Importance of Computer Science Education

Karen Chandler

Harris Corporation

Kchandle@harris.com

Introduction

How did I get here?

– **Graduate of Satellite Beach High School**

– **Graduate of Florida Atlantic University**

  • **Faculty Scholarship**

  • **Bachelors in Psychology and Mathematics/Computer Science**

– **Work:**

  • **DBA (now L3), Melbourne, FL**

  • **SSS, Melbourne, FL**

  • **Harris Corp., Melbourne, FL**

Why I love Software Engineering...

HARRIS

__Domain__ - a field of study that defines a set of common requirements, terminology, and functionality for any software program constructed to solve a problem in that field

Personal *Domain* experience:

- **Missile Recognition**

- **Railway Command & Control**

- **Healthcare**

- **Communications**
  - **FAA Air-to-Ground**
  - **Software Defined Radios**
  - **Data**

- **Satellite Command & Control**

- **Manufacturing Plant Automation (Michelin)**

- **Antenna Command & Control**

*assured*communications®

Have You Ever Wondered?

- ## Who created the rides at Universal?

- ## Who came up with instant messaging/iPods/MySpace?

- ## Who created the Internet?

Answer: Software Engineers

What is Software Engineering?

- Problem solving.

- Designing products to improve the way we live.

- Engineering is the art or science of making ideas useful.

- Scientists study the world as it is, engineers create the world that never has been.

- Engineering is the application of science to the common purpose of life

Benefits of an Software Engineering Career

- **Job Satisfaction**

- **Variety of Career Opportunities**

- **Challenging Work**

- **Intellectual Development**

- **Potential to Benefit Society**

- **Financial Security**

- **Prestige**

- **Professional Environment**

- **Technological and Scientific Discovery**

- **Creative Thinking**

- **Computer/Software Engineering**

  – **Cyber-Security**

  – **Network**

  – **Communications**

  – **Human-Computer Interfaces**

  – **Web Development**

  – **Embedded Development**

  – **Games**

Engineering Statistics

HARRIS

- 22 million new jobs in next decade, 17 million entering workforce
- Minority enrollment from 16.1% to 28.2% rising Hispanic
  - Yet minority & women in Engineering continue to decline especially computer science majors
- Enrollments of first-time, full-time graduate students in science and engineering (S&E) programs reached a record 108,819 in 2008, representing 20.6% of all graduate enrollments in these fields. The increase, 7.8% over fall 2007, was the largest 1-year increase in the last 10 years.
- For the first time since 2003, first-time enrollment in engineering fields grew faster among U.S. citizens and permanent residents than among foreign students with temporary Visas.
- 58,427 engineering degrees granted in 2000
  - Everyone wants top 10% (5,800)
  - Federal Government wants 117,415 entry level/new grads
    - DoD is expected to hire 14,000 engineers over the <u>next year </u>to backfill retirees
  - Plus new industry want engineers: hotel/hospitality, home building
    National Center for Education Statistics

Post Baccalaureate Employment 2007-2008

Demographic and Enrollment Characteristics	Employed
Bachelor's degree major	
STEM major	81.4
Computer and information sciences	88.9
Engineering and engineering technology	88
Biological and physical sciences, science technology, mathematics, and agricultural sciences	73
General studies and other	82.3
Social sciences	79.2
Humanities	79.7
Health care fields	86.9
Business	88.4
Education	90.8
Other applied	84.6

From the National Science Foundation

Starting Salaries

FROM DEGREES TO DOLLARS

Here are some average starting salaries for the class of 2007

Major	Avg. salary offer	Vs. 2006
Accounting	$47,421	+2.7 %
Business administration	$44,048	+7.5 %
Marketing	$41,285	+10.3 %
Computer science	$52,177	+2.5 %
Mechanical engineering	$54,695	+5.7 %
Chemical engineering	$59,707	+5.6 %
Civil engineering	$47,750	+4.8 %
Electrical engineering	$54,915	+1.6 %
Liberal arts	$31,333	+1.2 %

SOURCE: NATIONAL ASSOCIATION OF COLLEGES AND EMPLOYERS
*DATA ON LIBERAL ARTS GRADUATES WERE SCARCE AT TIME OF PUBLICATION

Harris

HARRIS

- In Melbourne in Software Engineering alone
  - 2011 – New grad hires = 47
  - 2012 – New grad hires >40

