Higher Education, Innovation and Entrepreneurship

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Contents

There are various factors which we need consider for educating innovative entrepreneurs.

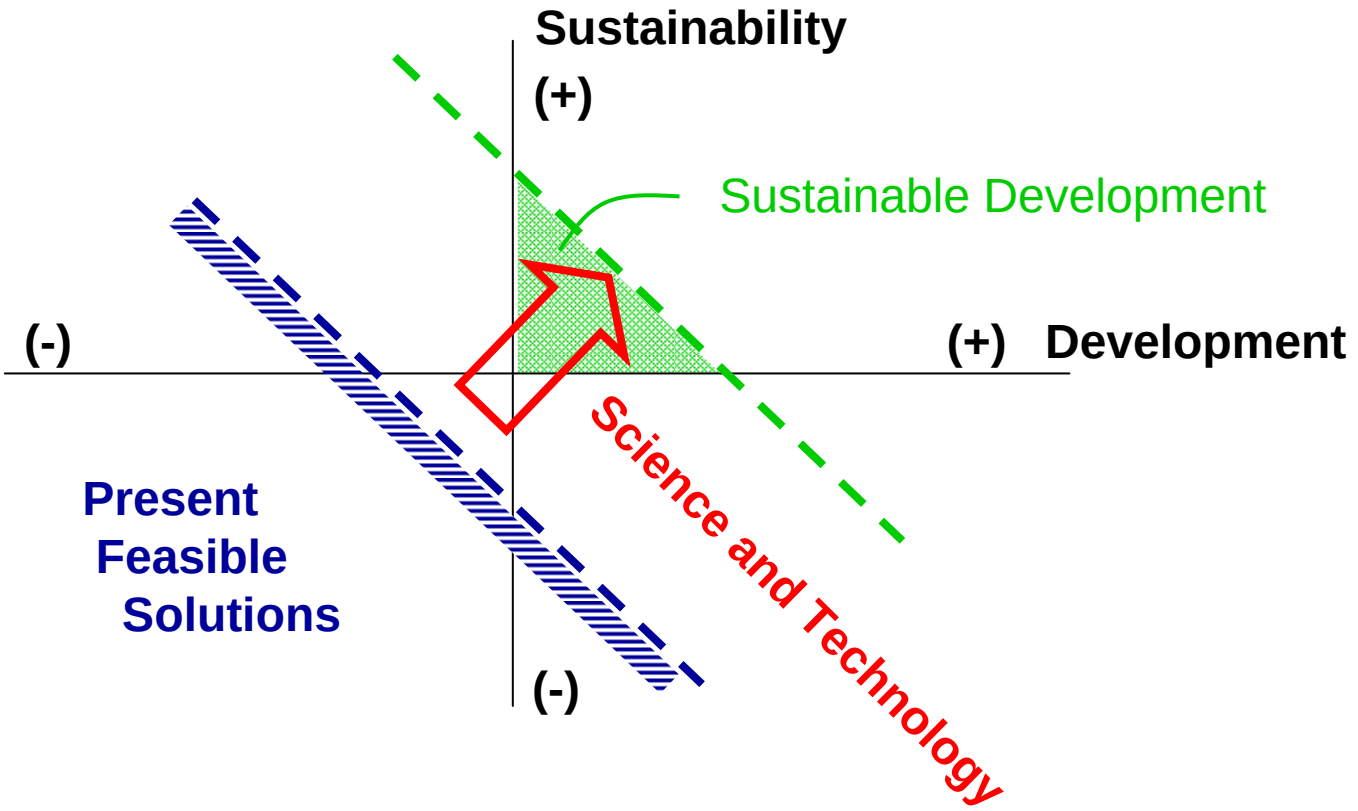
(1) Why do we need Innovations?

In the process of realizing sustainability, we must solve various problems which we have never experienced in the past. As progresses along continuous path do not solve them, we must take a step toward unknown space. It is innovation.

