

Business Analyst, Cost Engineer, Project Manager and Systems Engineer Compared - A Key Word Analysis of Current Job Descriptions To Analyze Project Management Related Job Roles and Responsibilities

Dr. Paul D. Giammalvo

INTRODUCTION

This paper is an EXTENSION of a 4 part “work for hire” research project undertaken by the author for and on behalf of the Guild of Project Controls as the basis to help them design their 4 track, 5 level competency based credentialing program, the results of which were published in the *PM World Journal* between June and September of 2016.¹

As a result of feedback received, requests were made to expand the original research to include the following 4 ADDITIONAL job titles, on the grounds these job titles are very closely related to “project control” functions and all share a common “body of knowledge”.

- 1) Planner Scheduler (Original)**
- 2) Cost Estimator/Quantity Surveyor (Original)**
- 3) Forensic Claims Analyst (Original)**
- 4) Project Controller (Original)**

The top listings show the ORIGINAL job titles and the bottom 4 are the NEW or ADDITIONAL job titles being analyzed as part of this paper:

- 5) Business Analyst (New)**
- 6) Cost Engineer (New)**
- 7) Project Manager (New)**
- 8) Systems Engineer (New)**

These 8 job titles cover many of the same functions, having evolved over time, based on specific project process applications or contexts. As an example, the International Council of Systems Engineers (INCOSE) defines a “Systems Engineer” to be²

“an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle,

¹Planner/Schedulers- <http://pworldjournal.net/wp-content/uploads/2016/06/pmwj47-Jun2016-Giammalvo-project-planner-scheduler-defined-featured-paper.pdf>

Cost Estimators/Quantity Surveyors- <http://pworldjournal.net/wp-content/uploads/2016/07/pmwj48-Jul2016-Giammalvo-cost-estimator-quantity-surveyor-defined-featured-paper.pdf>

Forensic Analysts/Claims Analysts- <http://pworldjournal.net/wp-content/uploads/2016/08/pmwj49-Aug2016-Giammalvo-forensic-analysis-defined-featured-paper.pdf>

Project Control/Cost Engineers/Systems Engineers/Business Analysts- <http://pworldjournal.net/wp-content/uploads/2016/09/pmwj50-Sep2016-Giammalvo-project-controller-defined-featured-paper.pdf>

² What is a Systems Engineer? <http://www.incose.org/AboutSE/WhatIsSE>



documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem:

Operations	Cost & Schedule
Performance	Training & Support
Test	Disposal
Manufacturing	

Systems Engineering integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation. Systems Engineering considers both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs.

Likewise, AACE defines a “Cost engineering” to be:³

“the engineering practice devoted to the management of project cost, involving such activities as estimating, cost control, cost forecasting, investment appraisal and risk analysis.” “Cost Engineers” budget, plan and monitor investment projects. (Asset creation, acquisition, maintenance, upgrading and eventual disposal).

Lastly, the International Institute of Business Analysts defines a Business Analyst to be:⁴

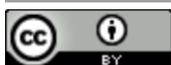
“Business Analysis is the practice of enabling change in an organizational context, by defining needs and recommending solutions that deliver value to stakeholders.” Job titles for business analysis practitioners include not only business analyst, but also business systems analyst, systems analyst, requirements engineer, process analyst, product manager, product owner, enterprise analyst, business architect, management consultant, business intelligence analyst, data scientist, and more. Many other jobs, such as management, project management, product management, software development, quality assurance and interaction design rely heavily on business analysis skills for success.

Business analysis is used to identify and articulate the need for change in how organizations work, and to facilitate that change. As business analysts, we identify and define the solutions that will maximize the value delivered by an organization to its stakeholders. Business analysts work across all levels of an organization and may be involved in everything from defining strategy, to creating the enterprise architecture, to taking a leadership role by defining the goals and requirements for programs and projects or supporting continuous improvement in its technology and processes.

We have the specialized knowledge to act as a guide and lead the business through unknown or unmapped territory, to get it to its desired destination. The value of business analysis is in realization of benefits, avoidance of cost, and identification of new opportunities, understanding

³ What is Cost Engineering and Total Cost Management? <http://web.aacei.org/about-aace/what-is-cost-engineering>

⁴ What is “Business Analysis”? <http://www.iiba.org/Careers/What-is-Business-Analysis.aspx>



of required capabilities and modeling the organization. Through the effective use of business analysis, we can ensure an organization realizes these benefits, ultimately improving the way they do business.”

Thus for all intents and purposes, while the job titles may be different depending on the sector, the roles and responsibilities with regard to these 8 job titles across both the Asset and Project Life Spans to support the creation, acquisition, maintenance, expansion, upgrading and eventual disposal or organizational assets are not only over-lapping, but are also both complimentary and synergistic.

In Figure 1 below, the Guild of Project controls has adopted the fully integrated Asset, Portfolio (of both Assets and Projects), Program (Operations) and Project Management Methodology, illustrating the roles these job titles play vis a vis the asset and project life span phases.

