University of the Past, University for the Future

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Advanced Societies

Advanced Societies means Advanced Culture

Single (or very few) student(s)
What kind of studies?

Theology
Art and Philosophy
Astronomy
Mathematics and Physics
Imperial Nanking Institute, the predecessor of Nanjing University, was originally founded in the first year of Yong'an reign (258) under the Kingdom of Wu by the emperor Sun Xiu and the first president was Wei Zhao.

The Imperial University in Nanking (南京太學, Nanking Taixue) was reestablished by Jin Dynasty's emperor Sima Rui in 317 and 155 new rooms were built in the campus.

It did not award degrees in the strictest sense.
University

Need of an effective generation and preservation of culture, values, knowledge and their formal transmission

Al-Azhar University, Cairo (969)

Theology, jurisprudence, Arabic grammar, astronomy, philosophy, and logic.
Book from the Middle Age

Preserve and transfer knowledge with books
Books in the Middle Age
Library of Salamanca (1218)
Pavia (1361) Library and Scarpa Hall
The word university is derived from the Latin *universitas magistrorum et scholarium*, roughly meaning "community of teachers and students".
Because the awarding of academic degrees for advanced studies was historically most prevalent in Europe and the Middle East, the modern definition of a university includes the ability to grant degrees.

Legal value and legal permission to profession.

Medicine, jurisprudence, engineering, …
Industrial Revolution: more and more emphasis on Science and Technology

Mechanics and chemistry
Electricity

On 20 March 1800, Volta informs the President of the Royal Society, Sir Joseph Banks, of the invention of the pile (battery). Volta virtually clinched the victory by constructing a device that would produce a large flow of electricity. Volta's device was an "electric battery" - the first in history. The invention of the battery lifted Volta's fame to its pinnacle.

In June of the same year, Napoleon, to whom Volta had paid his respects in 1796 - reconfirms the scientist from Como Professor of Experimental Physics at the University of Pavia.
- Reflection of A. Graham Bell that says: “Leave the beaten track occasionally and dive into the woods. You will be certain to find something that you have never seen before”.
Discover the unknown

but …

Is the return of investment satisfactory?
Change of Research Activity Role

Shift from human curiosity to research for society’s wealth
Why this change?

Information Technology Revolution

Pipeline for transforming concepts into products:

1. Idea
2. Possible application
3. Product

Time

IMS University of Pavia
The born of Knowledge Society

Industrial Society (USE OF HANDS)

Knowledge Society (USE OF BRAIN)
Frederick W. Taylor: Master of Scientific Management

Four key principles of the scientific management:

- Replace rule-of-thumb work methods with methods based on a scientific study of the tasks.
- Scientifically select, train, and develop each employee rather than passively leaving them to train themselves.
- Cooperate with the workers to ensure that the scientifically developed methods are being followed.
- Divide work nearly equally between managers and workers, so that the managers apply scientific management principles to planning the work and the workers actually perform the tasks.
Humankind has witnessed rapid historical progress during the past few centuries.

The Industrial Era sustained society for more than a full century until the Information Era came and took the leading role.

We then saw the introduction of the Information Sector. More changes followed, and now we are developing the Knowledge Society.

In such a society, knowledge becomes a driving force of an economy; it becomes a tool for development, a currency accepted all over the world.
Knowledge and Education

✧ Knowledge is built up from interaction with the world, and is organized and stored in each individual's mind.

✧ Education is the key to knowledge.

✧ Education creates the atmosphere where knowledge can be acquired and processed to make it useful to each individual.

✧ Education creates the stage for knowledge to be shared.

✧ Education makes us life long learners. That is the education that we believe in, we should make everyone WANT to learn.
The emergence of the Knowledge Society, building on the pervasive influence of modern information and communication technologies, is bringing about a fundamental reshaping of the global economy.

The application of knowledge to economic activity, to the extent that has become the predominant factor in the creation of wealth. As much as 70 to 80 percent of economic growth is now said to be due to new and better knowledge.
Kinds of Knowledge

- Tacit Knowledge
- Explicit Knowledge
- Cultural Knowledge
Kinds of Knowledge

- **Tacit knowledge**: It is personal, un-codified not reduced to rules and recipes, difficult to diffuse.
  - Originates from the abstraction over time of the cultural and technical activity of an individual, including the relationships with customers, suppliers, and partners.
  - Vital to the organization because organizations can only learn and innovate by somehow leveraging on the implicit knowledge of its members.