Sustainable Development

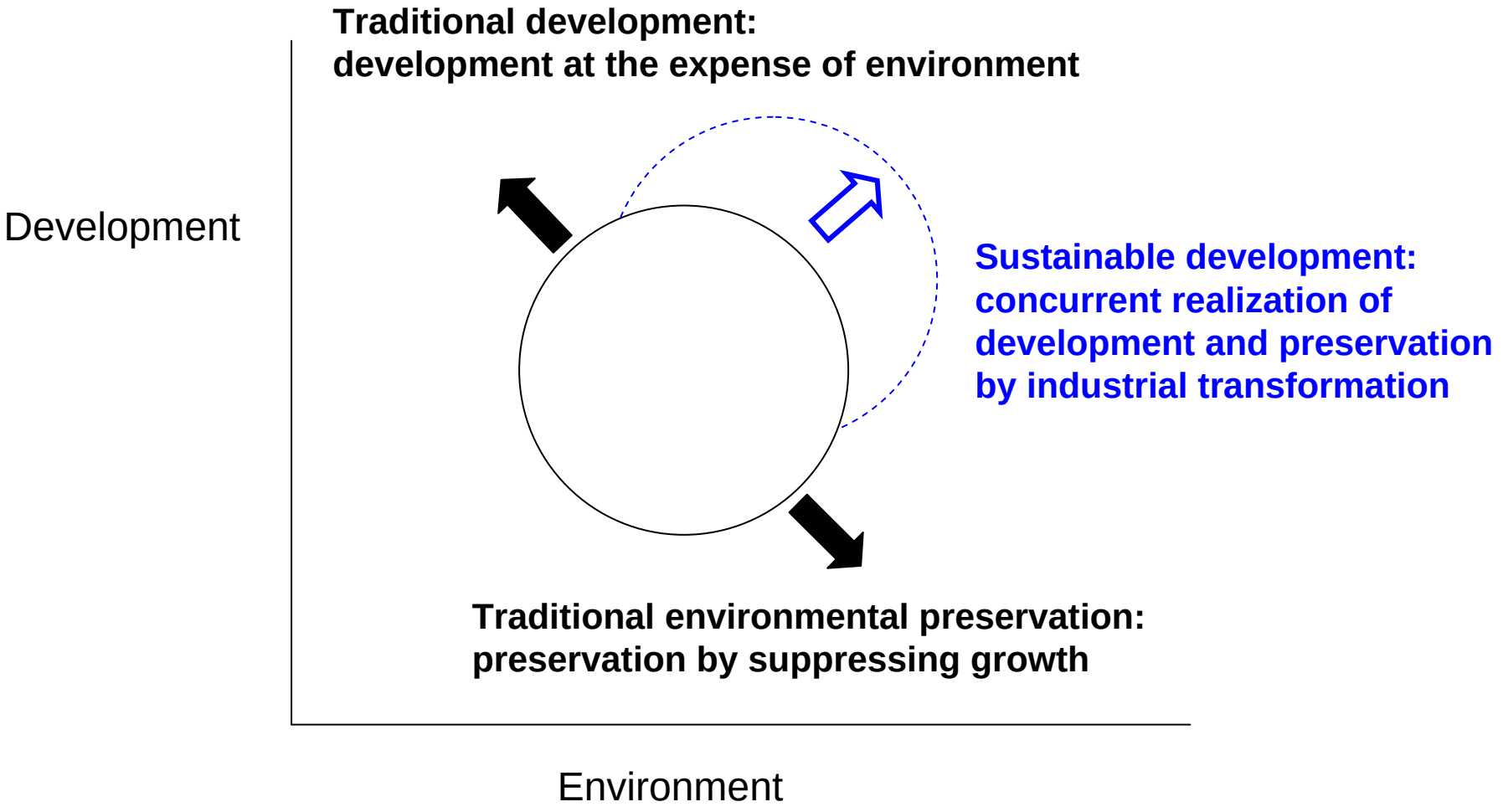
Sustainable Development by G.H.Brundtland (1987)

= (Sustain the earth) ^ (Develop Less-developed Regions)



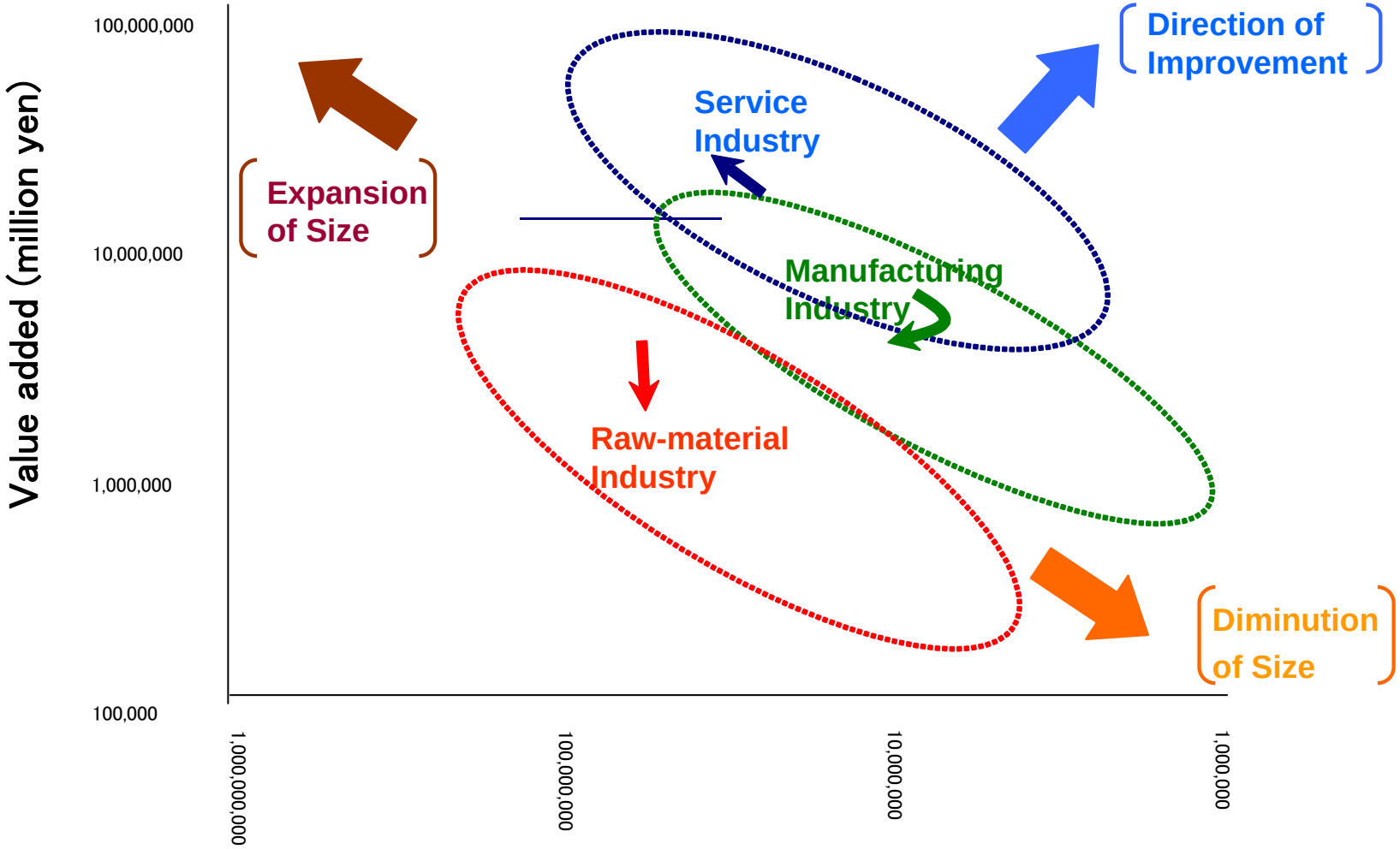
Making a Shift toward Sustainability

"Industrial Transformation by Innovations"



