Law earn the highest median mid-career salary overall ($201,000) of any school included in the College Salary Report. This relatively small private school in Atlanta, Georgia, beats out much more well-known law schools, including UCLA ($199,000), Georgetown ($188,000) and Harvard ($186,000).

Brand-name MBAs also lead to some of the highest salaries in this year’s report. Harvard Business School alumni earn a median mid-career salary of $190,000; edging out Wharton (Penn State) MBA alum ($182,000) and Stanford Business School alumni ($175,000).

Median earnings for graduates from master’s and Ph.D. programs at public universities lag significantly behind earnings for graduates from private not-for-profit schools.

When ranking two-year schools, median school ranking for public schools is nearly 15 percent higher than private for-profit schools, and nearly 25 percent higher than private not-for-profit schools.

Mo’ Money Mo’ STEM Degrees

The median percentage of STEM graduates for a given school decreases significantly as you go down the bachelor’s only list. The median percentage of STEM graduates for schools ranked 1 through 20 is 42.5 percent. The median for schools ranked 21 through 50 is 29 percent. The median for schools with a ranking above 50 is 11 percent.
Schools ranked in the top 50 master’s schools have a median of 37 percent STEM graduates. Schools ranked below the top 50 have a median of 11 percent STEM graduates.

### Gender Plays a Role

Male students are the majority at top-ranked schools: Only 45 percent of all students from schools ranked in the top 50 master’s schools are women, whereas 57 percent of students from schools ranked below the top 50 are women. Similar patterns are also present in four-year colleges, MBA level schools and PhD level schools (IPEDS Data).

### Major Matters Most

Thirteen out of the top 15 ranked bachelor’s majors are engineering-focused. Out of the 26 total bachelor’s engineering majors, 24 are ranked in the top 50.

Advanced degrees can pay off big time—if you choose wisely. Twenty-five percent of the 201 master’s level majors have mid-career median pay numbers above $100,000, but all are STEM subjects.

Don’t assume that the arts are a lost cause. People who earn a bachelor’s degree in industrial design are the highest-paid arts majors (mid-career median salary: $84,500).

A bachelor’s degree in philosophy leads to the highest mid-career salary of any humanities degree in our study ($85,000).

An associate degree in child development nets the lowest salary potential of any degree or subject major—just $30,000 per year with 10 or more years of experience.

### The Right School For The Right Major

Five of the top 10 schools for art majors are public colleges.

The Haas School of Business at UC Berkeley produces the highest-earning alumni with a bachelor’s in business (and no higher degrees) by both early career ($72,800) and mid-career ($140,000) measurements.

The most highly-paid software engineers don’t necessarily attend school in the Silicon Valley. UC Santa Barbara produces the highest-paid computer science majors with 10 or more years of experience ($147,000), and Columbia University produces the highest-paid alumni with five or fewer years of experience ($98,900). UC Berkeley comes in second place by both counts.

The highest-paid humanities majors almost all come from private colleges, including Tufts, Duke, UPenn and Columbia. UC Berkeley is the only public college on the top 10 list of schools for humanities majors by earning potential. Similarly, the 10 colleges with the most highly-paid social science majors are all private schools.

* Data included for law schools largely covers those who are employed at second-tier law firms or in public law due to standardized salaries at top tier law firms.
* For definitions and methodology, visit http://www.payscale.com/college-salary-report/methodology

### About PayScale

Creator of the largest database of individual compensation profiles in the world containing more than 40 million salary profiles, PayScale, Inc., provides an immediate and precise snapshot of current market salaries to employees and employers through its online tools and software. PayScale’s products are powered by innovative algorithms that dynamically acquire, analyze and aggregate compensation information for millions of individuals in real-time. Publisher of the quarterly PayScale Index™, PayScale’s subscription software products for employers include PayScale MarketRate™, PayScale Insight™, and PayScale Insight Expert™. PayScale’s cloud compensation software is used by more than 3,000 customers, including Bloomberg BNA, Cummins, Warby Parker, Clemson University and Signature HealthCARE. For more information, please visit: www.payscale.com or follow PayScale on Twitter: http://twitter.com/payscale.

