Licensing Software Engineers

Phil Laplante, CSDP, PE, PhD

Professor of Software Engineering

Penn State

Software PE Exam Development Committee Chair

Outline of talk

- Licensure – purpose
- Current status
- Road ahead

Licensure

- *"The goal of a software engineer is to retire without having caused any major catastrophe." —Dilbert*

- The goal of licensure is to protect public health, safety and welfare. By ensuring only minimally competent practitioners can offer their services to the public.

- States license doctors, nurses, accountants, lawyers, engineers (and barbers, plumbers, electricians, etc.)

- Certification is voluntary, licensing is mandatory.

IEEE CS/ACM Code of Ethics [1999, short form]

- 1. **Public.** Software engineers shall act consistently with the public interest.
- 2. **Client and employer.** Software engineers shall act in a manner that is in the best interests of their client and
- employer, consistent with the public interest.
- 3. **Product.** Software engineers shall ensure that their products and related modifications meet the highest professional
- standards possible.
- 4. **Judgment.** Software engineers shall maintain integrity and independence in their professional judgment.
- 5. **Management.** Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
- 6. **Profession.** Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
- 7. **Colleagues.** Software engineers shall be fair to and supportive of their colleagues.
- 8. **Self.** Software engineers shall participate in lifelong learning regarding

Systems that affect health, safety and welfare of public

- Utility plant control systems/ smart grids
- Medical devices
- Automotive systems
- People moving systems
- Financial systems?
- Etc….

Who would need a license?

- Would all software engineers need to be licensed?
  - No, only those providing their services directly to the public.
- Would all software have to be developed or supervised by licensed software engineers?
  - No, only software that has an impact on the lives, property, economy, or security of people.
- Licensing software engineers isn't a once-in-a-lifetime event
  - Engineers must renew their licenses annually and may be subject to mandatory continuous professional development

Source: Krutchten, 2009

Current status

- Currently, only Texas licenses software engineers for "the application of mathematical, physical, or computer sciences to activities such as real-time and embedded systems, information or financial systems, user interfaces, and networks."

- Licensing is "imminent" in 9 other states (10 is the minimum for the NCEES to develop an exam).
  - Alabama, Delaware, Florida, Michigan, Missouri, New Mexico, New York, North Carolina, Texas, and Virginia

- It is expected that all other states and territories will follow suit.

Organizations involved in licensure effort

- NCEES
- NSPE
- IEEE – USA
- IEEE-CS
  Texas Board of Professional Engineers
- Prometrics

The path to licensure

- Appropriate degree from an ABET-accredited program
- Fundamentals of Engineering examination
  - A broad-based exam of a body of knowledge common to all engineers
- 4-6 years relevant experience as a practitioner
- Principles and Practice (PE) exam
  - This exam is the only missing item in the path to licensure for software engineers.
- Differences by states?....usually in qualification to sit
  - Years of experience
  - Waiver process, grandfathering, recognition of certifications.

Source: Krutchten, 2009

Creating a SW licensure exam(1)

- Develop professional activities and knowledge survey (PAKS)pilot
- Conduct pilot survey
- Analyze pilot survey results and make adjustments
- Conduct the PAKS survey
- Conduct meeting to determine test specifications and number of questions in each area
  - Agreement among subgroups analyzed to ensure validity of specification
- EPE Committee of NCEES approves survey test specifications

Based on American Educational Research Association, American Psychological Association, National Council on Measurement in Education. (1999). *The Standards for Educational and Psychological Testing*. Washington, DC: American Psychological Association.

Creating a SW licensure exam(2)

- Recruit qualified SMEs to fill question bank with items
- Conduct exam writing/review workshops (2-3/ year)
  - Only PEs can write items
  - > 240 items needed to offer exam
  - All items are reviewed multiple times and continuously monitored
- Review and pretest examinations (1 or 2 meetings)
- Test administered
- Form cut-score sub-committee and establish cut-score

SW exam status

- Committee met September 2010 to develop PAKS survey instrument.
- Pilot survey developed and delivered (10/2010) – 22 respondents (of 39 invited).
- Survey adjusted and administered December2010 – 323 diverse respondents, 7.36% response rate.
- Committee met February to finalize PE exam specifications (percentages of each area).
- Exam specification to be approved October 2011
- Exam item writers recruited and item writing to begin Fall 2011.
- Earliest possible exam, October 2012, Likely April 2013

Knowledge areas*

1. Requirements
2. Design
3. Construction
4. Testing
5. Maintenance
6. Configuration Management
7. Engineering Processes
8. Quality Assurance
9. Safety, Security and Privacy

Within these areas > 150 skills/activities defined. The question allocation percentages are confidential until approved.

Exam format for principles and practices exam

- 80 questions
- Multiple choice
- Two four-hour sessions
- Each item is reviewed by 4 licensed PEs before pre-testing
- Ongoing validity and reliability of questions monitored after each exam offered

Road ahead

- Promoting licensure of software engineers
- Helping state boards adopt licensure statutes
- Dealing with offshore components and licensed PEs from other countries
- Dispelling fear and rumors

Questions?

Contact: plaplante@psu.edu

References

- Kruchten, Philippe, "Licensing Software Engineers?", *IEEE Software,* nov/dec 2008.
- Phillip A. Laplante, "Professional Licensing and the Social Transformation of Software Engineers," *Technology and Society*, Summer 2005, pp. 40-45.