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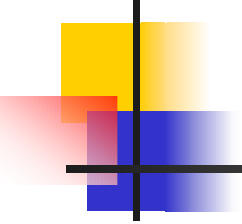
The profile of the Computer Science
graduate in 10 years :
Computer Science, Computer Engineering,
Software Engineering And
Interdisciplinary Studies meet

Predicting the future

Would you have invested?



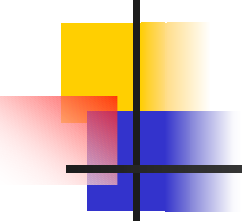
Microsoft Corporation, 1978



Predicting the future

1899: Charles H. Duell, U.S. Patent Office

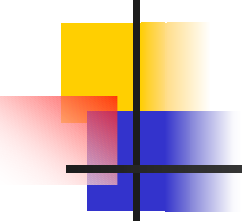
*Everything that can be invented has been
invented.*



Predicting the future

Jan. 2, 1909: Scientific American

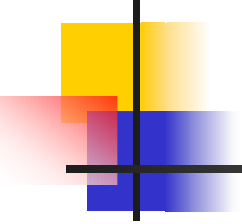
That the automobile has reached the limits of its development is suggested by the fact that during the past year no improvement of a radical nature has been introduced.



Predicting the future

1943: Thomas J. Watson, Chairman of the Board, IBM

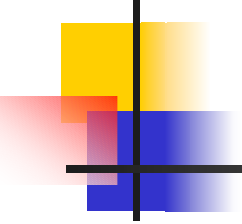
*I think there is a world market of about five
computers.*



Predicting the future

1948: IBM

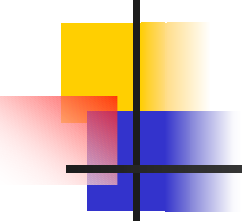
The computer has no commercial value.



Predicting the future

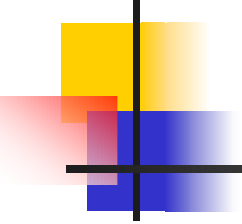
1981: Bill Gates, Chairman, Microsoft

640 kilobytes of RAM ought to be enough for anybody.



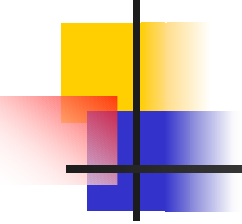
Changing World

- ❖ Population shift: developing countries
- ❖ Developing countries: agriculture to manufacturing
- ❖ Developed countries: manufacturing to knowledge based economies
- ❖ Globalization and communication boom



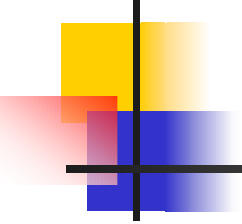
Changing World

- ❖ Skilled workforce: mobile
- ❖ Knowledge work and design work: transportable
- ❖ Intellectual property: most important
commodity of value
- ❖ Corporate downsizing and deregulation: entrepreneurship



Impact on Engineering and Comp. Science

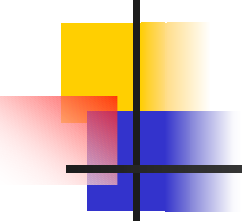
- ❖ **Globalization:** multi-disciplinary, multi-national, multi-cultural, large project teams
- ❖ **Small and medium size enterprises:** wide range of skills and responsibilities
- ❖ **Rapidly advancing technology:** lifelong learning and adaptation
- ❖ **Changing and widening social responsibilities**
- ❖ **Environment, sustainability, recyclability**



Expectations in the past

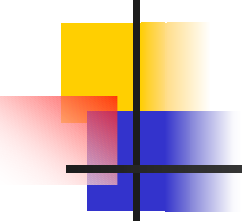
Critical and analytical thinking to apply knowledge and understanding of mathematics, science and engineering

- ❑ to identify, formulate and solve engineering and computational problems
- ❑ to design systems, components, processes that work and achieve goals



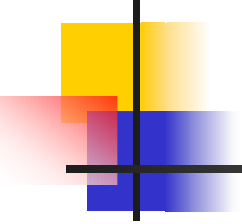
Expectations now - solve and design as before, PLUS:

- ❖ Function on multi-disciplinary teams
- ❖ Function alone
- ❖ Operate and communicate across discipline, cultural and national boundaries
- ❖ Understand and deal with social and ethical responsibilities, and economical, societal, environmental and global issues
- ❖ Keep learning and adapting continuously



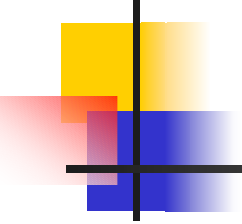
Today and Tomorrow

To be a good engineer or computer scientist, technical competence is required, but not sufficient.



