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Intersection and Divergence in CE, QS, and PM: Competencies, Qualifications, and Professional Recognition

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ABSTRACT

Purpose of this paper

As a project progresses through its lifecycle, different skills are required for adequate control and oversight. Much of this required expertise is provided by the cost engineering (CE), quantity surveying (QS), and project management (PM) communities.

Design/methodology/approach

This paper expands on the definitive ICEC white paper, "What are CE, QS and PM?", exploring intersection and divergence in the competencies of cost engineers, quantity surveyors and project managers. The analysis relies on competency definitions from leading professional associations.

Findings

Competencies are evolving in response to market demand, creating much overlap in the services provided by these disciplines. While the basic competencies have remained intact, professional associations providing certification have begun to recognize areas of specialist expertise.

Originality/value of paper

Understanding the role of the CE, QS and PM on projects can assist professional associations in serving their members, students in choosing a career path, and organizations in marketing their services. The discussion also draws attention to needed curriculum at the university level and continuing education for practitioners, thus maximizing career opportunities for this skilled population.

Conclusions
The influence and scope of work of the three fields continues to evolve, in response to globalization and professional society activities. As these roles expand, overlap and specialization will continue. It is likely that, over time, the roles of quantity surveyor and cost engineer will become almost fully interchangeable, and these functions will continue to support project management.

Keywords: Quantity surveying, project management, cost engineering, competency, skills & knowledge

1.1 INTRODUCTION

Globally, much of the expertise required for project management, oversight, and control is provided by the cost engineering (CE), quantity surveying (QS), and project management (PM) communities. Various efforts have been made to explore intersection and divergence in the competencies of these three fields, but many of those studies have relied on surveys and self-assessment. Ultimately, the outcome from such studies is an exhaustive list of skills that is so broad as to encompass all possible job descriptions, and dilutes a true understanding of the competencies.

For example, in AACE International's Cost Engineering journal, a series of over 47 member profile articles have been published. No two members featured in the articles perform exactly the same role in CE, QS, or PM. These articles have clearly illustrated that, once formal education has concluded, each individual's career path is unique, even unpredictable, and specialization occurs often. Asking these individuals 'what they do' opens a veritable Pandora's box of potential skills.

A more structured approach is needed, to understand and benefit from the relationship between the three fields. The analysis presented in this paper relied on competency definitions from leading professional associations. Here, "'competency' is defined as the ability to perform the activities within an occupation to the standard expected for employment," (Lenard, 2000), and "sufficiency of qualification," (Little, Fowler, & Coulson, 1984) where qualification can be defined as a "quality [or] accomplishment that qualifies or fits a person for some office or function." (Little, Fowler, & Coulson, 1984) In the analysis, occupational competency standards are represented by three cost engineering, six project management, and five quantity surveying professional associations. These particular standards were chosen for their rigorousness, clarity, and formal structure.

1.2 TRADITIONAL ROLES

Each of these three fields has evolved over time in response to market demand, but there do exist certain traditional roles and core skills of the cost engineer, quantity surveyor, and project manager.

1.2.1 Cost Engineer

Systematic approaches to CE and PM gained considerable momentum in the 1950s, and the roots of cost engineering can be traced to the 1800s [specifically, to the 'fathers' of scheduling: Priestley, Adamiecki, and Gantt]. (Weaver, 2007) AACE International (AACE) was founded in 1956, at approximately the same time as several other professional associations and software focusing on cost estimating and scheduling.

AACE defines 'total cost management' as "the effective application of professional and technical expertise to plan and control resources, costs, profitability, and risk … a systematic approach to managing cost throughout the life cycle of any enterprise, program, facility, project, product, or service, … accomplished through the application of cost engineering and cost management principles, proven methodologies, and the latest technology in support of the management process. … Engineering judgment and experience are utilized in the application of scientific principles and techniques to problems of business and program planning; cost estimating; economic and financial analysis; cost engineering; program and project management; planning and scheduling; and cost and schedule performance measurement and change control." (AACE International, 2012) In practice, the cost engineer is perhaps best known for capital project planning [scheduling] and [project cost] accounting. (Pietlock, 1997) Elaborating on the AACE definition, cost engineering is integrally linked to financial management, (Esterhuizen, 2011) project management, resource management, and management accounting practices. (AACE International, 2006)

1.2.2 Quantity Surveyor

Similarly, the origins of quantity surveying (QS) can be traced to the 1860s. The Royal Institution of Chartered Surveyors [RICS] was founded in 1868.

