
Creating a Competency Assessment for Cost Estimators¹

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Abstract

This paper describes a work in progress, having started in Q1 2011. It represents the work completed over the past 6 months to develop a competency based assessment instrument against which to assess professional cost estimators. The need for building competency derives from the growing problems producing valid, credible and reliable cost estimates. In this paper, the author explores other global competency based assessment models and using those as a template, and mapping published work by the US Government Accountability Office (GAO) and credible academic research on measuring output competency, he has produced a partially complete competency assessment. The paper concludes by seeking other interested professionals to join in this open source effort and makes several recommendations as to what individuals and those professional associations, who purport to represent us, can do to further raise the professional standing of cost estimating as an honorable and respected career path objective. Specifically, this paper is calling on organizations such as AACE to modify their Codes of Professional Conduct to enable professionals to “push back” when clients or management want us to produce cost estimates we know are faulty or unsubstantiated.

Introduction

Cost estimating, especially at the early phases of a project, when business decisions are being made and project funding is being allocated, requires accurate and reliable cost estimates being essential to enable decision makers to determine which projects are viable and which are not. Unfortunately, the credibility of capital cost estimating has become a farce. (Butts, 2009ⁱ, 2010ⁱⁱ, FMI, 2006ⁱⁱⁱ) And with the USA, both Federal and many states, along with many European countries on the verge of bankruptcy, the farce has the potential to become a financial tragedy. There are many reasons for this, some within our control as professional practitioners, some outside, but the fact remains, the practice of cost estimating has a serious credibility and image problem and unless we take action to remedy this, we will continue to generate estimates which border on being

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a misfeasance at best, possibly a nonfeasance under many circumstances and under a worst case scenario, a malfeasance, bordering on fraud.

The Problem-

Glenn Butts, in scathing condemnation of estimating practices at NASA in 2009, which he expanded to other public and private sector projects in 2010, identified 8 “root cause” problems as to why projects are so grossly underestimated, not only in the USA, but globally. These include:

- 1) Omitting or “forgetting” probable scope;
- 2) Failing to account for all possible risk events
- 3) Unrealistic or overly optimistic assumptions or scenarios
- 4) Using low or unrealistic escalation factors
- 5) Issuing estimates in base year as opposed to “real” or inflation adjusted dollars
- 6) Estimates not prepared by COMPETENT cost estimators
- 7) Rewarding those who lie or manipulate numbers to satisfy management or clients while punishing those willing to stand up and tell the truth
- 8) Not enough time to prepare credible estimates- good estimates take time and attention to details and both management and clients alike want fast answers.

In this paper, we will explore potential solutions to root causes #6 and #7, with the hopes that in fixing those two problems we can at least mitigate, if not eliminate, the remaining 6.

How Do We Underestimate?

- Let Me Count The Ways -

1. **OMIT PROBABLE SCOPE** from estimate
 2. **OMIT POSSIBLE RISKS** from analysis
 - Internal & External
 3. **UNREALISTIC, OPTIMISTIC** assumptions
- } **RAND Study – Reason for 74% of Cost Growth**
4. **Use historically LOW ESCALATION** projections
 - RAND Study – Reason for 11.2% of Cost Growth
 5. **Issue cost estimates in BASE YEAR** dollars
 - Estimates should be in then year dollars (escalated to year in which it is spent)
 6. **Many estimates NOT PREPARED BY A BONA FIDE ESTIMATOR**
 - Everyone's a estimator
 - Being certified no guarantee of having necessary experience
 7. **REWARD failure, PUNISH honesty**
 8. **NOT ENOUGH TIME** to prepare **CREDIBLE** estimates
 - Time often spent doing “what if” exercises, or splitting dollars into arbitrary buckets

“I reject a system that rewards failure and protects a person from its consequences”

- Barack Obama -

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Figure 1- “Root Causes” of cost estimate failures per Glenn Butts^{iv}

Based on his extensive and hard hitting assessment of cost estimating, not only by NASA, but other public and private sector organizations, Butts outlined not only the problem but several proposed solutions, (Butts, 2009^v) For the purposes of this paper, the two which are most relevant to ACE and the ones which are most under our own control as professional practitioners are these two recommendations, together which frame the subject and focus of this paper-

- 1) Project estimates should ONLY be done by “real” (professional, qualified, COMPETENT) estimators and;
- 2) Project Managers (Cost Estimators?) need to be held professionally accountable for their estimates, the same as engineers are professionally and legally accountable for their designs.

What this means is we can no longer assume that everyone can estimate or even worse, that just because someone is able to pass multiple choice exams, no matter how challenging, is sufficient to infer that one is competent and capable of producing not only cost estimates, but CPM schedules or risk analysis or even successful projects. The only thing passing multiple choice exams attests to is the ability of the exam taker to pass an exam. It does not stand as evidence that he/she actually implements the skills or knowledge covered by the exam or that he/she has the behavioral attributes (“EQ” or Emotional Intelligence^{vi}) to be able function in the work environment. This includes not only the technical skills, which are relatively easy to measure, but the much more important “soft” skills- leadership, conflict resolution, team building, mentoring, stakeholder communications and expectation management and making things happen when you have little or no formal authority over those contributing to your estimate.

In this paper, we will explore a practical approach in how to create, measure and asses COMPETENCY in cost estimators, based to as great an extent as possible on sound academic research.

“COMPETENCY” Defined-

Looking to the standard Merriam Webster dictionary as our starting point, we find that “COMPETENCY” is defined as *“the quality or state of being functionally adequate, characterized by marked or sufficient aptitude + attitude + skills + strength + knowledge”* (Merriam Webster Dictionary, restated)^{vii}

This is consistent with Spencer and Spencer (1993) who defined competency to be *“...an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation”^{viii}* and also with Kessler and Strasburg (2005) who posited competency to be *“a collection of related knowledge, attitudes and skills that affect the performance of one’s job, that can be measured against well-accepted standards and which can be improved with training*

and development”^{ix} What is clear from all these definitions is that competency is something we do.

