



# Where Have All the Estimators Gone?

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## A Brief History of Cost Estimating and Analysis

### Early Days

Cost analysis and practitioners have been around for a long time. Think of the invention of the wheel for wagons in the 4<sup>th</sup> millennium BC in Mesopotamia. Nasha went to Damuzi to get some wheels for his wagon to commute to work. Damuzi, having done this before, knew how long it would take to replace Nasha's wheels and so he determined the value of his time – a cost estimate with prior data points. (Side note, also the first engineering change proposal when Damuzi invented scope-creep by asking for upgraded stone tread, but that's another paper).

Cost estimating and analysis continued for millennia in various forms to determine the value of goods and services. Before we had shoddy work like the Navy's Littoral Combat Ship and Boston's Big Dig, we had Napoleon selling France's Louisiana territory for a mere \$15M (\$300M in today's equivalent). But not all bad analyses resulted in bad decisions. In the 1830's, the Pyramids were ordered to be disassembled by the Viceroy of Egypt, Muhammad 'Ali Pasha, and the blocks used to build dams on the Nile<sup>1</sup>. The chief architect, Louis Maurice Adolphe Linant de Bellefonds, personally opposed the plan but knew he'd be replaced if he defied orders. So, he prepared a false cost analysis showing that freshly quarried stone would cost less, thus saving the Pyramids. But examples like this are sadly rare.



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### Modern Day

Post-World War II saw the dawn of formalizing the field of cost estimating and analysis as a component of systems analysis in the Department of Defense. Funded by the Air Force in 1950, RAND set up their Economics and Cost Analysis Departments to conduct independent and objective research, pioneering concepts still in use today like parametric cost estimating, identification of cost elements, and program planning and budgeting. At the same time, defense firms had developed the industrial engineering approach to cost estimating, using the engineering build-up/bottom-up method. In 1959, a pricing division was formed in the Air Force Aeronautical Systems Center, comprising 17 analysts.

Along came Robert McNamara, Defense Secretary with an operations research background in the early 1960's and the need to fund weapon systems with the coming Vietnam War. The newly formed comptroller function in the DoD, the Office of the Secretary of Defense's (OSD) Systems Analysis Office, instituted the Program Planning and Budgeting System (PPBS), and other activities were ushered into the

<sup>1</sup> Stanley, Jean-Daniel. "The Near-Destruction of Giza". *American Scientist*, Volume 93, March-April 2005

<sup>2</sup> © 2010 Scott Adams, Inc

field like project control with Program Evaluation Review Technique (PERT), Cost/Schedule Control Systems Criteria (C/SCSC), Air Force Institute of Technology (AFIT), and reporting cost estimates to Congress. This drove the growth of cost estimating practitioners and illuminated cost and schedule overruns resulting in the demand for accountability, further affecting the profession.

The 1970's started with a new focus on controlling cost overruns – introducing should cost, design to cost, and life cycle cost while tying cost analysis to procurement reform and regulation. With David Packard as Deputy Secretary of Defense, new policy came into play like the Defense Acquisition Board (DAB), program milestones, independent cost estimates, Selected Acquisition Reports (SARs), and the establishment of the OSD cost analysis Improvement Group (CAIG). The services followed, most notably the Army Materiel Command (AMC) created 250 more personnel billets to provide more cost analysts to program managers, and the creation of the Visibility and Management of Support Costs (VAMOSOC) database.



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Cost analysts were now in the middle of acquisition decision-making. The 1980's saw each service forming a cost center to better collect data, conduct and monitor research, assist analysts, and establish professional standards for education, training, certification, and practice. These activities coincided with the newly formed cost estimating association we now know as the International Cost Estimating and Analysis Association (more on ICEAA's history later).

The Defense Acquisition Workforce Improvement Act (DAWIA) of 1990 addressed the need to improve the quality of the acquisition workforce, establishing formal career paths and standards for education and training. The 1990's saw the emergence of the intelligence community from the dark recesses of procurement reporting, resulting in more formally-recognized cost organizations, particularly at the National Reconnaissance Office (NRO) and National Geospatial-Intelligence Agency (NGA). Civil agencies like the Federal Aviation Administration (FAA) and Census Bureau followed suit.

Things changed, however, when Congress significantly reduced the Defense acquisition workforce between 1995 and 1998 because of the post-Cold War drawdown. The civilian acquisition workforce hit a low of 77,504 in September 1999 and between FY 1992 and FY 1999 the workforce was reduced by over 21,000 personnel, a drop of over 21%. However, the workload did not drop proportionately. From FY 1990 through FY 1999, the value of DoD procurement actions decreased from about \$144.7 billion to about \$139.8 billion, about 3%. At the same time, the number of procurement actions increased from approximately 13.2 million to about 14.8 million, about 12%. Although the reductions in workforce were meant to reduce costs, in 1998 the U.S. Government Accountability Office (GAO) wrote, "Potential savings from these [DAW] reductions cannot be precisely tracked in DOD's budget. In addition, some of the

<sup>3</sup> © 2010 Scott Adams, Inc

potential savings from acquisition workforce reductions may be offset by other anticipated costs. Such costs include those for contracting with private entities for some services previously performed by government personnel (i.e., substituting one workforce for another).”<sup>4</sup>

In the mid-90’s, the reporting of Nunn-McCurdy breaches<sup>5</sup> came to light. This amendment to *Title 10, U.S.C. § 2433, Unit Cost Reports (UCRs)* was introduced by Senator Sam Nunn and Congressman Dave McCurdy in the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 1982. It requires that Acquisition Category I (ACAT I) program managers (PMs) maintain current estimates of Program Acquisition Unit Cost (PAUC) and Average Procurement Unit Cost (APUC). If the PAUC or APUC increases by 25 percent or more over the current Acquisition Program Baseline (APB) objective, or 50 percent or more over the original APB objective, the program must be terminated unless the Secretary of Defense (SECDEF) certifies to Congress that the program is essential to national security.

After 9/11, these trends continued despite an initial uptick in the acquisition workforce immediately after those events. Despite skyrocketing contract outlays and steadily increasing investment outlays, the acquisition workforce remained relatively flat. In fact, between 2001 and 2007, the DoD acquisition workforce declined 2.5%, while our field – Business, Cost Estimating, and Financial Management (BCEFM) – declined 28.1%.<sup>6</sup>

In 2009 the Weapon Systems Acquisition Reform Act (WSARA), known in some circles as the “Cost Analyst Lifetime Employment Act”, came with the aim to improve the likelihood of success of major program acquisitions by focusing on decisions at their inception. WSARA reforms sought reliable and independent baseline cost estimates, rigorous early developmental testing and systems engineering oversight, and strong gatekeeping to prevent programs from proceeding with too much risk of immature technology.

The start of 2013 saw another challenge come into play - sequestration. DOD was required to reduce its discretionary budget by roughly \$37.2 billion, or about 7 percent, over the remainder of FY 2013. This impacted not only programs, but also program support and saw hiring freezes as well as reduced contractor support funding

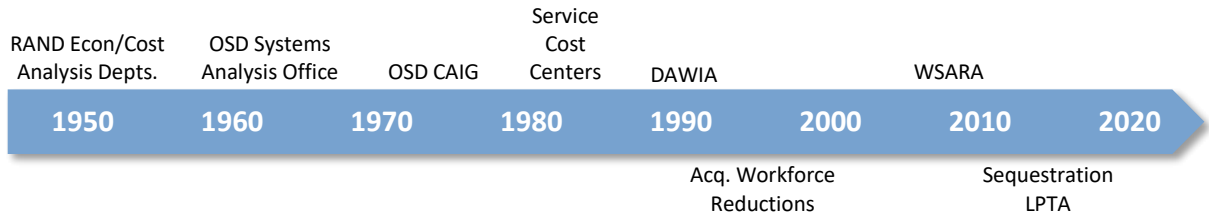
Around the same time, another trend hit the industry - Low Cost, Technically Acceptable procurements. Good in theory and great for contract support not requiring high expertise and education, LPTA procurements create a challenge for the industry to drive rates down while providing the minimal level of support that is acceptable. This trend affects the ability to recruit and hire, maintain salaries, and keep retention high while not allowing the quality of the work to decrease. Many contractors raced to the bottom to maintain competitive proposals while some new contractors emerged, arguably bringing unqualified, low-cost staff that technically satisfied poorly defined requirements. This approach resulted in lower costs to the delight of contract officers but to the detriment of program offices and technical staff responsible for ensuring the programs meet overall technical requirements.

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<sup>4</sup> GAO Report to the Chairman, Committee on National Security, House of Representatives, June 1998 “Defense Acquisition Organizations - Status of Workforce Reductions”

<sup>5</sup> DoD Cost Overruns - Trends in Nunn-McCurdy Breaches and Tools to Manage Weapon Systems Acquisition Costs Statement of Michael J. Sullivan, Director, Acquisition and Sourcing Management - March 29, 2011

<sup>6</sup> GAO Department of Defense - Additional Actions and Data Are Needed to Effectively Manage and Oversee DOD’s Acquisition Workforce – Mar 2009



**Figure 1 - Significant Cost Analysis/Estimating Events**

So far, the focus has been on the growth of the need for and formalization of the cost estimating field as driven by the Federal Government and associated policies. Over the last 70 years, industry has taken a similar path, both in terms of development contractors establishing internal capabilities to price and control the systems in development and procurement for government contracts, and support contractors providing services to Government agencies to supplement organic capabilities.