Computer Science Education must be:

- ❖ **RELEVANT** to the lives and careers of students
- ❖ **ATTRACTIVE** exciting and intellectually challenging to attract the best
- ❖ **CONNECTED** to needs and issues of the broader community



The Safe and Conservative Approach

Discrete Structures (DS)

Programming Fundamentals (PF)

Algorithms and Complexity (AL)

Architecture and Organization (AR)

Operating Systems (OS)

Net-Centric Computing (NC)

Programming Languages (PL)

Human-Computer Interaction (HC)

Graphics and Visual Computing (GV)

Intelligent Systems (IS)

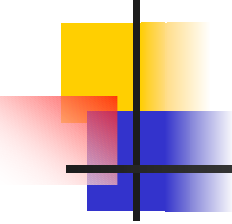
Information Management (IM)

Social and Professional Issues (SP)

Software Engineering (SE)

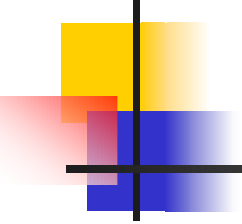
Computational Science and
Numerical Methods (CN)

*The ACM/IEEE 2001
Curriculum*



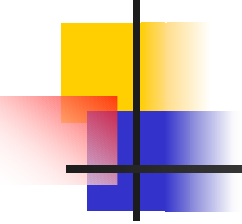
Who needs it?

- ❖ Which schools would be enhanced by the *ACM* guidelines?
- ❖ Hardware and Systems : a minimalistic approach



New Approach

- ❖ Technical curriculum with large design component
- ❖ Non-technical curriculum with impact of technology on society, individual and environment, plus ethics and law
- ❖ Teaching and learning methods
- ❖ De-compartmentalize concepts
- ❖ Open-ended problems
- ❖ Integrate the concepts of communication, teamwork, ethics, environmental awareness, treatment of uncertainty across the curriculum