For the purposes of this paper, what is more important is not what competency is, but what it is NOT. Unfortunately, in large part due to the popularity of the Project Management Institute’s “Project Management Professional” (PMP) credential, large numbers of people around the world have come to believe that IF they study books of sample questions for 35 hours and are able to pass multiple choice exams, that alone stands as evidence of their competency. The fallacy underlying this belief (and with the AACE credentials as well) lies in the fact that the work experience, which is a pre-requisite to taking either the PMI or AACE exams, is not validated. Nor are the work outputs measured to see whether the person being evaluated or assessed actually puts what he/she knows to work under real life conditions. Sufficient evidence exists to suggest this is not happening- people are passing tests but are NOT implementing what the tests supposedly validated..

How can we infer or measure “Competency”-

Professor Lynn Crawford, Bond University, in her standard GAPPS presentation ^x, has summarized the three fundamental ways that competency can be measured or is inferred:

- 1) Input Competencies- what we know
- 2) Personal Competencies- what kind of people we are (what is our emotional intelligence)
- 3) Output Competencies- what it is we actually do

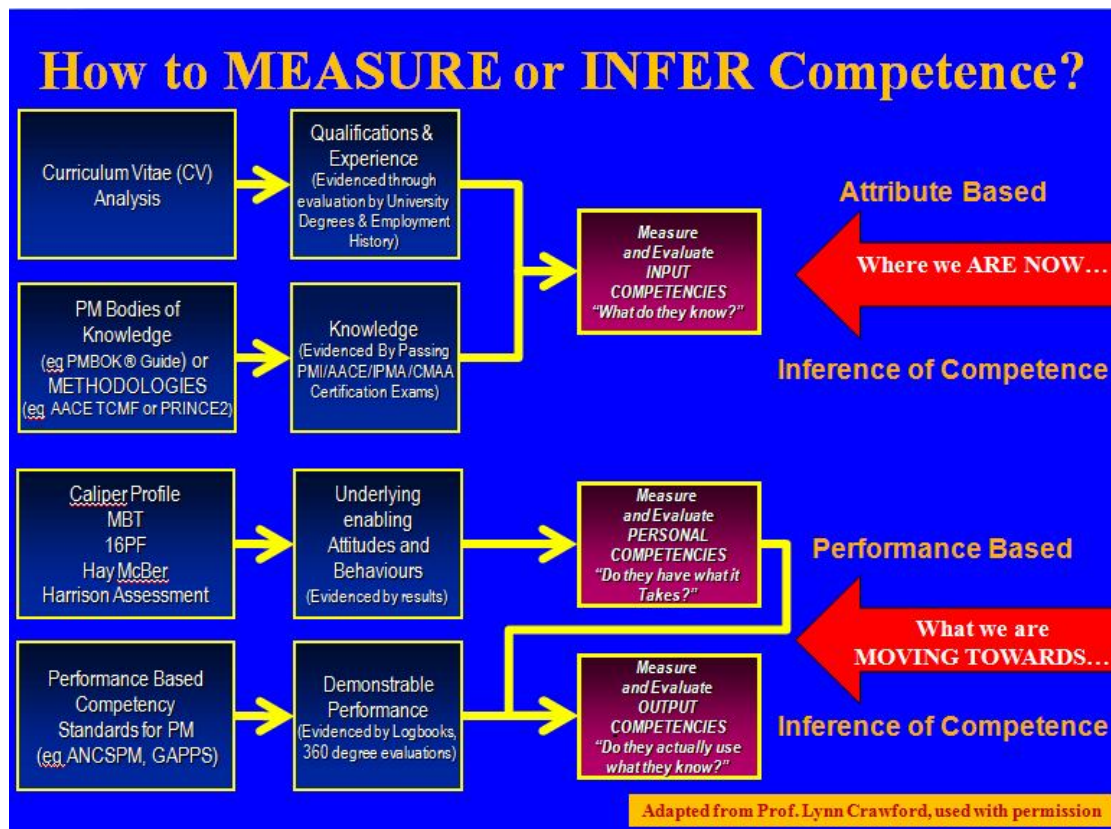


Figure 2- Ways to Infer Competency. Adapted from Crawford, L.^{xi}

As can be seen, the “as is” or “current” certification practice common to PMI, AACE et al, is to take a look at a person’s Curriculum Vitae (CV or resume) and based on some combination of academic degrees and number of years experience, followed by taking a written exam (most often computer based and consisting primarily of multiple choice questions) and assuming that because they have and hold a job or position that they are in fact “competent”. Clearly the weakness of this approach is or should be patently obvious, if for no other reason, by an unacceptably high failure rate of projects. (“project failure” for the purposes of this paper is defined to be some unacceptable combination of late delivery, over budget, poor quality and/or failure to substantially deliver on what the project was undertaken to deliver when funded and authorized).

Supposing the project manager or estimator or scheduler or any other project related position had never worked on a project that “succeeded”, finishing within budget, on time in substantial conformance to the technical specifications and substantially delivering the benefit for which it was undertaken in the first place? How do we know what contribution the individual made? And even if he/she made a positive contribution, was his/her input over-ridden or modified by others in management with less technical skills and knowledge?

The reliance on input competencies alone to infer competence for project management or project control practitioners has proven to be an abysmal failure, as evidenced by research from Gartner, FMI, Butts and a host of other researchers, or just by reading the headlines in your daily paper.

So how much longer are we willing to tolerate a system of developing talent which is clearly not working?