Move of Centre of Gravity of Industries (Japan)

Preliminary Metrics by AIST



持続性に向けた産業科学技術委員会(AIST)

From Observation to Action

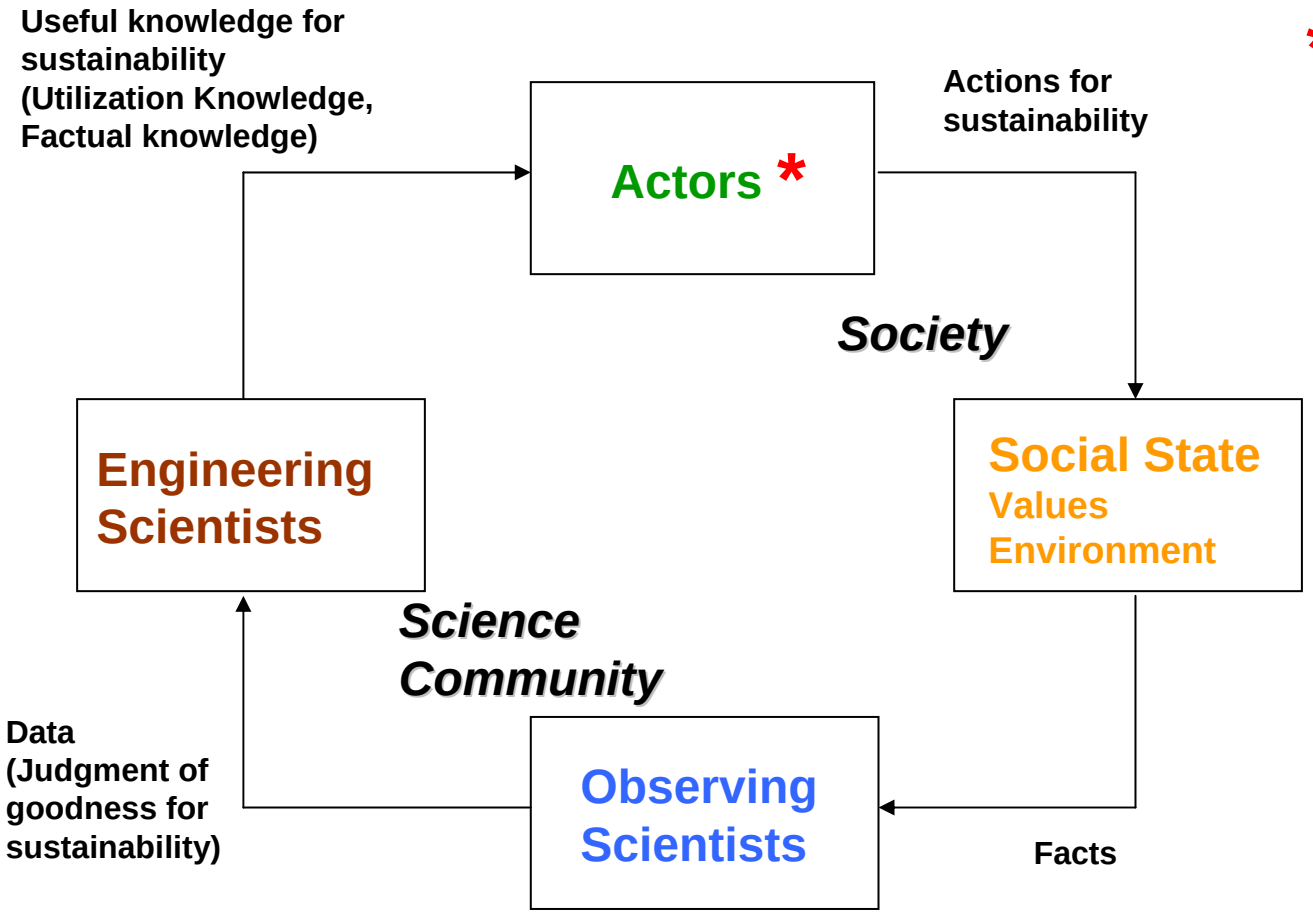
We have successfully *observed* changes of global environment by science and technology. Now, we should make more scientific and technological efforts toward *actions* to prevent the growth of and to protect us from the deterioration of sustainability.

We shall discuss manufacturing industry here, that is based upon science and technology and the most useful to develop less developed regions and, on the other hand, the most crucial to influence the global environment,

and try to find a way for society to realize sustainable development by industry.