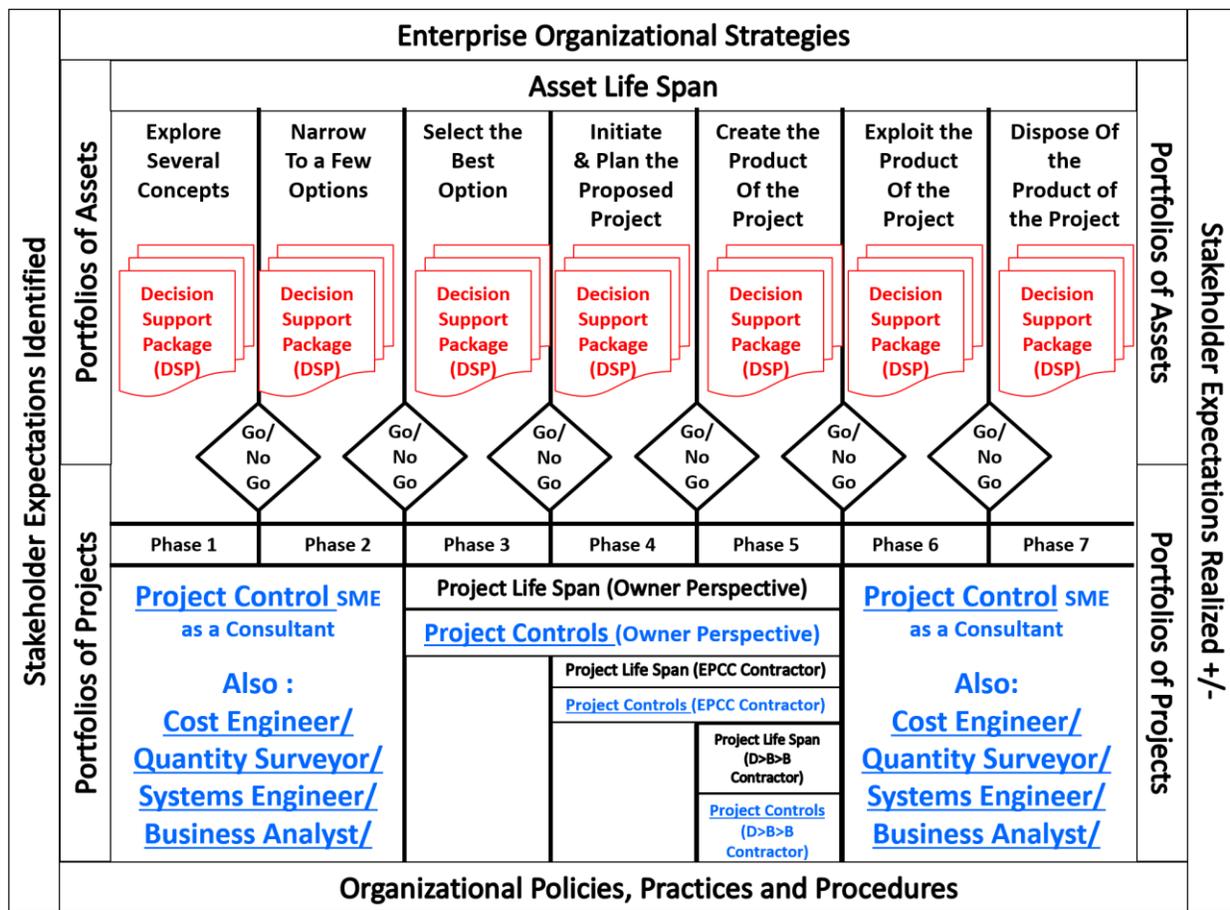
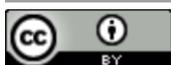


Figure 1- 8 Job Titles Showing their Roles in the Integrated Asset, Portfolio, Program (Operations) and Project Management Methodology. (To see the full explanation of this model, go [HERE](http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls) Access is FREE but does require a profile be filled out)



The model shown in Figure 1 above originated during the mid-1950 by either Esso or Diamond Shamrock Oil and standing as evidence that it actually works, has been adopted by virtually all the major international and most national oil companies around the world.

This asset centric model was first published in a non-proprietary form by AACE around 2006 with their Total Cost Management Framework and was adopted by the Guild of Project Controls in 2014 as the basis for their Guild of Project Controls Compendium and Reference (GPCCAR). PMI is in the process of creating their own version of this asset centric model for their PMBOK Guide 2017.

RESEARCH METHODOLOGY SUMMARIZED

To summarize the research methodology, to ensure a global representation, both the original pilot and this updated research consisted of a total of 30 job advertisements for each job title, with 5 job advertisements taken from each of the following countries having been randomly chosen by selecting the top 5 which showed up on a Google search for each of the “job titles” above plus “Job Openings” and [Country]:

- Australia (5)
- Canada (5)
- Middle East (5)
- United Kingdom (5)
- United States (5)
- Singapore/Malaysia/Hong Kong (5)

These countries were chosen as being a globally dispersed sample of countries doing large, complex and challenging projects AND who most likely are seeking globally qualified professional level talent to staff those projects.

The targeted sample population was “competent” level practitioners who had between 5-8 years of experience. Thus the key word analysis was NOT for entry level or senior practitioners but “mid-career path professionals. People who have chosen these job titles as a career path objective rather than just “passing through” as they climb the organizational ladder.

Each of these “help wanted” advertisements were copied to a single MS Word file (one for each job title) then using Sisence Data Analysis software <https://www.sisense.com/product/> a key word analysis was completed using key words from the Guild of Project Controls Compendium <http://www.planningplanet.com/guild/GPCCAR-modules> as the “seed” or “key words” against which the comparison was made”.⁵

⁵ When the Guild’s Compendium was written, the key words were cross referenced and validated against AACE’s “RP 11R-88- Skills and Knowledge of Cost Engineers”, Max Widman’s “Comparative Glossary of Project Management Terms” as well as PMI’s “PMBOK Guide 2015”.



For more details on the methodology, reference the earlier papers published in the PMWJ from June to September 2017.

HOW TO USE THIS RESEARCH

This research was designed to help us develop a quantitative analysis employing an empirical method, to tell us what the marketplace is looking for TODAY when employers advertise to hire project management practitioners or project management support professionals as team members, understanding that as the marketplace changes, by using “big data” analysis tools we can keep a close pulse on any changes in what the marketplace is seeking when they post job advertisements.

PRACTITIONERS- You can use this approach to create or update your CV’s or resume’s. Because the data analysis software is easy to use, you can select a minimum of 10 current job postings from your targeted job location and based on the key word analysis, you can create a customized CV based on a statistical analysis of the key words.

EMPLOYERS- For those who are looking to hire people, this research should help you craft better job descriptions internally as well as help your HR team short list candidates and conduct the initial interviews.

PROFESSIONAL ORGANIZATIONS- This information should be invaluable to you in updating your bodies of knowledge as the job advertisements are the best possible sources of what employers are looking for TODAY. By being able to measure the “pulse of the marketplace” should provide the ability to identify trends in advance and update your skills, knowledge, tools, techniques and methodologies defined in your “bodies of knowledge” or “methodologies” to meet those needs.

It also enables those PROFESSIONAL SOCIETIES developing credentialing programs to make sure they are assessing and validating what the marketplace is looking for in terms of competencies.

ACADEMICS/TRAINING PROVIDERS- With the pressure building for “Output Based” degrees and training courses, by being able to measure and assess exactly what employers are seeking in terms of competencies, you are well positioned to customize your training to meet those needs in “real time”.

