









### The Ten Forces that Flattened the World ... & Leveled the Playing Field

- 1. 11/9/89
- 2. 8/9/95
- 3. Work Flow Software
- 4. Open-Sourcing
- 5. Outsourcing
- 6. Offshoring
- 7. Supply-Chaining
- 8. Insourcing
- 9. In-forming
- 10. The Steroids



# The current globilization features 4 unprecendented trends

- 1. The movement of capital and other market instruments around the globe
- 2. The movement of human beings across borders, 100 million immigrants at any one time around the world
- 3. The movement of information through cyberspace
- 4. The movement of popular culture (clothing, food) across borders

Preparing Engineers for Rapidly Changing Global World

## **Three Stages of Globalization**

Globalization 1.0 – 1492 to 1800, focus was on countries & muscles



Preparing Engineers for Rapidly Changing Global World

### **Three Stages of Globalization**

Globalization 2.0 – 1800 to 2000, focus was multinational companies



Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung

### **Three Stages of Globalization**

Globalization 3.0 – 2000 to ..., focus on individuals & groups to collaborate & compete *globally* 



Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung

#### **Globalization = Competition Globalization = Collaboration** Every morning in Africa, a gazelle wakes up. It knows it must run faster than the how the fastest lion or it will be killed. Internet Every morning a lion wakes up. is changing It knows it must outrun the slowest gazelle or it will starve to death. our world It doesn't matter whether you are a lion or a gazelle. When the sun comes up, you better start running. Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung

The world has changed!

What does it mean for me??



"The Scream", Edvard Munch, 1893



Gerard O'Neil Princeton, 1981

Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung



RAPID GROWTH OF

**TECHNOLOGY** 

"640K ought to be enough for anybody."

> Microsoft Chairman Bill Gates,1981

Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung We are living in *exponential* times

The amount of new technical information is doubling every 2 years

Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung

## Two thirds of the jobs that will be available in the world by 2020 haven't been invented yet!

The changing nature of technology means that you'll be in the job market, all the time, even if you're happily employed.

Allison Overholt, Fast Company, March, 2006

Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknoloni Bandung

We are currently preparing students for jobs that don't exist ...

Using technologies that haven't been invented ...

In order to solve problems we don't even know are problems yet ...

Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung Educating students for an uncertain future is like "training for the Olympics" without knowing which sport you will compete in

Preparing Engineers for Rapidly Changing Global World Prof. Dr. Ir. Ichsan S. Putra - Institut Teknologi Bandung



In the history of human civilization, there have been only three waves of Transformation!

**1.** Tribal hunting and gathering to

agrarian society

- 2. Agrarian society to the industrial revolution
- 3. The industrial revolution to the information/knowledge age

Jorge Vanegas, Is the Capital Projects Industry observant...? Is it prepared ...?





# The Library of Congress



Collection 33.10<sup>6</sup> books avarage 200 pages  $\rightarrow$  6.600. 10<sup>6</sup> pages Needs 745 miles of bookshelves

While in the internet 1.800.000.000.000 pages (272 times more)

It is estimated that **all** the technological knowledge that is known today will comprise only 1% of all the technological knowledge available by the year 2030!

By 2017, iPod will contain the Library of Congress.

### However...

- ✓ The amount of information available digitally will continue to increase dramatically.
- The percent of digital information and services used by people will continue to increase dramatically.

How Do I Prepare Myself in the World with such an Abundant of Information



**Innovation Age!** 



99% of inventions are failures



Ten-in-one gardening tool







We need to seize the opportunity and keep our eyes open...



"Baby Reaching For An Apple" Mary Cassatt, 1893



# CURRENT & FUTURE ATTRIBUTES OF ENGINEERS



# EC 2000 General Criteria

#### Criterion 3. Program Outcomes and Assessment

- a) an ability to apply knowledge of mathematics, science, and enggr
  b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to design a system, component, or process to meet desired needs
- an ability to function on multi-disciplinary teams
- e) an ability to identify, formulate, and solve engineering problems
- n an understanding of professional and ethical responsibility
- g) an ability to communicate effectively
- ${\bf b}_{\rm 0}$  the broad education necessary to understand the impact of engineering solutions in a global and societal context
- a recognition of the need for, and an ability to engage in life-long learning
  a knowledge of contemporary issues
- $_{\rm k0}~$  an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### **Needed Attributes:**

- Analytical skills
- Creativity

- Ingenuity
- High ethical standards and strong sense of professionalism
- Leadership
- Lifelong learning



# 21st Century Skills

- Creativity & Innovation
- Problem Solving
- Critical Thinking
- Communication
- Collaboration
- Information Fluency
- Technological Literacy







- Researchers (Rand) checked out 6 health Web sites and 12 sites dedicated to specific diseases.
- How frequently Web sites are complete and accurate:

	PREPARING FOR INFOR ABUNDAN	MATION (
Information Problem #2: Quality		
	Breast cancer	63%
	Depression	44%
	Obesity	37%
	Childhood asthma	33%
U.S. News & World Report, June 4, 2001 v130 i22 p10		



PREPARING FOR INFORMATION ABUNDANCE ERA

### You Have to be Information Literate

Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." (American Library Association)

http://www.youtube.com/watch?v=KIUhvFxQ8C4



Frank Baker: Media literacy 101









### PREPARING YOUR MIND

### 1. The Disciplined Mind

Mastery of a major schools of thought (including science, mathematics, and history) and at least one professional craft.



3. The Creating Mind Capacity to uncover and clarify new problems, questions, and phenomena.





### Inventiveness is Your Right Brain Capacity



LEFT brain Logical, linear, computer-like

RIGHT brain Inventiveness, meaning, empathy, joyfulness

### PREPARING YOUR MIND

4. The Respecting Mind

Awareness of and appreciation for differences among human beings.







( 23