Actions in Society

Information Cycle for Sustainable Evolution



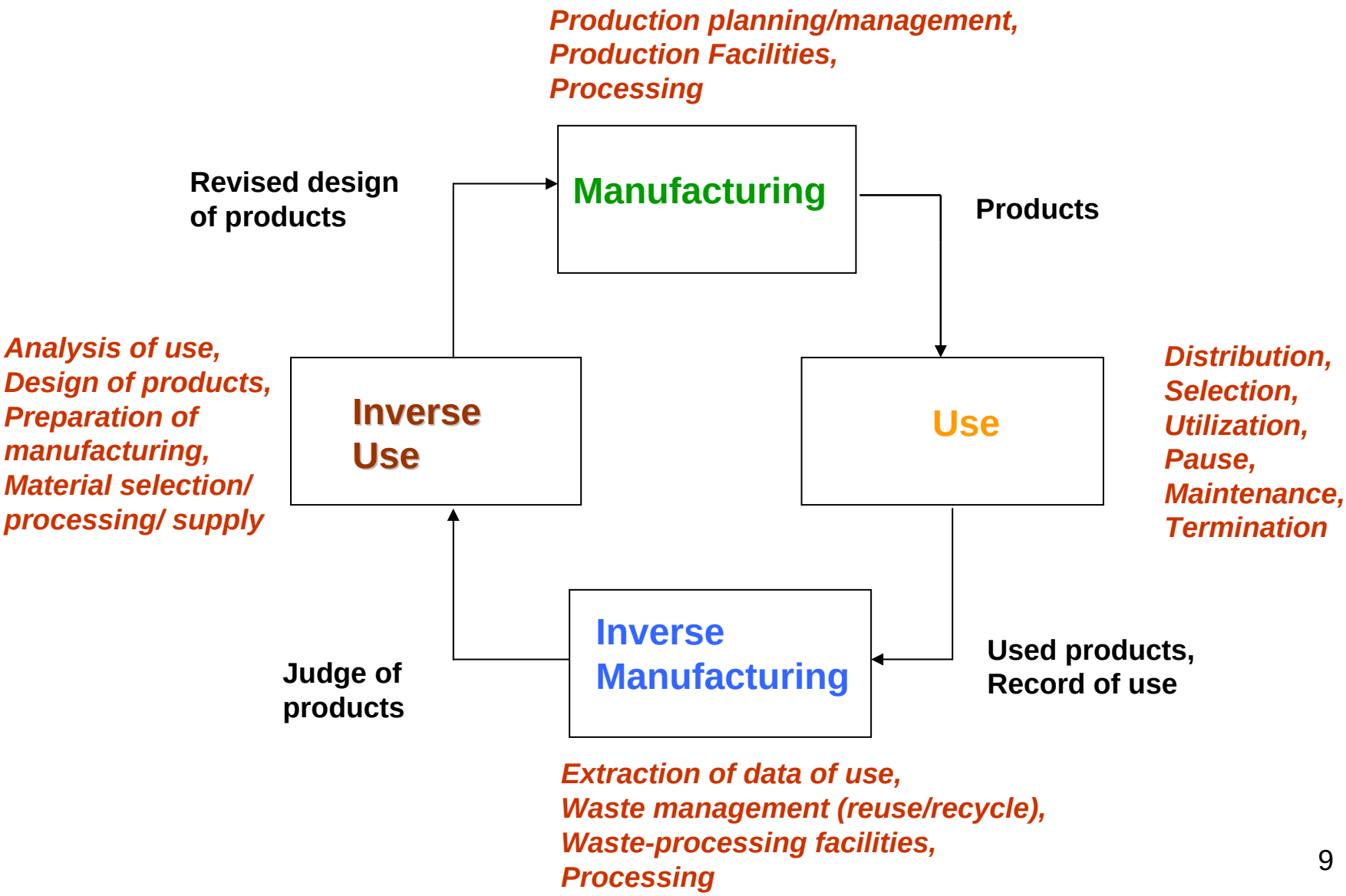
***Actors in Society are:**

statesmen,
policymakers,
business humans,
administrators,
engineers,
educators,
writers,
artists,
journalists,
etc…

who move society.

We must design evolutional loops in society for sustainability.

Elaboration of Actions in Manufacturing

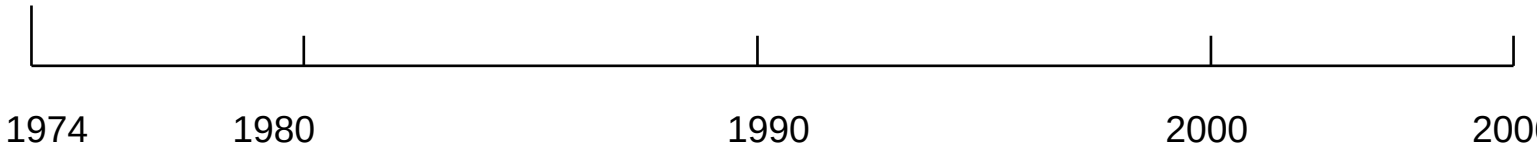


(2) Innovation Process

Innovation is not realized within a single discipline. Whenever an action is innovative, it is based upon the integration of diversified disciplines. Normally, it takes years to integrate them.