THREE DIMENSIONAL ANALYSIS

The original research took a three dimensional approach as the basis to define and assess the knowledge, skills, tools, techniques and methodology against which to measure or assess “competency” against, and this expansion of the research will build upon that three dimensional model, consisting of:

- 1) Dimension 1- Key Word Analysis sorted by the “Body of Knowledge”



Based on the “body of knowledge” researched and compiled by the Guild of Project Controls, and named the “Guild of Project Controls Compendium and Reference” or GPCCAR. This FREE ~650 page e-document is based on the 5 project management process groupings (Initiation,

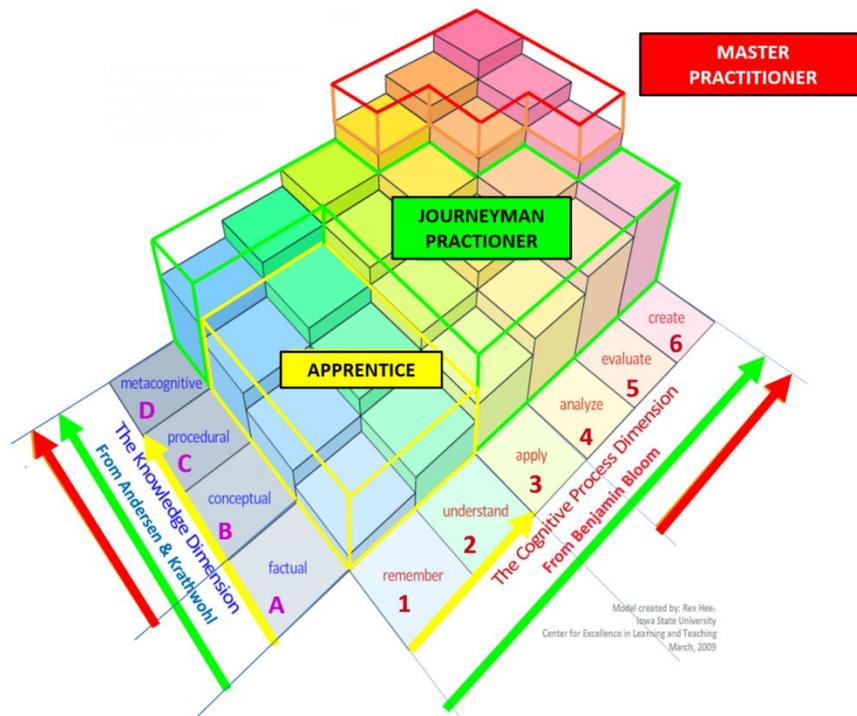
	Initiation		Planning						Controlling		Closing	
	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8	Mod 9	Mod 10	Mod 11	Mod 12
Modules for Managing:	Integration	Stakeholders	Scope	Risk/Opport	Contracts	Resources	Scheduling	Costs	Earned Value	Change	Database	Forensics

Planning, Executing, Controlling and Closing) and consists of 12 sub-modules:

Figure 2 GPCCAR Modules

Each sub-module covers specific functional areas of expertise that project control professional need to master to varying degrees of depth and breadth, depending on their job title.

The second and third dimensions, Bloom’s Cognitive Dimensions vs Andersen and Krathwohl’s Knowledge Dimension, together form a matrix, which comes to us from the Iowa State University Center of Excellence in Teaching, and is based on research by Anderson, Krathwohl⁶ et al as shown in Figure 2 below.



⁶ Anderson, L.W. (Ed.), Krathwohl, D.R. (Ed.), Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom’s Taxonomy of Educational Objectives (Complete edition). New York: Longman.

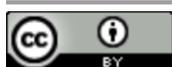


Figure 3 Levels of COMPETENCE are determined by TYPES of KNOWLEDGE (Andersen and Krathwohl) and HOW THOSE KNOWLEDGE DIMENSION ARE USED (Blooms) Source Heer, Rex (2009) Iowa State University Center of Excellence in Teaching <http://www.celt.iastate.edu/teaching/effective-teaching-practices/revise-blooms-taxonomy>

This model forms the basis for competency assessment by the Guild of Project Controls, the Green Project Management organization and is being adopted/adapted for use by several other professional credentialing and teaching organizations.

2) Dimension 2- Key Word Analysis Sorted by Blooms Cognitive Dimensions

The second dimension is based on Dr. Benjamin Bloom’s Revised 6 Cognitive Dimensions:

1. Knowledge
2. Understanding
3. Application
4. Analysis
5. Evaluate
6. Create

3) Dimension 3- Key Word Analysis Sorted by Andersen & Krathwohl’s Knowledge Dimensions

The third dimension is based on the 4 types of knowledge, which are:

- A. Factual Knowledge
- B. Conceptual Knowledge
- C. Procedural Knowledge
- D. Metacognitive or the ability to think critically and innovate

These are the 3 dimensions we are using against which to compare all 8 job titles, based on the key word analysis taken from the global job postings.

FINDINGS 1- JOB TITLES RANK ORDERED BY MODULES (“Body of Knowledge”)

	Initiation		Planning						Controlling		Closing	
	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8	Mod 9	Mod 10	Mod 11	Mod 12
Modules for Managing:	Integration	Stakeholders	Scope	Risk/Opport	Contracts	Resources	Scheduling	Costs	Earned Value	Change	Database	Forensics
Planner/Scheduler	8.4%	19.1%	1.8%	1.5%	3.8%	3.5%	30.6%	4.4%	23.6%	1.1%	1.3%	0.9%
Cost Estimator/Quantity Surveyor	2.9%	16.9%	5.5%	0.6%	21.9%	4.2%	13.0%	24.1%	8.5%	0.8%	1.2%	0.4%
Forensic/Claims Analyst	5.5%	18.4%	1.0%	1.4%	12.7%	0.9%	10.3%	5.2%	13.9%	1.1%	1.5%	28.1%
Project Controller	8.4%	17.4%	1.8%	2.3%	6.2%	2.3%	20.0%	14.3%	22.0%	1.9%	3.1%	0.3%
Business Analyst	6.0%	22.7%	1.2%	1.2%	6.5%	2.0%	14.6%	19.1%	17.2%	2.8%	6.3%	0.4%
Cost Engineer	5.4%	11.2%	3.1%	1.5%	13.0%	2.2%	10.4%	27.5%	19.6%	2.0%	3.5%	0.4%
Project Manager	4.8%	31.9%	3.0%	1.6%	9.1%	2.7%	20.9%	5.7%	14.7%	2.2%	2.8%	0.4%
Systems Engineer	8.5%	37.7%	7.7%	0.9%	7.2%	1.9%	14.7%	1.4%	13.4%	0.9%	5.7%	0.0%
Mean	6.3%	18.0%	2.5%	1.5%	11.2%	2.7%	18.5%	12.0%	17.0%	1.2%	1.8%	7.4%
Median	7.0%	17.9%	1.8%	1.5%	9.5%	2.9%	16.5%	9.8%	18.0%	1.1%	1.4%	0.7%
Standard Deviation	2.6%	1.0%	2.0%	0.7%	8.1%	1.4%	9.1%	9.2%	7.1%	0.5%	0.9%	13.8%

Table 1- Original Job Titles (Black typeface) and 4 NEW Job Titles (Red typeface) random sort.

