



21st Century Technology Challenges and Opportunities

Gene Meieran
Senior Intel Fellow
Intel Corp.
Chandler, AZ

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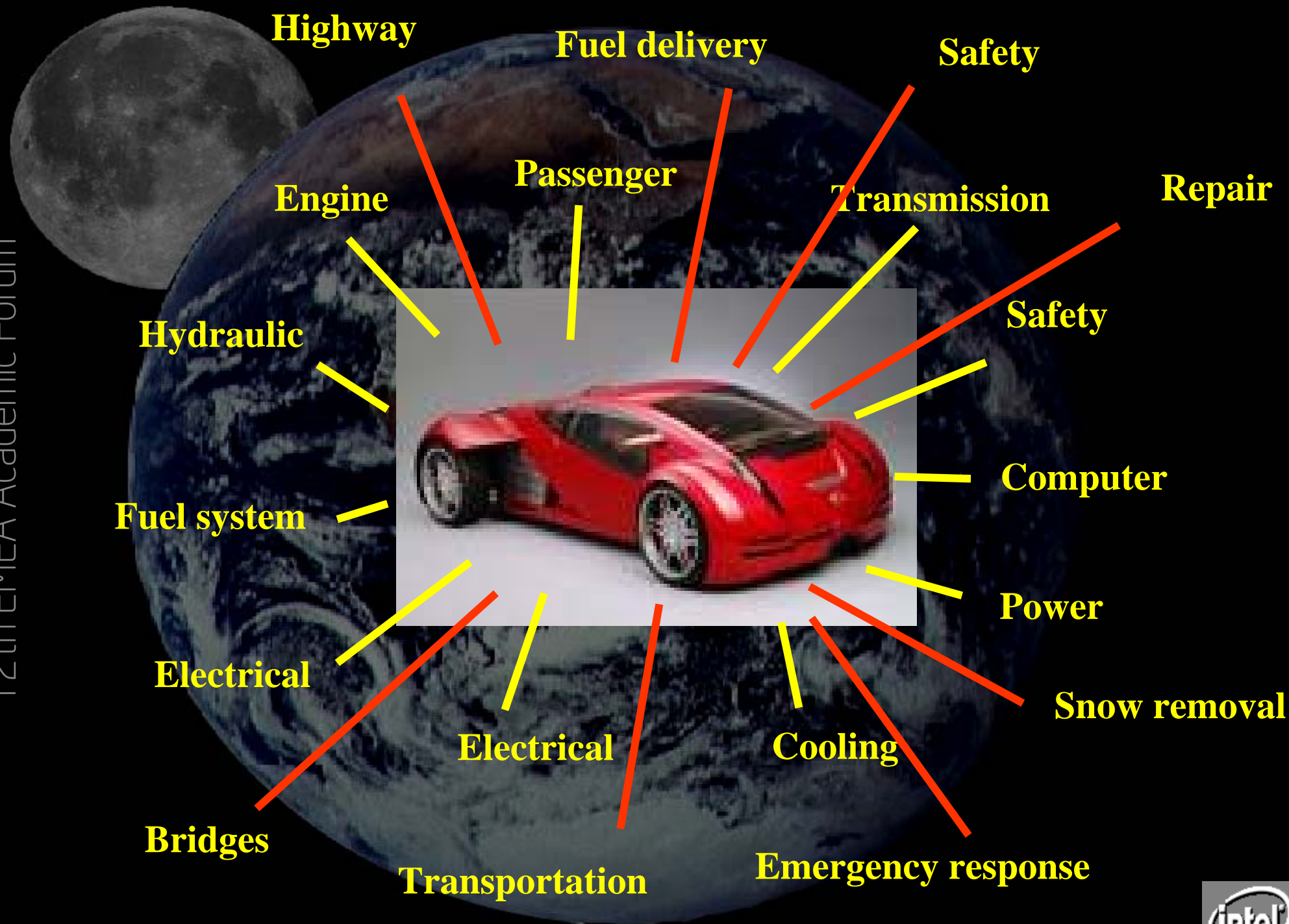
20th Century Top Science and Technology Achievements *

- 
1. Electrification
2. Automobile
3. Airplane
4. Water supply and distribution
5. Electronics
6. Radio and television
7. Agricultural mechanization
8. Computers
9. Telephone
10. Air conditioning/refrigeration
11. Interstate highways
12. Space flight
13. Internet
14. Imaging
15. Household appliances
16. Health technologies
17. Petrochemical technology
18. Laser and fiber optics
19. Nuclear technologies
20. High-performance materials