◆
Question:
How did you first learn about AACE?

Answer:
About 20 years ago, I became an engineering project manager in a firm that did a lot of industrial projects, and at that time I purchased and read AACE’s “Project and Cost Engineers’ Handbook (3rd Ed.)” I still refer to it occasionally. I later moved into project management consulting—mostly planning and controls—then about 5 or 6 years ago I was chasing a gig as a project controls manager for a US-based, global company. I (thought I) had all the right qualifications, but decision makers cited the lack of AACE membership and certification as an indicator that I wasn’t a serious candidate for this pretty senior role. I knew then that I was missing something important.

Question:
What is the greatest benefit you receive from being a member of AACE?

Answer:
Well, as you might guess from my earlier answer, I do value the professional credibility in some circles that goes with AACE membership and certification. I also know the local section networking opportunities are quite valuable, though my travel schedule has precluded my attendance at more than one or two meetings a year. Otherwise, I find the documentation available from AACE—including the annual compensation survey, the RPs, and the bi-monthly Cost Engineering journal—to be well worth the dues and other nominal costs for members.

Question:
Who are you employed with, what is your job, what do you do in this position, and what attracted you to this job?

Answer:
I own a small project management consulting firm—Boyle Project Consulting, PLLC, now in our 11th year—for whom I am the Managing Principal, Senior Consultant, and IT Director. I provide consulting and management services for client companies executing large projects in a few industries. I was attracted to the job by the promise of work-life balance, while being able to do very fulfilling work for clients that I really care about. (That first promise didn’t pan out exactly as expected, as I can be called away from home for months at a time.)

Question:
Was there a defining moment in your life that made you decide to take the direction in life that you have taken?
Answer:
No, not a defining moment; but certainly an evolving realization that projects provide an endlessly recurring opportunity to do something new.

Question:
Who most influenced your career direction? Do you have a personal mentor?
Answer:
I’ve been helped along by many co-workers, bosses, professors, and clients over a 30+ year career, for whose guidance I’ve been very grateful. I could probably name a dozen mentors—they are all retired or gone now, and I’m always on the lookout for chances to “pay forward” what they taught me. The major influence in focusing on project management probably came from my boss at my third employer—an international engineering firm with a strong “entrepreneurial” outlook. We worked together to land our first project-management-only engagement, and the work was a good match for me.

Question:
Do you have any advice for young professionals that are interested in a career similar to yours?
Answer:
The same advice I have for all young professionals and students:

- Keep personal integrity and intellectual integrity foremost;
- Avoid the temptation to overspecialize;
- Volunteer for the hardest jobs, then stretch yourself to succeed;
- Always seek incremental improvements in your personal toolset—if you can’t do something perfectly, leave a template to do it better the next time. Eventually, you will be sought out.

Question:
Does AACE help you do your job better?
Answer:
Yes! I realize that the personal dataset formed from 30 years of my own project experience is not fully reliable—however useful—without corroboration from the rest of the profession. AACE documents provide some of the best professional information available in the US, and they are easy for me to reference while tempering my own interpretations of available project/client data.

Question:
What words come to mind when you think of AACE’s brand?
Answer:
American, Integrated, Total, Cost, Management. (The first is probably unwelcome, but that’s the perception.)
In today’s complex, litigation-prone business environment, individuals with the proven capability to assess risk and guide organizations to the best decision possible are in high demand. AACE International’s new Decision and Risk Management Professional™ (DRMP™) certification program establishes credentials that recognize professional expertise, skills and knowledge in the decision and risk management area of practice within cost engineering.

If you desire to be recognized for strong skills and knowledge in decision and risk management as it relates to project management, the DRMP certification was made for you.

Candidates may include but are not limited to risk managers, decision and risk management consultants, capital program managers or planners, project managers, value engineers and any cost engineering professionals focusing on asset and project decision and risk management.

Skills and knowledge range from analytical (e.g., statistics and modeling) to socio/psychological (e.g., risk elicitation and communication) to management (e.g. risk response planning and management).

