Computing Research Association

Conference at Snowbird 2000

Slides from a workshop

on the topic of

"Software Engineering Licensing and Certification"

presented by

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http://www.cra.org/Activities/snowbird/00/wk3-5.html

Software Engineering Licensing and Certification

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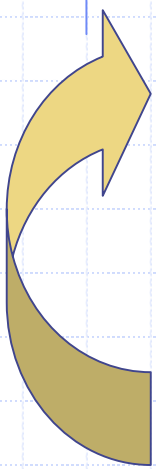
Software & the public interest

- Software is increasing material to the general public
- Improving the quality of software is increasingly important
- Establishing and validating the quality of software is of increasing importance

Three approaches to establishing and validating quality

- Focus on the product
- Focus on the organization producing the product
- Focus on the individuals producing the product



The discussions about licensing and certification generally fit into this approach

Today's objective

- Distinguish among different forms of credentialing
- Focus on the licensing of software engineers
  - Provide some basic history and facts
  - Lay out the varying opinions and the rationale behind them

Significant audience participation, please: corrections, clarifications, opinions

Three hats

Related issues

- Licensing of software engineers is associated, to some degree, with other issues related to software engineering as a profession
  - Other issues include curricula, ethics, etc.
- I'll try to remain focused on the licensing and credentialing issues
  - But it may not always be easy

Credentialing in many forms

- There are a number of different forms of credentialing
  - Professional registration, product-specific vendor certifications, etc.
- Each form of credential offers particular assurances — about those who receive the credential — regarding
  - Breadth of knowledge, depth of knowledge and degree of competence

Professional registration

- Profession registration is found for lawyers, doctors, professional engineers (PEs), etc.
- Managed in the public interest
  - Thus usually under direct or indirect control of the government
  - Guild protection may arise in some situations
- Held to a high standard
  - Holders of the credential will practice at a level consistent with the public safety

Private certification

- A form of credentialing with different assurances and expectations
- Ex: MCSE & Novell Certified Network Engineers
  - Generally product- and vendor-specific
  - Implies proficiency in the use of the specified product, but no more
- Usually of little interest to the general public

Other credentials

- Professional and trade organizations may offer credentialing
  - Some data processing and testing organizations do this
- Product (not people) oriented credentials
  - Ex: Underwriter's Laboratory

Professional Engineers (PEs)

- There has been significant interest in licensing software engineers as PEs
- A PE is a person licensed (in the U.S.) by a state
  - Most states define an engineer by “practice” (what they do), although “title acts” also exist
  - PEs are accountable for their activities and assume legal liability
  - Some reciprocity
  - Varying degrees of enforcement

Getting a PE license

- Four year ABET accredited university degree
- Eight hour examinations on fundamentals of engineering
  - Usually during senior year
- Four years of acceptable experience
- An examination on principles of practice
- Written recommendations of other PEs

PEs

- A PE is tested within a specific area but licensed as an "Engineer"
  - Practicing beyond one's area of competence may lead to disciplinary action
- The percentage of PEs varies widely across engineering disciplines

©Civil engineering

®Mechanical engineering

™Electrical engineering

Mandatory licensing

- Usually required
  - for those providing services directly to the public
  - For those involved in the design of facilities, roads, etc., where drawings must be submitted to state agencies for approval
- Some exceptions
  - Individuals who work in industry for a company and do not provide direct services to the public
  - Employees of the federal government

Fundamental of Engineering (FE) examination

- Four hour general examination based on first two years of ABET accredited engineering degree
- Four hour discipline specific examination based on material from the last two years of the degree

FE General Examination

- Chemistry
- Computers
  - Algorithm flowchart, spreadsheets, pseudo-code, data transmission and storage
- Dynamics
- Electrical circuits
- Engineering economics
- Ethics
- Fluid mechanics
- Material science/ structure of matter
- Mathematics
- Mechanisms of materials
- Statics
- Thermodynamics

Discipline specific FE exam

- Five disciplines
  - Civil engineering, mechanical engineering, electrical engineering, ...
- One general, non-specific discipline
  - Covers the general examination topics in more detail

Principles of engineering exam

- After a minimum of four years of practice, an applicant must pass an examination in a discipline-specific topic
- Many (all?) states use the National Council of Examiners for Engineers and Surveyors (NCEES) to develop these examinations
- The process for deciding on the topics to be covered is long and rigorous

Licensing software engineers

- Current status?
- On what basis?
- Is it a good idea or a bad idea?

Status

- Texas is the only state currently licensing software engineers
  - Several dozen have been licensed
- Other states are discussing this, as is Canada and several other countries

On what basis?

- There is general agreement that licensing would require the definition of a core body of knowledge for software engineering
- The body of knowledge should reflect actual achievable good practice that ensures quality consistent with the public interest
- The practices need not be guaranteed to produce perfect software, but that following them should provide reasonably intuitive expectations of quality

SWEBOK (www.swebok.org)

- The Software Engineering Body of Knowledge effort has been a joint effort of the IEEE Computer Society and the ACM under the auspices of the Software Engineering Coordinating Committee (SWECC)
- The intent is to provide a guide to the software engineering body of knowledge
- A three-phase multi-year effort, with the second phase supposed to have been completed recently
- Intended, in part, to be a basis for licensing of software engineers

Arguments for licensing

- Would provide, in applicable situations, assurances to the public
- Would act as a driver for improving our ability to engineer software
- Would help software engineering reach the status of a profession
- Would help software engineering become more respectable

An additional argument...

- ...for being involved in licensing software engineers

- Since jurisdictions are pursuing licensing, the professional societies should be involved to influence the process in as positive a way as possible

Arguments against licensing

- Would not be effective at improving software quality
- Would provide false assurances to the public about software quality
- Would be premature in the absence of an agreed upon body of knowledge that commands respect of the community

ACM's position (May 1999)

- "ACM is opposed to the licensing of software engineers at this time because ACM believes it is premature and would not be effective at addressing the problems of software quality and reliability.
- "ACM is, however, committed to solving the software quality problem by..."
- Position based largely on the report of the Advisory Panel on Professional Licensing in Software Engineering
  - A majority but not all of the members were against continued involvement in licensing
  - F. Allen, B. Boehm, F. Brooks, J. Browne, D. Farber, S. Graham, J. Gray, P. Hawthorn, K. Kennedy, N. Leveson, D. Nagel, P. Neumann, D. Parnas, B. Wulf

<insert discussion here>

Two final slides

- Not precisely related to licensing, but related in some ways

Additional ACM task forces

- Assessment of Body of Knowledge efforts
  - D. Notkin (chair), M. Shaw, M. Gorlick
  - Focused on whether existing efforts, especially SWEBOK, would provide an effective basis for licensing
- Licensing of Software Engineers Working on Safety-Critical Software
  - J. Knight and N. Leveson (co-chairs), L. Clarke, M. DeWalt, L. Elliot, C. Kaner, B. Littlewood, H. Nissenbaum
  - Draft version, focusing on licensing and its effectiveness and applicability to safety-critical software

ACM position (June 2000)

- Based in part
  - on these task forces, and
  - on a perception that SWECC has become closely associated with licensing software engineers
- ACM voted to withdraw from SWECC and thus SWEBOK