National Academy of Engineering;
“A Century of Innovation”
narrated by Neil Armstrong

Providing universal power was
a key to success in the 20th century





20th Century Technologies:

- Generated **significant global wealth** because they **delivered something of value at an affordable price**

A Century of Innovation

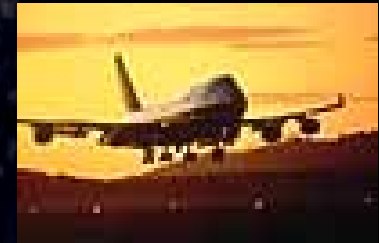
~1900

~2000

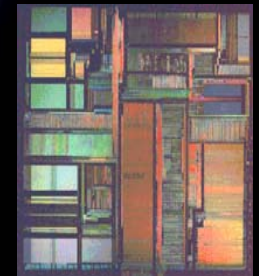
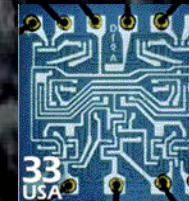
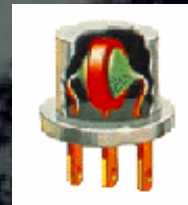
Automobiles



Airplanes



Electronics



Telephone



A Century of Innovation

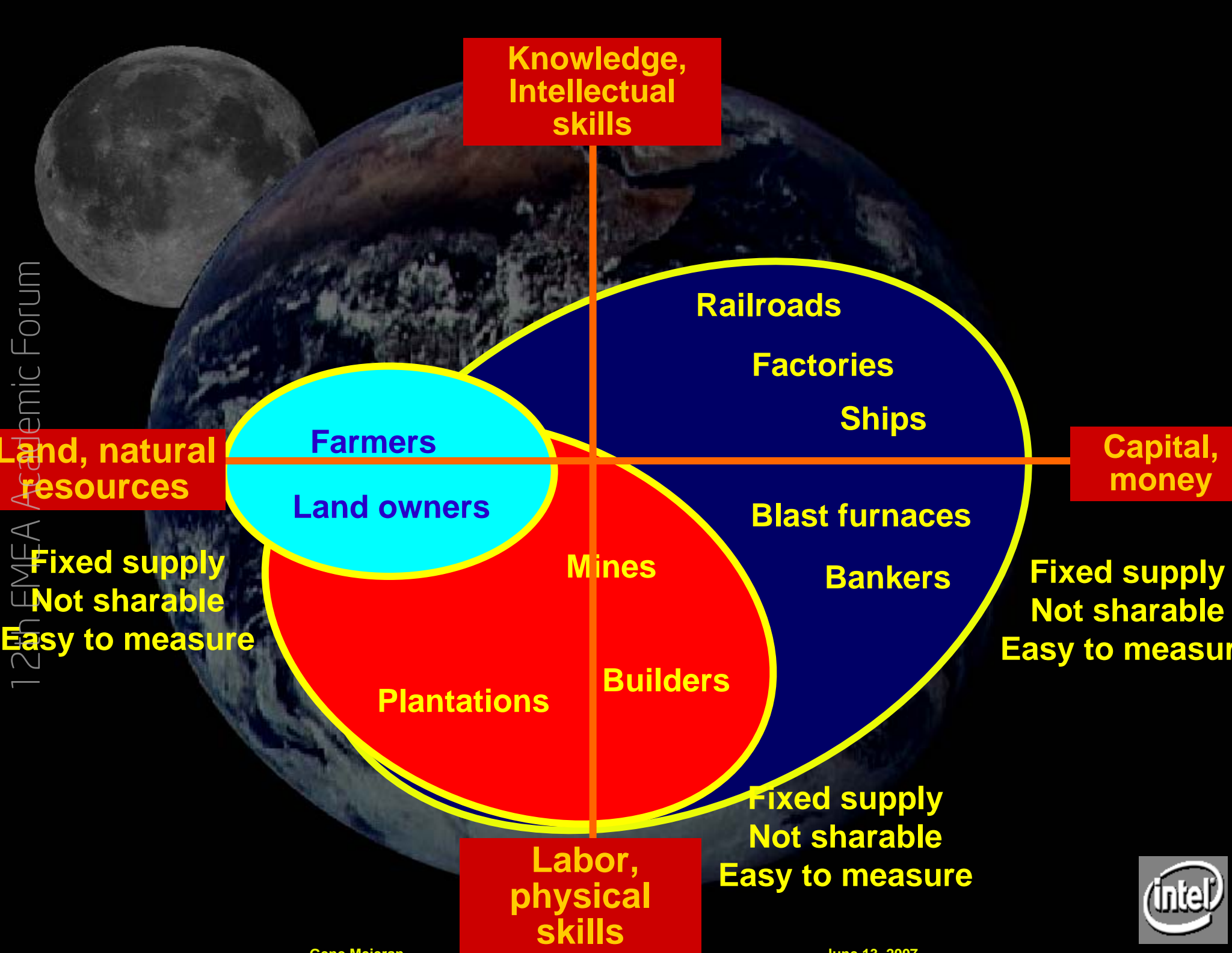
12th EMEA Academic Forum



20th Century Technologies:

- Generated **significant global wealth** because they **delivered something of value at an affordable price**
