Facts About Our State’s Computer Science Professional Shortage

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Topics

• My personal background
• Why it matters: The scale and impact of Washington’s ICT (Information and Communication Technology) sector
• Where are the workforce gaps in our state – the gaps between degrees granted and jobs available?
• What is the makeup of the workforce at Washington’s ICT companies?
• What is the educational background of these employees?
• How does the national picture compare to Washington’s?
• What about student demand? If we had additional capacity, would we have the student interest?
• UW Computer Science & Engineering’s nature and role
My personal background

• I have an industry background
  – 10 Years at Digital Equipment Corporation in the late 1970s/early 1980s
  – Member of the National Academy of Engineering
  – I do not have a Ph.D.
• I joined the UW faculty in 1983
• I have co-founded two companies from UW Computer Science & Engineering technologies
  – Performant: acquired in 2003
  – Skytap: employs more than 100 and has raised $64M in venture funding
• I have been UW CSE department chair for 9 years
Washington’s ICT (Information and Communication Technology) industry is a powerhouse that is driving our economy

- 8,610 ICT employment establishments
- $36.9 billion annually in Washington business revenue; $16.4 billion annually in exports; hundreds of billions annually in total revenue (Amazon and Microsoft alone total more than $150 billion)
- 176,600 workers in ICT companies (such as Amazon, Microsoft, RealNetworks, Zillow); 62,300 additional workers in Tech Units (blocks of ICT talent in non-ICT companies such as Boeing, Nordstrom, REI, Starbucks)
- **We are the software capital of America:** The US Bureau of Labor Statistics reports more software developers in Seattle-Everett-Bellevue than in Silicon Valley!

Not surprisingly, then, Washington’s largest workforce gap – by far – is in Computer Science.

High Demand Fields in WA State, Baccalaureate Level & Above
WSAC / SBCTC / WTECB, October 2013

- **Computer Science**
- **Engineering**
- **Health Professions***
- **Research, Science, Technical***

*Gap exists at the graduate and/or professional level only

Source: Washington Student Achievement Council, State Board of Community and Technical Colleges, and Workforce Training and Education Board; A Skilled and Education Workforce – 2013 Update; October 2013
The ICT companies that call Washington State their home – the companies that are headquartered here – have relatively diverse workforces in terms of educational backgrounds.
But even these companies hire predominately technical employees

All Microsoft Hires from UW, FY 13 and 14, Interns and Permanents

Source: Microsoft’s UW recruiting team; actual numbers are confidential but the scale is accurate
And – at the companies that can afford to be selective – these technical employees predominately have degrees in Computer Science from top programs.

Microsoft Technical and Research Hires from UW, FY 13 and 14, Interns and Permanents

Source: Microsoft’s UW recruiting team; actual numbers are confidential but the scale is accurate.
Major ICT companies headquartered elsewhere are opening offices in our region that do *software development only* – these are tilted *even more heavily* towards technical employees.
To summarize my remarks thus far ...

- The 8,610 companies in Washington’s ICT (Information and Communication Technology) sector employ a broad range of people with a broad range of educational backgrounds.
- The Tech Units in Washington’s non-ICT companies exhibit even a broader range.
- All of these companies, and jobs, and people are important!
- But what distinguishes our state from others, and what truly powers our economy, are not the 14,050 “Computer Programmers” or the 4,230 “Web Developers” or the 1,430 “Database Administrators” or the 5,210 “Network and Computer Systems Administrators” or the 8,420 “Computer User Support Specialists” (these are BLS classifications and numbers).
- It’s the 48,440 “Software Developers, Applications” and the 7,560 “Software Developers, Systems Software” – more, in total, than Silicon Valley.
- And we know who these people are! Predominately, men and women with Computer Science degrees from America’s top programs, including UW.
Nationally, the story is similar: BLS projects Computer Occupations will be 71% of all newly-created STEM jobs in this decade …

Computer Occupations = 71% of all STEM

- Computer Occupations 71%
- Engineers (Aerospace, Biomedical, Chemical, Civil, Electrical, Electronics, Environmental, Industrial, Materials, Mechanical, Other) 4%
- Life Scientists (Agricultural & Food Scientists, Biological Scientists, Conservation Scientists & Foresters, Medical Scientists, Other) 3%
- Physical Scientists (Astronomers, Physicists, Atmospheric & Space Scientists, Chemists & Materials Scientists, Environmental Scientists & Geoscientists, Other) 4%
- Social Scientists and Related Workers (Economists, Survey Researchers, Psychologists, Sociologists, Urban & Regional Planners, Anthropologists & Archeologists, Geographers, Historians, Political Scientists, Other) 3%
- Mathematical Science Occupations 15%

Source: Spreadsheet linked at http://www.bls.gov/emp/ep_table_102.htm
And that Computer Occupations will be 57% of all available jobs, whether newly-created or available due to retirements.

Source: Spreadsheet linked at http://www.bls.gov/emp/ep_table_102.htm
The student demand is there! Despite recent expansion, UW CSE can accommodate only 1/3 of the students who successfully fulfill prerequisites and apply to the major.

Note: Additional students receive “direct admission” to the major from high school. This chart shows students who have successfully completed college-level prerequisite courses and apply to the major.
Introductory course enrollment is booming – we expect to exceed 5,000 student enrollments this year!
Freshman interest is booming too – and this data understates the interest, because 30% of UW students are transfers, and 40% of CSE majors (and 60% of our female majors) planned on a different major but took our introductory course and loved it
UW Computer Science & Engineering is one of the nation’s premier programs

- Our only competitors for faculty and students are Stanford, MIT, Berkeley, and Carnegie Mellon
- We awarded 300 degrees in the most recent year; we are funded to grow to 375; we would like to reach 600
- We are a top supplier of students to Amazon, Microsoft, and Google Seattle
- We are the predominate supplier to the leading smaller companies and startups in the region
- We prepare Washington’s top students for Washington’s top jobs: more than three-quarters of our students are from here, and more than three-quarters of our graduates remain in the state
Washington’s ICT companies, the academic programs that staff these companies, the students who aspire to work at these companies, and Washington’s economy need and deserve your support

• Washington will always be a net importer of talent
  — Otherwise, smart kids who grow up in Kansas won’t have any place to go!
• But Washington students who have the ability and the desire to prepare for these leading-edge jobs ought to have the opportunity to do so!