Looking to the established professions for guidance, we can see that whether it is medicine, engineering, commercial aircraft piloting or even the construction trades, all are characterized by:

- 1) Formal training over an extended period of time, (measured in years, not hours) often combined with on the job training;
- 2) A clear career path development program, with periodic reviews and acceptance criteria
- 3) An apprenticeship, internship or practicum usually consisting of 2-7 years, working directly under the supervision and guidance of a master practitioner/mentor.
- 4) Some sort of licensing or credentialing program which requires:
 - a. Continuing education
 - b. Periodic peer reviews or evaluations of work outputs
 - c. Rehabilitation/removal of those who are not suited to the work for whatever reason

This is the essence of what are known as the OUTPUT COMPETENCIES- not only does the person know what they are supposed to do, but they have the emotional intelligence and behavioral aptitude to be able to do the work, evidenced by consistently and appropriately applying their *aptitude + attitude + skills + strength + knowledge* in a way that demonstrates through evidence provided from their day to day working environment, to meet or exceed legal “professional standards of care”.

What is a “professional standard of care”?

Professional practitioners in any field have a legal duty or obligation to those who use their services or consume products produced by the professional. Failure to fulfill this duty is known as “professional negligence” and is grounds for legal action known as “malpractice”.

To help us define “standard of care” we can paraphrase the jury instructions for professional malpractice actions which provides an excellent definition for the “standard of care” required of all professionals, regardless of their profession, trade or craft.

In performing professional services for a client, the professional practitioners has the duty to have that degree of learning and skill ordinarily possessed by reputable professionals practicing in the same or a similar locality and under similar circumstances.

It is his or her further duty to use the care and skill ordinarily used in like cases by reputable members of his or her profession practicing in the same or a similar locality under similar circumstances, and to use reasonable diligence and his or her best judgment in the exercise of his or her professional skill and in the application of his or her learning, in an effort to accomplish the purpose for which he or she was employed.

A failure to fulfill any such duty is negligence.”^{xii}

Why is the “professional standard of care” so important to competency development?

If we are to raise the professional image of those who practice the art and science of cost estimating (or scheduling or project management) to a level consistent with other professions, following Butt’s recommendations (Butts, 2009 page 31) it is essential that the cost estimating professional be held accountable for his/her cost estimates and the flip side of that responsibility, to have the independence to exercise professional judgment and not have it over-ruled or modified by either managers or client.

And to raise the level of the practice of cost estimating (or scheduling or project management) it is further essential that we move beyond inferring competency based on taking multiple choice exams and following other established professions, develop a formal career path development plan which includes not only exams to test knowledge (i.e. Engineer in Training or EIT) but also a robust internship/mentoring program concluded with an assessment by one’s peers based on a portfolio of work produced by the fledgling practitioner under the watchful eyes of his/her mentors.

The importance of the concept of independence in making decisions is exemplified in the Code of Ethics from the Society of Corporate Compliance and Ethics (SCCE) which is the professional organization representing those who practice corporate governance and social responsibility issues. In paragraph R 1.4 the SCCE Code of Ethics states

“If, in the course of their work, CEPs become aware of any decision by their employing organization which, if implemented, would constitute misconduct, the professional shall:

- (a) refuse to consent to the decision;*
- (b) escalate the matter, including to the highest governing body, as appropriate;*
- (c) if serious issues remain unresolved after exercising “a” and “b”, consider resignation; and*

(d) report the decision to public officials when required by law^{xiii}

Essentially what this is saying is that IF management over-rides or fails to follow the advice proffered by competent professionals, then the professional has the fiduciary obligation (and perhaps under Sarbanes Oxley, a legal obligation?) to report this up through the chain of command through whatever channels are set up for whistle blowers and if management still doesn't accept sound professional advice, to resign or at least recuse yourself from further work on that project.

One of the recommendations this paper concludes with is that professional organizations such as AACE, would be wise to incorporate similar wording in our Canon of Ethics, to help professionals push back to management and clients who overrule, ignore or modify our work.

After all, can the owner modify the engineers design drawings and still have the engineers stamp be valid? Can the patient tell the doctor what medications he/she wants or what procedure to use? And can the passengers enter the flight deck and tell the pilot in command how to fly the plane? The absurdity of this is obvious, yet how often is the professional opinion of cost estimators, schedulers and other project management/project control professionals over-ruled or modified by clients or management?

What does a Competency Assessment Model look like?

Having defined what competency is, the various ways to infer competency and having established a legal baseline for why competency is important, we need to explore what a competency model looks like.

The best analogy is the process of obtaining ones driver's license. Normally, (at least in North America) one attends some number of hours of required, formal classroom training, covering fundamentals of driving a car as well as the rules of the road, traffic laws and courtesies. Successfully passing of what is usually some sort of multiple choice exam earns the potential driver a learners permit, which qualifies that person to actually drive a vehicle on public roads, provided they are accompanied by a licensed adult. The potential licensee practices against a checklist of applied skills (i.e. making 3 point turn, parallel parking or starting on a hill) for a period of time, until their instructor believes the student is sufficiently competent at performing this set of tasks that the probability of them passing is sufficiently high that they can schedule in a test ride with the Department of Motor Vehicles representative. This DMV officer provides a series of challenges that the student driver must complete to some minimum acceptable standard, and if the student does so to the satisfaction of the DMV officer, the license to drive is awarded.

The process to perform a competency assessment for project managers or cost estimators or schedulers or any other function within the field of “project management” or “project controls” is essentially no different.