- Depended on **cheap power** (“electrification of the US”)
- Required development of **significant infrastructure and standards**
- Generated **significant unforeseen problems** requiring **LOTS of attention**
 - traffic jams
 - inner city decay
 - nuclear waste, etc.)
- Greatly **improved the quality of life** and **strongly impacted the way the world operates**





**Knowledge,
Intellectual
skills**

**Land, natural
resources**

**Capital,
money**

Farmers
Land owners

Fixed supply
Not sharable
Easy to measure

Fixed supply
Not sharable
Easy to measure

Railroads
Factories
Ships


Mines
Builders
Plantations

Blast furnaces
Bankers

**Labor,
physical
skills**

Fixed supply
Not sharable
Easy to measure





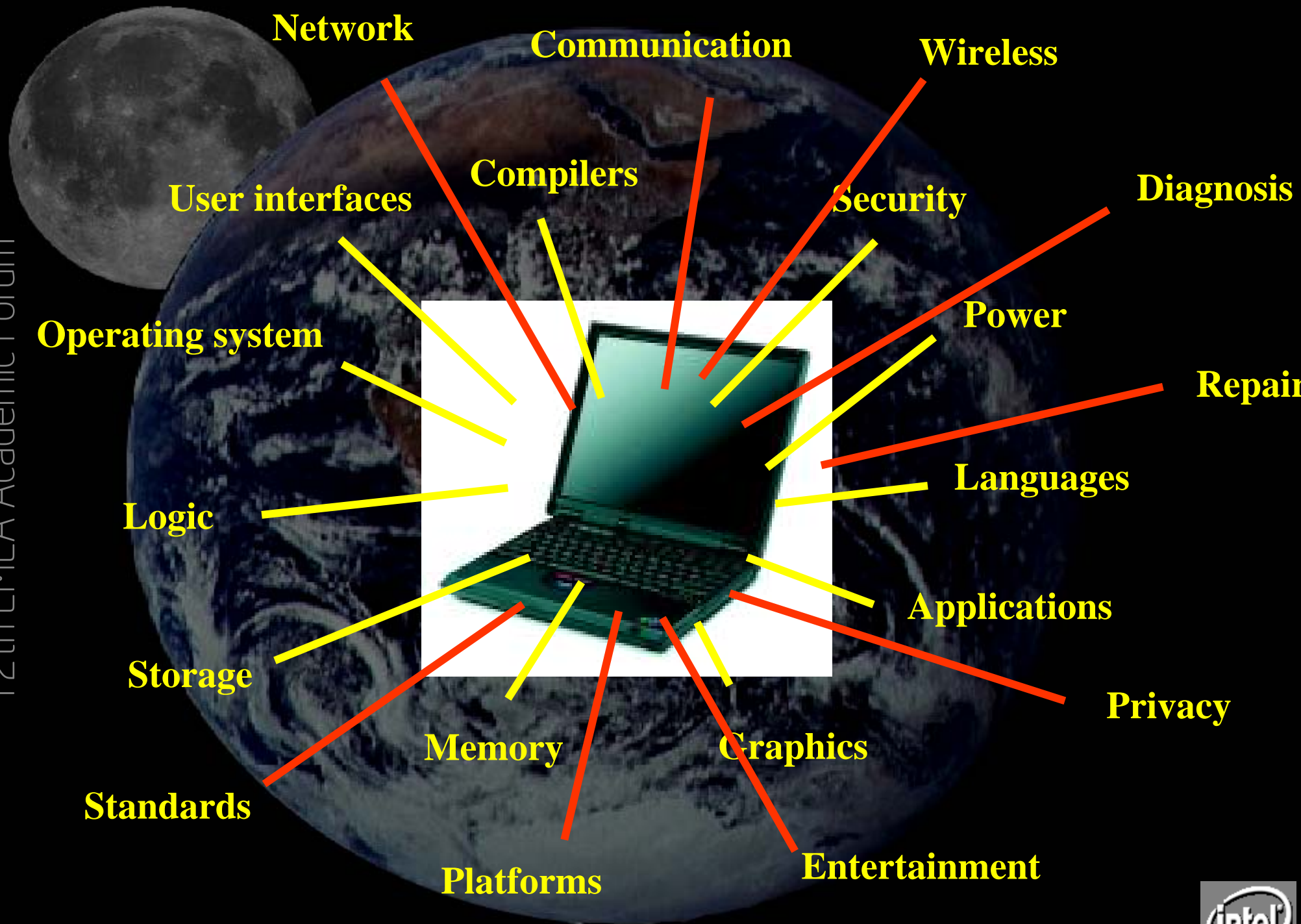
**How do we match the value
of 20th century innovations
in the 21st century???**