## History of Cost Estimating Organizations

According to the Bureau of Labor and Statistics (BLS), there were 217,900 cost estimators and 114,000 operations research analysts in the US in 2016<sup>7</sup>. The employment outlook predicts the number of cost estimators to grow by 11% and operations research analysts to grow by 27% between 2016 and 2026. Both growth rates exceed the average expected growth across all occupations (7%) and are at least in part driven by the demand of companies and government organizations for accurate cost projections to ensure projects and services are profitable and within budget.

There are four major professional organizations that exist to provide cost estimators with opportunities to grow professionally and interact with colleagues working on similar problems. The organizations speak to “providing Education, Fellowship, and the opportunity for Professional Development”<sup>8</sup>, being “committed to the constructive exchange of ideas between members, development of technical guidance and quality education and recognition of subject matter experts”<sup>9</sup>, promoting “estimating as a professional field of endeavor through education of our members”<sup>10</sup> and being “dedicated to advancing, encouraging, promoting and enhancing the profession of cost estimating and analysis”<sup>11</sup>.

There is no definitive date for when the cost estimating career field started but three out of the four cost estimating professional organizations have existed since the mid-1950s --- shortly after RAND set up their Economics and Cost Analysis Departments. The American Society of Professional Estimators (ASPE), Professional Construction Estimators of America (PCEA) and Association for the Advancement of Cost Engineering (ACE) International were each started in 1956. The current ASPE is comprised mostly of construction estimating professionals and includes an estimated 3,500 members (as of 2012) with 65 Chapters across the US. PCEA is also largely comprised of construction estimators and has grown to almost 1,000 members with 12 chapters in five states. ACE International is the largest of the cost estimating organizations with an estimated 7,000 members in 100 countries. The association focuses on a variety of cost estimating-related areas including project/program management, estimating, planning and

<sup>7</sup> Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Cost Estimators; <https://www.bls.gov/ooh/business-and-financial/cost-estimators.htm>

<sup>8</sup> American Society of Professional Estimators (ASPE)

<sup>9</sup> Association for the Advancement of Cost Engineering (ACE) International

<sup>10</sup> Professional Construction Estimators of America (PCEA)

<sup>11</sup> International Cost Estimating and Analysis Association (ICEAA)

scheduling, cost engineering, decision and risk management, earned value, and claims and disputes, and offers 8 different certifications.

ICEAA has over 1,200 members with Chapters around the world and its history is much more complex than the other associations. ICEAA was created by the merger of the International Society of Parametric Analysts (ISPA) and the Society of Cost Estimating and Analysis (SCEA) in November 2012. ISPA was formed in 1979 while SCEA came about after a merger of the National Estimating Society (NES) and the Institute of cost analysis (ICA) in 1990. This merger was an opportunity to join an organization with an industry focus (NES) with a group primarily focused on the government (ICA).

Prior to the ISPA/SCEA merger, the two organizations cooperated and collaborated on topics relevant to members of both establishments including publication of a joint professional journal and eventually sharing business operations and administrative activities. Despite its history of bringing together related groups to create larger, more inclusive organizations, ICEAA has experienced declining membership levels ever since the ISPA/SCEA merger in 2012.

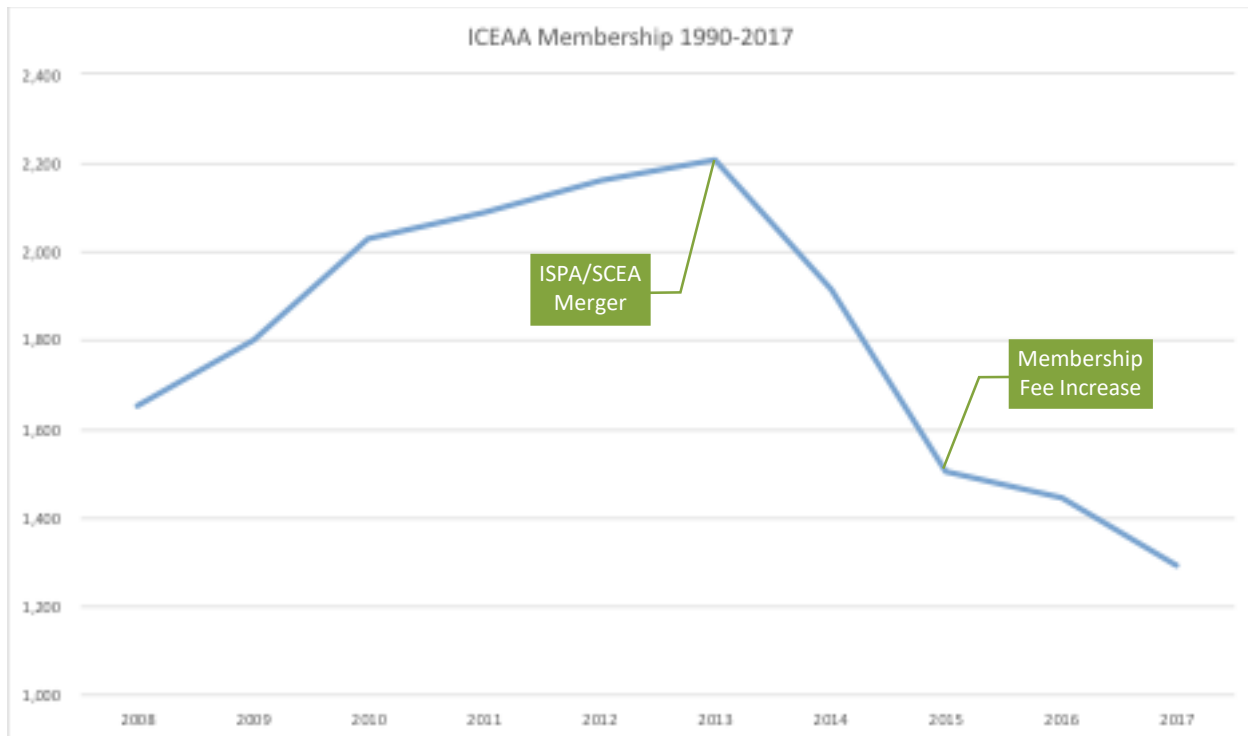
## ICEAA Membership Database

Working with ICEAA's Executive Director, we were able to obtain a data output of the association's membership database. After gaining an understanding of some of the unusual entries and removing a few duplicative entries, we were ready to begin our analysis.

The total number of entries was 6,354 members including 180 lifetime members, 5,561 annual memberships, 503 two-year memberships, 22 five-year memberships, and 18 student memberships. Looking at the "active" memberships, there were 178 lifetime members, 844 annual memberships, 333 two-year memberships, 21 five-year memberships and 9 student memberships.

Analyzing the amount of time a member has maintained an ICEAA membership requires considering if the membership was dropped and later renewed. After accounting for this gap in membership, the average length of membership for active members is just over six years while the average membership length for all members in the database is less than four and a half years. The longest active membership for a non-lifetime member is almost 38 years . . . dating back to 1980.

Two common metrics that are tracked by organizations are the number of memberships which are renewed after they expire and the number of former members who rejoin the organization after an extended period (beyond any grace period given to allow members to renew their memberships). Overall, there are relatively few people who rejoined ICEAA after their membership expired, with only 327 members rejoining including 1 person who rejoined twice. The amount of time for a member to rejoin ICEAA extended as high as 30 years. The average amount of time for the people who rejoin is roughly 6 ¼ years although there is member scheduled to present a paper at the 2018 ICEAA conference who renewed his membership after more than 26 years. In reviewing the data, it became apparent that primarily focusing on a 10-year window from 2008 – 2017 (Figure 2) provided enough time to identify current trends while not including somewhat untraceable data from earlier in the association's history. Additionally, this 10-year window captures some significant ICEAA events such as the ISPA/ISCEA merger and the dues increase of 2015.



**Figure 2 - ICEAA Membership 2008-2017**

The overall decline in ICEAA membership from 2008 – 2017 becomes apparent when looking at the 10-year period. While the peak membership point comes around 2013 just after ISPA and SCEA merged, on the surface it appears there were fewer people interested in joining a single, merged organization than in joining two organizations with separate purposes. It is unknown if the members who did not join ICEAA went to other professional organizations or simply stopped participating in this type of professional activity.

In 2015, ICEAA raised its annual membership fee from \$55 for the first time since at least 1987. While no one likes change, this was a change that was required to support the organizational costs of the association and reflect the value of membership in ICEAA. Prior to the increase, it was estimated that annual cost per member was roughly \$87 meaning the organization was subsidizing the value of each membership by \$32 per year. The fee increase was not insignificant as the \$55 annual membership fee was raised to \$95. Putting this increase into perspective, the \$55 fee in 1987 was the equivalent of a fee of over \$115 dollars if it had kept pace with the US Consumer Price Index. Interestingly, the downward trend in membership did not continue at the same pace and even slowed a bit in the 2016 timeframe. There could be many factors for this, but one might have been members seeing increased value in membership after the fee increase.

After looking at the membership data in various charts and tables, we decided to review the information graphically from a US and worldwide perspective. A dashboard was created after overcoming three obstacles; identifying a visualization solution, configuring the data to represent active memberships, and formatting the data to include the geographical location.