For more information about the new AACE International DRMP certification, go to www.aacei.org/cert/DRMP/
COMP is a comprehensive package of benefits designed to encourage companies to develop the skills of their total cost management employees through AACE membership.

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Contact the AACE Membership Administrator by calling 304-296-8444 or go online to www.aacei.org/mbr/comp/

Want your company to be an AACE COMP Member?

UPCOMING AACE ANNUAL MEETINGS

- 2016 Annual Meeting - June 26 - 29
  Sheraton Centre  Toronto, Ontario, Canada

- 2017 Annual Meeting - June 11 - 14
  Hyatt Regency  Orlando, Florida, USA

- 2018 Annual Meeting - June 24 - 27
  Manchester Grand Hyatt  San Diego, California, USA

- 2019 Annual Meeting - June 16 - 19
  Sheraton  New Orleans, Louisiana, USA
Montreal Section

Members of the Montreal Section were treated to a special dinner event on June 5, at the Omni Hotel in Montreal. The special guest speaker was AACE international’s President (2014/2015) Martin Darley, who graciously accepted the invitation to visit the Montreal Section, topping off a very busy year as President.

Mr. Darley started the evening with an overview on the status of AACE International and congratulations to the top winner of AACE international’s Canadian Scholarship recipient for 2015, Ms. Laya ParvizSedghy, of Concordia University, who was in attendance and gave a brief speech of appreciation.

This was followed, after dinner, with a technical presentation entitled, “Building Owner’s Cost Engineering Organizational Capability” which described how AACE’s Total Cost Management (TCM) was used as the prime framework for development of an owner’s cost engineering program and the process of implementation.

Presentation highlights included project controls in the oil & gas Industry, the owner’s perspective, defining a cost engineering system, how to build project controls capability, and results and Insights.

Martin also provided some highlights of a talk recently presented in Dubai at the 1st UAE Project Management Conference 2015 entitled, “Mastering Project Management in Mega Projects.”

The visit was a great encouragement to the Montreal Section and guests in attendance. A good time was had by all who attended this special event. The evening ended with an extended question and answer period, and many enjoyed the opportunity to meet and talk with Martin afterwards.

AACE International Past President Martin Darley, CCP, is shown above at the Omni Hotel in Montreal, Canada, addressing a meeting of the Montreal Section in June.

At the June Montreal Section, Hagire Emrani is shown with Canadian Top Scholarship recipient, Lara Parvizsedghy, AACE Past President, Martin Darley, CCP; Alex Ocheoha; and Les McMullan.
When Will Your Section News Submission Be Published?

The digital Source magazine includes all “Section News” submissions. Source has a submission deadline of two months in advance of the issue date. Please review the following production schedule. It lists the submission periods for the six bi-monthly issues of Source magazine in 2014.

2015-2016 Source Section News Submission Schedule

February 2015
- Items submitted from Oct. 16 - Dec. 15, 2014

April 2015
- Items submitted from Dec. 16 - Feb. 15, 2015

June 2015
- Items submitted from Feb. 16 - April 15, 2015

August 2015
- Items submitted April 16 - June 15, 2015

October 2015
- Items submitted June 16 - Aug. 15, 2015

December 2015
- Items submitted Aug. 16 - Oct. 15, 2015

February 2016
- Items submitted from Oct. 16 - Dec. 15, 2015

April 2016
- Items submitted from Dec. 16 - Feb. 15, 2016

June 2016
- Items submitted from Feb. 16 - April 15, 2016

This production schedule is based upon production schedules at AACE headquarters, as well as our printer having two to three weeks production time to take our in-house files and convert them to the Nxtbook software for posting. Enhanced features like audio, video, website links, and more will be a part of each issue of the Source. Some technology features will require additional production time and earlier deadlines. The magazine is to be ready for posting by the first of the month.

Within 2 to 3 business days of submitting a “Section News” item, you should receive a return confirmation e-mail that your submission was received at AACE headquarters.