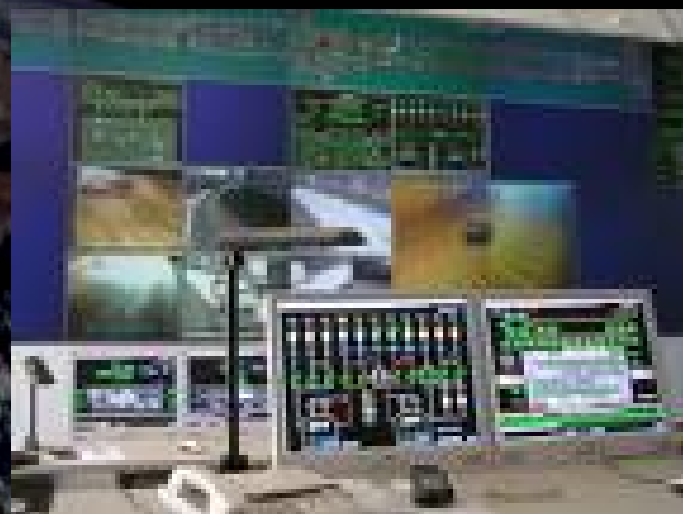
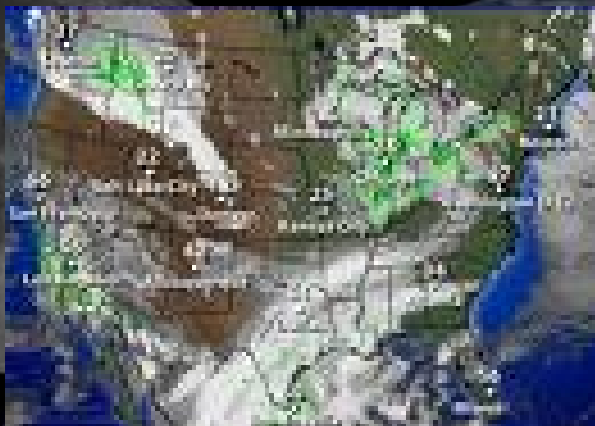
21st Century Challenges*

- Energy conservation
- Resource protection
- Food and water production, distribution
- Waste management
- Medicine and prolonging life
- Security & counter-terrorism
- Education and learning
- New technology
- Genetics and cloning
- Knowledge sharing
- Global communication
- Traffic and population logistics
- Weather prediction and control
- AI, interfaces and robotics
- Integrated electronic environment
- Sustainable development (new topic)
- Globalization
- Space exploration
- Preservation of species
- Entertainment
- “Virtualization” and VR
- Preservation of history

*Gene Meieran prediction; no ranking







21st Century Technologies:

- Will depend on availability of **cheap knowledge** (“knowledgification of the US”)
- Will generate **significant global wealth** because they will **deliver something of value at an affordable price**
- Will require development of **significant infrastructure and standards**
- Will generate **significant unforeseen problems** requiring **LOTS** of attention
 - Internet jams
 - Terrorism
 - Useless, redundant, incorrect information
- Will greatly **improve the quality of life** and **strongly impact the way the world operates**