*assured*communications®

Career Paths – Software Engineering
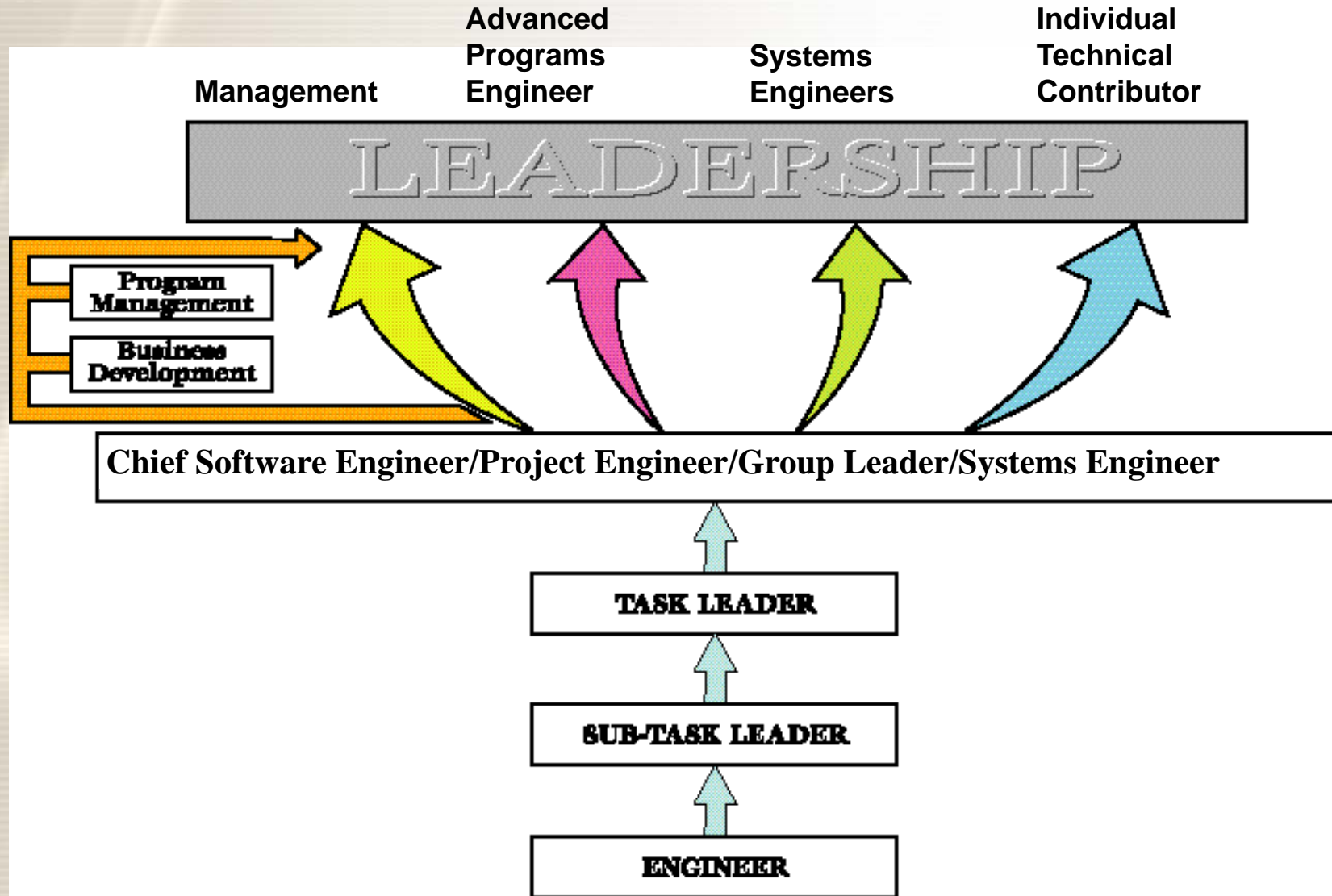
Examples Of Projects at Harris

HARRIS

- Develop Near Real Time Control Applications for Satellite Earth/Ship terminals in C++ in a Windows Environment with Object Oriented and Model-Driven Analysis, Design, and Development.

- Develop Real Time Control Applications for Antennae and Communications Hardware Control in an Embedded Environment using the VxWorks Real Time Operating System, Windows CE, and C++.

- Development for FAA meteorological system including weather data ingest storage and manipulation/display using C++/Java, X/Motif, Unix Sun Workstations, Oracle, Builder Xcessory.

- Design device drivers for secure 802.11 network cards.

- Create new functionality in aircraft digital map processors.

- Implement new image and signal processing algorithms for the Space Based Radar satellite system.

- Develop geospatial image processing systems for use by DoD and other US Government agencies.

