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Individual Certification as an Engineering Manager?

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Abstract

Several of the discipline specific professional societies are offering or planning to offer certification of individuals as engineering managers. Does this have implications for Engineering Management programs at universities? Other stakeholders (faculty, students, employers, and graduates of engineering management programs) are impacted by certification as well. This paper attempts to look at the issue from several points of view. This paper is intended to provoke a dialog on the topic.

Background

Certification of individuals in certain skills has been common for many years. A certified applicator for any of the different predetermined time systems is one example of a typical certification. The skill is taught by the certifying organization – often the owner of a proprietary system - for a fee. The holder of the certification has typically been tested to ascertain their competency to use the tool (or software); the “prerequisite” for the certification is typically limited to those necessary to understand the training. While degreed engineers may hold these certifications, the certification is seldom difficult to obtain. Other examples are certified network engineer – which is not an engineer – where the training is offered by a trade school or as continuing education and is not based on “engineering” as we know it.

In engineering certification of interest has long been that of PE (Professional Engineer). This certification is more of a license to practice engineering and is required by state law for certain engineering work. Examples of this work are structural designs and pressure vessels. In many, if not most states, the offering of engineering consulting services requires at least the principal(s) in the firm to have a PE. The professional organization for holders of the PE designation is the National Society of Professional Engineers (NSPE)¹. This organization supports the need for the license/certification and provides support and services for the holder of this certification. Membership in NSPE is not required for certification and NSPE does not offer the PE certification.

The awarding of the PE in the United States is done at the state level by some governmental board – for example in Virginia PE certification is done by the Virginia Board for Architects, Professional Engineers, Land Surveyors, and Landscape Architects. Each state board sets its own requirements but they generally follow the same basic requirement set:

- Four to six years of professions experience as an engineer (generally under the supervision or observation of a PE)
- Successful completion of the Fundamentals of Engineering Exam (FE Exam)– the national exam by the National Council of Examiners for Engineering and Surveying² typically taken by engineering students during their senior year
- Graduation from an ABET (Accreditation Board for Engineering and Technology) accredited engineering program (many states accept graduates of ABET accredited engineering technology programs) – there are exceptions to this requirement based on engineering experience as one example
- Successful completion of the PE Exam – in most states the national exam by the National Council of Examiners for Engineering and Surveying is used

While by no means a certification held by all (or even most) engineers, the PE is readily recognized as an achievement by the holder which requires a level of knowledge and skill. It should be noted that the pass rate on the FE exam is typically around 70%.

The other long standing engineering certification is of engineering programs themselves by ABET. While this is not an individual certification, graduation from an ABET accredited program carries an implication of competency on the holder of the degree. The accreditation process by ABET is done with the cooperation of the professional engineering societies.

The professional engineering societies representing academic disciplines (with at least one exception) do not offer certification to their members as an engineer and most (if not all) do not require a degree in their specific branch of engineering, any branch of engineering, or any other degree for membership. The Society for Manufacturing Engineers⁵ (SME) does offer certification as a Certified Manufacturing Engineer (CMfgE). This certification is open to both degreed and non-degreed engineers via a test developed and administered by SME.

The certifications offered by professional engineering societies can be typified by the Institute of Industrial Engineers. IIE offers certificates in Lean Enterprise, Six Sigma, Supply Chain Improvement, and Basic Industrial Engineering Skills. The subject of each of these certificates is a specific skill or skill set which would be the equivalent of roughly one college course (3 semester credits). Other, not specifically engineering, societies offer certifications in similar regards – i.e. APICS (The Association for Operations Management) and ASQ (American Society for Quality) which offer production planning and control certifications and different quality certifications such as Certified Quality Engineer. PMI (Project Management Institute) is an example of a society built around a skill set which is common to all engineering disciplines, as well as, most non-engineering disciplines. PMI has developed a body of knowledge for the skill set, a standardized test based on the skill set, and promoted the certification they offer as representing the general degree of knowledge and skill needed in project managers.

Engineering Manager Certification Programs

The professional engineering societies need to offer value to their members. PMI's certification program has been very successful in growing the society (members equal a steady revenue stream) and generating income (both from the training offered to prepare examinees and from the exam itself) and is seen as an attractive model by other professional organizations – both those

representing the specific engineering disciplines and those supporting niche fields which include engineers. Most engineers according to Babcock and Morse¹³ rapidly progress into a position with an emphasis in management – engineering manager, project manager, other functional manager. Over time engineering graduates progress from being engineers into being managers who still identify very strongly with their engineering roots.

This situation has led to the idea of certification as a member (and income) generating opportunity for professional societies. Since engineering management (EM) is a common theme in most engineers' jobs or aspirations, it is the logical candidate for a certification effort. The argument of EM as a common theme for practicing engineers just put forward is supported by the success of the EM graduate programs:

1. they draw students from all engineering undergraduate disciplines not just from the graduates of EM undergraduate programs (thus a large target population),
2. are what the customers want (look to EM program enrollments, often the largest graduate program in the college of engineering, and employer support, since most working students are reimbursed for tuition by their employer for job-relevant education),
3. and the material in the EM programs (this is “good stuff” - as reported by the graduates of EM programs).

NSPE has looked into certifying individuals as Engineering Managers but has not been able to put a viable plan into action to date.