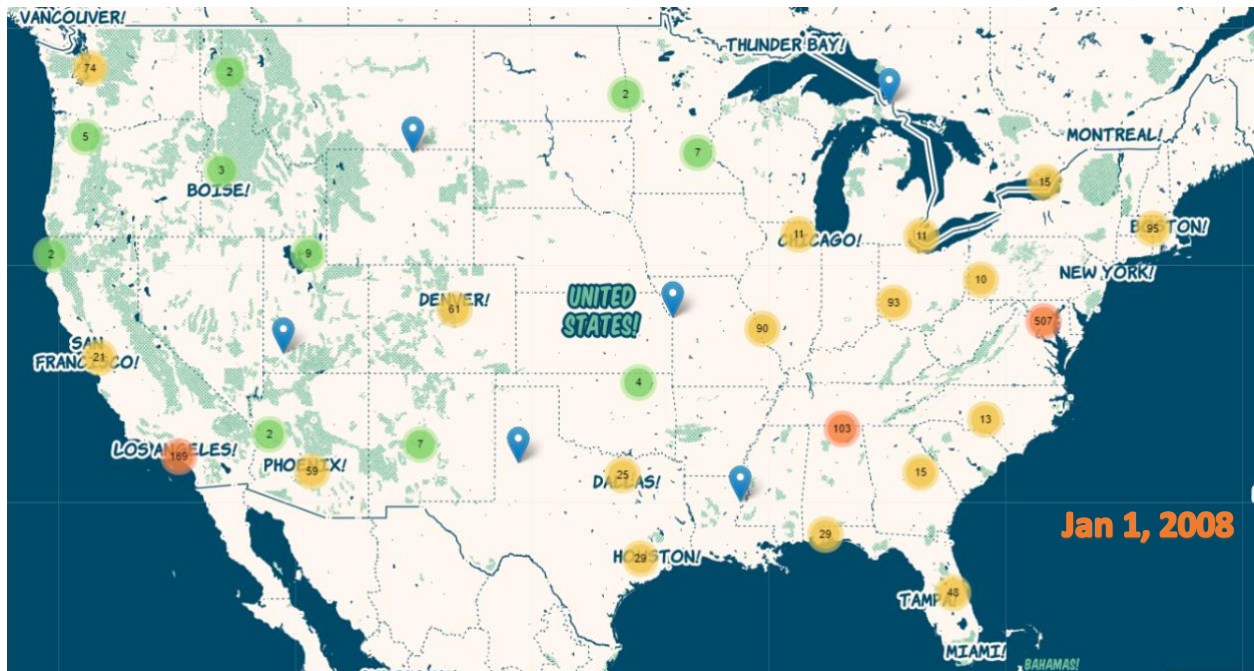
Overcoming the first obstacle included creating the technology stack in the visualization using NodeJs, Python, and HTML/CSS. NodeJs provided the HTTP server using Express to serve the web files. As the user inputted the date, NodeJs would do an AJAX call to Python to retrieve the membership data that was active at that date.



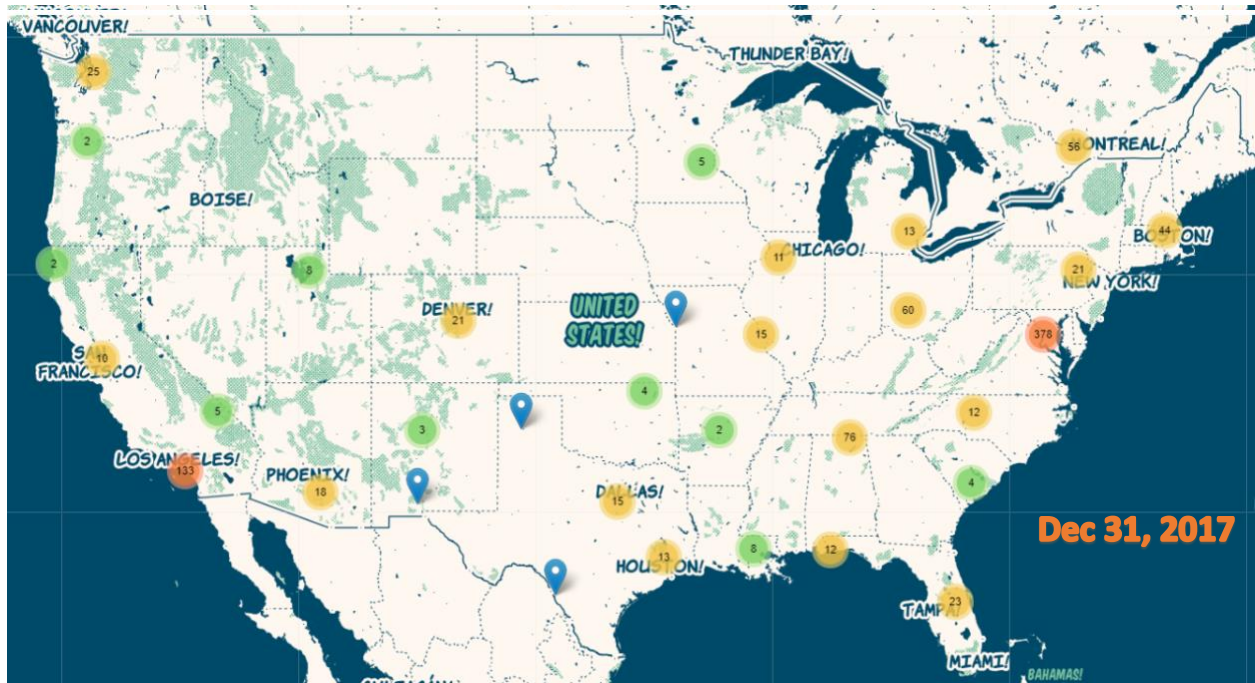
The second obstacle required a detailed analysis of when the member had joined (or rejoined) ICEAA. This involved consideration of when the member joined, the type (or duration) of the membership and when the membership expired. After performing some time-based calculations, a functioning dataset representing the active membership timeframe for each entry was created

A solution to overcome the third obstacle included transforming the zip codes within the membership files into a format that was recognizable and usable to create the geographic displays. We used a Python script to call Google Maps API to convert the zip code into the longitude and latitude coordinates. The final step of creating the dashboard was clustering or grouping the data based on proximity to other member data points to show density of members within geographic regions. This was done using an algorithm based on Voronoi tessellation.

The final result allows us to compare membership locations from 2008 through 2017 in Figures 3 - 6.



**Figure 3 - ICEAA US Members January 1, 2008**



**Figure 4 – ICEAA US Members December 31, 2017**

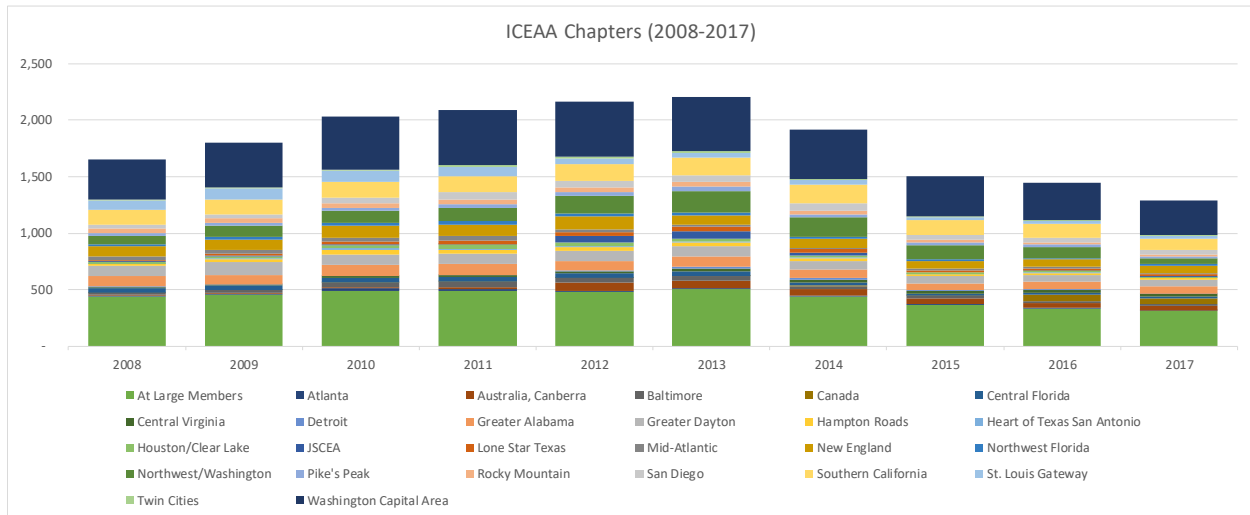


**Figure 5 - ICEAA World Members January 1, 2008**



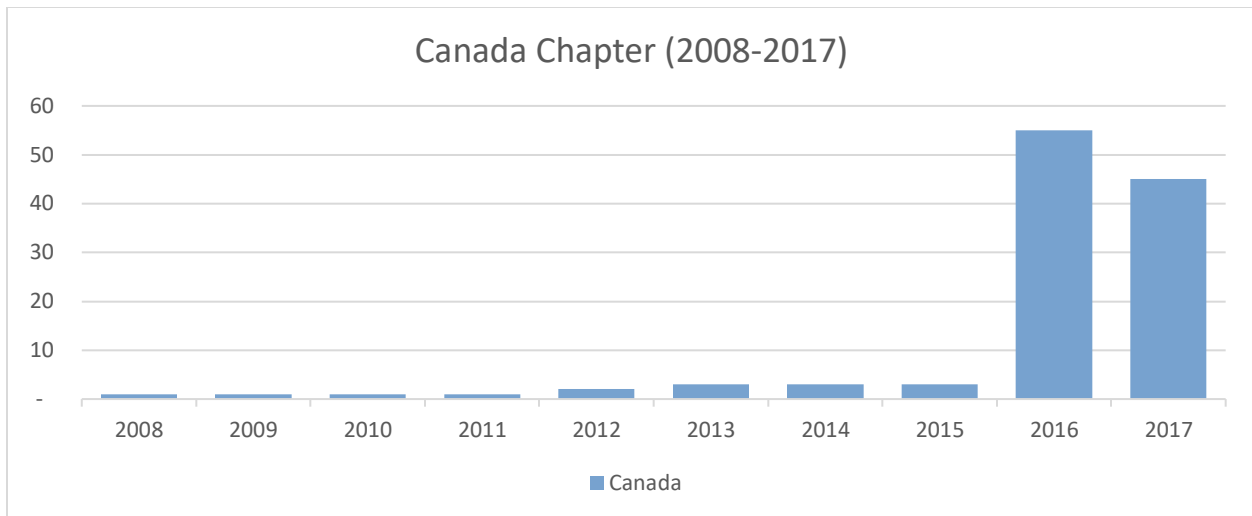
**Figure 6 - ICEAA World Members December 31, 2017**