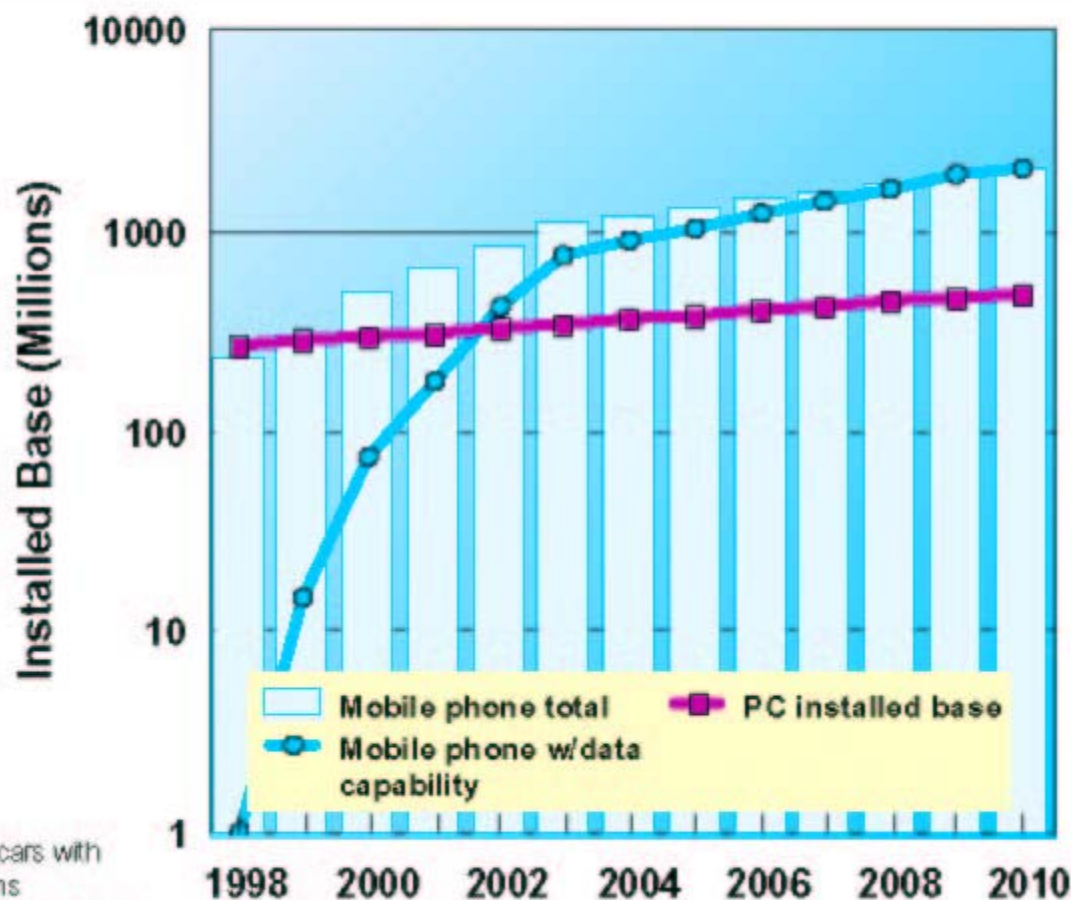


Embedded Systems and Portable Computing

- ❖ 92% of market
- ❖ knowledge base needed
- ❖ Hardware/Software Codesign
- ❖ Only competence in CE?



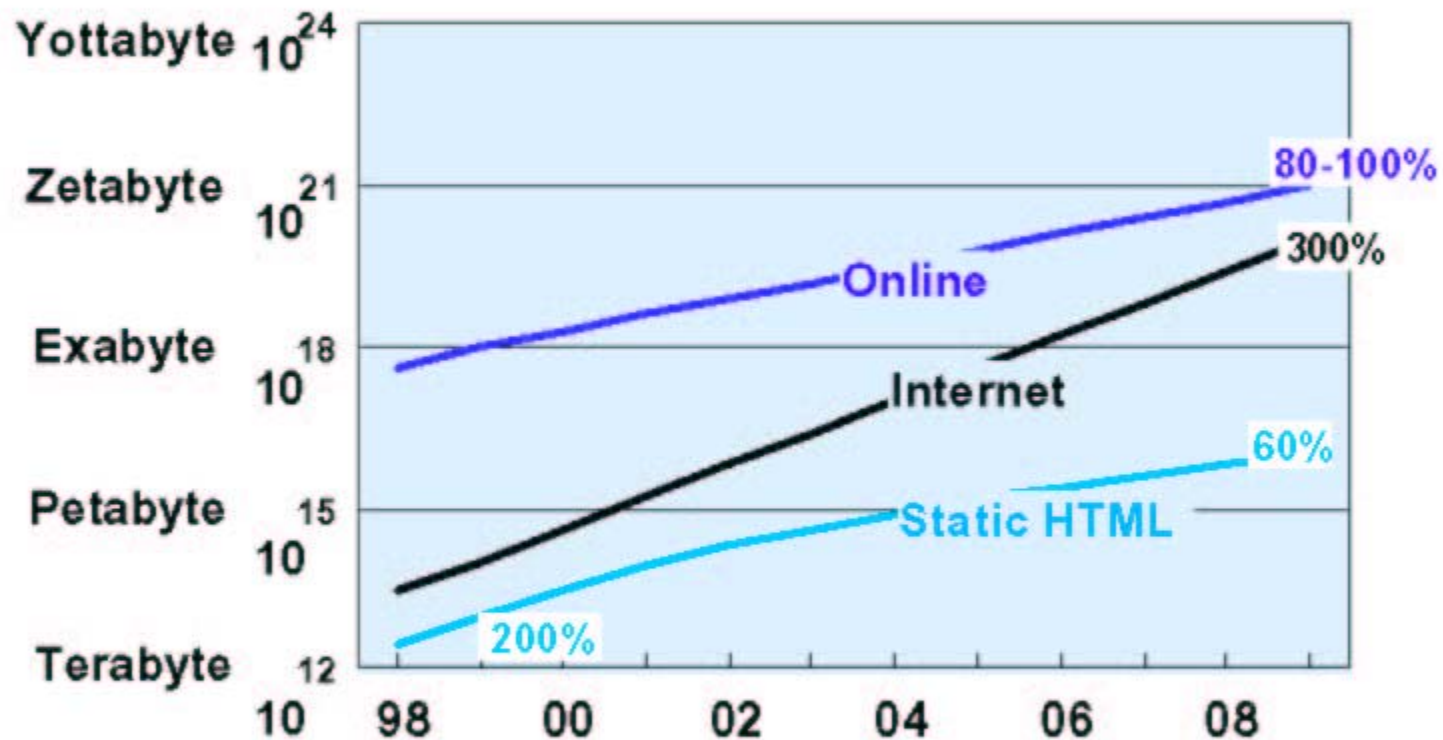
Pervasive Devices Will Be the Dominant Means of Information Access



Note: Does not include cars with driver information systems (approximately 8% of 150 million in 2006 - Jupiter)