How to Submit Text and Photos

Please submit any and all text as a part of the e-mail or as a Microsoft Word file attachment. Please submit any photo or photos as individual attachments in tiff or jpg formats. Do not embed photos in Microsoft Word files.

For photos to be used, we require either large original files or print size photos at 300 dpi (dots per inch). We can convert large 72 dpi submissions into the required 300 dpi. This process shrinks the size of the original submission. We cannot use photos taken on cell phones. For photos to be published, they must be in focus, of print quality, and wide enough to fill the width of the column layout.

Please include the names and titles of each person shown in any photos. Please list names from left to right or refer to those shown as being above left or right. For group photos please list names from left to right, beginning with the front row and working to the back. Do not list the Section officer first unless he or she is photographed on the left with guest speakers on the right.

All submissions should be e-mailed to editor@aacei.org. Please use the official name of the Section as approved by the AACE Board when the Section’s charter was approved. Never refer to the Section as a chapter.

Contact AACE Concerning Missing Submissions

Generally, all submissions received in the above scheduled times will be published in the listed issue. Items are not held because of space restrictions. There is no waiting list and no preference is given to one Section over another. Questions about incomplete submissions or failure to follow these submission guidelines could delay publication. Text will be published without submitted photos if the photo does not meet the listed quality requirements.

If a submission is not included in the designated issue, please e-mail or call the Managing Editor to ensure that it has not been lost or misplaced. Call or e-mail if you do not receive a confirmation e-mail within 3 business days of submission.

AACE reserves the right to edit all submissions and/or to refuse to publish any submissions determined by the Managing Editor or the Art Director to not meet the standards of the journal. Any appeals of these decisions will have a final decision determined by the Executive Director.

Any Section representative with questions is advised to e-mail editor@aacei.org or call the Managing Editor during regular business hours (9 a.m. to 5 p.m. Eastern Standard Time, Monday-Friday, except holidays and special closings.)
Scott J. Amos, Editor, 2007
This updated and expanded guide for fundamentals is an excellent choice for anyone interested in a concise reference to all aspects of the profession. The new 5th edition includes twenty-seven chapters on estimating, manufacturing and operating costs, scheduling, planning progress and cost control, and much more. This is a very useful book for those studying for the certification exam. 450 pages

CCP Certification Study Guide, 1st Edition
Michael B. Pritchett, CCP, Editor, 2006
The AACE International CCP Certification Study Guide provides an all-encompassing reference text to prepare for the exam. The CCP Certification Study Guide provides background information on how to become certified; gives those studying for the certification exam a single reference text that includes theory, worked problems with answers, references, and a full discussion of key topics; allows students to maximize their study time; and provides a concise overview of the fundamentals of cost and project management.

PSP Certification Study Guide, 1st Edition Revised
Peter W. Griesmyer, Editor, 2008
This study guide is intended to assist you in your study and review of the overall topics as one step toward successful Planning and Scheduling Professional certification. The outline provides a listing of the terms you should know & topics for which you should have a good understanding of how to apply the concepts to solve problems. Each chapter also contains sample exercises, which test your knowledge of that chapter's concepts. Additional sample questions are provided in an appendix.

EVP Certification Study Guide, 3rd Edition
Sean T. Regan, FAACE CCP CEP, Editor, 2009
This study guide is intended to assist you in your study and review of the overall topics as one step toward successful Earned Value Professional certification. The outline provides a listing of the terms you should know & topics for which you should have a good understanding of how to apply the concepts to solve problems. Each chapter also contains sample exercises, which test your knowledge of that chapter's concepts.

The Total Cost Management Framework, 2nd Edition
John K. Hollmann, PE CCP, Editor, 2016
The TCM Framework: An Integrated Approach to Portfolio, Program and Project Management is a structured, annotated process map that for the first time explains each practice area of the cost engineering field in the context of its relationship to the other practice areas including allied professions.

Cost Engineers’ Notebook
This CD-ROM is an important reference for any project or cost professional. It includes data and procedures related to basic skills and knowledge that all cost engineers should possess, extensive material on capital and operating cost estimation, and papers in four subject areas: cost control, planning and scheduling, project management, and economic analysis and business planning.