ASME (American Society of Mechanical Engineers) has an engineering management certification program in place. This program is supported by ASME, ASCE (American Society of Civil Engineers), AIChE (American Institute of Chemical Engineers), and IEEE (Institute of Electrical and Electronic Engineers). The certification examination is based on a body of knowledge ASME has developed. The body of knowledge has eight domains³:

- Market Research, Technology Updates and Environmental Scanning
- Planning and Adjusting Business Strategies
- Developing Products, Services and Processes
- Engineering Operations and Change
- Financial Resources and Procurement
- Marketing and Sales
- Leading Individuals and Engineering Project Teams
- Professional Responsibility

SME also has an engineering management certification program in place. This program is supported by SME and IIE. It is based on a body of knowledge developed by SME. This body of knowledge has five areas, each of which is broken down into many elements. The areas are¹¹:

- Customer Focus
- People, Teamwork, and Organization
- Business Processes
- Resources and Responsibilities
- External Enterprise Influences (Standards, Resources, Programs)

The approaches to certification are different for each professional society. SME advertises: **“If you have skills, experience, but no degree.** The next job on the ladder might require a degree. Ask the boss if Certification qualifies you.”¹² ASME requires a bachelor’s degree plus a certain number of years experience as an engineer or engineering manager.³ Both societies offer training for the examinees. ASME offers two and three day courses on each domain. SME offers a one and one half day review course (at the conclusion of which the exam is given.).

The American Society for Engineering Management (ASEM) is in the process of developing an Engineering Manager Certification Program as well.

The Problem

Is Engineering Management an academic discipline, a position at work, or some combination of the two? Mechanical Engineering is an academic discipline which is often reflected in a job title of mechanical engineer. Industrial Engineering is an academic discipline which may be reflected in a job title of industrial engineer. The person holding the job title of industrial engineer, based on 15 plus years in industry managing IE functions, is more likely than not to not hold an industrial engineering degree, an engineering degree, or in many cases no degree at all. ASME does not certify its members as mechanical engineers. Of all the professional societies, SME seems to be the only one which offers certification as an engineer. ASME and SME are now willing to certify individuals as engineering managers. Does this open the door for the certification of engineers in other field by the other professional engineering societies? If so, this is an unsettling trend. Should ASME (as an example) certify people as mechanical engineers based on a test they provide and which they will train candidates to take/pass? Should they do the same for chemical engineers, or for professors of engineering – like they are planning to for engineering managers? Traditionally society has looked to the colleges and universities to provide this education (and not training) in the form of a degree in engineering and has used bodies such as ABET to judge minimum acceptability of these education programs at offering institutions. As a final check society uses the PE designation to certify individual competency and this is done by a body of the state government in which the engineer practices. Is certification to become a substitution for education?

What stance should we as representatives of engineering management take on certification within our own field? Several paths are open to us. We can ignore the practice and hope it goes away. We can get involved in these certification programs and try to strengthen them to reflect the discipline as we teach it. We can hold up the degree as a “gold standard” for the discipline by pushing the quality of our programs and our products – students, research, and the positive impact of “good” engineering management in the workplace.

Conclusion

This paper is not written to raise fears for the profession. It is written to start a dialog on what we need to do to protect the discipline of engineering management and the degrees of our graduates. Does a day and half of study equal a 30 credit master’s degree? Does 128 to 192 hours of study equal this degree? We offer good programs of study. We need to make sure that these degrees remain the “gold standard” for the discipline. Let us not take anything away from the engineer who has moved into management and has been successful. However, one should question the value these individuals receive from certification unless it is rigorous and is supported by a

commonly agreed to examination of a core body of knowledge. The exam should be as challenging for the person without a degree in EM as the FE is for an examinee without an engineering degree. It should not be a trivial exercise for the holder of an EM degree, just as the FE and PE Exam are challenges for all. The starting point in these exams is the expectation of study at an ABET engineering program. Should not the same be true for engineering management – a recognized engineering discipline?

In 2004 only one EM program is ABET accredited at the graduate level – the program offered by the Air Force Institute of Technology – and four EM at the undergraduate level - United States Military Academy, Stevens Institute of Technology, University of Missouri Rolla, University of the Pacific - plus one undergraduate program in engineering management technology – Western Michigan University. ASEM has started a program to certify EM master's programs to address this shortfall. As a discipline we should be pushing our programs to be accredited. If accreditation is not an option, then our programs should be certified. Students earning an MBA and employers hiring MBA graduates place value on certification by the Association for Advancing Collegiate Schools of Business – International (AACSB). This certification is hard to earn and all MBA programs do not have this certification. This sets these programs apart. MBA's are not certified, their sources of education are certified – should this not be the model for EM?

The final issue for the discipline is a recognized body of knowledge. This body of knowledge should be based in the EM discipline. SEMS and ASEM are working, separately as of this writing, to develop formal bodies of knowledge for engineering management which are in agreement with the ABET standards for Engineering Management, our research (yours and mine) in engineering management, and the practice of engineering management. Since this is a constantly evolving discipline, these bodies of knowledge should define be dynamic. Since EM can cover a broad range of knowledge is must defined to reflect this breathe while still defining a core set of skills/knowledge all EM graduates should have.

The issue of individual certification brings to the fore several issues which should be address by the EM discipline in the near future. These issues are:

1. individual certification – is it a good idea?
2. program certification – does it need to happen to lend academic creditability to the discipline as engineering discipline first and foremost?
3. a commonly accepted body of knowledge for the EM discipline – one the discipline owns

What role do we, as academics, play in this process? I see our role as key. How do you see it?

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