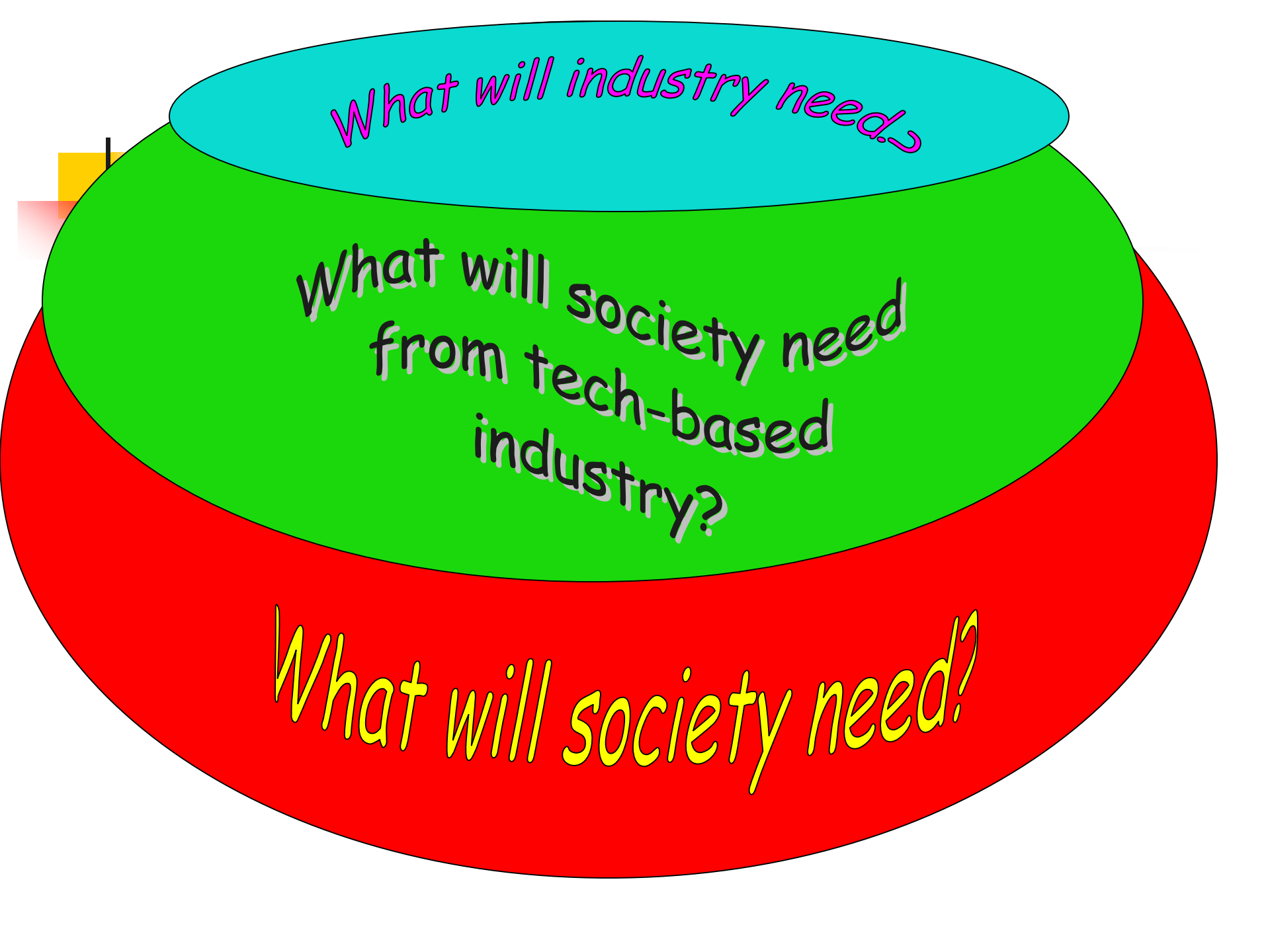
Sources: ResearchPortal.com, Semico, EE Times, Reuters, Gartner, Ericson...

Information Grows Exponentially



Static HTML = unchanging web pages, Internet = dynamic web pages and web accessible DBs, Online=computer accessible storage, e.g. HDD. Data includes multiple copies in the world. Source: IBM

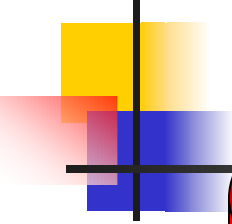
100% CGR for structured data (billing, customer, transactions...etc) [Gartner 1999]



What will industry need?