- Develop Multi-media Control Software for a Crisis Operations Center.

- Develop Network Intrusion Detection Software as a Commercial Product.

What I wished I learned in High School

What I wished I learned in High School

- Communication Skills
  - How to prepare and conduct formal presentations to an unfamiliar audience
  - Presentation skills; how to tell a story
  - Better writing skills (creative and research)
- Teamwork
  - Fundamentals of team projects
  - How to work on a project as a team with varied backgrounds; more practical experience would have been helpful
  - Interaction management skills

What I wished I learned in High School

- Coursework
  - Math, math, math (Calculus)
  - Computer programming
  - Science (Physics)
  - Foreign language requirements, more than 2 years
  - Social skills
  - Problem solving, analytical thinking skills, logic skills
  - More exposure to technology and how to use it in the real world
  - Exposure to real world applications of education/coursework
  - Creative thinking
    - Encouragement of thinking out of the box
    - It is good to question status quo
- .

What I wished I learned in High School

HARRIS

- ## Career
  - Overview of various careers and what HS and college coursework would be required to position one-self for each career path
  - Some more practical, detailed examples of professions and job-related expectations; their potential salaries and academic preparation required - not just generalizations
  - What the day in the life of a career looks like and how it impacts life (i.e., why important to self and others)
  - Career guidance/counseling to help individuals assess their strengths and weaknesses and what careers would fit their personalities and preferences

*assured*communications®

Harris Corporation K – 12 Outreach Program

K – 12 Outreach Activities

Harris Corporation has a long-standing relationship with the Brevard County Public Schools

Junior Achievement

The Harris Corporation Science Hall of Fame Teacher Honoraria

FIRST Program

CSA judges   SNAP Circuit electronics workshop

Science project evaluators

Panel discussions

Mentoring through Take Stock in Children

Mentoring Programs

Southeastern Consortium for Minorities in Engineering

Mentors for FIRST robotics team

Advisory board member for PIRATES academy

FLL Robotics competition judges

In-Service days for teachers   Harris Mini-grants

Science Fair judges

SWE WOW! That's engineering for girls

Career day speakers

Advisory board member for BETA academy

Elementary School Art & Science Fair

Lego Robotics software/mechanical workshops

Introducing Girls to Engineering Workshop

High School Science Fair

Our corporate culture is strong in community involvement, and our employees receive great satisfaction supporting K – 12 outreach activities

HARRIS

How do we administer our outreach activities?

1. Schools request a visit through outreach@harris.com email
2. Our admin team advertises visit opportunities with a bi-weekly newsletter and a SharePoint site calendar
3. Harris volunteers sign up for the events through the site
4. Visits are set up on our off-Fri. (Sat & evenings are OK too)
5. Our volunteers take the lesson portable "kit" with lesson plans and hands-on activities to the schools
6. New volunteers sign up as helpers to receive hands-on training
7. Our admin team coordinates the school visits with the school contact and provides follow-up to each visit with a teacher survey for improvement ideas
8. We keep records of each visit and the metrics on visits, volunteers, students reached, etc.

We are able to support most events with volunteers

assuredcommunications®

K – 12 Outreach Lessons

1. Canned lessons are more effective
2. Lesson by lesson planning is more effective than requesting all day or multiple lessons in a day (ie. an entire 3rd grade)
3. Hands on activities always get the BEST feedback
4. Enthusiastic and passionate volunteers best represent the engineering profession as fun and rewarding
5. Use new grads for the high school activities
6. Using female and minority engineers makes a huge impact
7. Teachers should try to consider their class and appropriateness of the lesson
8. The teachers can expand the lessons and can even teach the lesson to meet specific needs; borrow our materials
9. Teachers that have some control over their classes make the volunteer's job easier and more likely to come back
10. Hand written thank-you's ALWAYS makes the volunteer smile
11. Boys generally dominate the lesson, considering pairing by gender
12. Although we meet most requests, there is more demand than supply

K – 12 Outreach Summary

1. We know that US industry is facing a technology skill gap
   - Baby boomers retiring, international stresses, ect.
   - We can't just *hope* that it works itself out
2. Programs like Harris' K-12 outreach help shape our future by exposing our children to the wonders and possibility of engineering
3. Industry MUST play a role and CAN successfully team with K-12 partners
4. Both the teacher's and volunteers need to be sensitive to each other's needs
5. Harris' K-12 outreach program has been successful, both internally and externally; something worth copying
6. Children do respond to additional, focused attention

Programs like Harris' K-12 outreach will help grow the STEM pipeline of the future