Unlimited supply
Easily sharable
Difficult to measure

Knowledge,
Intellectual
skills

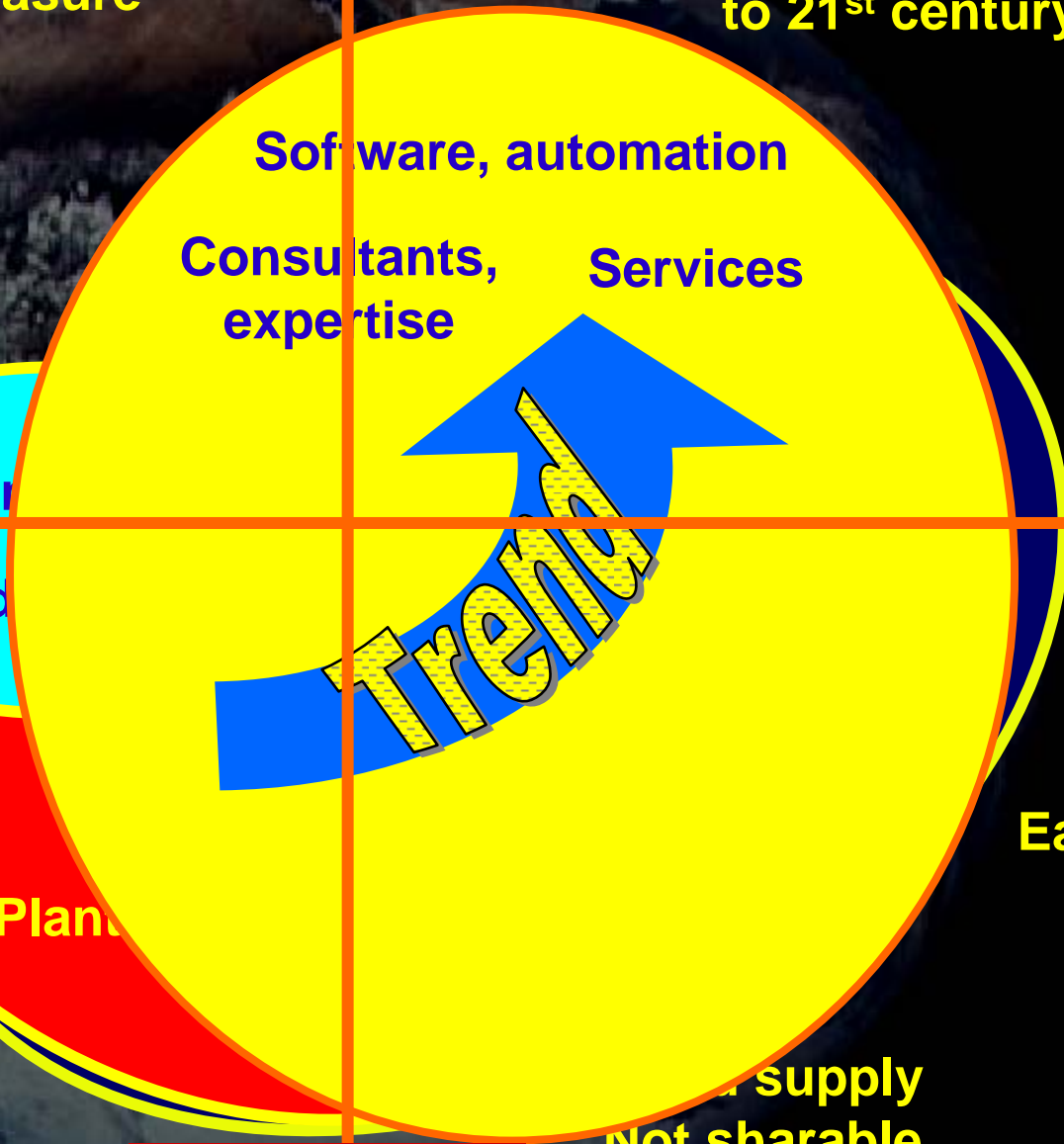
Providing information and
knowledge will be the key
to 21st century innovation

Land, natural
resources

Farm
Land

Capital,
money

Fixed supply
Not sharable
Easy to measure



Fixed supply
Not sharable
Easy to measure

Fixed supply
Not sharable
Easy to measure

Labor,
physical
skills



The Virtual Universe

The virtual universe is expanding

Knowledge objects are getting farther apart

Knowledge sharing (the exchange of knowledge “pixels”) is the force holding this universe together