Worth noting here is that competency assessments are NOT prescriptive. That is, they don't tell you exactly HOW to do something. There may be more than one “right” or “acceptable” way to get something done, and going back to our legal definition of “Standard of Care” being a

“duty to use the care and skill ordinarily used in like cases by reputable members of his or her profession practicing in the same or a similar locality under similar circumstances, and to use reasonable diligence and his or her best judgment in the exercise of his or her professional skill and in the application of his or her learning, in an effort to accomplish the purpose for which he or she was employed”^{xiv}

We can see that as long as the professional practitioner works within an acceptable range of options, which “tool and technique” or approach he/she applies in any given situation is of relatively little importance, so long as the outcome meets whatever minimum standards which have been set. This is important to understand not only when writing competency standards, but also in assessing others against those standards. Provided the outcome is satisfactory, the assessor should not, in retrospect judge the tool/technique chosen by the practitioner.

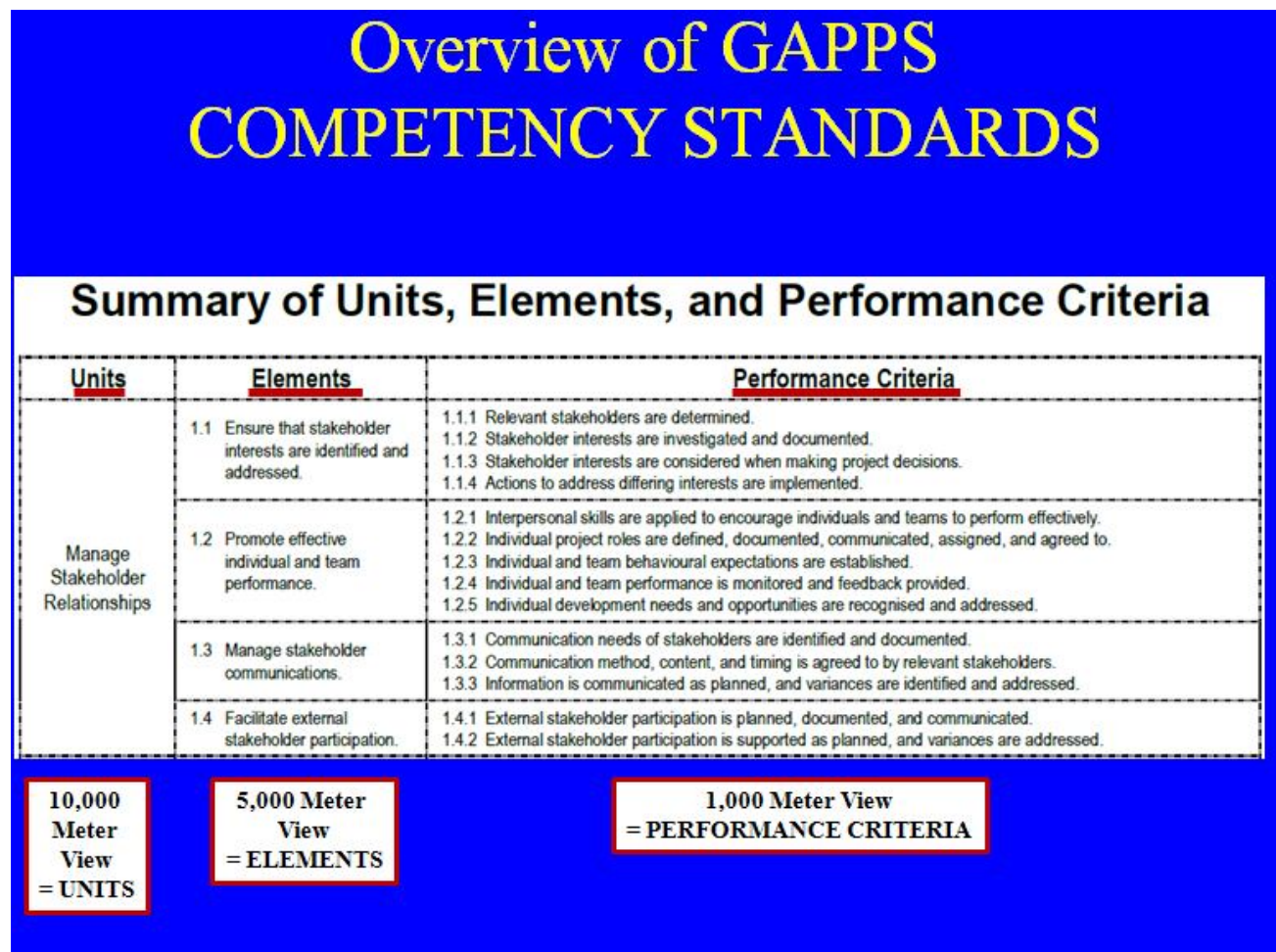


Figure 3- Over-view of the GAPPS Competency Standards (available at no cost http://www.globalpmstandards.org/main/page_project_manager_standard.html)^{xv}

Figure 2 is taken from the Global Alliance for Project Performance Standards (GAPPS) open source competency standards. This standard, which is based on the Australian and UK competency standards, was created to serve as a source of competency standards which are INDEPENDENT of any specific body of knowledge, methodology or organization. Furthermore, these standards have been put in the public domain under “open source” or “creative commons” license to be used by anyone at no cost or obligation. Here you can see that the competencies are organized around Units, and the units are further divided into Elements and lastly, the elements are decomposed into discrete tasks, each of which can readily be measured and documented.

Having established the structure, we then need to provide some explanation, clarification or guidance to those doing the competency assessment to help them measure or evaluate the competency of the individual against each set of criteria. For this, we create the RANGE STATEMENTS, which describe what evidence is acceptable in order to adequately measure or assess whether the individual is or is not competent.