Analyzing membership at the Chapter level (Figure 7) shows similar trends to the overall ICEAA membership. Within some of the chapters there are occasional peaks but overall there is generally a downward trend.



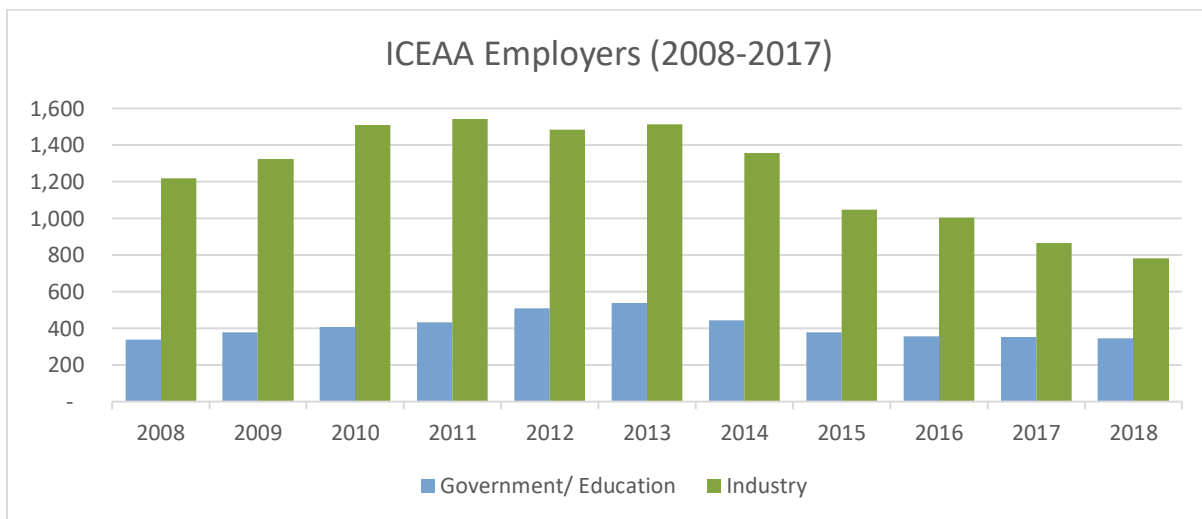
**Figure 7 - ICEAA Chapters (2008-2017)**

One exception to this trend is the Canada Chapter (Figure 8). While the Canada Chapter is relatively small with roughly 50 members, it has shown significant membership growth since 2016.



**Figure 8 - Canada ICEAA Chapter (2008-2017)**

The membership records were reviewed and categorized as either working for a government/educational organization or working for a business (Figure 9). Using submitted data related to the member’s employer, email, job title, etc., approximately 95% of the database entries were categorized as falling into one of the two categories. However, it is important to note that this data is self-reported, and many people incorrectly report that they work for a government organization when they actually are employed as a contractor supporting the government organization. Also, members change employers during their careers, so a membership entry might not accurately represent their current job. Based on this categorization process, 24% of current or former ICEAA members work for a government or educational organization while the remaining 76% work for industry. Of the active members, 29% of the members work for a government or educational organization while the remaining 71% work for industry.



**Figure 9 - ICEAA Employers (2008-2017)**

## Membership Retention

One of an association's biggest challenges after recruiting members is how to keep them. Like customer acquisition for a business, it can be very difficult for an organization to identify potential members, “sell” them on the benefits of membership, and have them commit to joining. Once a new member joins an

association, there is a constant battle to make the person see value in the membership and be engaged so that their membership, and the associated dues, don't suddenly disappear at the end of the term. Failing to retain members and constantly having to obtain new ones is known as the membership churn.

Retention rate, also known as renewal rate, is the number of members an organization retains each year. It takes into consideration the number of members from the previous year, the number of new members who join and the number of members at the end of the current year. As Table 1 shows, from 2008 – 2017 ICEAA's retention rate based on the membership data dropped from 81% to 67%. Based on studies of associations, only 7.4% of associations with fewer than 5,000 members experience renewal rates in the 60%-69% range<sup>12</sup>. While there is no "standard" for renewal rates, 69% of organizations of the same size see rates of 80% or higher.

Related to the retention rate is the loss rate which is the number of members who drop out each year and were not replaced by new members. This is also the inverse of the retention rate formula meaning ICEAA's loss rate from 2008 – 2017 grew from 19% to 33%.

**Table 1 - ICEAA Retention Rates**

Year	Members at Start	Members at End	New Members	Retention Rate	Loss Rate
2008	1,436	1,652	484	81%	19%
2009	1,652	1,801	459	81%	19%
2010	1,801	2,031	550	82%	18%
2011	2,031	2,088	467	80%	20%
2012	2,088	2,161	562	77%	23%
2013	2,161	2,207	496	79%	21%
2014	2,207	1,916	330	72%	28%
2015	1,916	1,505	233	66%	34%
2016	1,505	1,446	374	71%	29%
2017	1,446	1,292	324	67%	33%

While recruiting new members helps an organization expand, keeping the existing members is also important and many times can be done at a lower cost than recruitment due to the lack of marketing and other expenses involved. ICEAA's primary issue is not with recruiting new members but rather with retaining existing members.

## Why Is ICEAA Declining?

All of the results of our (somewhat) thorough analysis begs the answer to the question: *WHY* is ICEAA declining? Is it a result of something ICEAA is, or is not, doing? Is it a symptom of changing demographics and multi-media innovations that we aren't keeping up with? The answer isn't straightforward, but the truth seems to be a combination of multiple big picture trends in the broader cost analysis industry. Studying the market ICEAA is trying to serve may provide us some insight into some of the issues driving ICEAA's member retention rates.

## Limited Pool of Analysts

ICEAA, with its limited focus on cost analysis and estimating, is not a large organization trying to serve a broad, varied audience. It is a narrowly-focused, resource-challenged group that is dedicated to serving and promoting a limited, aging population of analysts. ICEAA's Venn diagram is challenging. The Bureau of Labor and Statistics projects high growth in cost estimating and operations research positions but so far, that's not translating into high growth in qualified personnel. The "If you build it, they will come" idea is not working out for us, which drives ICEAA's potential pool of members even lower.

<sup>12</sup> MGI Membership Marketing Benchmarking Survey, 2009.

Turning the phrase upside down, “it’s been built; so why aren’t they coming?” One reason may be due to the nature of what we do. Stereotypically, cost analysts are not exactly the biggest self-promoting group of people under the sun. A lifetime of working in the field — behind closed doors, under NDAs, in SCIFs, limited by Need-to-Know — stymies our natural impulse to advertise the interesting things we’re working on. We can’t talk about the coolest stuff we do and sometimes we can’t even say who we’re working for. And the aspects we CAN talk about, such as the methods and tools we use (looking at you, Excel), aren’t exactly cutting-edge or attention-grabbing for new recruits.

That inability to fully advertise our career tends to make recruiting and attracting new talent difficult. Anecdotally, across all areas but especially for opportunities supporting the DoD and Intelligence Community, there are never-ending barriers to entry in the development of new cost analysts and the transition of other professionals into the field. Especially for DoD/IC-related positions, the slow security clearance process, a lack of public knowledge, and limited ability to transition into the field creates barriers to entry for cost analysis jobs. These barriers create a perfect storm that prevents new cost analysts from entering the industry or gaining the direct experience in particular systems or offices that contracts often require.

While the scarcity helps with job security for current professionals, the long-term growth and stability of the labor pool could be in jeopardy. The main issues can almost be described as multiple conjoining feedback loops:

1. *“No one knows about the field unless someone recruits you for it”:*
2. *“It’s hard to get a job in the field unless you’re already in the field”:*
3. *“It’s hard to get a job without a clearance but impossible to get a clearance without a job”:*

While engineering and other DoD/IC-related lines of work suffer the same issues when it comes to finding and hiring experienced, cleared personnel with specific skill sets, the field of cost analysis, as a niche hybrid of engineering, finance, math, and operations research, also has unique complications.