We have the ability to CONTROL knowledge sharing

We CAN manage our destiny



Expansion
Hubble's Law

$$V = H_0 R$$



Attraction
Newton's Law

$$F = k \frac{M_1 M_2}{R^2}$$

Radical Innovation

- Goes beyond competitive positioning
- May lead to major paradigm shift
- Usually an individual achievement; champion driven
- Proactive and opportunistic
- Risky with high failure rate; rare in mature companies

1860



1910



1970



Radical Innovation:

1920

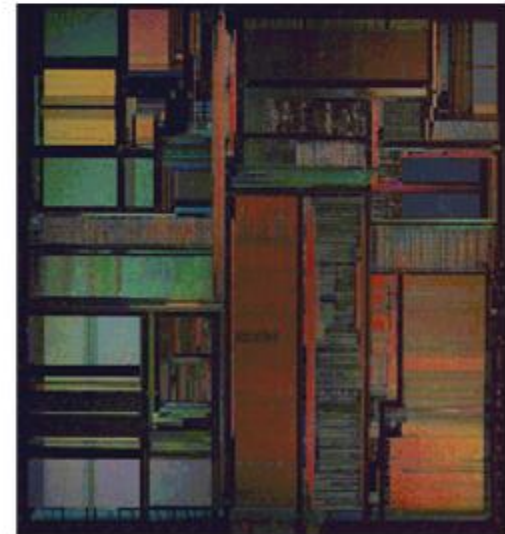


1/1,000,000 the cost
1/10,000,000 the size
1,000,000 X the reliability

1960



2000



Incremental Innovation

- Address issues in non-traditional ways
- Necessary to retain competitive position but does not threaten status quo
- Responsive to problems, opportunities or trends
- Team driven; high expectation of success
- Lots of recognition and reward for success



