



## Software Engineering

- Software has become **pervasive** in modern society
  - Directly contributes to quality of life
  - Malfunctions cost billions of dollars every year, and have severe consequences in a safe-critical environment
- All about building **quality** software, especially for **large-scale** development
  - Requirements, design, coding, testing, maintenance, configuration, documentation, deployment, and etc.



## One of the BEST jobs

- CareerCast.com (2011): 1<sup>st</sup> Best Job
- CareerCast.com (2010): 2<sup>nd</sup> Best Job (Software Engineering)
- CareerCast.com (2009): 5<sup>th</sup> Best Job (Software Engineering)
- CNN Money (2009): 4<sup>th</sup> Best Job in Quality of Life (Software Developer), 8<sup>th</sup> Best Job in High-Pay (Software Architect)



## Great Impact



### Software Errors Cost U.S. Economy \$59.5 Billion Annually NIST Assesses Technical Needs of Industry to Improve Software-Testing

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Software bugs, or errors, are so prevalent and so detrimental that they cost the U.S. economy an estimated \$59.5 billion annually, or about 0.6 percent of the gross domestic product, according to a newly released study commissioned by the [Department of Commerce's National Institute of Standards and Technology \(NIST\)](#). At the national level, over half of the costs are borne by software users and the remainder by software developers/vendors.

The study also found that, although all errors cannot be removed, more than a third of these costs, or an estimated \$22.2 billion, could be eliminated by an improved testing infrastructure that enables earlier and more effective identification and removal of software defects. These are the savings associated with finding an increased percentage (but not 100 percent) of errors closer to the development stages in which they are introduced. Currently, over half of all errors are not found until "downstream" in the development process or during post-sale software use.

NIST funded the study, which was conducted by the Research Triangle Institute (RTI) in North Carolina, as part of a joint planning process with industry to help identify and assess technical needs that would improve software-testing capabilities. Findings of the 309-page report are intended to identify the infrastructure needs that NIST can meet through its research programs.



## Quotes from Dr. Parnas

### *Which computer-related area is most in need of investment by government, business or education?*

I think it would have to be [software engineering education](#). First we have to improve the quality of that education. I find that most students receive a [poorly structured and random](#) introduction to software issues. They learn a lot of folklore that is too vague to apply and a lot of theory that seems (and often is) irrelevant. Second, we must make sure that people do get a professional education. In a world where you need a license to be a barber, anybody can get a job writing software without any credentials. In the last few years I have devoted much of my time to developing an educational program for engineers who are specialists in software, a program that can be accredited by the professional engineering societies.

### *What advice do you have for computer science/software engineering students?*

Most students who are studying computer science [really want to study software engineering](#) but they don't have that choice. There are very few programs that are designed as [engineering programs](#) but specialize in software.

I would advise students to pay more attention to the fundamental ideas rather than the latest technology. The technology will be out-of-date before they graduate. Fundamental ideas never get out of date. However, what worries

Extracted from his ACM Fellow Profile

<http://www.sigsoft.org/SEN/parnas.html>