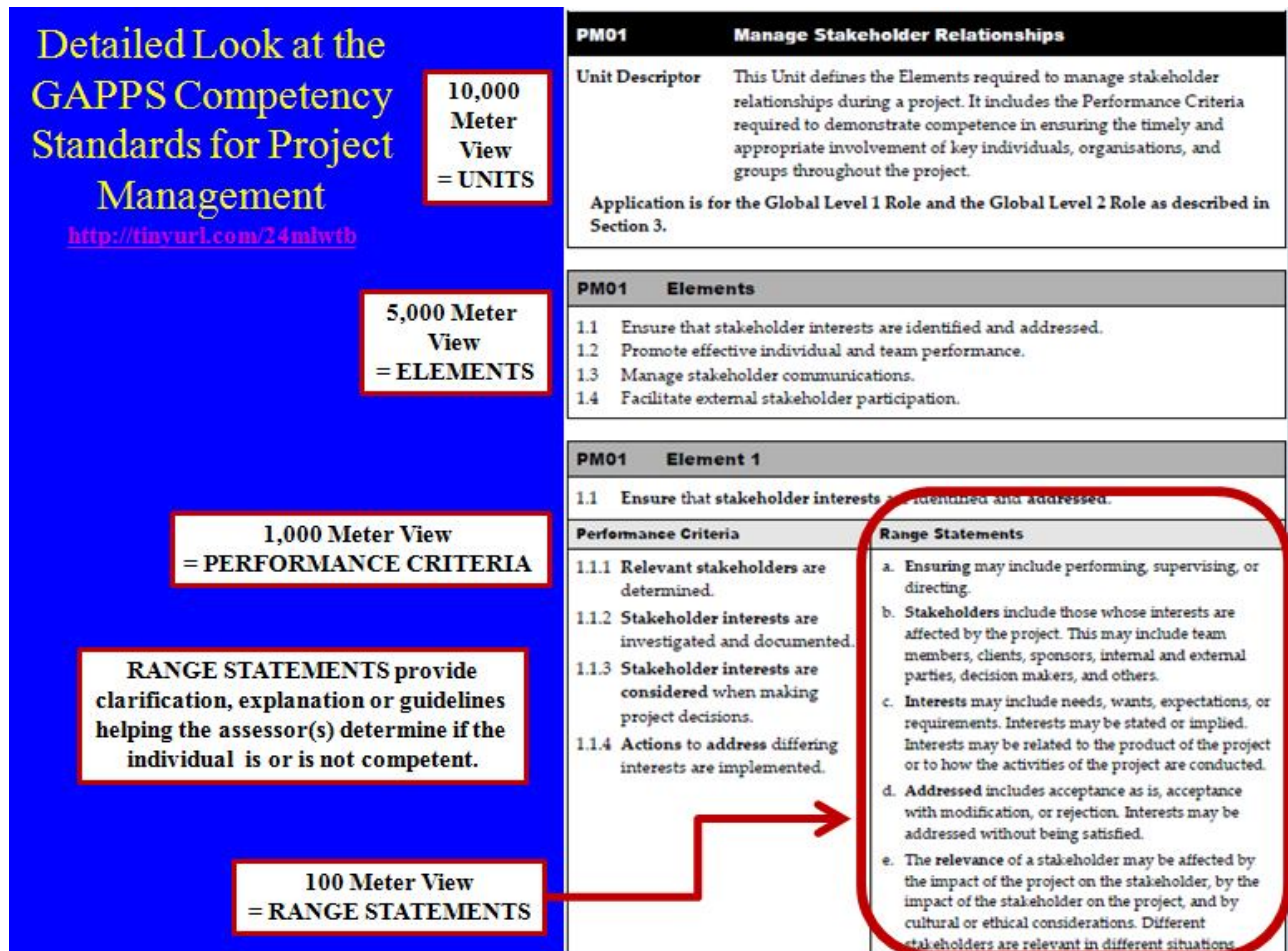


Figure 4- A more detailed view of the Competency Standards including the Range Statements^{xvi}

How do we score an assessment against this model?

The scoring model is quite similar to the one we are all familiar with from the Olympics and other many other competitive sports, such as boxing.

The judges are experienced professionals, meeting the same criteria defined by our “Legal Standard of Care”- experienced, reputable professionals, from the same general geographic area; with academic or education backgrounds in that specialty and experience on that type of project. (i.e it would be inappropriate for an IT cost estimator to evaluate or assess a construction cost estimator)

Like Olympic judges, cost estimator competency assessors (“judges”) also need to be trained in how to score a candidate, trying as best as possible to end up with as little variation between the scores as possible, and if there are variations, to reconcile them with the team of judges.

Normally, assessment teams consist of three people, with one being selected by the individual being assessed and the other being appointed by the professional organization or government agency issuing the credential or license, with those two selecting a third assessor to be the chair or lead assessor.

Figure 5 offers a simple explanation showing how the process of professional assessment is closely analogous to the same process applied in many Olympic sporting events.