1903



1920



1940

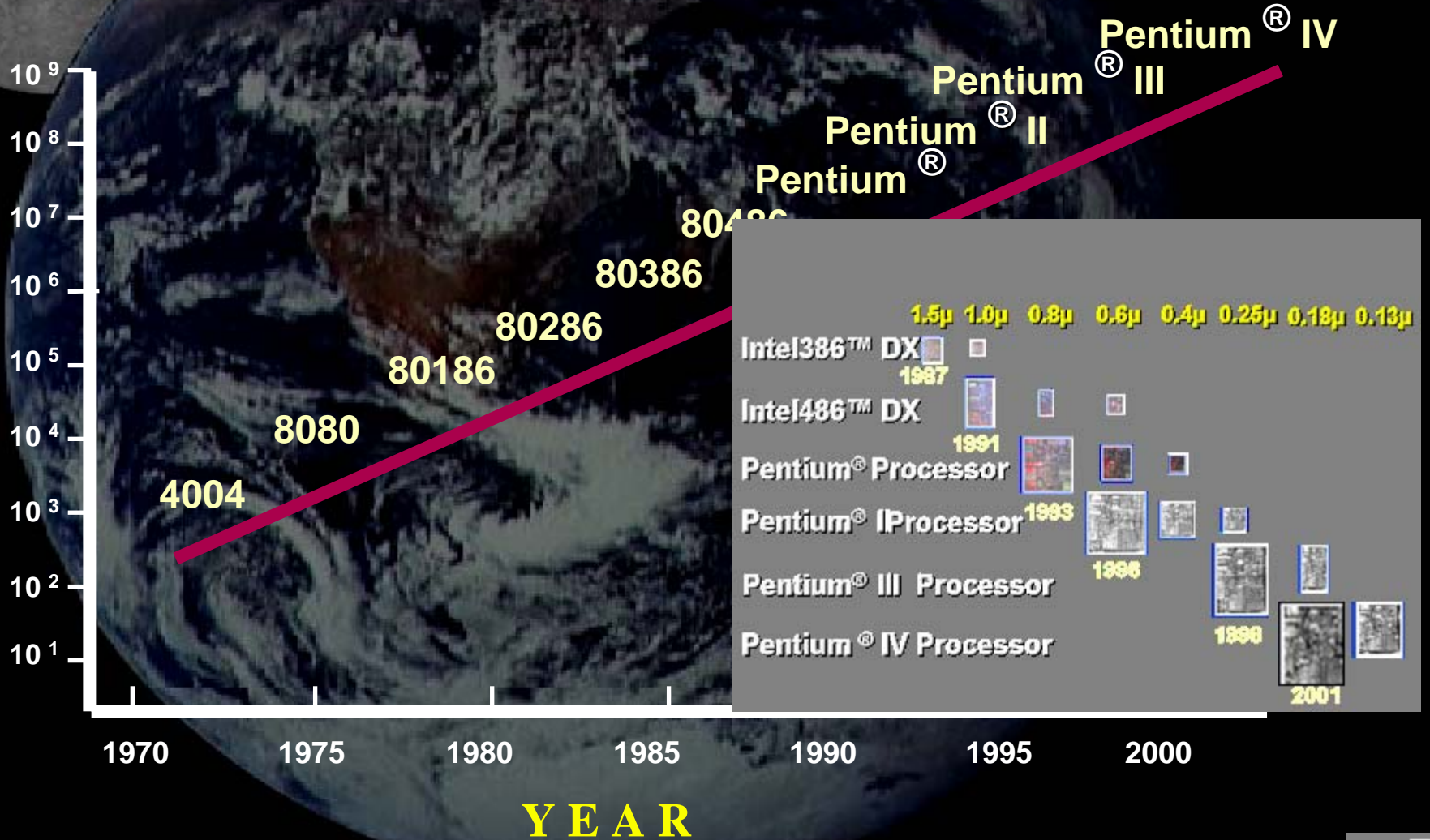


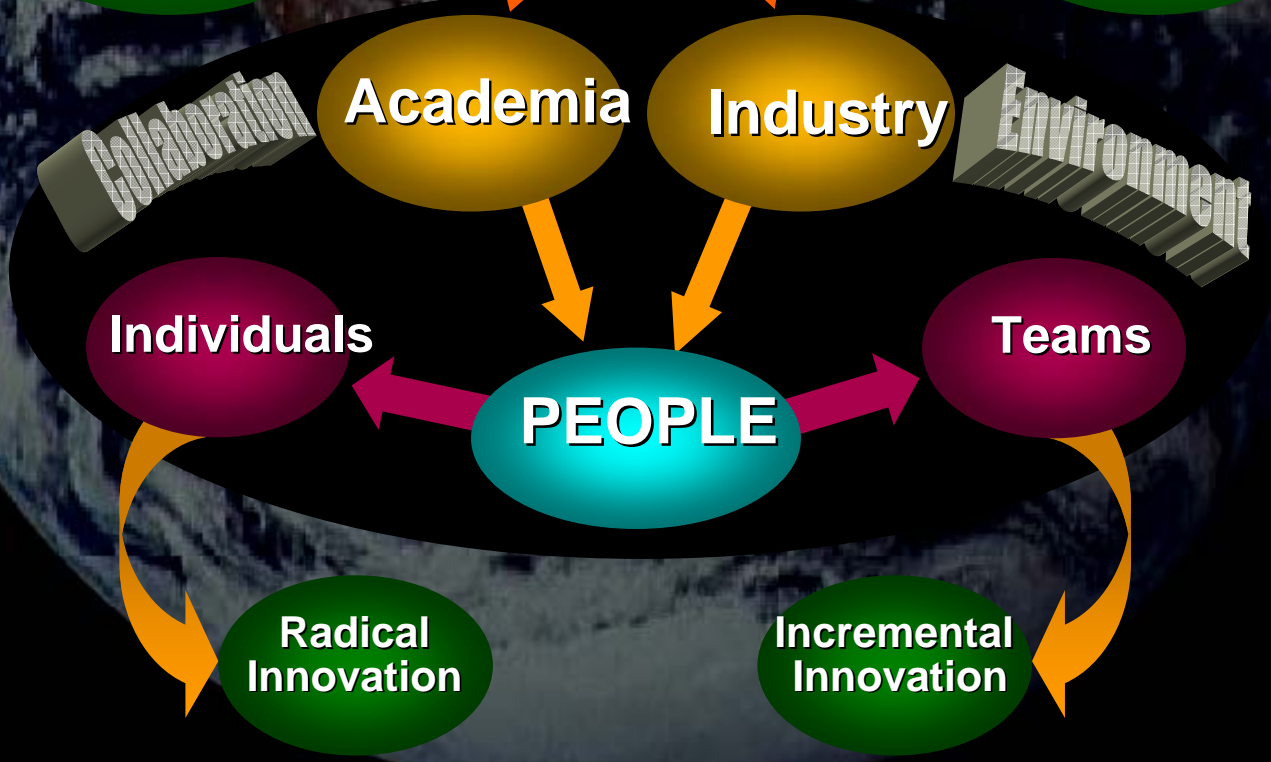
1980

Incremental Innovation: Enabled Intel to continue to build more complex devices (Follow Moore's Law)