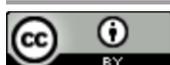


Table 1 above shows both the original 4 job titles (black typeface) along with the 4 new job titles (red typeface) with the percentages generated from the key word search of 30 global job postings for each of those job titles. The percentages shown in each cell are the percentages of key words from the job advertisements which correspond to the key words or key concepts covered in each module. A “heat map” was generated showing that while all the job titles are based on the same underlying “body of knowledge” that the focus or emphasis as to how important each Module was for any given job title changes. This is important for those developing credentialing programs and competency development courses.

The mean and median values along with the standard deviation for each column has been provided as well, for those organizations wanting to benchmark their job titles/job descriptions or their exam content outlines using this method.

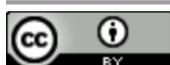
	Initiation		Planning						Controlling		Closing	
	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8	Mod 9	Mod 10	Mod 11	Mod 12
Modules for Managing:	Integration	Stakeholders	Scope	Risk/Opport	Contracts	Resources	Scheduling	Costs	Earned Value	Change	Database	Forensics
Systems Engineer	8.5%	37.7%	7.7%	0.9%	7.2%	1.9%	14.7%	1.4%	13.4%	0.9%	5.7%	0.0%
Project Manager	4.8%	31.9%	3.0%	1.6%	9.1%	2.7%	20.9%	5.7%	14.7%	2.2%	2.8%	0.4%
Business Analyst	6.0%	22.7%	1.2%	1.2%	6.5%	2.0%	14.6%	19.1%	17.2%	2.8%	6.3%	0.4%
Planner/Scheduler	8.4%	19.1%	1.8%	1.5%	3.8%	3.5%	30.6%	4.4%	23.6%	1.1%	1.3%	0.9%
Forensic/Claims Analyst	5.5%	18.4%	1.0%	1.4%	12.7%	0.9%	10.3%	5.2%	13.9%	1.1%	1.5%	28.1%
Project Controller	8.4%	17.4%	1.8%	2.3%	6.2%	2.3%	20.0%	14.3%	22.0%	1.9%	3.1%	0.3%
Cost Estimator/Quantity Surveyor	2.9%	16.9%	5.5%	0.6%	21.9%	4.2%	13.0%	24.1%	8.5%	0.8%	1.2%	0.4%
Cost Engineer	5.4%	11.2%	3.1%	1.5%	13.0%	2.2%	10.4%	27.5%	19.6%	2.0%	3.5%	0.4%
Mean	6.2%	21.9%	3.1%	1.4%	10.1%	2.5%	16.8%	12.7%	16.6%	1.6%	3.2%	3.9%
Median	5.8%	18.8%	2.4%	1.4%	8.2%	2.3%	14.6%	10.0%	16.0%	1.5%	2.9%	0.4%
Standard Deviation	2.0%	8.7%	2.3%	0.5%	5.8%	1.0%	6.8%	10.0%	5.0%	0.7%	2.0%	9.8%

Table 2- Job Titles Rank Ordered by Module 2- Managing People- (To see what key words are covered in this module, go HERE <http://www.planningplanet.com/guild/gpcar/introduction-to-managing-people> Access is FREE but does require a profile be filled out)

In Table 2, we have rank ordered each job title based on the percentage of key words in the job postings which came from Module 2. As we can readily see, those employers seeking Systems Engineers place a 15.8% premium on the “soft” or “people” skills. (37.7% - Mean 21.9% = 15.8%)

In second place are Project Managers, with a 10% premium and in third place are Business Analysts with a slightly above average preference for people with strong soft or people skills.

You can also see that by knowing the Standard Deviation or Sigma, all 8 job titles easily fall within +/- 2 sigma of the mean. From the standpoint of “making sense” this is logical and rational, as the top three job titles are the people most likely responsible as “team leaders” with strong interfaces with the clients, end users and other key stakeholders.



The table shown to the right (Figure 4) comes to us compliments of the National Association of Colleges and Employers (NACE) and further breaks down the “soft” or “people” skills into the top 19 traits or attributes which employers are seeking when they hire an employee. This assessment was used as the basis for developing the key words and the content in Module 2. Applying Pareto’s “80/20” Rule we can see that the top two attributes employers are expecting to see in the people they hire are demonstrated LEADERSHIP skills and the ABILITY TO WORK IN A TEAM.

Attribute	% of respondents
Leadership	80.1%
Ability to work in a team	78.9%
Communication skills (written)	70.2%
Problem-solving skills	70.2%
Communication skills (verbal)	68.9%
Strong work ethic	68.9%
Initiative	65.8%
Analytical/quantitative skills	62.7%
Flexibility/adaptability	60.9%
Technical skills	59.6%
Interpersonal skills (relates well to others)	58.4%
Computer skills	55.3%
Detail-oriented	52.8%
Organizational ability	48.4%
Friendly/outgoing personality	35.4%
Strategic planning skills	26.7%
Creativity	23.6%
Tactfulness	20.5%
Entrepreneurial skills/risk-taker	18.6%

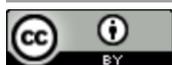
Source: *Job Outlook 2016*, National Association of Colleges and Employers

Figure 4- NACE Attributes Desired by Employers (2016) <http://www.naceweb.org/s11182015/employers-look-for-in-new-hires.aspx>