Unlike engineering and accounting, cost analysis does not have a lot of general public awareness since there is no widely-known sequential professional pathway that students follow when they come out of school. Since there is no undergraduate “cost analysis” major at most universities, students are not introduced to the field as a logical next step the same way they would be if they were aiming for an internship in Finance, graduate school in Biology, or a teaching certificate. Likewise, students concentrating in those feeder-majors probably would not search for jobs using the terms “cost analysis” unless they are exposed to it through engineering coursework or on-campus recruiting.

Anecdotally, many professionals in the field describe their introduction to cost analysis as almost an accident, dependent on a particular conversation, unique job experience, or single interview, rather than a purposeful goal. While it’s a standard joke that “No one grows up dreaming of being a cost analyst someday”, there is some truth to it. There is also an element of luck, in that the people who find out about it also must grow to have both an interest and an aptitude.

Cost analysis is a difficult field to transfer into for mid- and senior-level applicants, especially for DoD/IC roles. Accounting majors may have an easier time transitioning to earned value management (EVM)-related jobs due to the similarities with cost accounting, but cost analysis does not have the same cross-occupation applicability or the same publicity that comes with being attached to a widely-known/accepted professional certification like a CPA. Likewise, professionals with a few or many years of experience in engineering, finance, etc. may have an easier time transitioning to construction, or oil and gas projects since managers hiring on behalf of a company may have more leeway and ability to discern whether a candidate’s experience is relevant than a government Contracting Officer or Human Resources department of a Federal agency. Transfers may also have more luck at other Federal agencies outside of

the DoD/IC such as the FAA, DHS, etc., where a high-level security clearance is not required and experience in other industries can be applied more easily.

For DoD and IC mid/senior new hires and contractor support, though, where the lack of uncleared analysts is keenly felt, the job opportunities are a little scarcer if an analyst was not recruited directly out of school and “grew up” in the field. Additionally, positions that do not require either a pre-existing clearance or the ability to obtain one, either for government direct hires or as a contractor, can be difficult to find, yet even then most still require directly applicable experience to meet contractual requirements or the hiring manager’s job description on USA Jobs.

In addition to lack of a widely-known career path and strict contractual requirements, the timelines and requirements involved with obtaining a security clearance and working in a classified environment are also largely to blame for the cost analysis logic traps. Many smaller companies do not have an overabundance of relevant, unclassified contracts and cannot afford to pay new hires for months and months while waiting for the clearances to come through, yet the potential employees cannot be submitted for clearances until they have accepted offers for their new jobs and are not employed elsewhere.

As anyone who has spent any significant amount of time in the icebox can attest, it can take a long time to get a security clearance but, unfortunately for new entrants into this field and new initial adjudications, the timeline has worsened over the past 8 years. Since FY10, the timelines have grown significantly for all clearance types. In December 2017, the GAO reported “the number of executive branch agencies meeting established timeliness objectives for initial security clearances decreased from fiscal years 2012 through 2016[...]. For example, 59 percent of the executive branch agencies reviewed by GAO reported meeting investigation and adjudication timeliness objectives for initial Top Secret clearances in fiscal year 2012, compared with 10 percent in fiscal year 2016.”<sup>13</sup>

The GAO analysis shows the decline in the percent of executive branch agencies meeting their timeliness objectives for initial Secret and Top Secret security clearances decreased from FY12 through FY16. The data showed that for FY12, 27% of agencies they studied met investigation and adjudication objectives for initial Secret clearances, and 59% for initial Top Secret clearances. By fiscal year 2016, that decreased to 2% for Secret and 10% for Top Secret.

The metrics released by the National Background Investigations Bureau (NBIB) in May 2017 for DoD-Industry show that the average days for end-to-end processing time grew to 458 days for an initial Top Secret clearance (Table 2), and 272 days for an initial Secret (Table 3).

**Table 2 -Initial Top Secret Processing Time**

	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017
<b>100% of Reported Adjudications</b>	721	759	755	697	681	935	871	793	605	701	845	1,018
<b>Average Days for Fastest 90%</b>	295	315	327	334	340	370	372	380	396	441	439	458
	days	days	days	days	days	days	days	days	days	days	days	days

**Table 3 -Initial Secret Processing Time**

	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017
<b>100% of Reported Adjudications</b>	3,464	3,582	4,188	2,352	3,413	2,191	2,730	2,871	4,680	2,402	4,125	4,119
<b>Average Days for Fastest 90%</b>	189	198	201	233	226	253	262	253	222	224	238	272
	days	days	days	days	days	days	days	days	days	days	days	days

<sup>13</sup> GAO-18-29, PERSONNEL SECURITY CLEARANCES: Additional Actions Needed to Ensure Quality, Address Timeliness, and Reduce Investigation Backlog, December 2017

The limitations that classified projects place on workplace flexibility also make cleared cost analysis positions less appealing for new college graduates and transfers from other industries. The modern popularity of flexible schedules and working from home (or Starbucks or anywhere but in the office, really) are impossible when the work must be performed in a classified environment. It also makes it difficult to retain mid- and senior-level professionals who need more flexibility due to family commitments. Formerly, when there were no such things as dial-ins, laptops, Wi-Fi, or Skype, the only difference between classified and unclassified work was that one you could talk about and the other you couldn't. Modern technology has turned that small difference into a marked lifestyle change and makes attracting new talent for cleared positions an even harder sell, even for the savviest of Human Resources departments.

## Perceived Lack of Value

Professional associations have also been affected by technological innovations. Once upon a time, before the advent of LinkedIn, Glassdoor, Indeed and the many other networking, job search and information-gathering websites, professional association membership was valued as one of the primary methods of staying current with an industry and a means of career advancement. A large portion of networking was accomplished in person, such as at conferences and social events, and association membership was viewed as a basic first step in establishing and furthering oneself in a career. LinkedIn, Glassdoor and similar sites have now turned that necessity into a nice-to-have, with attendance in person at events an expense that can be more frequently pushed aside in favor of a LinkedIn message or Glassdoor search.

A 2016 Harvard Business Review article<sup>14</sup> discussed this issue:

“According to the American Society of Association Executives [ASAE], [...] association membership is declining across the board. The recession certainly didn't help, but cost-cutting isn't the only reason for the decrease. Social networks now provide easy and convenient ways for industry members to find each other and network, and the proliferation of online content has led to vast and often free access to the types of information, insights, and training that professionals used to be able to access only through association membership and industry conferences. Plus, the ASAE has had to address Millennial workers who place less value on formal and traditional means of networking, preferring to establish their own relationships in their own ways.”

A 2016 Association for Information Science and Technology (ASIS&T) study<sup>15</sup> also discussed the issues behind declining memberships, such as members who join do not renew their membership due to a lack of perceived value for the cost of the membership dues. Other reasons for the decline were also discussed, including:

1. Associations are not innovative or responsive to the changing needs of its members
2. New leadership is hard to attract, and best practices/lessons learned are not well documented.
3. Services provided by the organization are not delivered adequately or may not fulfill the members needs

But even with those hurdles, there have been some organizations that have grown in popularity and relevance recently, such as the Project Management Institute with their popular PMP certification. “In 2002, PMI's global membership stood at just 93,000, with the vast majority in the U.S. and Canada. Just

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<sup>14</sup> Yohn, Denise Lee, “To Stay Relevant, Professional Associations Must Rebrand”, Harvard Business Review, Jan 5, 2016

<sup>15</sup> Naresh Kumar Agarwal, Md Anwarul Islam “How can professional associations continue to stay relevant? Knowledge Management to the rescue”, 2016



five years later, in 2007, PMI's membership [grew] to more than 253,000, with much of that growth coming from outside North America. Reflecting the active involvement of PMI members, the number of chartered chapters has grown to more than 250 in 70 countries."<sup>16</sup> As of year-end 2016, PMI had grown to be the "world's leading not-for-profit membership association for the project management profession, with more than 472,000 members and 801,000 credential holders in over 200 countries."<sup>17</sup>

The growth trend in the PMP's parent organization matches the growth in the popularity of the PMP certification. What used to be a rarer, abilities distinguisher is now viewed by many hiring managers as a basic qualification. Additionally, certain labor categories in government contract Statements of Work now specify the PMP as a minimum requirement. With the PMP now a government-advocated industry standard, PMI's well-being as a professional association is assured and PMI's members see the necessity, and **value** in their continued membership. While ICEAA doesn't need to copy PMI exactly, there are lessons that can be learned with regard to improving ICEAA's value proposition and customer satisfaction. "Consumer behavior is changing in dramatic ways, and consumers expect organizations with which they engage to follow suit. The consumerization of the association/member experience will have a tremendous impact on associations of all shapes and sizes as members request more mobile, nimble, personalized, and efficient engagements similar to the experiences they have with Amazon or Netflix."<sup>18</sup>

The most visible, concrete products ICEAA delivers include the CCEA certification and the CEBoK training package. While the training modules offer valuable information, the format they're currently offered in – PowerPoint slides delivered on a USB flash drive – are not generally what tech-focused analysts have come to expect for software deliverables, and they may be disappointed that they aren't offered a more interactive, web-based experience, especially considering the cost of the training. Ultimately, the training accomplishes what it needs to, but younger analysts and those not accustomed to more cumbersome delivery methods may not see the value in purchasing the training, especially if they're on the fence about whether or not the certification is necessary.