"The RICS emphasise that the distinctive competencies or skills of the quantity surveyor are associated with measurement and valuation, which provide the basis for the proper cost management of the construction project in the context of forecasting, analysing, planning, controlling and accounting." (Nkado, 2000) The QS is perhaps best known for measurement, quantification, and preparation of Bills of Quantities. Elaborating on the RICS definition, the quantity surveyor has skills in procurement, financial, and contractual controls, (Nkado, 2000) which include all aspects of "controlling costs and monitoring expenditure on behalf of others." (Novis, 1984)

1.2.3 Project Manager

Although today's concepts of project management (PM) were built upon management science, production control, architectural monitoring, CE, and QS concepts from the 1800s, (Weaver, 2007) with concepts formalized in the 1950s, the titled position of 'project manager' did not start to appear with increasing frequency until the 1960s (the International Project Management Association [IPMA] was founded in 1967, and the Project Management Institute [PMI] in 1969).

As defined by the American Society for the Advancement of Project Management (asapm), "project management is the planning, organizing, staffing, motivating, directing, leading, tracking, measuring, and controlling of all aspects of a project. Properly applied, the discipline helps to ensure that the project meets its objectives safely, and within agreed-upon time, cost, and performance criteria." (asapm, 2008)

However, some of the PM competencies defined by professional associations appear to be overarching; while the individual PM may have a basic grasp of the key concepts, it is doubtful that every PM has deep expertise in all of the areas of competency. It is therefore recognized that contract administration may be "typically executed by any or a combination of the project manager, general contractor, engineer, architect, quantity surveyor, and other members of the project team," (Reynolds, 2008) and thus "consulting engineers, management consultants, and chartered quantity surveyors are competing" (Novis, 1984) for portions of the roles traditionally defined as that of the PM. Although professional associations include measurement, planning, and costing within the PM competency list, it appears (in practice) that the CE and QS often fulfull these functions as key specialist members of the PM team.

1.3 EVOLUTION AND SPECIALIZATION

Table 1.1 shows the competencies in the three fields, in aggregate, as defined by a sampling of professional associations from around the globe. The table demonstrates that the roles between the fields are blurring, and there is considerable overlap as they expand beyond their traditional roles.

Referring to the table shown below, quantity surveying maintains its foothold in cost management and contract administration. "The QS profession was established as specialists in measurement and valuation of construction work. In recent years, there has been considerable expansion and diversification of services." (Perera, Pearson, & Dodds, 2010) Expansion of the skillset includes asset management, environmental issues, feasibility studies, health & safety, insurance, auditing, project management, and quality assurance. This trend has become most recognizable with the incoming generation of QS: "the majority of new graduates appear to be entering more non-traditional QS routes." (Perera, Pearson, & Dodds, 2010)

Table 1.1 CE, QS, PM, and Specialist Competencies

	CE	PM	QS	Optional
Asset Management	✓		✓	
Budgeting	✓	✓	✓	
Cash Flow Analysis	✓	✓	✓	✓
Change Management	✓	✓	✓	✓
Claims Management / Disputes	✓	✓	✓	✓
Closeout		✓		
Compliance		✓	✓	✓
Constructability Analysis	✓			✓
Construction Technology	✓	✓	✓	
Contract Administration	✓	✓	✓	✓
Contracting and Procurement	✓	✓	✓	
Cost Accounting	✓	✓	✓	
Cost Management	✓	✓	✓	✓
Document Controls		✓		
Earned Value	✓	✓	✓	
Economic Analysis	✓	✓	✓	✓
Environmental Initiatives	✓	✓	✓	✓
Estimating	✓	✓	✓	
Ethics	✓	✓	✓	
Feasibility Studies	✓	✓	✓	✓
Financial Audit			✓	✓
Health & Safety	✓	✓	✓	
Information Technology	✓	✓	✓	
Insurance	✓	✓	✓	✓
Lifecycle Cost Analysis	✓		✓	✓
Material Quantity Takeoffs	✓	✓	✓	
Optimization	✓	✓	✓	
Performance Assessment	✓	✓	✓	✓
Planning & Scheduling	✓	✓	✓	✓
Policies & Procedures	✓	✓	✓	
Portfolio Management		✓		
Productivity Management	✓		✓	
Premises, Energy, & Maintenance Audit			✓	
Program Management		✓		
Project Controls	✓	✓	✓	
Project Management	✓	✓	✓	✓
Reporting	✓	✓	✓	
Resource Analysis	✓	✓	✓	✓
Risk Management	✓	✓	✓	✓
Quality Assurance	✓	✓	✓	✓
Scope Definition	✓	✓		✓
Stakeholder Management	✓	✓		
Startup		✓		
Tax Assessments	✓		✓	
Tax Depreciation	✓		✓	✓
Valuation & Appraisal			✓	✓
Value Management	✓	✓	✓	✓