	Initiation		Planning						Controlling		Closing	
	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8	Mod 9	Mod 10	Mod 11	Mod 12
Modules for Managing:	Integration	Stakeholders	Scope	Risk/Opport	Contracts	Resources	Scheduling	Costs	Earned Value	Change	Database	Forensics
Planner/Scheduler	8.4%	19.1%	1.8%	1.5%	3.8%	3.5%	30.6%	4.4%	23.6%	1.1%	1.3%	0.9%
Project Manager	4.8%	31.9%	3.0%	1.6%	9.1%	2.7%	20.9%	5.7%	14.7%	2.2%	2.8%	0.4%
Project Controller	8.4%	17.4%	1.8%	2.3%	6.2%	2.3%	20.0%	14.3%	22.0%	1.9%	3.1%	0.3%
Systems Engineer	8.5%	37.7%	7.7%	0.9%	7.2%	1.9%	14.7%	1.4%	13.4%	0.9%	5.7%	0.0%
Business Analyst	6.0%	22.7%	1.2%	1.2%	6.5%	2.0%	14.6%	19.1%	17.2%	2.8%	6.3%	0.4%
Cost Estimator/Quantity Surveyor	2.9%	16.9%	5.5%	0.6%	21.9%	4.2%	13.0%	24.1%	8.5%	0.8%	1.2%	0.4%
Cost Engineer	5.4%	11.2%	3.1%	1.5%	13.0%	2.2%	10.4%	27.5%	19.6%	2.0%	3.5%	0.4%
Forensic/Claims Analyst	5.5%	18.4%	1.0%	1.4%	12.7%	0.9%	10.3%	5.2%	13.9%	1.1%	1.5%	28.1%
Mean	6.2%	21.9%	3.1%	1.4%	10.1%	2.5%	16.8%	12.7%	16.6%	1.6%	3.2%	3.9%
Median	5.8%	18.8%	2.4%	1.4%	8.2%	2.3%	14.6%	10.0%	16.0%	1.5%	2.9%	0.4%
Standard Deviation	2.0%	8.7%	2.3%	0.5%	5.8%	1.0%	6.8%	10.0%	5.0%	0.7%	2.0%	9.8%

Table 3- Job Titles Rank Ordered by Module 7- Managing Planning & Scheduling- (To see what key words are covered in this module, go HERE <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-planning-and-scheduling> Access is FREE but does require a profile be filled out)

In Table 3, we have taken the same approach, but this time rank ordering the job titles based on how important Planning and Scheduling skills are to those looking to hire people. Obviously enough, for anyone wanting to hire a Planner/Scheduler they would expect that the person be competent in those skills. However, it is interesting to note just how important planning and scheduling is to those wanting to hire Project Managers (20.9%) and Project Controllers, (20.0%) all of whom score over the average.



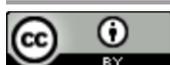
Also worth noting is that those advertising for Systems Engineers and Business Analysts, also expect them to have about 15% of their knowledge in Planning/Scheduling.

Interesting analysis on the lowest ranked Forensic Analyst, the reason “Planning and Scheduling” scored so low is a person being hired to be a forensic analyst or claims consultant is not expected to CREATE a schedule but be able to analyze “as built” schedules usually created by others, which is why the high score of 28.1% shows up in Module 12.

	Initiation		Planning						Controlling		Closing	
	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8	Mod 9	Mod 10	Mod 11	Mod 12
Modules for Managing:	Integration	Stakeholders	Scope	Risk/Opport	Contracts	Resources	Scheduling	Costs	Earned Value	Change	Database	Forensics
Cost Engineer	5.4%	11.2%	3.1%	1.5%	13.0%	2.2%	10.4%	27.5%	19.6%	2.0%	3.5%	0.4%
Cost Estimator/Quantity Surveyor	2.9%	16.9%	5.5%	0.6%	21.9%	4.2%	13.0%	24.1%	8.5%	0.8%	1.2%	0.4%
Business Analyst	6.0%	22.7%	1.2%	1.2%	6.5%	2.0%	14.6%	19.1%	17.2%	2.8%	6.3%	0.4%
Project Controller	8.4%	17.4%	1.8%	2.3%	6.2%	2.3%	20.0%	14.3%	22.0%	1.9%	3.1%	0.3%
Project Manager	4.8%	31.9%	3.0%	1.6%	9.1%	2.7%	20.9%	5.7%	14.7%	2.2%	2.8%	0.4%
Forensic/Claims Analyst	5.5%	18.4%	1.0%	1.4%	12.7%	0.9%	10.3%	5.2%	13.9%	1.1%	1.5%	28.1%
Planner/Scheduler	8.4%	19.1%	1.8%	1.5%	3.8%	3.5%	30.6%	4.4%	23.6%	1.1%	1.3%	0.9%
Systems Engineer	8.5%	37.7%	7.7%	0.9%	7.2%	1.9%	14.7%	1.4%	13.4%	0.9%	5.7%	0.0%
Mean	6.2%	21.9%	3.1%	1.4%	10.1%	2.5%	16.8%	12.7%	16.6%	1.6%	3.2%	3.9%
Median	5.8%	18.8%	2.4%	1.4%	8.2%	2.3%	14.6%	10.0%	16.0%	1.5%	2.9%	0.4%
Standard Deviation	2.0%	8.7%	2.3%	0.5%	5.8%	1.0%	6.8%	10.0%	5.0%	0.7%	2.0%	9.8%

Table 4- Job Titles Rank Ordered by Module 8- Managing Costs- (To see what is covered in this module, go HERE <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-cost-estimating-budgeting> Access is FREE but does require a profile be filled out)

While there are no surprises coming to us from the top 4 job titles, what is a major surprise is to see both the Project Manager (5.7%) and the Systems Engineer (1.4%) not being expected to manage costs in their respective roles? Is this a case of those writing the job advertisements simply assumed that “cost management” is an important part of being a project manager or systems engineer or do those hiring for these positions expect that someone else will be responsible for cost management? (Cost Engineer? Project Controller? Accounting/Finance?) This is a topic that further research is necessary to investigate why such a low level of importance on costs for these positions.