Additionally, transfers from other fields may have second thoughts about whether the CCEA is something they should pursue because of the title of the training: **Cost Estimating** Body of Knowledge. The naming convention of CEBoK and the CCEA may be unnecessarily limiting the potential customer base, since the CCEA does in fact cover more than just cost estimating and, with some re-work and re-wording, could be applicable to a wider variety of fields than it is currently.

Along the same lines as the delivery of the training, the opportunities to take the exam are also in need of updating. Currently, potential test takers are limited by geography and dates: If they don't happen to live near a testing center; if their company does not have enough people to warrant an on-site test or does not have a CCEA-certified proctor; or, if they cannot manage the dates the exam is being offered, their options are limited. Other than the yearly conference, the areas of the U.S. where ICEAA frequently schedules the test – e.g. Huntsville, AL; Dayton, OH; Washington D.C. area, per ICEAA's website as of March 2018 – are due to the historical dominance of DoD/IC-related analysts as ICEAA members. With about two months' notice, ICEAA will also schedule a test anywhere where a CCEA-certified analyst is available to proctor it.

While that model works for analysts in certain population areas and subject fields, as shown on the map in Figure 3 previously, it might be a struggle for someone living in a geographic region where a CCEA-certified analyst is not readily available to proctor it, or if the pre-scheduled date doesn't work for them. ICEAA currently allows test takers to use commercial testing centers or universities as a backup plan, if it's

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<sup>16</sup> Project Management Institute, 2007 Annual Reports & Consolidated Financial Statements

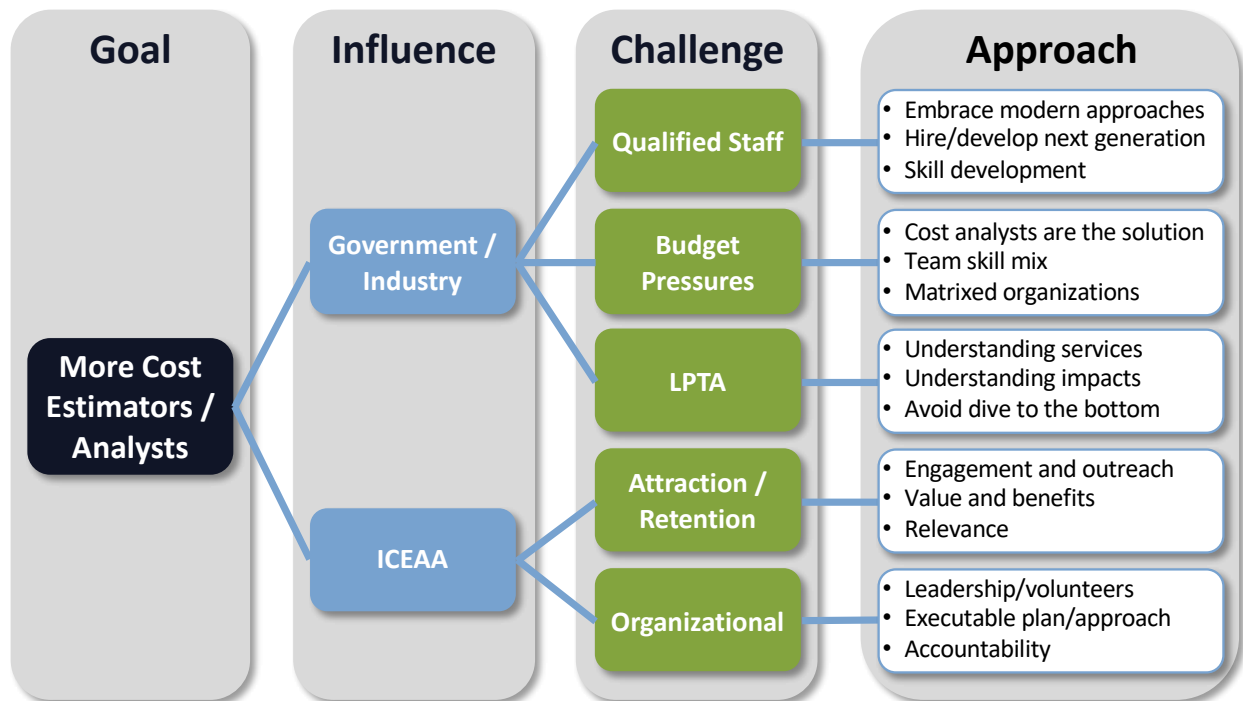
<sup>17</sup> Project Management Institute, 2016 Consolidated Financial Statement

<sup>18</sup> <http://www.abila.com/company/press-releases/abila-predicts-key-association-trends-2017/>

unlikely there will be a test scheduled in the vicinity in the near future. Allowing the solo analyst to pick the day, time and location of the test is great but for everyone else, who need to arrange work schedules and vacation time around the date that works for the CCEA-certified proctor, logistics may be harder. The process of taking the test may work for the most flexible and motivated, but may be more of a hardship for the people on the fence, or for those who are dealing with tough travel schedules or struggling to make time to study, etc. Ultimately, limitations in both geography and frequency limit the potential growth in test takers, especially for newbies/transfers but even for analysts already squarely in the cost analysis field. The most visible aspect of what ICEAA offers its members, the ability to be professionally certified in the field, is difficult to obtain not only due to the subject matter being tested, but also simply due to the logistics of studying for, and taking, the test.

## Recommendations (“Self Help”)

Figure 10 outlines a path towards achieving the goal of bringing more cost estimators/analysts into the field.



**Figure 10 - Recommendations Summary**

This goal is primarily influenced by Government/Industry and ICEAA. Government and Industry’s challenges are getting qualified staff, addressing budget pressures, and pushing back on LPTA types of contracts. ICEAA’s main challenges are attracting and retaining members and organizational. What follows are recommendations for approaches to meet these challenges in an effort to achieve our end-goal of more cost estimators and analysts.

## Government/Industry

### Qualified Staff

We need to embrace modern approaches. Cost analysis is not conducted in isolation. As we know, it requires an understanding of the program or system, hence an understanding of the technology. An understanding of scheduling is needed to phase the cost analysis over the program/system lifecycle. Risks and uncertainty can affect both the costs and the schedule. How to ensure funds are allocated requires an understanding of the budget process. Ensuring adherence and performance to the plan in terms of cost and schedule requires an understanding of EVM and project control. Data from EVM could be valuable for not only the revised estimate but for estimates of other systems or subsystems in the future. Given all these disciplines playing a role in cost analysis, why limit the requirements of a solid cost analyst to just the work of developing a cost estimate? A qualified cost analyst should not only have the tools and training to understand all these impacts, but the buyer of these services should understand that these skills result in better solutions.

Additionally, with the rapid advances in data science/analytics, embracing these developments and applying them in our field is not only necessary to ensure better solutions but could be viewed as the means to ensure the field remains relevant and attracts a new generation of analysts. Gone are the days when data was rare or hard to mine. Data science/analytics now allows us to exploit previously inaccessible data sources that may be unstructured and/or filled with errors and gaps, allowing for more robust and data-rich analyses. While it might be much more interesting for data scientists to play with large, structured data sets to tease out meaningful analyses, applying these rapidly-developing tools and approaches to do the upfront work around data cleansing and normalization could have significant downstream impacts to the solution.

We saw in the latter part of last millennium and into the early years of this millennium a large influx of young talent into the field of cost analysis, both on the government side and with contractors. The pace of this influx has slowed to a crawl over the last decade and revitalizing the push to hire and develop the next generation solves a number of the current challenges we see today. First and foremost, it aids in closing the supply/demand issue where demand continues to increase, but supply is lagging. Second, this generation of college graduates has broad and useful knowledge and skills around modern analytical tools and approaches that, with guidance in an apprenticeship model, can be brought to bear. Third, this generation largely isn't enamored with specializing, and are hungry to learn and use the breadth of skills needed to be a well-rounded, qualified cost analyst. Finally, understanding that not all new analysts are going to stay in the field, those who stick around will replace those leaving the field at various stages of their careers. We struggle to recruit young engineers, mathematicians, and computer scientists – the next generation of cost analysts – when competing against companies such as Google, Amazon, and Microsoft. Actively recruiting and making the field relevant and appealing to their career goals is paramount.

The oft-discussed broken clearance process clearly poses a challenge to bring in qualified staff. The timelines needed to get government or contractor staff cleared are daunting so there is no surprise that organizations are unwilling to wait up to 2 years to get staff fully cleared to meet security requirements. So, what is the impact? We are in the midst of a big game of musical chairs, where those with clearances are in high demand, jumping to new projects with new agencies to advance their career, maybe get a pay increase, or get closer to home leaving the losing organization with a gap to be filled by...someone else leaving another project with another agency. Add attrition from those that leave the industry or retire, and we are faced with an ever-dwindling supply while demand, at a minimum, remains constant.

The solution is for government organizations to take the long-term view that pipelining analysts for clearances, whether organic staff or contractor, will be a benefit in the long run. The pool of viable staff

will increase and some will have some longevity with the organization. To keep staff engaged while waiting out the process, government agencies could set up partnerships with other organizations or agencies to “loan” resources that meet the security requirements of the receiving organization, and in parallel those loaned individuals get experience, mentoring, and on-the-job training at the expense of loaning organization. The benefit is a cleared, better trained analyst with a less-likely flight risk and a mutually beneficial partnership between organizations that can reach into sharing of data, methods, models, and more. This is not unheard of, as this was somewhat common in the Navy in the early 90’s (an author of this paper is a product of such an arrangement).