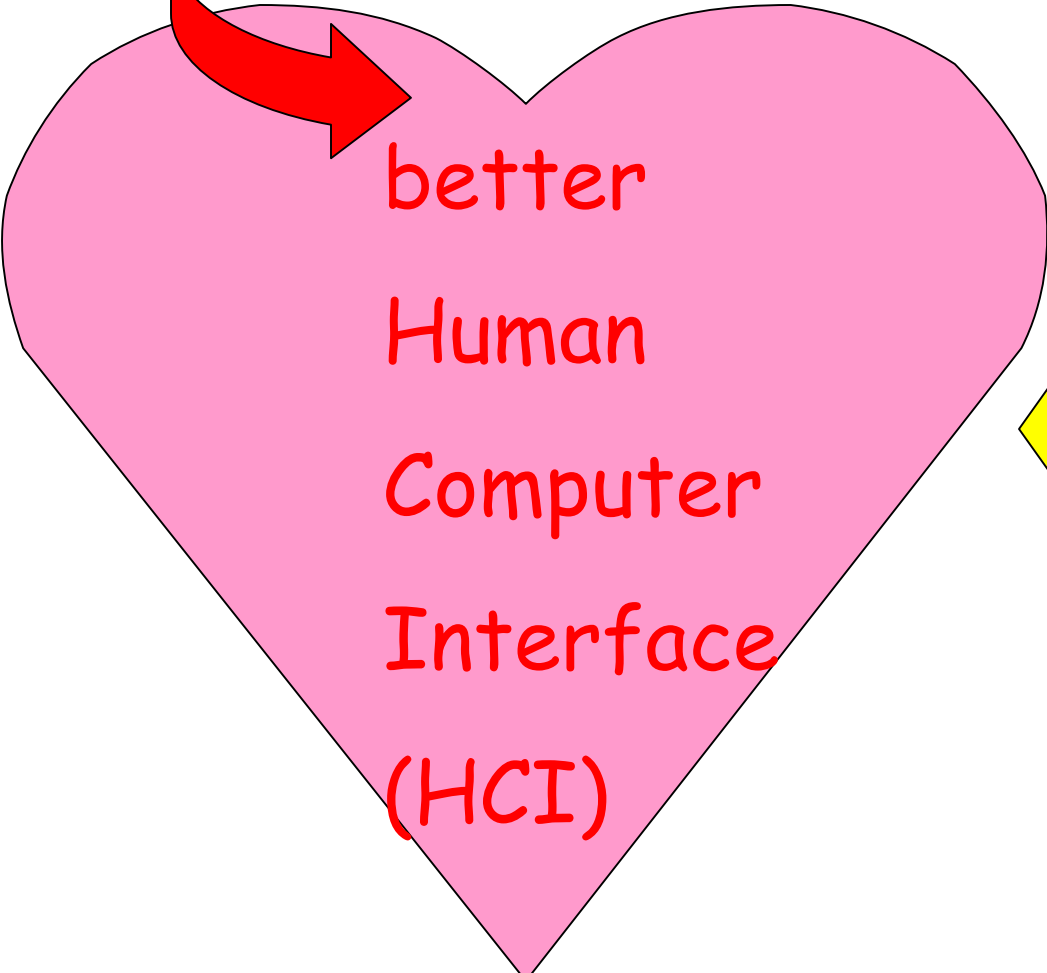
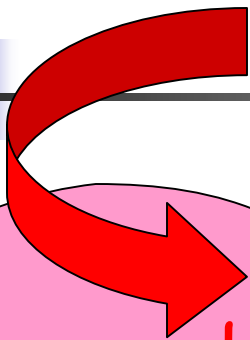
*What will society need
from tech-based
industry?*

What will society need?

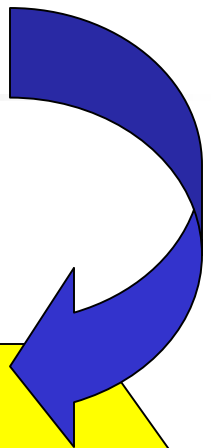


Kindness

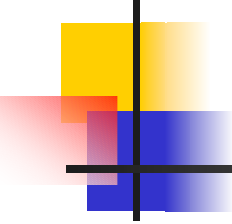
Trust



better
Human
Computer
Interface
(HCI)