	Initiation		Planning						Controlling		Closing	
	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5	Mod 6	Mod 7	Mod 8	Mod 9	Mod 10	Mod 11	Mod 12
Modules for Managing:	Integration	Stakeholders	Scope	Risk/Opport	Contracts	Resources	Scheduling	Costs	Earned Value	Change	Database	Forensics
Planner/Scheduler	8.4%	19.1%	1.8%	1.5%	3.8%	3.5%	30.6%	4.4%	23.6%	1.1%	1.3%	0.9%
Project Controller	8.4%	17.4%	1.8%	2.3%	6.2%	2.3%	20.0%	14.3%	22.0%	1.9%	3.1%	0.3%
Cost Engineer	5.4%	11.2%	3.1%	1.5%	13.0%	2.2%	10.4%	27.5%	19.6%	2.0%	3.5%	0.4%
Business Analyst	6.0%	22.7%	1.2%	1.2%	6.5%	2.0%	14.6%	19.1%	17.2%	2.8%	6.3%	0.4%
Project Manager	4.8%	31.9%	3.0%	1.6%	9.1%	2.7%	20.9%	5.7%	14.7%	2.2%	2.8%	0.4%
Forensic/Claims Analyst	5.5%	18.4%	1.0%	1.4%	12.7%	0.9%	10.3%	5.2%	13.9%	1.1%	1.5%	28.1%
Systems Engineer	8.5%	37.7%	7.7%	0.9%	7.2%	1.9%	14.7%	1.4%	13.4%	0.9%	5.7%	0.0%
Cost Estimator/Quantity Surveyor	2.9%	16.9%	5.5%	0.6%	21.9%	4.2%	13.0%	24.1%	8.5%	0.8%	1.2%	0.4%
Mean	6.2%	21.9%	3.1%	1.4%	10.1%	2.5%	16.8%	12.7%	16.6%	1.6%	3.2%	3.9%
Median	5.8%	18.8%	2.4%	1.4%	8.2%	2.3%	14.6%	10.0%	16.0%	1.5%	2.9%	0.4%
Standard Deviation	2.0%	8.7%	2.3%	0.5%	5.8%	1.0%	6.8%	10.0%	5.0%	0.7%	2.0%	9.8%

Table 5- Job Titles Rank Ordered by Module 9- Managing Progress- (To see what is covered in this module, go [HERE](http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-progress) <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-progress> Access is FREE but does require a profile be filled out)

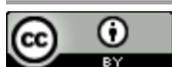
Table 5 contains no big surprises, however it seems a little bit strange that Earned Value does not seem to be as important to those hiring project managers or systems engineers as one might think. However, this is consistent with research done by Professors Brian Hobbs and Claude Bessner on how few project managers actually use earned value management.⁷

For organizations such as AACE, IPMA-USA and PMI, given Obama has recently signed the “Program Management Improvement and Accountability Act” <https://www.pmi.org/about/press-media/press-releases/senate-program-management-act> it would seem that a greater emphasis on using and understanding Earned Value Management should be a higher priority and emphasized more in assessing competency?

FINDINGS 2- JOB TITLES RANK ORDERED BY BLOOM’S COGNITIVE DIMENSIONS

This dimension is important when assessing competency as this tells us what any given level of practitioner should be able to do with the knowledge, skills, tools and techniques they have learned. Based on the Guild of Project Controls credentialing model, a person with 5-8 years of experience should be at Blooms Level 3 “Apply” and Bloom’s Level 4, “Analyze”. IF we look at the original 4 Job Titles, the percentages validate this at least in terms of “project control” professionals.

⁷ Bessner, Claude and Hobbs, Brian “The Contextualization of Project Management Practice and Best Practice” <http://docplayer.net/14500063-The-contextualization-of-project-management-practice-and-best-practice.html>



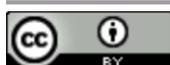
	Blooms Levels					
	Level 1 Know	Level 2 Understand	Level 3 Apply	Level 4 Analyze	Level 5 Evaluate	Level 6 Create
Systems Engineer	36.1%	30.6%	1.9%	23.1%	0.9%	7.4%
Project Manager	26.5%	31.9%	14.2%	17.7%	2.7%	7.1%
Cost Estimator/Quantity Surveyor	26.1%	18.8%	30.5%	19.6%	1.4%	3.6%
Planner/Scheduler	23.1%	7.5%	30.5%	23.1%	11.8%	3.8%
Project Controller	19.4%	12.9%	4.0%	46.0%	4.8%	12.9%
Cost Engineer	17.7%	8.8%	35.4%	27.6%	6.1%	4.4%
Forensic/Claims Analyst	15.3%	22.9%	1.5%	48.9%	3.8%	7.6%
Business Analyst	12.4%	10.7%	13.0%	53.8%	2.0%	8.0%
Mean	22.1%	18.0%	16.4%	32.5%	4.2%	6.9%
Median	21.3%	15.9%	13.6%	25.4%	3.2%	7.2%
Standard Deviation	7.6%	9.6%	13.9%	14.6%	3.5%	3.0%

Table 6- Job Titles Rank Ordered by Blooms Cognitive Dimensions

Table 6 is perhaps one of the most intriguing analysis as it points out that while both Systems Engineers and Project Managers are only expected to KNOW and UNDERSTAND the skills, knowledge, tools and techniques associated with project management, based on key words contained in the help wanted advertisements, they are not expected to be able to APPLY those skills or knowledge, leaving that up to the Cost Engineer (35.4%); Planner/Scheduler (30.5%) or Cost Estimator/Quantity Surveyor (30.5%) while they would expect the ANALYSIS to be done by the Business Analyst (53.8%); Forensic Claims Analyst, (48.9%) and the Project Controller, (46.0%) Again, as this “makes sense”, it starts to build a “comfort level” that by analyzing the key words from the help wanted advertisements, when taken in aggregate, does yield an accurate profile of the roles and responsibilities we are expected to fill in these 8 job titles.

For those professional organizations who are developing CREDENTIALING PROGRAMS for these job titles, this information should be invaluable to you in designing tests or assessments on how best to measure and evaluate these cognitive dimensions. Specifically, while multiple choice questions are appropriate to validate “Knowing” and “Understanding” they are not so well suited to validating “Applying” or “Analyzing”. Those require more open ended questions.

Another important piece of information coming from this research is that at least for a person with 5-8 years’ experience, supports the hypothesis that people at this level are not expected to be competent in Bloom’s Level 5 “Evaluate” (the work of others) OR Bloom’s Level 6 “Create” (new factual, conceptual or procedural knowledge). As we can see from Figure 3 above, these would be the responsibilities of the “Master Practitioner” level.



FINDINGS 3- JOB TITLES RANK ORDERED BY ANDERSON & KRATHWOHL’S KNOWLEDGE DIMENSIONS

This analysis is of more interest to the academics and those who are responsible to design training programs for practitioners. This dimension tells us what KIND or TYPE of knowledge the help wanted advertisements are expecting to see in practitioners with 5-8 years’ experience

	Knowledge Domains			
	Factual	Conceptual	Procedural	Metacognitive
Cost Estimator/Quantity Surveyor	23.2%	8.9%	58.6%	9.3%
Project Controller	16.8%	14.1%	57.6%	11.5%
Planner/Scheduler	11.0%	19.4%	53.7%	15.9%
Project Manager	16.1%	14.2%	52.3%	17.5%
Business Analyst	12.0%	13.5%	48.2%	26.2%
Systems Engineer	14.6%	18.5%	48.1%	18.8%
Cost Engineer	34.0%	11.4%	45.5%	9.1%
Forensic/Claims Analyst	14.5%	10.6%	29.3%	45.6%
Mean	17.8%	13.8%	49.2%	19.2%
Median	15.3%	13.8%	50.3%	16.7%
Standard Deviation	7.5%	3.7%	9.3%	12.1%

Table 7- Job Titles Rank Ordered by Anderson & Krathwohl’s Procedural Knowledge Domain.