Contractors with a diverse portfolio of clients do this often, putting analysts in the clearance pipeline on projects not requiring clearances. Contractors, however, are beholden to government sponsorship for clearances, so this again requires a long-term view from the government sponsor to pipeline contractor staff under the assumption that once cleared, the analyst will provide services to the sponsoring organization. Two years is a long time and, in all likelihood, this will not happen every time but mechanisms and incentives can be put in place to ensure the highest probability that it will happen.

Learning and developing new skills is the fountain of youth. Henry Ford said, “Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young. The greatest thing in life is to keep your mind young.” There are constantly new ways to collect data, develop a cost analysis, or communicate results. Excel, Word, PowerPoint; they aren’t always the answer. Cost analysts need to have the intellectual curiosity to seek ways to push the state of the art and develop new skills.

## **Budget Pressures**

As cost analysts, we know what drives costs in a program or system. When a program faces budget challenges, wouldn’t it make sense to task the analyst to find potential solutions? Instead, we sometimes see decision-makers taking an uninformed approach to solving the problem – cutting program office support, to include cost analysts, to make ends meet. There could be efficiencies to be gained by reducing what may appear to be a bloated oversight group but they are often short-term solutions with severe consequences in the long run. Program overruns and budget challenges are solved by cost analysts and removing that tool from your toolkit isn’t the best course of action.

We as cost analysts, however, need to be part of the solution by ensuring we are an integral part of the process and the program’s success. We need to be relevant and visible, continuously bettering our solutions, ensuring engagement in the acquisition process, and being a vocal and visible force in front of decision-makers. This is done by constantly upping our game with new methods and approaches, better products and solutions. Don’t just do an annual estimate of the program, show the impacts of risks occurring or being mitigated in scenario analysis, provide an analysis of alternatives for a subsystem, design a project control structure that feeds actual data into a living estimate and schedule. Do as much as time allows to show that the cost analyst role in the organization is a program advocate role versus a necessary evil.

Budget pressures can be alleviated somewhat by mixing up the makeup of a larger cost team. Rather than two senior analysts and a mid-level analyst, support costs can be reduced even by increasing the team size, like one senior, one mid, and two juniors. This, of course, only works if the decision-makers see the benefits of a more diverse team that includes junior staff with little or no experience working under an apprenticeship model with more senior staff. A model that has been proven to work time and again, the list of organizations successfully doing this is long and diverse.

Finally, we need to overcome our demand for direct support sitting at the next desk every day, all day. Yes, it’s great to have available at a moment’s notice, but dedicated resources may not always be the best plan. Having support from a central organization that can ebb and flow with the needs of multiple program

offices is a proven solution that oftentimes is underappreciated. A cost analyst point of contact attuned to the needs of program office can anticipate, plan for, and execute the influx of more support staff as needed, and the reverse. This not only allows for the more efficient and cost-effective use of resources but allows for cross-fertilization of ideas and solutions across programs. This can go beyond the matrixed cost shop into more flexible contracting approach where there is a need for contractor support. Rather than plan and contract for a fixed level of effort every month over the course of a contract year, an hour-ceiling could be set allowing for staff to surge in and out as needs dictate while still remaining under the ceiling.

## **Low Price Technically Acceptable Contracts**

We all know the person who graduate at the bottom of the class from medical school is still called doctor but we don't purposely put our lives in the hands of the least experienced, cheapest doctor. Cost is often the most critical component to ensure the successful life of a program so why would we put that in the hands of the least expensive resource possible? Our field is a highly-skilled field requiring a foundation in science, technology, engineering, and math. We can't attract and keep people in the field if we continue to see the erosion of salary and benefits in the drive to the lowest rates.

If avoiding LPTA is not an option, the government and industry need to work together to raise the bar of technical acceptance by understanding what is required to develop a robust, reliable, repeatable, and defensible cost analyses. As discussed before, it requires an understanding of all things surrounding the analyses (technical, schedule, control, budget) as well as when and how to apply the best tools and methods. LPTA has a role in contracting for less-skilled services but the very nature of what it takes to do our job should not be considered as a candidate for an LPTA procurement of services.

## **ICEAA**

As a mostly-volunteer organization serving a small, niche corner of the program acquisition and management world, ICEAA's current membership growth is directly tied to the growth of the cost analysis field. In the previous section, we discussed ways to increase the number of cost analysts in the industry... improving the depth of ICEAA's "bench", to borrow a sports term. In this section, we talk about ways to expand ICEAA's reach beyond its traditional membership pool.

## **Attraction/Retention**

Historically, ICEAA had always done well focusing on its bread and butter: cost estimating and cost and risk analysis. The majority of members came from DoD/IC-related work and many participated in their local chapters or attended annual conferences as ways to keep up-to-date with research and network with people they didn't see frequently. The advent of social media, and challenges associated with bringing new analysts into this line of work are forcing ICEAA to rethink its operations and membership recruiting goals. To increase ICEAA's numbers, reach, and popularity of the CCEA certification, we recommend that ICEAA diversify its member base and reach out to similar organizations to form strategic partnerships.

To broaden its foundation of potential members, ICEAA should look at occupations similar or complementary to cost estimating and analysis that use the same tools, methods, and concepts, or work on behalf of the same clients, such as operations research or program analysis. Rather than attempting to gain distance and draw distinctions between cost analysis and other fields, as was done in the past, ICEAA should cast a wider net for drawing in new members. Embracing the inherent similarities between cost analysis and the growing, ever-more popular field of data science/analytics would cement a relationship that already exists today and allow the cost analysis field, and its primary professional organization, to receive more recognition.

Similarly, recruiting members in operations research, program scheduling, EVM, program control and other similar occupations would augment the member base and increase the opportunities of its members for collaboration, knowledge sharing, and research partnering. Providing opportunities for professionals in those fields to be exposed to cost analysis would also increase prospects for recruiting new analysts. Cost analysis is already a 1<sup>st</sup> cousin of those fields and the many cost analysts perform or touch aspects of most of those occupations over the course of a career. Including them in the association would enhance the experience for all members and allow ICEAA to tap into a larger membership base.

One way to branch out to professionals in other related industries is to collaborate with their associations and form strategic alliances. These could be partnerships or mutually beneficial agreements that form a more universal, cross-industry institute in the same manner that the Project Management Institute reached across industry lines to appeal to all program management professionals. Likewise, we suggest forming strategic working relationships with other complementary associations, such as advertising for each other in newsletters, highlighting newly published research papers, or listing certification exam dates. Offering discounted ICEAA membership rates for members of related organizations or allowing those members to receive the ICEAA member price for the CCEA could be other ways to increase new memberships, traffic to ICEAA's website, and interest in the certification exam. Along the same lines, those organizations would provide the similar discounts and opportunities to ICEAA's members, raising the ICEAA members' return on investment.

We suggest ICEAA work with other cost estimating organizations to form a standard grouping of recognized professional certifications that could become an industry standard across the acquisition workforce and would include the CCEA as a member level of certification. In addition to increasing ICEAA's member base, these improvements would raise the visibility of ICEAA and provide additional value to ICEAA's current member.

ICEAA should expand its outreach and marketing activities to help inform job seekers and recent college graduates of how cost estimating is related to fields of study and majors such as business administration, economics, statistics, mathematics, engineering, operations research, and finance. The process should start with educating professors and career advisors within universities on the overall cost estimating career field along with the earning potential and growth opportunity. ICEAA should emphasize such factors such as the projected cost estimating career growth of 10.5% from 2016 to 2026 compared to 7% average growth along with the median cost estimating salary of \$61,790 compared to \$37,070<sup>19</sup> for all occupations.

To gain a better understanding of what the association's members really want, ICEAA should conduct a membership survey. This would provide the members with an outlet for voicing their opinions while also identify what they like (or dislike) about the organization. This is not only a chance to get to know the members, but it would be a way for the members to identify areas where they are willing to become more engaged. The survey should be used to collect information to help ICEAA grow by asking how they found out about ICEAA and what made them decide to join. The survey can also be used to get direct feedback on some of the benefits of membership such as opinions on publications and ideas to expand services. Finally, the survey should look to the future by asking for suggestions for future events and if the member is likely to renew his or her membership. Whether the survey results confirm current approaches or provide new insights and direction, they will have come from members and will help to strengthen the overall organization.

The annual ICEAA Conference would benefit from modern technological solutions commonly used for business meetings. For instance, to increase the number of people being served and improve the

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<sup>19</sup> Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Cost Estimators

conference experience for all members, a live-stream of paper presentations and awards could be set up with dial-in conference capabilities and recordings saved on ICEAA's website. This would allow members not able to attend in person to still participate. Allowing questions to be asked by remote participants would increase the perception that the conference is for all members, not just those whose agency or company is able to send people in person. It would also allow conference attendees to hear recordings of presentations that were occurring in the same time slot rather than just reviewing the slides.

Social media innovations also provide potential opportunities to reach more people. ICEAA has a presence on LinkedIn but there are other social media platforms that could help ICEAA get its message out. We suggest broadening ICEAA's reach by posting information to Twitter and Instagram, for example, to reach a more diverse (and possibly younger) audience. Information about ICEAA's future plans, chapter happenings, new job postings, etc could be provided to members on these sites so it shows up in their Twitter feeds. Consuming the information from different sources, as opposed to hunting for it by attending a chapter meeting or digging through board meeting minutes on the website would allow members to stay more up to date with events. ICEAA is already making plans for a lot of great things that members don't necessarily know about, and it's in ICEAA's best interest to tell them. Pushing the information to them in more ways, as opposed to depending on members to pull it in, will improve the value perception and may be a way to attract more volunteers and resources for special projects.