An Economical Innovation to Eradicate Poverty

Yunus of Grameen Bank



1974 Conception

1976 Experiment, Bangladesh University of Chittagong

1979 First success, Village of Jobra

1983 Legislated, Independent Bank

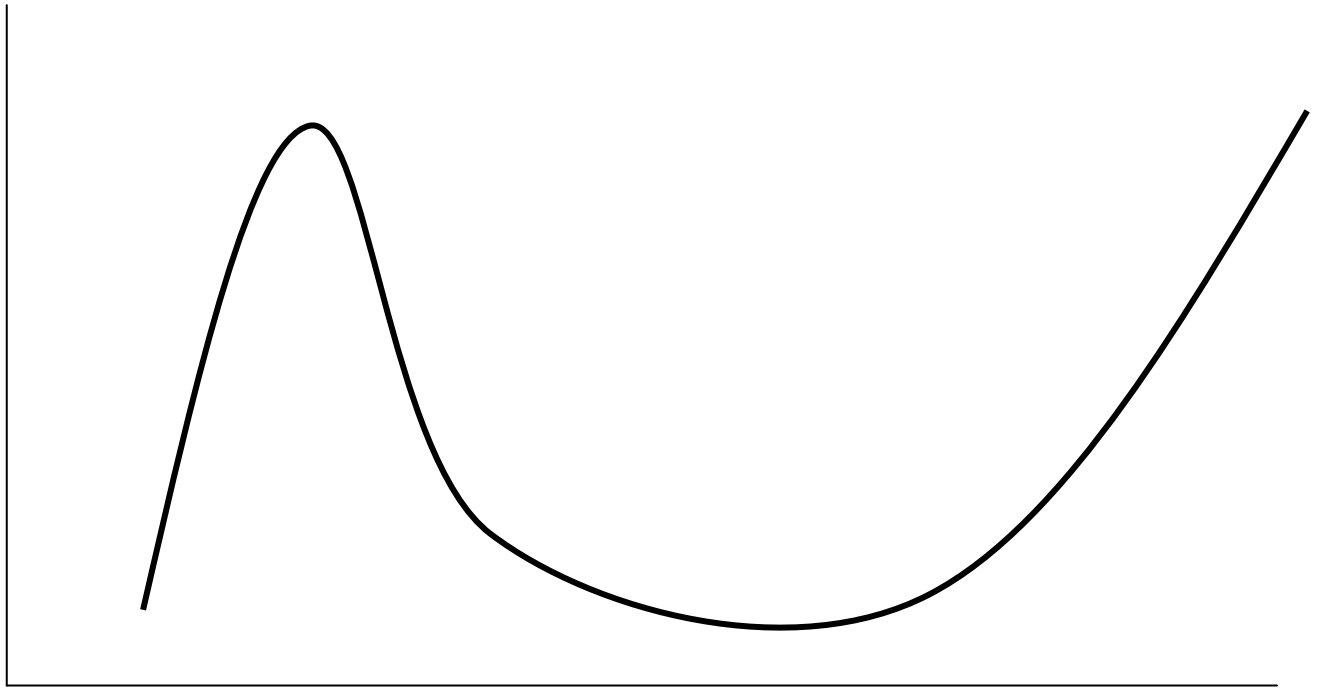
2006 *2100* Branches

2006 Nobel Prize

Dr.Muhammad Yunus of Grameen Bank has successfully developed a bank which encourages women and ameliorated the poverty in Bangladesh. The bank is innovative. It is interesting to investigate the process of development after conception.

Dreams, Nightmares and Reality

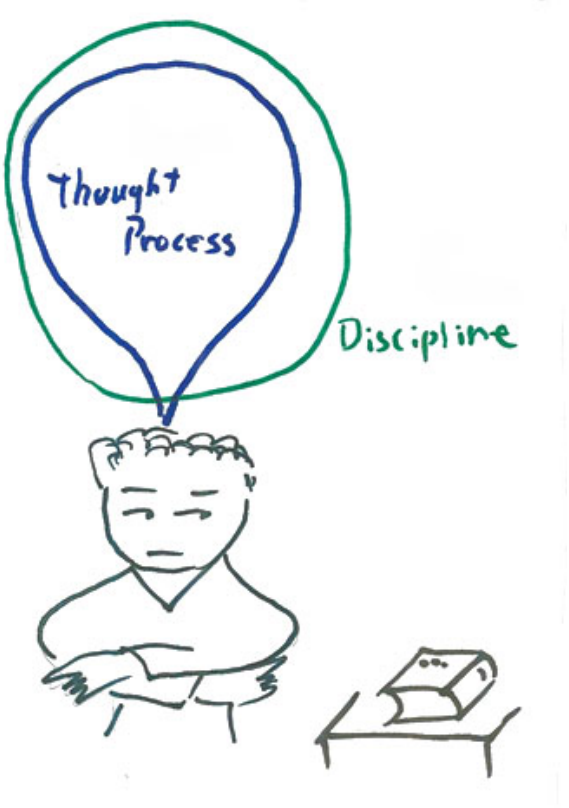
General pattern of science-technology based innovation process