AACE International Recommended Practices
Cost Engineering Terminology; Cost Estimate Classification System; Estimate Preparation Costs in the Process Industries; Project Code of Accounts; Required Skills and Knowledge of a Cost Engineer; Roles and Duties of a Planning and Scheduling Engineer; Profitability Methods; plus many more.

2015 AACE International Transactions
For CD-ROM version please contact AACE International Headquarters
(PPGs) are a series of reference s that consists of selected Cost Engineering articles, AACE International Transaction papers, and other previously published documents to which AACE has rights.

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James G. Zack Jr., Editor, 2008
Covers: Contract Administration; Management of Construction Schedules; Schedule Control; Schedule Float Ownership; Cost Control; Management of Change; Cost Impacts; Productivity Impacts; Management and Analysis of Delay; Concurrent Delay Issues; Pricing of Delay; and more.

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Sarwar A. Samad, Editor, 1998
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Trevor X. Crawford, CCP, Editor, 2011
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**PPG #5: Earned Value, 2nd Ed.**
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**PPG #6: Construction Cost Estimating, 3rd Ed.**
Dr. Douglas D. Gransberg, PE CCP, and Carla Lopez del Puerto, CCP, Editors, 2011

**PPG #7: Cost Engineering in the Utility Industries, 2nd Ed.**
Dennis M. Thompson, Editor, 2007
Covers: Auditing; Cost Estimating; Cost Modeling; Cost/Schedule Control; Generation Power Plant; Natural Gas Industry; Nuclear Power Plant; Other Energy Related Topics; Planning and Scheduling; Project Management; Utility Rates; and Utility Property Valuation.

**PPG #8: Contingency, 4th Ed.**
Kul B. Uppal, PE CEP, Editor, 2011
Covers: General Topics On Contingency; Cost Estimating and Contingency; Risk Analysis and Contingency; and Other Related Topics.

**PPG #10: Project Delivery Methods, 2nd Ed.**
Covers: Design-Bid-Build (DBB) – DBB Estimating, DBB Scheduling, DBB Project Management; Construction Management (CM) – CM Estimating, CM Scheduling, CM Project Management; Design-Build (DB) – DB Estimating, DB Scheduling, DB Project Management; International Project Delivery; Constructability; and Partnering.

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**PPG #12: Construction Project Controls, 2nd Ed.**
Dr. Douglas D. Gransberg, PE CCP, and Eric Scheepbouwer, Editors, 2010
Covers: Introduction to Construction project controls; Cost Control; Schedule Control; Quality Control; Document Control; Computer Applications; and International Project Controls.

**PPG #13: Parametric and Conceptual Estimating, 3rd Ed.**
Larry R. Dysert, CCP CEP, and Todd W. Pickett, CCP CEP, Editors, 2012
Covers: Parametric/Conceptual Estimating; Classification; Methodology; Capacity Factoring; Process and Non-Process Industries; and Systems.

**PPG #14: Portfolio and Program Management, 2nd Ed.**
Randy R. Rapp, PE CCP, Editor, 2007
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**PPG #15: Life-Cycle Cost Analysis, 2nd Ed.**
Dr. Carla Lopez del Puerto, CCP, and Dr. Douglas D. Gransberg, PE CCP, Editors, 2012

**PPG #16: Cost Engineering in the Global Environment, 2nd Ed.**
Kul B. Uppal, PE, Editor, 2011
Covers: General Topics on International Projects; Applicable AACE International Recommended Practices; Cost Estimating Methodology; Risk and Contingency; and Miscellaneous Topics.

**PPG #17: Public Sector Estimating**
Joseph L. Macaluso, CCP, Editor, 2007
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John J. Hannon, CEP, Editor, 2008
Covers: Leadership; Teams; Leadership Roles; Motivation; and Ethics.

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James G. Zack, Jr., CFCC, Editor, 2008
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**PPG #21: Cost Engineering in the Process Industries**
Kul B. Uppal, PE CEP, Editor, 2009
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