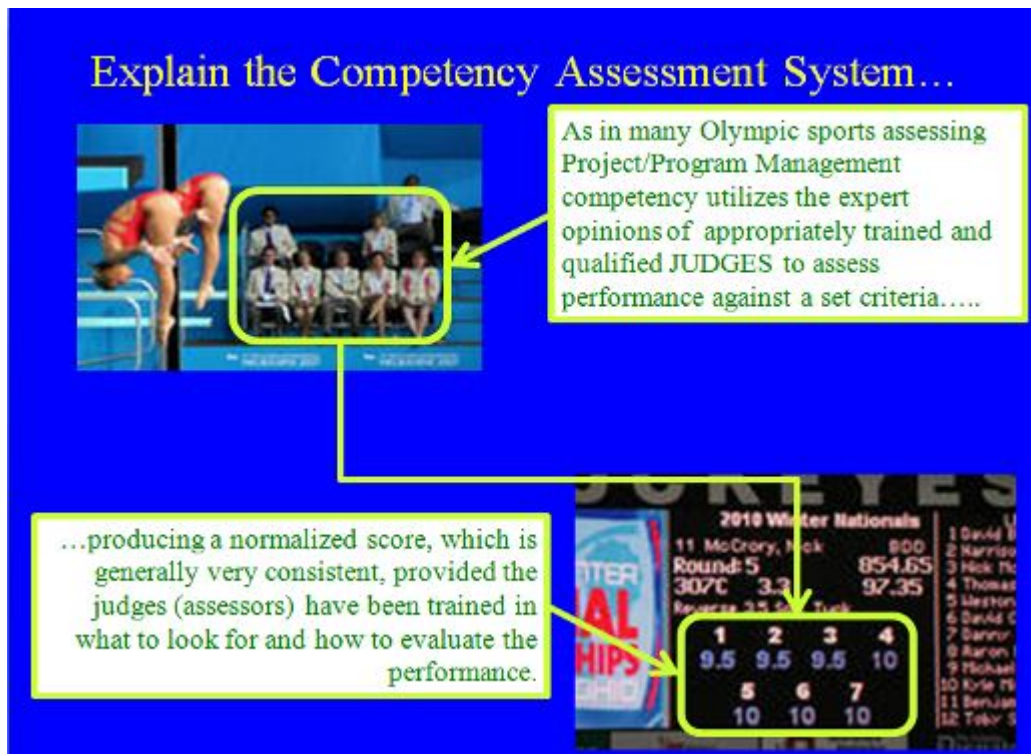


Figure 5- Illustration explaining the way competency assessments are scored^{xvii}

The actual scoring models vary, but the one being proposed for cost estimators is based on two well established and credible education psychologists, David Krathwohl and Benjamin Bloom.

<http://www.celt.iastate.edu/teaching/RevisedBlooms1.html>

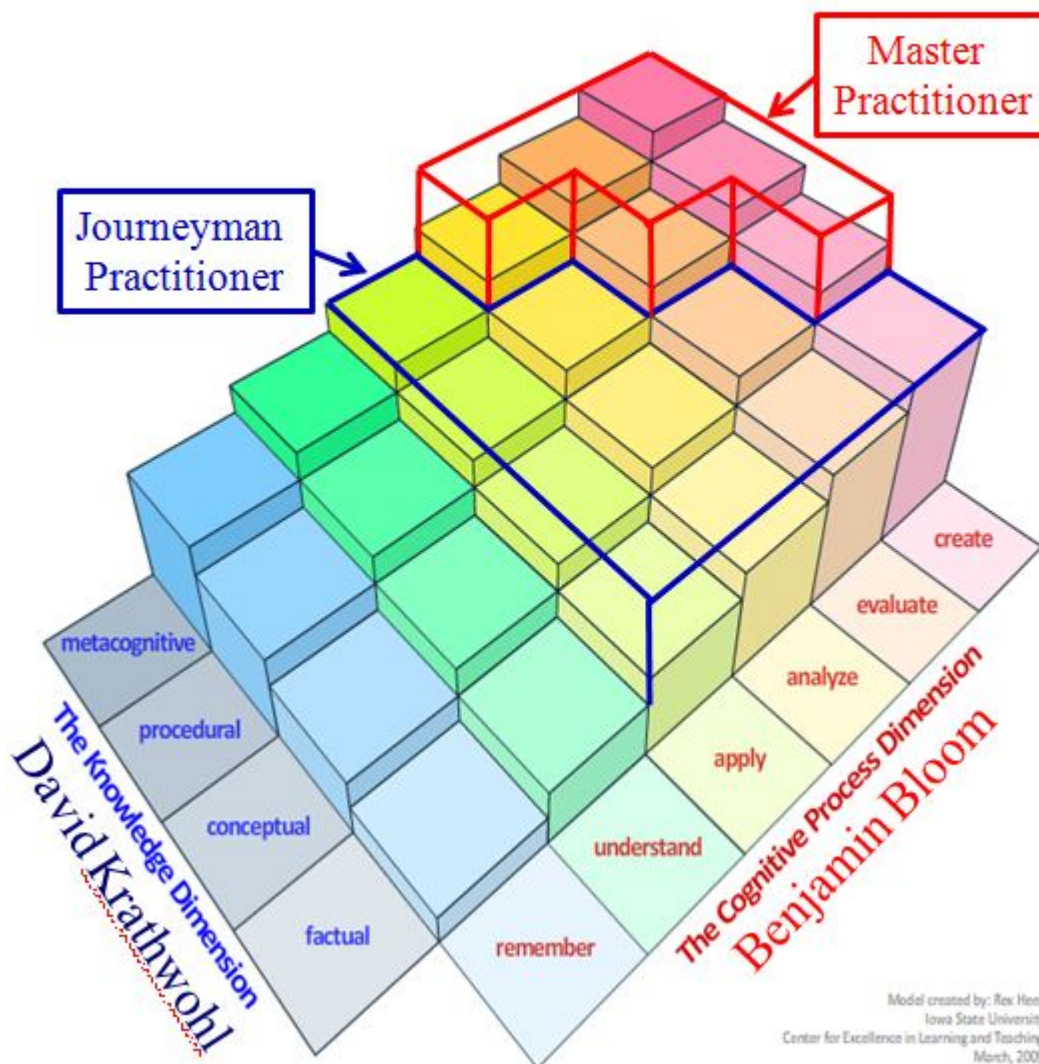


Figure 6- Multi- Dimensional Scoring Model Based on Krathwohl and Bloom^{xviii}

Krathwohl identified 4 different types of knowledge:

- 1) Metacognitive or the ability to think critically. To be able to “think outside the box” to solve problems;
- 2) Procedural or the ability to know and understand what steps should be taken and in what order, to accomplish a goal or objective or to produce a deliverable
- 3) Conceptual is knowing the underlying theory behind why something is or should be done
- 4) Factual is the ability to remember or recall specific facts, i.e. remembering a formula

On the other axis, we have Bloom's Taxonomy. From Bloom we can measure the appropriate role and responsibility the individual did or should play and measure it against the role predetermined to be appropriate to be competent. Bloom's Cognitive Processes range from being able to remember something, to actually understanding it, applying, analyzing, evaluating and eventually, synthesizing or being able to adapt it for new or different applications.

