Software Engineering

CSCI 201
Principles of Software Development

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Outline

• Software Engineering
Software Engineering

- Software engineering deals with the process of creating software
  - This includes more than just writing code, which is the main focus you have had in all of your programs so far
  - There is a difference between creating a program, working on a project, or building a product
  - How much longer does it take to create a software product system compared to creating a program?
    - **Approximately 9 times as long!** (from *The Mythical Man-Month* by Fred Brooks)
Software Engineering vs Computer Science

- Software engineering is an engineering discipline that is concerned with the practical aspects of developing and delivering software.
- Computer science focuses on theory and fundamentals.
People like to criticize software engineering as being a failure because of all the buggy software in the world. However, how many pieces of software work quite reliably?

There are so many different types of software, and each type may require a different type of engineering.

What percentage of software costs are for development compared to testing in 2015?

![Pie chart showing Development, 65% and Testing, 35%]
Software Failures

- What would make a manager say that a software project has failed?
  - Not functional or buggy
  - Missing critical features
  - Over schedule
  - Over budget

- What percentage of projects are either over schedule or over budget?
  - A 2004 study concluded nearly 3/4 of all IT projects were over budget
  - The B-2 stealth bombers had an original estimate of $929M per aircraft, but they actually cost $2.13B to build (in 1997 figures)
Software Failures

- Why does software engineering fail?
  - Each project is different in some way
  - Larger systems are being created
  - Technology changes rapidly
  - More complex systems that may need capabilities that are not handled by existing software engineering techniques
  - They don’t necessarily use formal software engineering
  - Communication may suffer within the team because of this
Software Engineering Intent

- The intent of software engineering is to support professional software development, not individual programming
- Four fundamental activities common to all software
  - Specification – define what is needed
  - Development – program what is needed
  - Validation – ensure the program is what is needed
  - Evolution – modify the program based on new requirements
Software Engineering Ethics

▪ Software engineers have the ability to cause harm
▪ ACM has a Code of Ethics and Professional Conduct [(http://www.acm.org/about/code-of-ethics)]
  › Here are a few imperatives from the code
  › Section 1 – General Moral Imperatives
    • 1.2 Avoid harm to others
    • 1.3 Be honest and trustworthy
  › Section 2 – More Specific Professional Responsibilities
    • 2.2 Acquire and maintain professional competence
    • 2.3 Know and respect existing laws pertaining to professional work
  › Section 3 – Organizational Leadership Imperatives
    • 3.1 Articulate social responsibilities as members of an organizational unit and encourage full acceptance of those responsibilities
    • 3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system
  › Section 4 – Compliance with the Code
    • 4.1 Uphold and promote the principles of this Code