Updating and modernizing member interactions, information delivery methods, and the products ICEAA offers would help improve members' perceived value and may help increase participation rates overall. Some of the most visible products ICEAA offers to its members-- the CCEA exam, the CEBoK training modules, and the annual conference -- all have aspects that could be refreshed and improved.

It is no secret that the CEBoK training modules need to be updated, including the format, delivery method, and content. The current delivery method ("conveniently available on a USB flash drive") and file format ("Microsoft Excel macro-based tool" requiring "Microsoft Excel 2000 or later") is surprising considering the web-based capabilities that exist now and the cost of the training package. Younger analysts and new college graduates especially may call into question the quality of the content and logic of purchasing the training if the product doesn't match their expectations, which then influences the perceived value of the ICEAA membership. Along with increasing membership to include data analysis, scheduling, EVM, etc, professionals, we suggest changing the title of the training to be more inclusive of other topics since those topics are in fact covered in the CCEA exam. Although incrementally improving over the past two decades, CEBoK is still DoD-centric in its content and language. Inclusion of more commercial practices, as well as broader Federal practices beyond DoD, could increase engagement with practitioners in those areas.

With something as large and encompassing as CEBoK, however, the challenge is how to rely on a predominately volunteer organization to make this initiative a reality. Originally, the first version of CEBoK, CostPROF (Cost Programmed Review of Fundamentals) was created under a small dollar-value contract to TASC. The value of that contract was almost negligible, particularly given the amount of work it actually took to complete that first version. The value of building the modules was in branding. As we already have a well-grounded and robust body of knowledge in place, many agencies and companies would be willing to donate time, resources, and modern tools for the opportunity to not only advance the training material value but to also allow for branding, having an organization or company logo on the material to signify a presence and contribution to the industry.

The CCEA application process, a lengthy process completed online, would benefit from automation and refinement. Currently, potential test takers submit one application that both indicates their desire to take the exam and supplies the necessary documentation for receiving the various designations.

Instead of the current combined test/certification application, we suggest splitting that application into 2 parts, with the intended result of decreasing the paperwork burden on ICEAA, and increasing the numbers of potential test takers:

1. Application for Test: One application that would let ICEAA know of their desire to sit for the test, and the date/time/location that it will be taken. Application would include statement that applicants understand the requirements for the certification being sought.
2. Application for Certification: One application that would be submitted AFTER the test results are returned, providing the necessary proof of qualifications for the various designations.

Separating the application into two could have any or all of the following favorable results:

- Decrease the time it takes to fill out the test application and streamline the application process, which may entice more people to register for the test.
- Decrease the turnaround time between application submittal and approval for testing, which would allow test takers to re-take the exam more quickly if they don't succeed the first time
- Decrease the workload on ICEAA personnel who are tasked with reviewing each entire application and judging the experience/qualifications for the PCEA/CCEA, whether or not the applicant subsequently takes the test they registered for or passes it.
- Decrease the number of times an unsuccessful test taker must fill out the experience and qualifications section of the application, which are time-consuming

Also surprising, and in need of updating, is the method in which the CEAA exam is given: pencil and paper with a calculator. New graduates and analysts who have been working in professional industries have not only grown accustomed to MS Excel, they may not remember how to use a normal calculator. Requiring potential test takers to purchase and re-learn how to use one when MS Excel is the industry standard gives the impression that the exam itself is antiquated, in need of modernizing, and not testing how analysts actually use the information in the workplace. With logical updates made to the content of the test and the way in which questions are asked, providing test takers with an unconnected, stand-alone MS Excel program would not give them the answers to questions they don't already know. Rather, it would take away the user error associated with using a tool that is never actually used anymore, by anyone in the cost analysis industry, to compute complex formulas.

The geographical locations where the exams are offered also limit the number of potential test takers. Currently, ICEAA offers the test monthly in certain locations aligning with the greatest number of cost analysts around the country, such as the Washington D.C. area. It also will allow tests to be given on-site at analysts' offices IF there's a CCEA-certified analyst available to proctor it. Both of these options place restrictions on the number of new analysts who are able to take the exam. Holding the exam in the analyst's office, with any inherent office politics and peer pressure that currently exists, may also make an analyst hesitate to take the exam if he or she fears professional consequences for failing.

ICEAA's website also states: "If it is determined that ICEAA is unlikely to offer an exam in your area in the near future, alternatives will be suggested including arranging your own exam with a local proctor; college or university; or testing service." However, a potential test taker or someone not familiar with ICEAA's website may not see that a university or testing service is an option, since the language does not jump out to the casual viewer. A testing center is also currently just a back-up plan, and not a standard way to take the exam.



To get as many people as possible interested and able to take the exam (and therefore become and remain ICEAA members), we suggest that ICEAA provide test takers with 3 standard options that are front and center on the website:

- Attend a monthly testing session offered by ICEAA at the normal locations
- Host a session at your office/college/university, proctored either by: a CCEA-certified analyst in person; or an ICEAA member, manager, or professor on-site
- Make arrangements with a college/university or commercial testing center to take the test (Any additional fees charged by a commercial testing service would be the responsibility of the test taker)

## Organizational

### Leadership/volunteers

Other than the core ICEAA office staff, the association relies on volunteers at both the leadership level, as well as for the more tactical efforts like training, proctoring exams, and working groups. As with any volunteer organization, dedicating free time to things other than mowing the lawn, taking the kids to the pool, or binge-watching something on Netflix, is a challenge. Those that rise to the challenge are to be commended, and maybe rewarded in some way. Admittedly, we are ignorant of any incentives available to ICEAA Board members but study after study has proven rewards that incentivize people do not always need to take a monetary form.

#### Volunteer Incentives

- Let them lead/explore
- Certificate of recognition (Service Award)
- Public recognition/Wall of Fame
- Cover an expense
- ICEAA Apparel or Swag

### Executable plan/approach

ICEAA has a dedicated staff, involved chapter leadership and core member base that draws on everyone's skills and strengths to support the overall organization. The value of the membership data is dependent on the quality of the information within the database. To improve the overall validity of the data, ICEAA should regularly push for members to update their profiles and contact information. This will allow everyone to self-correct any errors within their membership profile and ensure ICEAA can accurately contact each member. Additionally, ICEAA should identify multiple key data fields to request within each profile based on the likelihood that the information will change over time. For example, a member's employer or home email address could change but if the database contained the member's home address and email address along with their work address and work email address, then the likelihood of all four pieces of information changing would be greatly reduced and ICEAA's database would be more reliable and useful.

To expand ICEAA's membership rolls, the association should look for growth opportunities based on the information within its existing member database. ICEAA has contact information for many people who are already familiar with the organization and have previously been members. ICEAA should initiate a communication campaign to reengage with former members to try to determine why their memberships have lapsed, if they are interested in rejoining, and if they have recommendations to make membership more appealing. ICEAA should also build on the networks of its members by encouraging current members to bring in additional members. Offering a "reward" such as a free or half-price year of membership for five or more referrals could motivate members to appeal to colleagues to join the association. ICEAA should also consider "corporate memberships" where a company could get a discount for having a large number of ICEAA members. The memberships would still be held as individuals but having all of the members on a single account paid for by the company would reduce the overall administrative actions and costs.

### **Accountability**

No volunteer organization wants to hound volunteers and make sure they're doing the things they signed up to do. But the work must get done, and some volunteer organizations require volunteer hours to even operate. With ICEAA, Board members should be setting the example. It's understandable that competing agendas could come into play, but those agendas can be harnessed if, at the end of the day, they still are an ultimate benefit of the field and community. In addition to the Board and various committee/working group members, key government and industry leaders should be engaged and vocal, potentially as a form of checks and balances, and to bring different sides together for the common good.

In terms of ensuring accountability of volunteers and their assigned efforts, there are a number of things that can be done to ensure success. For ICEAA initiatives, clear expectations on time required and allotted need to be set and communicated. Realism is required when defining the time and task commitments for each role versus minimizing the commitment in order to attract volunteers. Volunteers, although self-regulating themselves, need to periodically share progress in some kind of reporting format or venue, which is even more critical as a number of volunteers work remotely. Progress should be against measurable outcomes with specific target dates, and if they find themselves unable to fulfill their volunteer roles, based on personal or professional demands, they should feel comfortable backing out of — or perhaps minimizing — their commitment moving forward. This requires the establishment and use of two-way communication.

## **Summary/Closing**

This paper has meandered from the origins of cost estimating in the 4<sup>th</sup> millennium BC, through the formation of the cost estimating career field, to background and state of the ICEAA professional organization before finally offering some approaches to increase the overall well-being of ICEAA. We understand that there are many challenges, some large and few small, but with vision, defined goals and a crawl/walk/run approach, some, if not all, of the outcomes are achievable. We also understand that some of the recommendations are already being implemented or have been tried before but that doesn't mean that a similar approach, if applied differently, shouldn't be tried again with the expectation of better results. Finally, we see the future of ICEAA as requiring a partnership of not just government and industry, but of long-term members and new members, "experienced" practitioners and recent college graduates. Working toward a common vision for the resurgence of ICEAA, all of these people with their diverse backgrounds can make it happen.