Cost engineering remains strong in planning / scheduling and estimating, along with all types of economic, accounting, and cost management. The cost engineer has begun to move “into areas beyond the traditional tasks of estimating and cost control.” (Pietlock, 1997) Expansion of the skillset includes the traditional scopes of work covered by quantity surveying and project management.

The scope of project management now includes all of the above, with certain exclusions such as: asset management, constructability analysis, taxation, valuation, auditing, and specialty cost analysis. Project management qualification appears to have expanded to include all skillsets typically found on a project team or within a project management organization.

Within the realm of cost engineering and quantity surveying, even the terminology used is inconsistent. “Quantity surveyors are called by so many names all over the world such as cost engineers, building economists, cost managers, construction accountants, etc.” (Oke, Timothy, & Olaniyi, 2010) Cost engineers, likewise, are referred to by those terms and more, such as project controls professionals. Little global terminology has been developed to consistently describe the professions, and the terminology confusion has likely been to the detriment of these professions when marketing their services.

Table 1.2, in the Appendix, further illustrates the substantial variation in the definition of members’ competencies by professional associations, on a regional level. While there have been formal certification programs developed and competencies defined within various professional associations, there remains “no universally accepted definition of programme management,” (Shehu & Egbu, 2007) and the same can also be said for cost engineering and quantity surveying. Roles are evolving more quickly than globally accepted definitions can be agreed, creating a moving target.

1.3.1 Changes in Response to Market

At the Pacific Association of Quantity Surveyors (PAQS) Congress 2010, it was acknowledged that “the role of the Cost Engineer and Quantity Surveyor (CEQS) has been changing since the last decade, celebrating the maturity and innovative growth of the discipline. These roles have been entrenched in every construction project and have developed into value adding and even environmental saving responsibilities. Since the inception of the discipline, there is a tremendous accumulation of knowledge and information generated from what the profession has to offer and all these happen through the boom and bust of the construction cycle, no matter what country we are in.” (PAQS, 2010)

The competencies of cost engineering, quantity surveying and project management are evolving in response to market demand, creating much overlap in the services provided by these disciplines. “The project cost management profession is now recognized as a distinct professional discipline around the globe. Whether it be carried out by quantity surveyors, cost engineers or project managers, the basic principles of effective project cost management remain the same and the portability of professionals to work within each of these three disciplines is evident. The scope of services provided by these professionals is now very broad as firms embrace the concept of total cost management to effectively service their clients.” (Smith, 2008) As individuals and firms seek to satisfy client needs, the roles of the QS, CE, and PM continue to broaden.

This evolution should not come as a surprise, and is a natural response to the need “to meet differing and changing client needs and to grow the market” (Nkado, 2000) for the professions. “Changes in business environments bring about intense pressure to the managers to think and rethink, search and research, view and review the skills and competencies to put them at the top of their demanding jobs.” (Shehu & Egbu, 2007) Ultimately, “every profession must evolve in response to the rapid changes in the global business environment, [and] practitioners must … understand their clients and their commercial objectives and explore innovative ways to deliver value.” (Frei & Mbachu, 2010) These changes are natural, and will likely continue unabated.

1.3.2 Industry and Functional Specialization

While the traditional core competencies have remained intact for all three fields, professional associations providing certification have always needed to recognize industry specialization and have recently begun to recognize areas of functional specialist expertise.

“Cost engineering practitioners tend to be specialized in function (e.g., cost estimating, planning and scheduling, etc.); focused on either the asset management or project control side of the TCM [Total Cost Management] process; and focused on a particular industry (e.g., engineering and construction, manufacturing, information technology, etc.); or asset type (e.g., chemical process, buildings, software, etc.).” (AACE International, 2012) There has been some criticism of cost engineering professional societies, for appearing to focus heavily on civil and building works; however, the skillset has translated well to other industries.

