



Center for
**LifeLong
Learning
& Design**

University of Colorado at Boulder

**Wisdom is not the product of schooling
but the lifelong attempt to acquire it.
- Albert Einstein**

Globalization and Offshoring of Software

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**Course information environment (SWIKI):
<http://l3dswiki.cs.colorado.edu:3232/phd-intro>**

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The Study

- study was **not** intended to be a study of offshoring from the United States to India and China and the impact of that offshoring on the computing profession in the United States

- the task force was charged with looking at the forces shaping the migration of jobs worldwide in the computing and information technology fields

- requirements for the future:
 - deep grounding in the fundamentals of computing
 - new knowledge surrounding business processes and platforms
 - a deeper understanding of the global community in which work will be done
 - the educational systems that underpin our profession will need to change.

Specific Topics

- The economic theories and data that underpin our current understanding of the forces shaping globalization today and in the future.
- Offshoring from the perspective of different countries—both developed and developing
- Offshoring from the perspective of different types of corporations
- The globalization of computing research.
- The risks and exposure that offshoring engenders.
- The implications for educational systems throughout the world
- The political responses to the opportunities and disruptions that accompany globalization

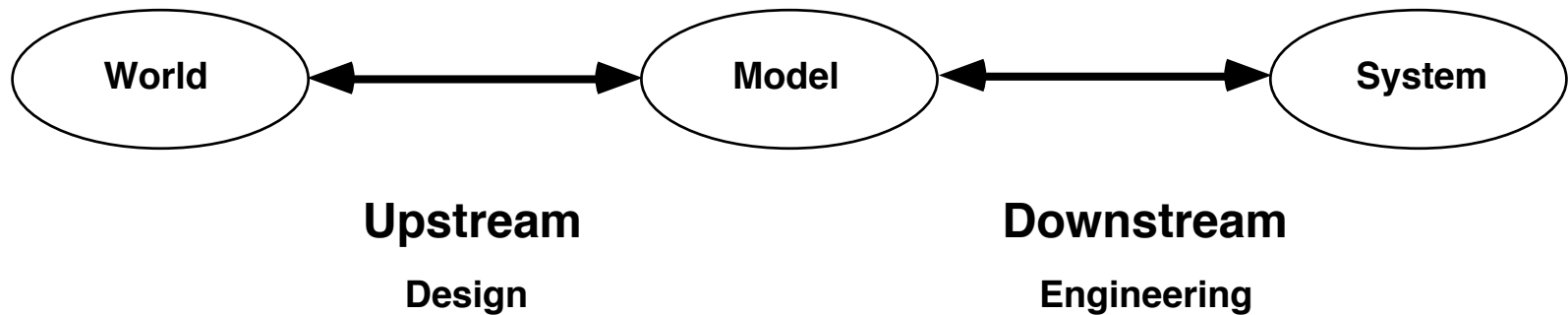
Findings and Recommendations

- Globalization of, and offshoring within, the software industry are deeply connected and both will continue to grow. Key enablers of this growth are information technology itself, the evolution of work and business processes, education, and national policies
- Both anecdotal evidence and economic theory indicate that offshoring between developed and developing countries can, as a whole, benefit both, but competition is intensifying.
- While offshoring will increase, determining the specifics of this increase are difficult given the current quantity, quality, and objectivity of data available. Skepticism is warranted regarding claims about the number of jobs to be offshored and the projected growth of software industries in developing nations.

Findings and Recommendations

- Standardized jobs are more easily moved from developed to developing countries than are higher-skill jobs. These standardized jobs were the initial focus of offshoring. Today, global competition in higher-end skills, such as research, is increasing. These trends have implications for individuals, companies, and countries.
- Offshoring magnifies existing risks and creates new and often poorly understood or addressed threats to national security, business property and processes, and individuals' privacy. While it is unlikely these risks will deter the growth of offshoring, businesses and nations should employ strategies to mitigate them.
- To stay competitive in a global IT environment and industry, countries must adopt policies that foster innovation. To this end, policies that improve a country's ability to attract, educate, and retain the best IT talent are critical. Educational policy and investment is at the core.

Software Design: Upstream and Downstream Activities



- **upstream: world → model / specification**
 - ill-defined problem
 - integration of problem framing and problem solving
 - collaboration and communication between different stakeholders
 - failure leads to ***design disasters*** (wrong problem is solved)
- **downstream: model / specification → implementation / system**
 - well-defined problem
 - dealing with difficult technical problems
 - creating reliable code
 - failure leads to ***implementation disasters*** (wrong solution to the right problem)

Outsourcing

- **an emerging question** for prospective computer science students: *“if the heart and soul of computing (programming) is being auctioned off to the lowest offshore bidder, what is the future for me?”*
- **question:** what will be the computing jobs, skills, and knowledge that are less likely to migrate offshore
- **claim:** activities related to upstream activities: communication, collaboration, design, context, integration of problem framing and problem solving, deal with fuzzy and shifting requirements, satisfy customers (“soft skills”) → these are the difficult and important problems

Current Computer Science Education and Outsourcing

| | upstream activities | downstream activities |
|---|---|---|
| themes | creative work, communication, collaboration, context, integration of problem framing and problem solving, fuzzy requirements, customer satisfaction | programming, programming languages, compilers, rule-based behavior (tax returns),.... |
| emphasis in current CS programs | X | XXXXX |
| future jobs (not being outsourced) | XXXXX | X |