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Homework #1

List 3 names of well-known SW engineers (computer scientists) who contributed to our field (of SWE). State with which idea did they contribute, or how they helped advance the practice of SWE. Is their idea relevant today?

- Edsger Wybe Dijkstra defined the "Shortest Path First Algorithm" and articulated the term "Software Crisis." He is relevant today.
- Donald Ervin Knuth wrote "The Art of Computer Programming" and created the TeX typesetting system. His book is still relevant today.
- Tony Hoare contributed the Quicksort algorithm which is extremely relevant today.

Name and very briefly explain key goals or key deliverables of any substantial SWE product development. How can one know, if the goal is reached?

- Correct function (works as intended)
- Complete function (all promised features operational)
- Acceptable, defined speed (uses system resources efficiently)
- Portability (works in other compute environments)
- Intuitive (must be understandable to the end user)
- Complete documentation (common tools, no special environment)
- High stability and reliability (no crashing or overflows)

List some (at least 3) real, typical challenges in the creation of mature software products.

- Legacy Systems: old and valuable systems must be maintained and updated
- Heterogeneity: systems are distributed and include a mix of hardware and software
- Delivery Time: there is increasing pressure for faster delivery of software

List, and briefly characterize at least 3 SWE activities (or sub-disciplines), activities each SWE must undertake some time.

- Software Design: defining architecture, components, interfaces, and other characteristics of the system or component.
- Software Testing: empirical, technical investigation conducted to provide stakeholders with information about product quality.
- Software Engineering Models and Methods: impose structure on software engineering to render activity systematic, repeatable, and more success oriented.
- Software Engineering Economics: make decisions related to software engineering in a business context.

Name a widely known (professional) SWE model, developed with intent to successfully manage large SW projects. List its name and acronym. Which phases (or practices) are listed in this model?

- Capability Maturity Model or CMM
    - Level 1 Initial: processes unpredictable, poorly controlled and reactive
    - Level 2 Managed: processes characterized for projects, is often reactive.
    - Level 3 Defined: processes characterized for the organization and is proactive
    - Level 4 Quantitatively Managed: processes measured and controlled
    - Level 5 Optimizing: Focus on process improvement

What is Software Engineering?

- It is an engineering discipline of Computer Science that produces correctly working, efficient, low cost, software solutions to defined compute problems.

Looking at the history of PL (Programming Languages), what characterizes their evolution? What is the state of technology today? What are probably reasons for the current evolutionary state?

- The sheer amount of programming languages increased drastically as time went on. However, as we near the modern era many of the old languages begin to fall out of popularity. This is probably due to certain languages gaining universal acceptance.

What do you know about the SW Engineering Institute?

- Established in 1984 on the campus of Carnegie Mellon University (CMU). Led by Watts Humphreys in 1986. He is known as the father of software quality. The institute was aimed at understanding and managing the software engineering process.

In the western world, the medical profession has a strict code for admission into its field of practitioners (e.g. acquiring MD degree). Does a similar process exist for SWE? Did/does it exist elsewhere in the world? Would/does it make sense to have an analogue process? Why would/should an engineer pursue this?

- Varies from country to country. The UK has no licensing or legal requirement to assume the title. In Europe you can obtain the European Engineer professional title and, in the US, the NCEES professional engineer exam allows for software engineering licensing. It makes sense to control the entry of people into the field thereby increasing the quality of the software engineering title. It should be pursued so as to prevent people who falsely claim to be software engineers from using the title.

List some (about 4) attributes of good SW. What makes them of value?

- Maintainability: software must evolve to meet changing needs
- Dependability: software must be highly trustworthy and predictable
- Efficiency: software should not be wasteful of system resources
- Usability: software must be satisfactory to the end-user, easy to use