To quickly demonstrate the application, looking at the lowest box, clearly, the ability to REMEMBER (Bloom) FACTUAL INFORMATION (Krathwohl) alone is not an adequate attribute to be considered a "competent" practitioner. Moving up, the MINIMUM level of a competent practitioner would be the demonstrated ability of the applicant to be able to APPLY (Bloom) FACTUAL KNOWLEDGE (Krathwohl), which indicates that the individual not only has factual knowledge, but he/she actually applies it to some minimum standard. And ideally, to be considered a "Master" or "Subject Matter Expert", requires some demonstrated ability to combine the top two Blooms attributes (the ability to evaluate the work of others and/or create new knowledge or applications, combined with the top two Krathwohl attributes of Procedural knowledge combined with Metacognitive knowledge. Taking this approach, we can provide a robust assessment based upon sound academic research from the field of education and learning.

As we can see in Figure 6, the minimum acceptable standard to join the practice as an apprentice or intern, would be to pass an exam which measures the ability to remember basic concepts and terminology, and perhaps a few formula. Essentially, what the PMP requires. From that point onwards, the individual, working under the guidance of a mentor, would develop his/her Cognitive Skills (Blooms) as well as his/her Knowledge Dimension (Krathwohl) to the point where they would be deemed qualified to sit for another exam and present their work for peer review and assessment.

How do we use all this to create a competency based assessment for Cost Estimators?

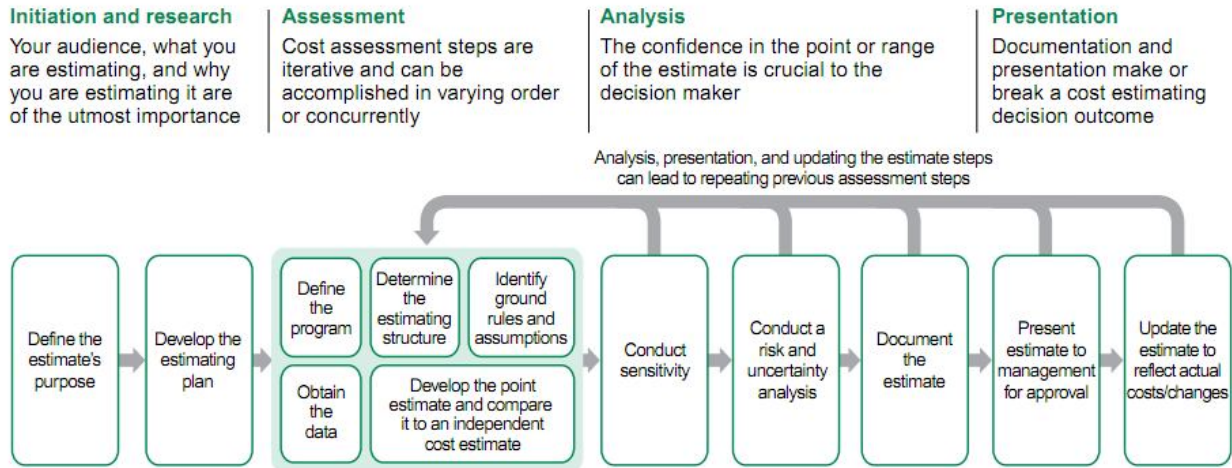
Following the advice of Stephen Covey to "begin with the end in mind", to quickly recap, we have a definition of competency; we have a framework for assessing competency; we know the importance of professional standard of care and we know what a competency assessment looks like. We just explored credible ways to score the individual to see if he/she is competent.

So how do we start to create a competency assessment for Cost Estimators?

First, whether it be project management, cost estimating, scheduling or any of the other project control functions, it is all process based. So where better to start than with the process of cost estimating. And to ensure we have the "end to end process" we cannot just look at cost estimating from the contractor's

perspective, but from to look at it from the OWNERS perspective, as being the broader, more complete perspective.

Figure 1: The Cost Estimating Process



Source: GAO.

Figure 7- Cost Estimating from the OWNERS perspective- the GAO Cost Estimating Processes^{ix}

To ensure that we have covered all the performance criteria, we are proposing that the 12 steps of the GAO Cost Estimating Process (Life Span) becomes the UNITS for our competency model.

Thus, we would have 12 Units corresponding to each of the above boxes. Consistent with the GAPPS Competency Standards, the next step would be to create the ELEMENTS.

Here again, a good part of that job has already been done by the GAO.

Table 2: The Twelve Steps of a High-Quality Cost Estimating Process

Step	Description	Associated task	Chapter
1	Define estimate's purpose	<ul style="list-style-type: none"> Determine estimate's purpose, required level of detail, and overall scope; Determine who will receive the estimate 	5
2	Develop estimating plan	<ul style="list-style-type: none"> Determine the cost estimating team and develop its master schedule; Determine who will do the independent cost estimate; Outline the cost estimating approach; Develop the estimate timeline 	5 and 6
3	Define program characteristics	<ul style="list-style-type: none"> In a technical baseline description document, identify the program's purpose and its system and performance characteristics and all system configurations; Any technology implications; Its program acquisition schedule and acquisition strategy; Its relationship to other existing systems, including predecessor or similar legacy systems; Support (manpower, training, etc.) and security needs and risk items; System quantities for development, test, and production; Deployment and maintenance plans 	
4	Determine estimating	<ul style="list-style-type: none"> Define a work breakdown structure (WBS) and describe each element in a WBS dictionary (a major automated information 	8

Figure 8 GAO Showing the Steps (Units) and the Associated Tasks (Elements) (pages 9-11)^{xx}

As we can see from Figure 8, the GAO has further decomposed the 12 Steps (Units in the GAPPS Model) into “Associated Tasks” (Elements in the GAPPS Model)

Where does that leave us today?