Table 7 tells those who are developing or updating bodies of knowledge, methodologies, or processes that with the exception of Forensic Claims analysts, that between 45% to 59% of these job titles are all about PROCESSES. This is one of the reasons why trying to make project management a profession makes little or no sense, as there is no way to build a profession around a process or series of processes, especially when those processes are context or application specific.

The reason Forensic Claims Analysis is less reliant on set procedures is because each claim situation is very much unique, and thus doesn’t lend itself to a “cookbook” recipe. Explained another way, although there are many different approaches to conducting time impact analysis (TIA) which one is used in any given situation will be very much rely on the point the forensic analyst is trying to prove.

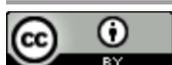


	Knowledge Domains			
	Factual	Conceptual	Procedural	Metacognitive
Cost Engineer	34.0%	11.4%	45.5%	9.1%
Cost Estimator/Quantity Surveyor	23.2%	8.9%	58.6%	9.3%
Project Controller	16.8%	14.1%	57.6%	11.5%
Project Manager	16.1%	14.2%	52.3%	17.5%
Systems Engineer	14.6%	18.5%	48.1%	18.8%
Forensic/Claims Analyst	14.5%	10.6%	29.3%	45.6%
Business Analyst	12.0%	13.5%	48.2%	26.2%
Planner/Scheduler	11.0%	19.4%	53.7%	15.9%
Mean	17.8%	13.8%	49.2%	19.2%
Median	15.3%	13.8%	50.3%	16.7%
Standard Deviation	7.5%	3.7%	9.3%	12.1%

Table 8- Job Titles Rank Ordered by Anderson & Krathwohl’s Factual Knowledge Domain.

In Table 8, we see that the people who are expected to have strong FACTUAL knowledge are those who provide the PROJECT MANAGER, PROJECT SPONSORS and other KEY STAKE HOLDERS with their professional advice based on an analysis of the numbers. This includes the Cost Engineer (34%); Cost Estimator/Quantity Surveyor (23.2%). It is these people who are responsible to generate and analyze the dashboards, interpreting the results which are used to make the recommended corrective or exploitive actions to the Project Manager, Project Sponsors and other key stakeholders.

As the Standard Deviation is 7.5%, all the job titles from Planner/Scheduler to Cost Estimator Quantity Surveyor all fall within +/- 1 sigma of the mean. The only job title falling into the +3 sigma range is the Cost Engineer, with 34.0%. Further research needs to be done to determine why factual knowledge is so important to employers hiring cost engineers but only 16.1% for project managers.



	Knowledge Domains			
	Factual	Conceptual	Procedural	Metacognitive
Forensic/Claims Analyst	14.5%	10.6%	29.3%	45.6%
Business Analyst	12.0%	13.5%	48.2%	26.2%
Systems Engineer	14.6%	18.5%	48.1%	18.8%
Project Manager	16.1%	14.2%	52.3%	17.5%
Planner/Scheduler	11.0%	19.4%	53.7%	15.9%
Project Controller	16.8%	14.1%	57.6%	11.5%
Cost Estimator/Quantity Surveyor	23.2%	8.9%	58.6%	9.3%
Cost Engineer	34.0%	11.4%	45.5%	9.1%
Mean	17.8%	13.8%	49.2%	19.2%
Median	15.3%	13.8%	50.3%	16.7%
Standard Deviation	7.5%	3.7%	9.3%	12.1%

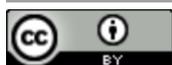
Table 9- Job Titles Rank Ordered by Anderson & Krathwohl’s Metacognitive Knowledge Domain.

Table 9 is interesting as it shows (appropriately) that the job titles where CRITICAL THINKING skills are most desirable are Forensic Claims Analysts, (45.6%) followed by Business Analysts (26.2%); Systems Engineers (18.8%) and Project Managers, (17.5%)

What is interesting is how much higher those employers seeking to hire Forensic Analysts put on the importance of Critical Thinking skills. Given the nature of their business, this emphasis can be appreciated and does serve to validate that this research passes the “smell” test- that is, the results can be understood and explained rationally and logically.

This does not mean that critical or innovative thinking is not required for all the other positions, as all but the Forensic Analyst fall within +/- 1 sigma of the mean, but in terms of what management is looking for when they hire someone, anyone applying for the top 3 jobs would be wise to keep this in mind when crafting your CV or cover letter.

Here again for those professional societies who are developing credentialing programs for these job titles, it is important that you decide how best to go about measuring and validating “critical” or “innovative” thinking, as clearly these skill sets are of some importance to those who will be hiring.



	Knowledge Domains			
	Factual	Conceptual	Procedural	Metacognitive
Planner/Scheduler	11.0%	19.4%	53.7%	15.9%
Systems Engineer	14.6%	18.5%	48.1%	18.8%
Project Manager	16.1%	14.2%	52.3%	17.5%
Project Controller	16.8%	14.1%	57.6%	11.5%
Business Analyst	12.0%	13.5%	48.2%	26.2%
Cost Engineer	34.0%	11.4%	45.5%	9.1%
Forensic/Claims Analyst	14.5%	10.6%	29.3%	45.6%
Cost Estimator/Quantity Surveyor	23.2%	8.9%	58.6%	9.3%
Mean	17.8%	13.8%	49.2%	19.2%
Median	15.3%	13.8%	50.3%	16.7%
Standard Deviation	7.5%	3.7%	9.3%	12.1%

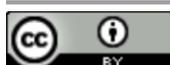
Table 10- Job Titles Rank Ordered by Anderson & Krathwohl’s Conceptual Knowledge Domain.