1985 J.Hatvany, H.Yoshikawa

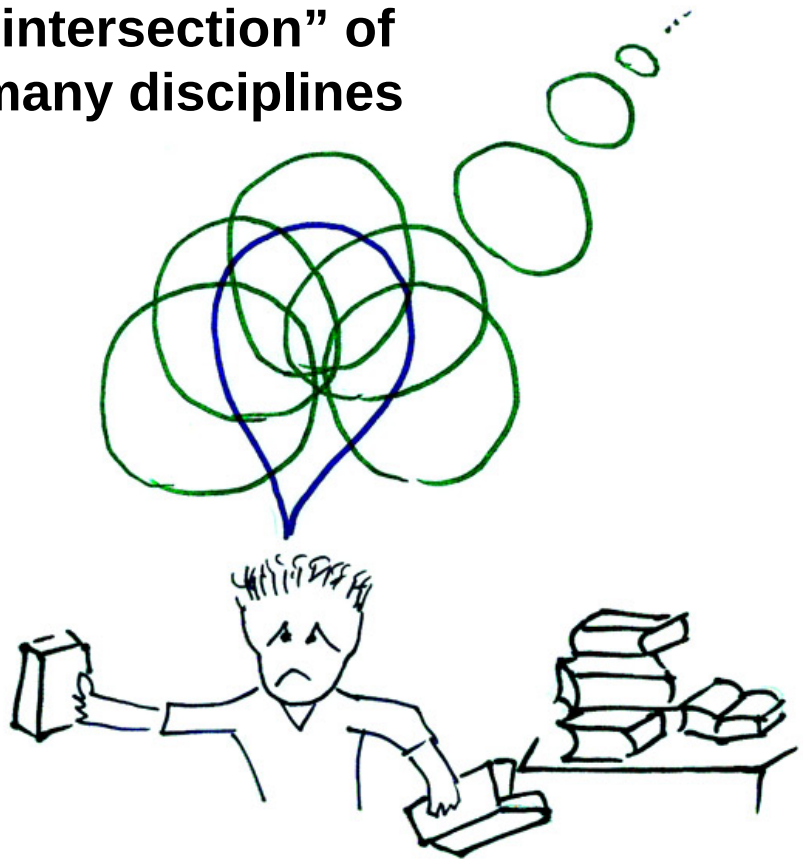
Integration of Disciplines is Necessary

Thought process within their own disciplines



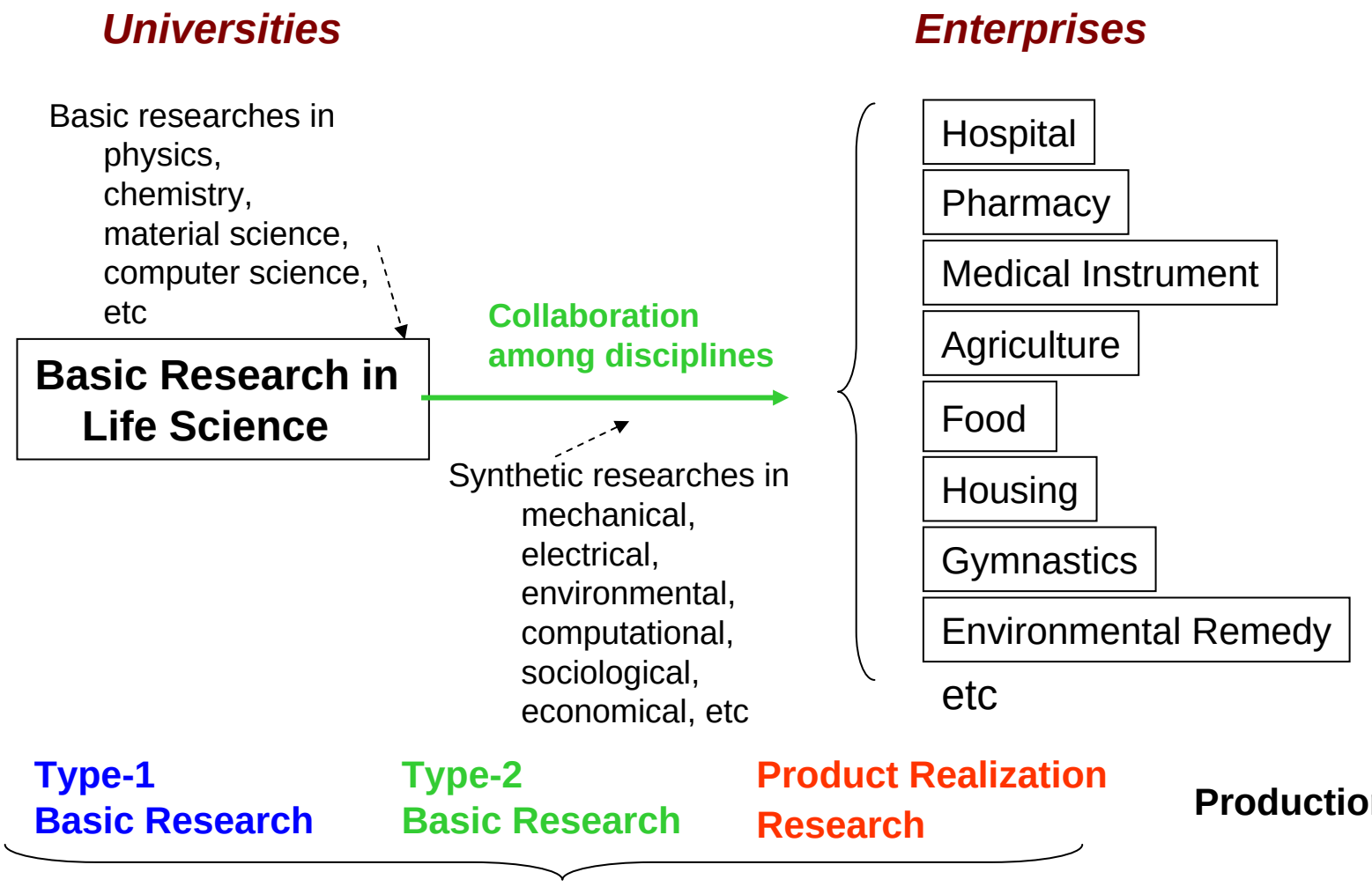
Dream Research

Thought process in "intersection" of many disciplines

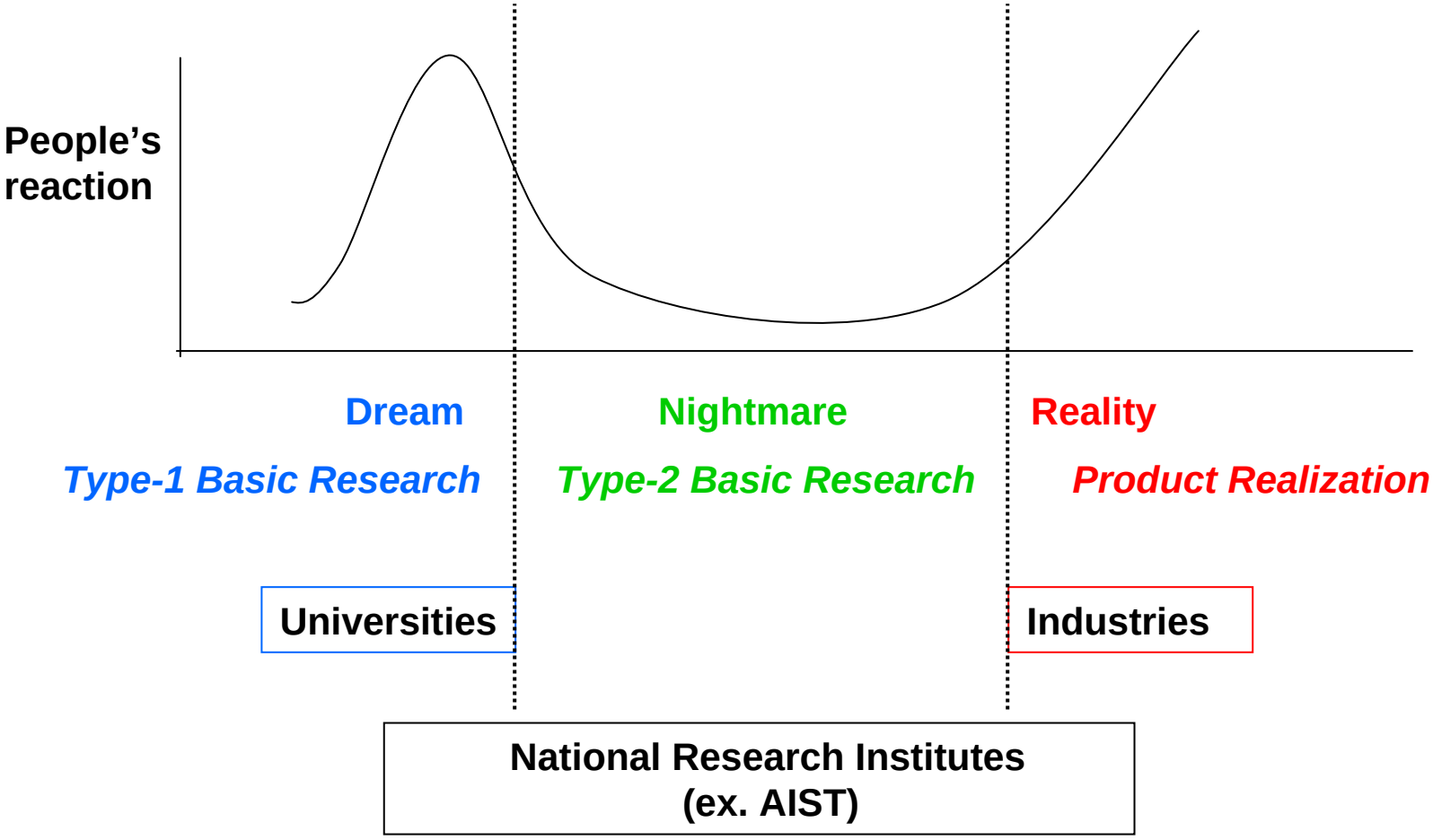


Nightmare Research

Conceptual picture of full research in life science for health



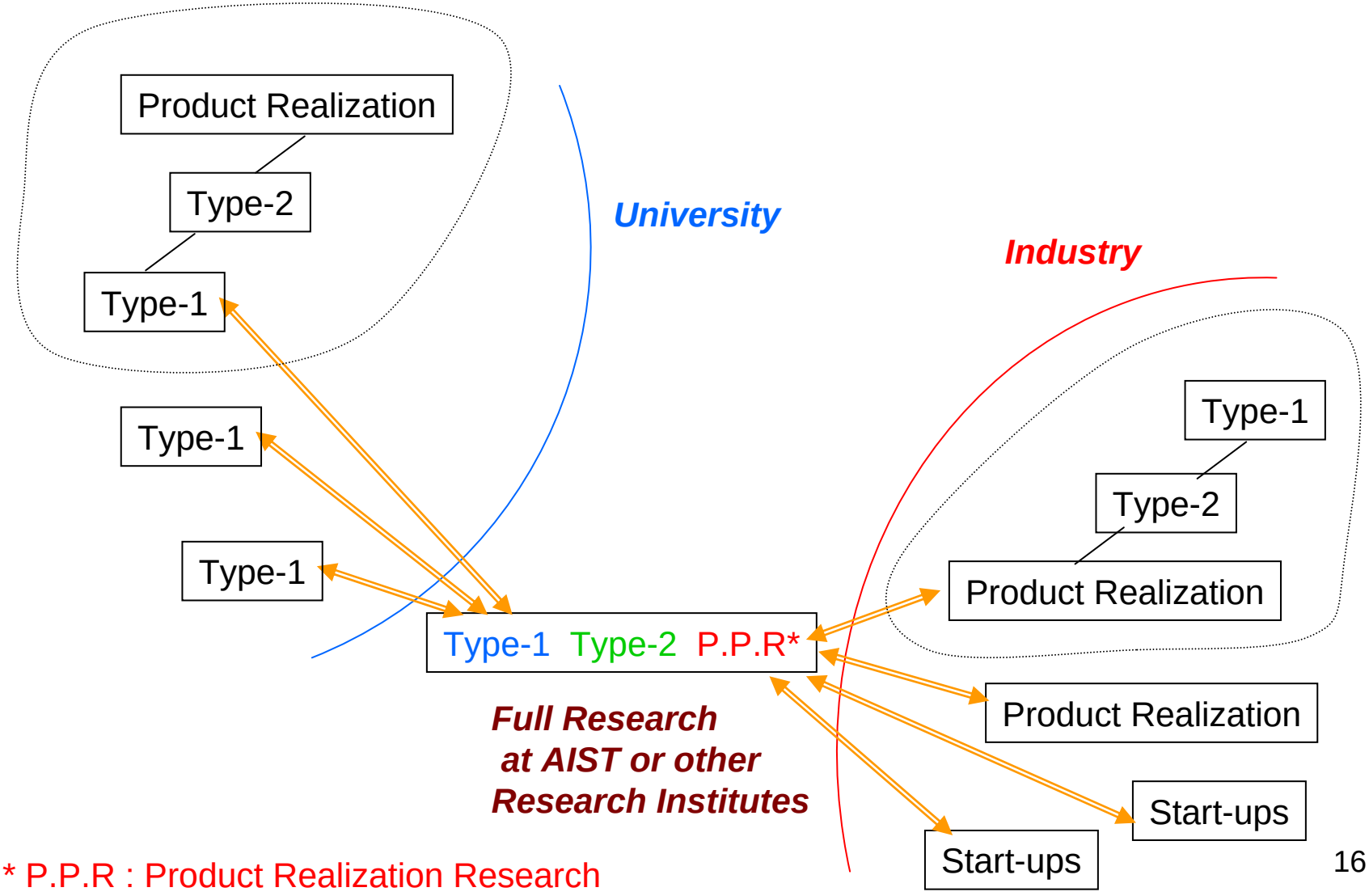