- **Explicit knowledge**: object based or rule based
  - Permits an efficient transformation of knowledge into products.
  - A widespread use of standardized approaches increases the reliance on methodologies but reduces motivation to probe more deeply and creatively into the underlying assumptions and rules.
Kinds of Knowledge

- **Cultural Knowledge**: it is the cognitive and affective structure of an organization or a community. It is the set of believes norms and values that govern the behavior of the organization members.

- Cultural knowledge of a community is its particular common sense.
- Constitute the glue of the community: mix of communities involve the difficult task of harmonizing different cultures while quickly spreading the new resulting cultural knowledge.
Research in the Past and for the Future
Research and Development

- $R$ and $D$ are the initials of two activities that “&” joins together.
- Research is for satisfying needs for erudition while development answers the demands of production and profit.
- Research belongs to the “republic of science”; development is part of the “realm of technology”.
- Just a few decades ago: a sequence of distinct phases, separated in time: the generation of tacit intellect, its pre-coding presented at technical meetings and published in scientific literature, the disclosure of pre-codified knowledge to possible end-users, the transformation of intellectual products into codified knowledge, and its optimal application to industrial products.
What kind of research now?

GUIDELINES

- To generate knowledge for obtaining a key competitive advantage.
- To generate “knowledge for future business” (within a 3-6 years perspective) resulting from a realistic and “proactive” vision of the future world.
- To produce a stimulating environments capable to favor interactions, cultural confrontations, and exchange of information.
- To resolve the increasing difficulty in having in the same entity or in the same geographical site the right conditions that favor high-tech creativity by effectively networking knowledge generators.
- To protect knowledge, that in high-tech is a perishable good, by a fast exploitation, more than by patents or secrecy.
Therefore,

- It is urgent to activate mechanisms for a more efficient knowledge creation and a suitable forging of creative people.

- It is necessary to speed up mechanisms for the transformation of new knowledge into wealth. This results by closer links between the knowledge creator and the knowledge transformer.

- It is essential to activate processes for a careful and visionary forecast of the future social growth and its impact on science and technology developments.
“Produce” Excellent Knowledge Workers

Knowledge use: use of tools and methodologies (product engineer, operational manager) 50%

Knowledge transformation: coding knowledge for systematic use 15%

Knowledge leverage: patents, transfer of knowledge, knowledge dissemination 15%

Knowledge creation 20%
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Knowledge User
- Wide spectrum curricula
- Use of tools and methodologies
- Homework and laboratories
- Crisp teaching approach
- Weak link with external world

Knowledge Transf. & Lev.
- Wide spectrum curricula
- Use of tools and methodologies
- Deep understanding of methods
- Crisp teaching approach
- Moderate link with external world

Knowledge creator
- Special and focused topics
- Un-perceptible directions
- Challenging targets
- Fuzzy teaching approach
- Strong link with industry
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Motivation

Strategies

Cultivate

Creation

Skills

Organization

Systemization

Time

Management

of Characteristics

Responsibility

Determination

Discipline

Scheduled

Off days

Rewards

Process

Affirmations

Positive

Enthusiasm

through

Optimism

Self-Talk

Positive

Motivational Maintenance
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Right background for a bright and challenging future
To favor human progress and … to win!
My strategy (and vision) on Research

✧ Do research that provide an answer to real needs but is not development
✧ Remain young and stay with young persons
✧ Avoid avenues with no-return
✧ Avoid bureaucracy
✧ Use and exercise the brain
✧ Strictly follow scientific ethics
✧ Walk with your own legs

✧ Enjoy what you do!!!
The key point is that scientific research and high education are essential for social development but they are not (and can not be) the direct instruments for achieving market competitiveness; instead, they are the cultivation soil of technical innovation and social progress.
How to Find the Right Balance

✧ Global view and international dimension.
✧ Unfettered information flows.
✧ Balanced research-industry relationship.

The link between research, invention, innovation and competitiveness is quite complex. The best approach is the following: researchers receive hints, stimulus for ideas from the productive world; these hints are able to trigger the technical curiosity that generates that brain processing which can transform problems into solutions, theories, methodologies.
Look for Effective Social Results

- Personal and society grown.
- Long term perspective and short term objectives.
- Co-ordination between scientific organizations
- Favor use and development of state-of-the-art technologies.
- Seek for proper government legislation.
- Stimulate customer feedback.
Before I conclude …. 

♦ Just a Reflection:

“Try to find the right track that enables you to have fun and, at the same time, to favor innovation and social happiness”.

And a recommendation:

The care for the man and his destiny must be the top concern of your scientific and technical efforts. Never forget this, ... you, flooded by your diagrams and your equations.

Albert Einstein

Thank you!