Reliability
Robustness



Fault Tolerant Computing



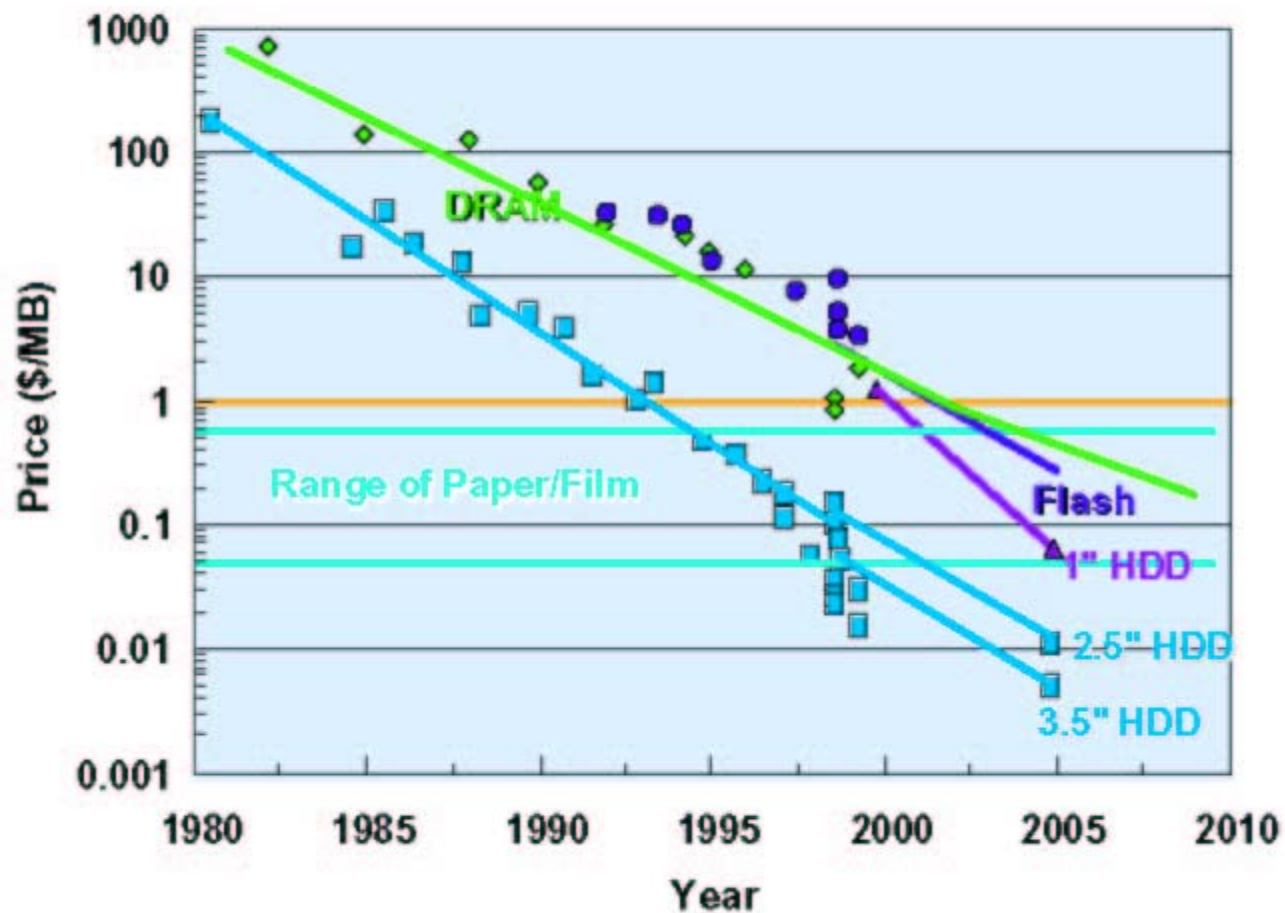
Reliability
Safety
Robustness

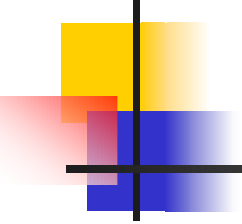
(Ethics)



HCI

Average Price of Storage



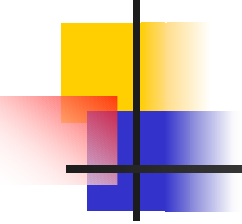


Question of the day

Setting: Biotechnology firm

Need: DB + scripts + computations +
elaboration

Domain: enzymes, proteins, molecular biology,
DNA strands

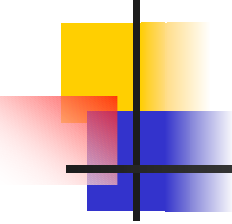


Question of the day

Will you look for:

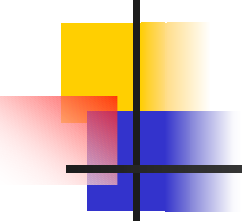
*C SC Graduate
with some domain knowledge
or even Minor Degree in
domain*