To continue the GAPPS Model and apply it to a Cost Estimating Competency we next have to further break the Associated Activities into “Performance Criteria” and then establish Range Statements covering what is the acceptable evidence to support any claims that the individual has met or fulfilled the Performance Criteria. We also have to establish the scoring model based on Krathwohl and Bloom, or some other credible way to measure not only skills and knowledge but the ability to apply that knowledge effectively in a real working environment.

	A	B	C	D	E	F	G	H
3			Performance	Range	Krathwohl's	Blooms's	Matrix	
4		Unit	Criteria	Statements	Scoring	Scoring	Score	
5		1 Define estimate's purpose						
6		1.1 ■ Determine estimate's purpose, required level of detail, and overall scope;						
7		1.2 ■ Determine who will receive the estimate						
8		2 Develop estimating plan						
9		2.1 ■ Determine the cost estimating team and develop its master schedule;						
10		2.2 ■ Determine who will do the independent cost estimate;						
11		2.3 ■ Outline the cost estimating approach;						
12		2.4 ■ Develop the estimate timeline						
13		3 Define program characteristics						
21		4 Determine estimating structure						
26		5 Identify ground rules and assumptions						
36		6 Obtain data						
43		7 Develop point estimate and compare it to an independent cost estimate						
52		8 Conduct sensitivity analysis						
56		9 Conduct risk and uncertainty analysis						
66		10 Document the estimate						
77		11 Present estimate to management for approval						
87		12 Update the estimate to reflect actual costs and changes						
93								
94								
95								
96								

Figure 9- The Next Steps Create the Performance Criteria, Range Statements and Scoring Model^{xxi}

As this is a “work in progress” in order to further develop a competency assessment instrument for Cost Estimators, we need to build on the initial work by the GAO further refining their 12 Step Process, as well as validating their Associated Activities. Once that is completed, we then need to develop the Performance Criteria (answering the question what should a competent practitioner be able to do demonstrate his/her competency for that activity) and then develop the Range Statements, providing the applicant as well as those judges doing the assessment, with what evidence is acceptable or appropriate for the applicant to provide showing how he/she delivered what is expected from the activity.

Conclusion

It is clear that given the global financial crisis, all organizations, be they private sector or public sector, governmental, quasi-governmental or non-governmental, State, Federal or global, MUST start to produce more accurate, reliable and valid estimates.

We also know that to achieve this, the key is to move beyond merely producing “professionals” able to pass multiple choice exams, and looking to what other established professions have done and are doing to produce more COMPETENT, professional estimators. Estimators who are not punching their card on the way to another promotion in line or functional management, but true professionals for whom cost estimating is a career path objective- what they want to be when they grow up.

We also know that to achieve this level of professionalism, not only does the career professional estimator need to have the autonomy to render professional opinions in

terms of cost related items, but he/she also needs to be held professionally accountable for those numbers, just as a professional engineer is held professionally accountable for his/her design or a pilot of a plane is held professionally accountable for the safety of his passengers and the integrity of the plane.

And lastly we know that academically sound research has been done globally on creating competency based standards and competency based assessments, so the question is, are we willing and able to move beyond “the not invented here” syndrome?.

So now the challenge is up to us, as professionals. Is this something you too believe in? If yes, then join other professionals in completing what has been started by the GAO and the scores of professionals who volunteered our time in contributing to the GAO document by completing the unfinished work-

- 1) Validating the Unit (Steps) and Element (Supporting Activities) of the GAO Model
- 2) Creating the Performance Criteria
- 3) Creating the Range Statements
- 4) Creating the Scoring Card

Lastly, to those professional organizations representing or purporting to represent those who are or wish to become professional cost estimators, you need to follow the lead of the Society for Corporate Compliance professionals and build into the Code of Ethics/Code of Conduct, a clause or clauses which enable us to “push back” against clients or managers who expect us to manipulate or adjust numbers based not on sound professional assessment, but on politics.

Footnotes

- i) Butts, G and Linton, K. (Apr, 2009) "Joint Confidence Level Paradox- A History of Denial" NASA Cost Symposium <http://tinyurl.com/773ntsj> last accessed 1/27/12
- ii) Butts, G with Linton, K (Feb, 2010) "Mega Projects Estimates- A History of Denial" <http://tinyurl.com/7vlsdd3> last accessed 1/27/12
- iii) Schoppman, G, (2006) FMI 2006 Project Management Survey Report, FMI Corporation
- iv) Butts, G with Linton, K (Feb, 2010) "Mega Projects Estimates- A History of Denial" page 12. <http://tinyurl.com/7vlsdd3> last accessed 1/27/12
- v) Butts, G with Linton, K (Feb, 2010) "Mega Projects Estimates- A History of Denial" page 31. <http://tinyurl.com/7vlsdd3> last accessed 1/27/12
- vi) Consortium for Research on Emotional Intelligence in Organizations, N.D. <http://www.businessballs.com/emotionalintelligencecompetencies.pdf> last accessed 1/31/12
- vii) Merriam Webster Unabridged Dictionary, Online Version <http://www.merriam-webster.com/> last accessed 1/27/12
- viii) Spencer, L. M and Spencer, S.. M. (1993) *Competence At Work- Models for Superior Performance*. Wiley Publishing
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- x) Crawford, L (2009) Standard Introductory Presentation at all GAPPS Workshops.
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About the Author



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