The QS practical focus has traditionally been “heavily directed toward civil and building works,” (Bennett & Maddalena, 2010) and has perhaps not tranferred or been marketed quite as well to other industries as the CE function. Some of the QS professional societies shown in Table 1.2 have identified optional competencies, recognizing that “a number of the other competencies are quite specialised and therefore optional and might only be acquired by Quantity Surveyors working in a specific area or on particular projects. It is therefore unlikely that all these competencies will be

found in any one Quantity Surveyor. However, in many Quantity Surveying practices the balance of these competencies is likely to be provided by pooling all the skills of the various staff." (Pacific Association of Quantity Surveyors, 2001) These areas of "specialty or future career diversification … include arbitration and other dispute resolution procedures, development appraisal, facilities management, insolvency, insurance, project management, property investment funding, research methodology and techniques, taxation allowance and grants and valuation." (Oke, Timothy, & Olaniyi, 2010) The areas of specialization appear to reflect a continuing focus on civil and building works.

In contrast, the field of project management has been defined very broadly as a management science, diluted so as to be applicable across a range of industries. There is little industry specialization, except at the level of the individual. Functional specialization does occur, as noted earlier.

1.4 REGIONALIZATION

In the past, it has been noted that "quantity surveying is a profession with origins in the United Kingdom and is a professional title recognized mainly in Commonwealth countries. Cost engineering is the term used in North and South America, China and some parts of Europe. In other regions, particularly in Europe, neither of these two titles is recognized, with cost management services largely carried out by project managers as part of their suite of services. The fundamental cost management principles and practices of these professions are the same – the main differences lie in the fact that cost engineering generally has wider application to other industries (particularly engineering projects and processes) and that project management encompasses cost management as one of the components of the overall management of projects." (Smith, 2008)

Looking at the global reach of the professional societies studied herein, along with a cross-section of professional associations that are members of the International Cost Engineering Council (ICEC), it becomes clear that the above statement remains largely true. Cost engineering is quite strong in North and South America, with some recognition of quantity surveying in major cities. In contrast, quantity surveying is strong in the Middle East, Central America, United Kingdom, Africa, Asia, Oceania. The cost engineering influence is growing in these parts of the world, more slowly in Africa and Asia. Project management functions are prevalent in all these regions. In non-Commonwealth European countries, project management dominates, to the extent that CE and QS functions are nearly excluded. Cost engineering is beginning to gain recognition across Europe, but progress is slow.

Considering these trends with a global view, cost engineering appears to be gaining influence worldwide, although inconsistently, in areas previously dominated by project management and quantity surveying. Much of this expanded recognition may be due to visibility and activity of certain professional societies, and globalization of North American workers. In contrast, recognition of project management and quantity surveying may well be slowing, with the exception of pockets of influence in South America, Eastern Europe,.the Middle and Asia (again due to the professional association activity).

1.5 EDUCATION AND CERTIFICATION

Cost Engineering and Quantity Surveying differ primarily in the route taken to professional qualification, not to any substantive difference in the two professions. Project Management overlaps both Quantity Surveying and Cost Engineering in the project cost management area to some degree, but most Project Management functions are quite different from those of Cost Engineering and Quantity Surveying. (ICEC, 2009)

The profession of cost engineering suffers from a lack of formal training programs at universities. (Esterhuizen, 2011) There is no such thing as a university degree in cost engineering; rather, training in cost management, estimating, and scheduling are more often included as coursework in civil engineering, construction management, and project management curricula. Indeed there is no standardized career path for the cost engineer, with individuals joining the profession from such areas as accounting, building, manufacturing, and engineering. Certification is achieved on a voluntary basis, and certain certification programs allow years of experience in lieu of a university degree. As a result, “cost engineer’s (CE's) regularly get involved with mega projects without formal requirement for qualification or competency.” (Bennett & Maddalena, 2010) Some employers and clients do require certification, but there is no statutory requirement, such as for registered professional engineers, architects, or lawyers. A number of specialist certifications are also available in cost engineering, in knowledge areas such as claims, estimating, scheduling, and earned value analysis.

In contrast, “Quantity surveyor (QS) competence and formal qualification are driven by tertiary intuitions that give meaning to the professional nature of the role.” (Bennett & Maddalena, 2010) University degrees are conferred in quantity surveying, and these appear to be the primary path to the profession. The majority of the universities conferring QS degrees are located in the United Kingdom and Commonwealth countries. However, certification in quantity surveying may also be achieved through a CE or PM path without a university degree in quantity surveying, along what has been known as an ‘expert route’ to qualification. Once qualification has been achieved, additional areas of specialization

may be indicated, in professional groups such as building surveying, dispute resolution, project management, and quantity surveying (construction).