Last but not least, Table 10 shows us which job titles require CONCEPTUAL thinking and by what percentages this type of knowledge is valued by employers. Certainly these make sense as those job titles which score above average are all positions where concepts need to be identified and can be adopted/adapted for use in any given situation. As we can see, that of all the knowledge areas, conceptual are the least highly desired or valued in the marketplace, HOWEVER what is of considerable interest are the top three ranking job titles which are looking for conceptual skills are also amongst the top ranked job titles which are looking for those who have metacognitive or “critical thinking” skills. Implicit in this is people who have strong conceptual skills combined with strong critical thinking skills should be able to adapt concepts for use in new or different applications.

For those developing certification programs and/or those developing training courses this information should be valuable for you to know as you structure what your credentials are validating as well as the training to support those credentials. How do you develop training programs which teach people how to adapt concepts new or innovative uses? How do you measure or validate that a person is competent at taking concepts and modifying them for use under different circumstances?

CONCLUSIONS-

As the move towards “outcome” or “results based” education and training, where courses are being designed to prepare people for actual jobs when they graduate, continues to grow, it becomes imperative for those developing/delivering training programs focus on those skills and competencies which are in demand. So following the advice of Steven Covey to “begin with the end in mind” what better place to start than with help wanted advertisements reflecting what organizations hiring people right NOW are looking for?



The same goes for those organizations who are designing credentialing programs. Speaking very candidly many of the more popular credentials are little more than money making cash cows for the professional organizations who created them. Many of them are little more than scams, and if we, as professional practitioners ever want to raise the professional image of project management, then we have to EARN the trust and respect of the consuming public- those people who, directly or indirectly, use our services. And that means we need to stop supporting those credentials which do not measure and validate COMPETENCY, which is defined as being “the quality or state of being functionally adequate, characterized by marked or sufficient aptitude + attitude + skills + strength + knowledge”.

This means we cannot validate competency ONLY by taking multiple choice exams. Like getting your first driving license, to measure and validate competency requires BOTH an exam component combined with an experiential component, and that experiential component needs to be independently validated by a qualified third party. (As with the DMV officer for your driver’s license or the FAA Examiner for your Pilot’s license)

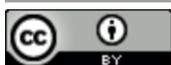
This presents an ideal opportunity for professional organizations, who are uniquely positioned to be able to IDENTIFY those competencies their member employers need and want, and through their professional certification programs, develop the programs necessary to take the individual members and provide them with a structured career path development program built around what employers need and want, not just initially but for their entire career.

Implicit in this is the understanding that the needs and wants by employers are fairly broad and are likely to change and that the only way to keep abreast of changing requirements is to continuously analyze the collective wisdom found in “help wanted” advertisements. Assuming those placing the advertisements are being realistic in knowing what they need/want, no place else can you get “real time” market information and analyze it using any one of a number of “big data” analytic software packages.

FOLLOW ON RESEARCH-

While the author has validated that the approach taken by the Guild of Project Controls is sound and does represent a “best tested and proven practice”, with a sample size of only 30 job postings for each job title, those wanting to use this approach are going to have to further VALIDATE these initial findings through a more robust analysis.

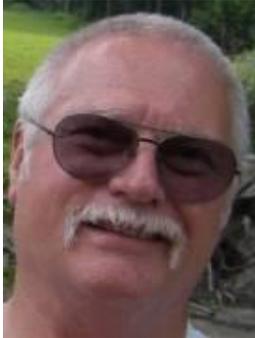
At the same time, keeping in mind that the Guild is one of the very few global professional organizations who recognize those with advanced degrees as an integral part of the credentialing process, <http://www.planningplanet.com/guild/certification> the Guild would like to encourage practitioners who are looking for Masters or PhD thesis or dissertation topics to consider expanding this pilot study by adding more job postings, and a more robust demographic analysis to see if there are any significant differences between industrial sectors or between different parts of the world which were not evident looking at a relatively small sample size.



Another avenue for those interested in “analytics”, a very interesting masters or PhD thesis would be to develop an app which monitors global help wanted postings based on a list of key words and is able to create a more sophisticated “heat map” of those terms. This will help identify local or regional trends in the marketplace as well as help identify what competencies are in demand along with trending to see what competencies are likely to be in demand in the future.



About the Author



Dr. Paul D. Giammalvo, CDT, CCE, MScPM, MRICS

Jakarta, Indonesia



Dr. Paul D. Giammalvo, CDT, CCE (#1240), MScPM, MRICS, is Senior Technical Advisor (Project Management) to PT Mitratata Citragraha. (PTMC), Jakarta, Indonesia. www.build-project-management-competency.com.

For 25+ years, he has been providing Project Management training and consulting throughout South and Eastern Asia, the Middle East and Europe. He is also active in the Global Project Management Community, serving as an Advocate for and on behalf of the global practitioner. He does so by playing an active professional role in the Association for the Advancement of Cost Engineering International, (AACE); Construction Specifications Institute (CSI) and the Construction Management Association of America, (CMAA). He previously served on the Board of Directors of the American Society for the Advancement of Project Management (asapm) <http://www.asapm.org/> and served previously as the Chair of the Certification Board of the Green Project Management organization. <http://www.greenprojectmanagement.org/> He is active as a regional leader and a compensated consultant to the Planning Planet's Guild of Project Controls. <http://www.planningplanet.com/guild>

He has spent 18 of the last 45 years working on large, highly complex international projects, including such prestigious projects as the Alyeska Pipeline and the Distant Early Warning Site (DEW Line) upgrades in Alaska. Most recently, he worked as a Senior Project Cost and Scheduling Consultant for Caltex Minas Field in Sumatra and Project Manager for the Taman Rasuna Apartment Complex for Bakrie Brothers in Jakarta. His current client list includes AT&T, Ericsson, Nokia, Lucent, General Motors, Siemens, Chevron, Conoco-Philips, BP, Dames and Moore, SNC Lavalin, Freeport McMoran, Petronas, Pertamina, UN Projects Office, World Bank Institute and many other Fortune 500 companies and NGO organizations.

Dr. Giammalvo holds an undergraduate degree in Construction Management, a Master of Science in Project Management through the George Washington University and a PhD in Project and Program Management through the Institute Superieur De Gestion Industrielle (ISGI) and Ecole Superieure De Commerce De Lille (ESC-Lille- now SKEMA School of Management) under the supervision of Dr. Christophe Bredillet, CCE, IPMA A Level. "Dr. PDG" can be contacted at pauldgphd@gmail.com.

For those interested in doing follow on research, copies of underlying data an/or access to the Excel spreadsheet, send an email.