*Bio Graduate
with C SC
Minor Degree*



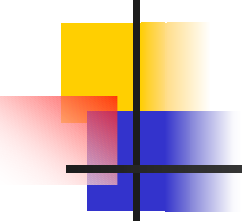
The Car Industry

- 100 years ago, design and engine implementation
- cars have completely pervaded our lives
- mechanical engineers $\leftarrow \rightarrow$ industry $\leftarrow \rightarrow$ mechanics
- urban planning, parts, roadworks, environmental research, dry-by-wire
- everything surrounding cars



Design and Application

There is more money in applications of
wireless technology than in designing
wireless technology



Joint and Combined Programs, Minor Degrees

Geomatics

Mechatronics

Interdisciplinary?

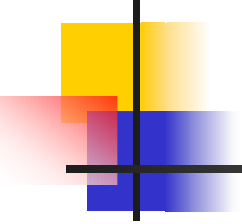
Visual Art

UVIC

Psychology

Health Information Science

Music



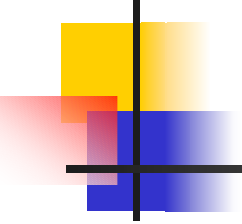
Engineering

Small professional programs in Engineering stay directly focussed

"The group that provides the greatest obstacle to change in industry is engineering"

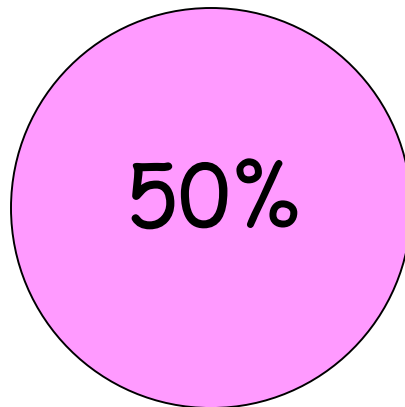
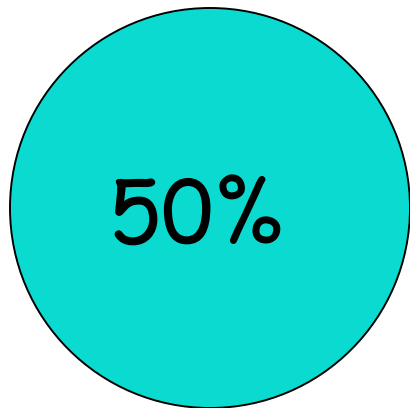
(Globe & Mail, about 2 weeks ago)

Given a technical problem, they solve it brilliantly, but this may not be the real requirement



Where are the women?

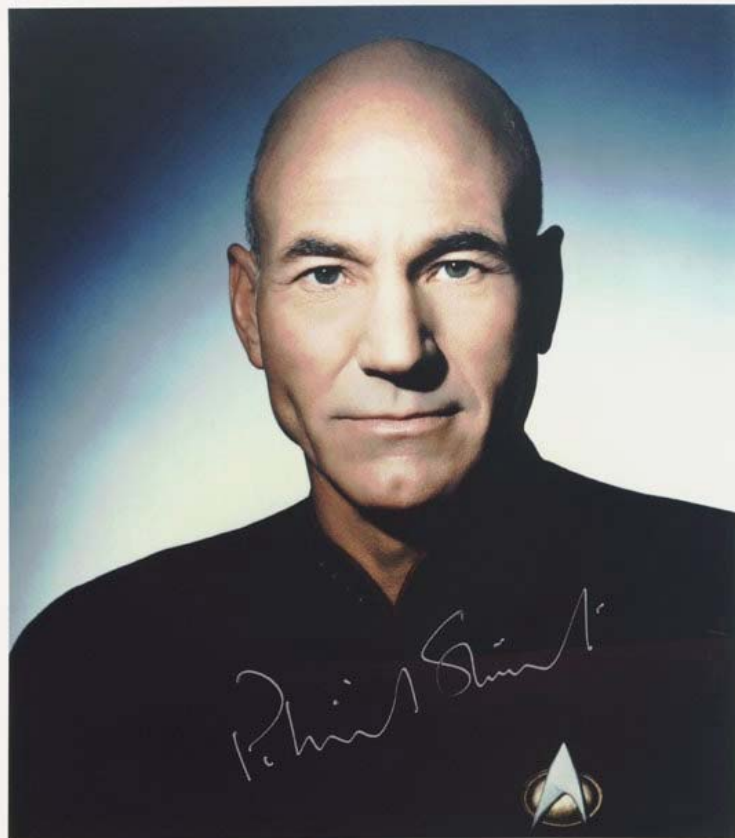
by 2013?