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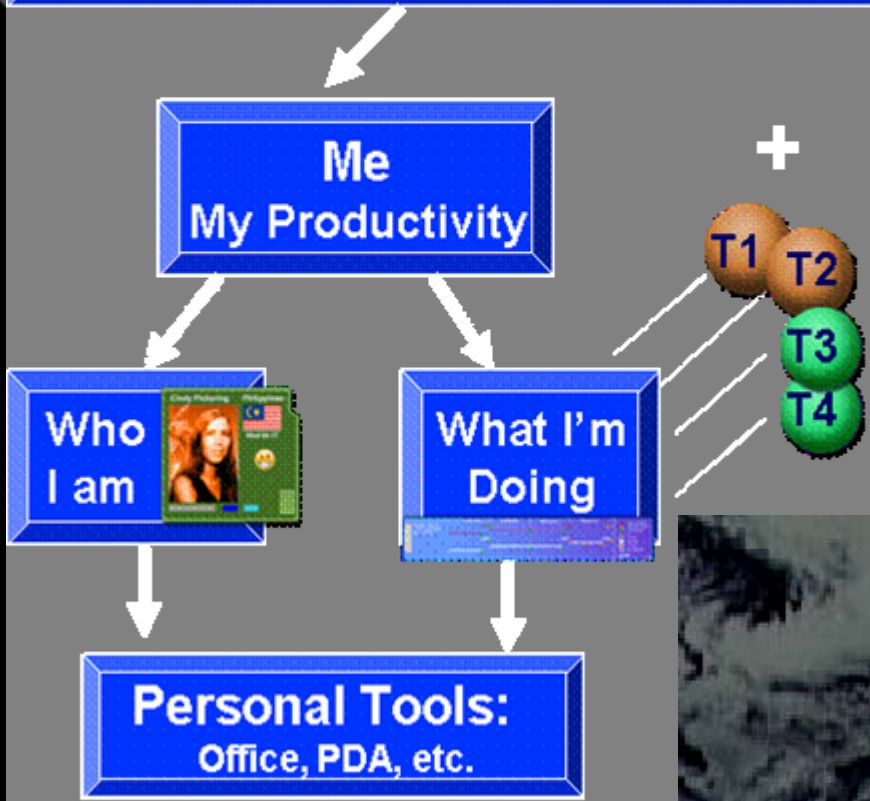


THESE are the new enabling technologies



Collaboration Elements

Integrated Collaboration Environment



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Collaboratory Project Portfolio Chandler, AZ



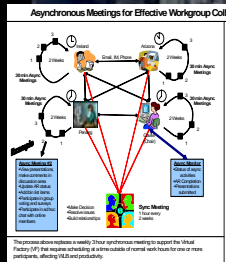
SketchNet / Meetnet



Senseboard



Being There



GeoSync:
Async Meetings



Miramar2.0: 3D Integrated
Global Team Environment



Mobile
iPerson



iPerson



BACC
Room



Global conferencing



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What's Needed

- **Building of new infrastructures even as we repair or replace old infrastructures**
- **Research on rapid prototyping and rapid manufacturing in undeveloped societies**
- **Research on better high volume manufacturing methods**
- **More sophisticated knowledge sharing and collaborative environments**
- **Understanding and remediation of the growing gap between various factions:**
 - **Fundamentalists**
 - **Undeveloped nations**
 - **Poor vs rich**
 - **Technologically secure vs technologically unprepared**
- **Understanding of “unforeseen consequences” of technology implementation**



Summary

- The 21st century promises to be **EXCITING** for Intel! There should be **PLENTY** of jobs
- Most 21st century innovations will be based on the exploitation of intellectual assets where knowledge sharing becomes essential
- A lot of work need be done to protect us from unforeseen consequences and to fix the issues left over from the 20th century
- **OUR** future looks promising!
 - Academia
 - Industry (especially those involved in IT)
 - Users and customers
 - Services



A Measure of Time: From the Earth to the Moon

1903



**66 years.....
Not a long time!**

**2073 is coming:
Not a long time!**



1969