University degrees are conferred in project management and construction management at institutions of higher education around the world, both as a bachelor's degree and at the post-graduate level. Again, certification may also be achieved through professional associations without a university degree. Certification is available for project management, program management, and portfolio management, and certain certification programs recognize the distinction between organizational tiers in PM, such as project manager and project director.

1.6 THE PATH FORWARD

Due, in part, to the established key role they they now perform in support to PM on large and mega industrial engineering projects, there is now a global resource shortage in the field of cost engineering, (Esterhuizen, 2011). At the same time, there universities around the world producing qualified PM and QS practitioners who, by virtue of their qualification and lack of specialisation, have thus far been largely precluded from entering the CE market.

Additionally, an older generation is retiring and young practitioners are needed to fill the gap. However, young practitioners are being drawn to other professions which are better understood and in which undergraduate degrees are available, such as information technology and project management. Universities around the world need to recognise the market need for CE specialisation, and offer both graduate and post-graduate programs in this discipline, in addition to the PM and QS degrees currently available. University degree programs in the field of cost engineering must be comparable in stature to those of quantity surveying.

Indeed, this process has already begun. AACE International have produced Recommended Practice No. 12R-89, "Model Master's Degree Program", (AACE Education Board, 1989) and the Dutch Association of Cost Engineers (DACE) have a Dutch Association of Cost Engineers post-graduate cost engineering degree program, which is a two-year part-time post-graduate course for those with a technical bachelor's degree. As degree programs become available, companies, professional associations, and educators must work together to promote cost engineering / quantity surveying as ONE lucrative and professionally satisfying career choice.

In order to satisfy demand, it is imperitive that "cost engineers and quantity surveyors must join forces." (Esterhuizen, 2011) This includes developing shared terminology, which can then be used in marketing both the profession and services. RICS and AACEI should, once again, take a leading role in managing the process, but should do this together with leading tertiary institutions as well as other CEQS professional associations

around the world. RICS has established a strong presence globally for the QS profession, but has only recently begun to recognise the role of CE practitioner, and this must be further strengthened.

In 2009, RICS Americas commissioned the study "Opportunities for project control and quantity surveying roles on development projects," led by Alexia Nalewaik and Steve Elias as part of the Construction Council. The objective of the study was to identify how the quantity surveyor (QS) can add value on development projects in the North American region, with the goal of determining how the QS is currently utilized in industry, and the benefits (value) of making incremental change to the process by expanding utilization of the quantity surveying profession based on a researched and clear definition of both pre- and post- contract project controls functions / quantity surveying roles and methods for integration with the project team. (Nalewaik & Elias, 2009) The study was forestalled, due to the challenges of self-evaluation noted earlier, and ultimately led to the development of this white paper based on competencies as defined by leading global professional associations. The study is now expected to be used by several leading CE and QS professional associations to: a) identify opportunities to provide continuing education for members, b) refine marketing plans, c) grow membership, and d) build alliances. In order for this initiative to have maximum effect, CE, QS, and PM professional associations must be fully engaged and cooperating. In addition, the contents of this white paper have expanded the scope to be of a more global nature, and thus benefit membership in CE, QS, and PM professional associations around the world. All three professions "need to lead the change developing a set of competencies that are regional, as opposed to national, reflecting the world's best practice." (Lenard, 2000) These global competencies, combined with shared terminology, will simplify the process of promoting the profession.

Lastly, to avoid confusion about specialized competencies and overlap, "duties or functions which are clearly project management should be transferred to that domain," (Bennett & Maddalena, 2010) while the CE and QS should be recognized as unreplaceable specialist members of the PM team. This must be aligned and integrated with PM and QS curriculae. This will ensure congruence in approach and synergy in application, irrespective of the chosen specialisation discipline of the practitioner. It will also ensure identifiable routes to CE specialisation qualification, whether commenced from PM, Engineering, QS, or other fields.

1.7 CONCLUSION

The competencies of cost engineering, quantity surveying and project management are evolving in response to market demand, creating much overlap in the services provided by these disciplines. While the basic competencies have remained intact, professional associations providing certification have begun to recognize areas of specialist expertise and its application in the global context.

The discussion draws attention to needed curriculum at the university level and continuing education for practitioners, the need for global shared terminology, and better marketing of the CE, QS & PM professions, thus maximizing career opportunities for this skilled community.

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1.9 APPENDIX

This table represents the full analysis of CE, QS & PM competencies.

TABLE 1.2 CE, QS, PM, and Specialist Competencies, by Professional Association