What is good for women is good for
humanity

(and for Computer Science)

Women and Star Trek



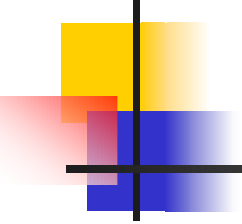
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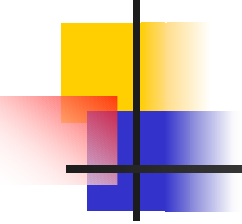
STAR TREK
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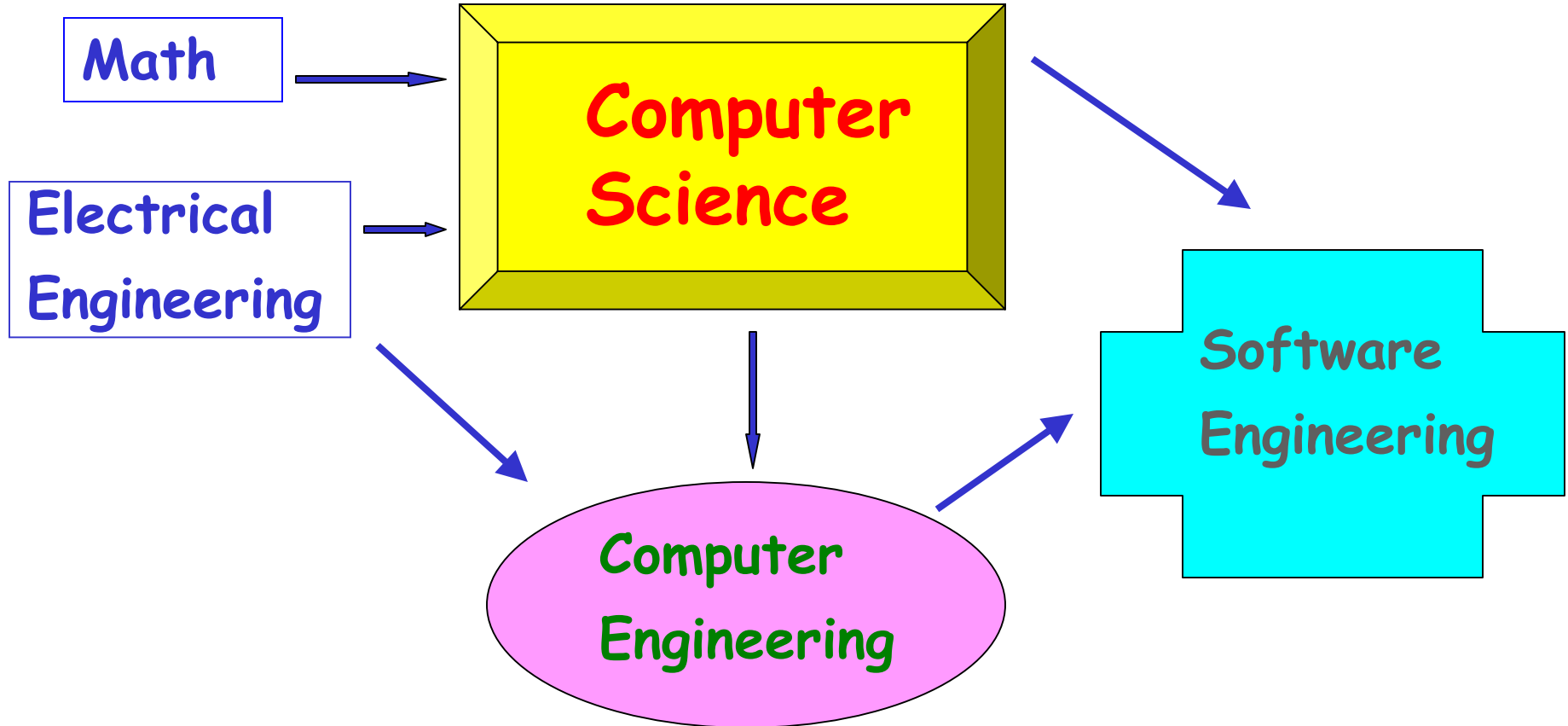


Voice Activation

- ❖ future effects
- ❖ SW + HW + side effects
- ❖ SW for processing and customization, HW for filtering
- ❖ what will the graduate need?
- ❖ (perhaps be competent with McDonald's interface given the current job market)



Who will be left in C SC?



Which graduate
do you want?