Full Research



Full Research

University-Industry Cooperation through *Full Research*

A Method to Implement the Network of Excellence



* P.P.R : Product Realization Research

(3) New Disciplines in Science

In order to realize sustainability scientifically, we need new engineering knowledge based on new disciplines in science. Universities and research institutes must pioneer for them and professors of different disciplines should make collaboration.

Knowledge Integration for Sustainable Science

Integrated Knowledge
in Real World
(indigenous knowledge)

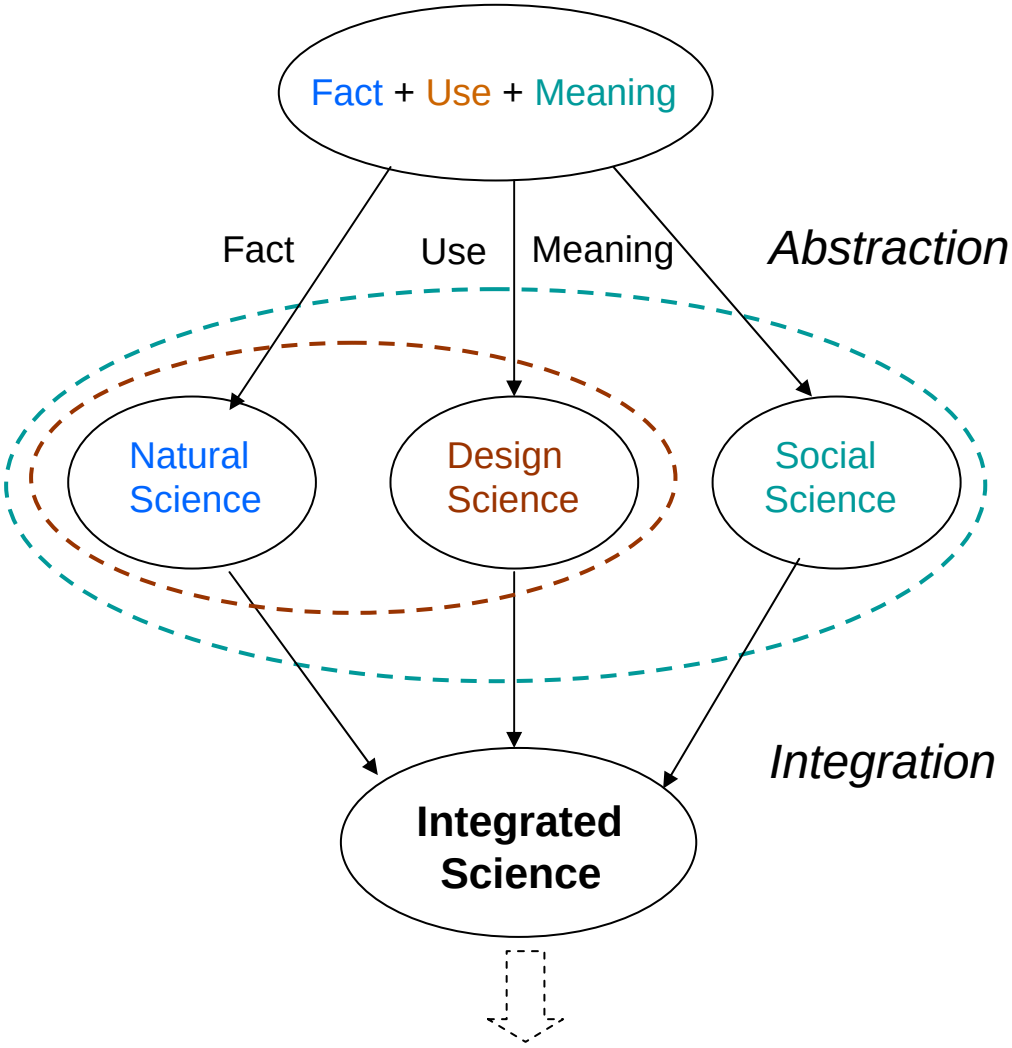
(1)Modern masters

Separate Knowledge
in Abstract World
(Science)

(2)Collaboration of different scientists

Integrated Knowledge
in Abstract World
(Integrated Science)

(3)Theoretical study on disciplinary integration



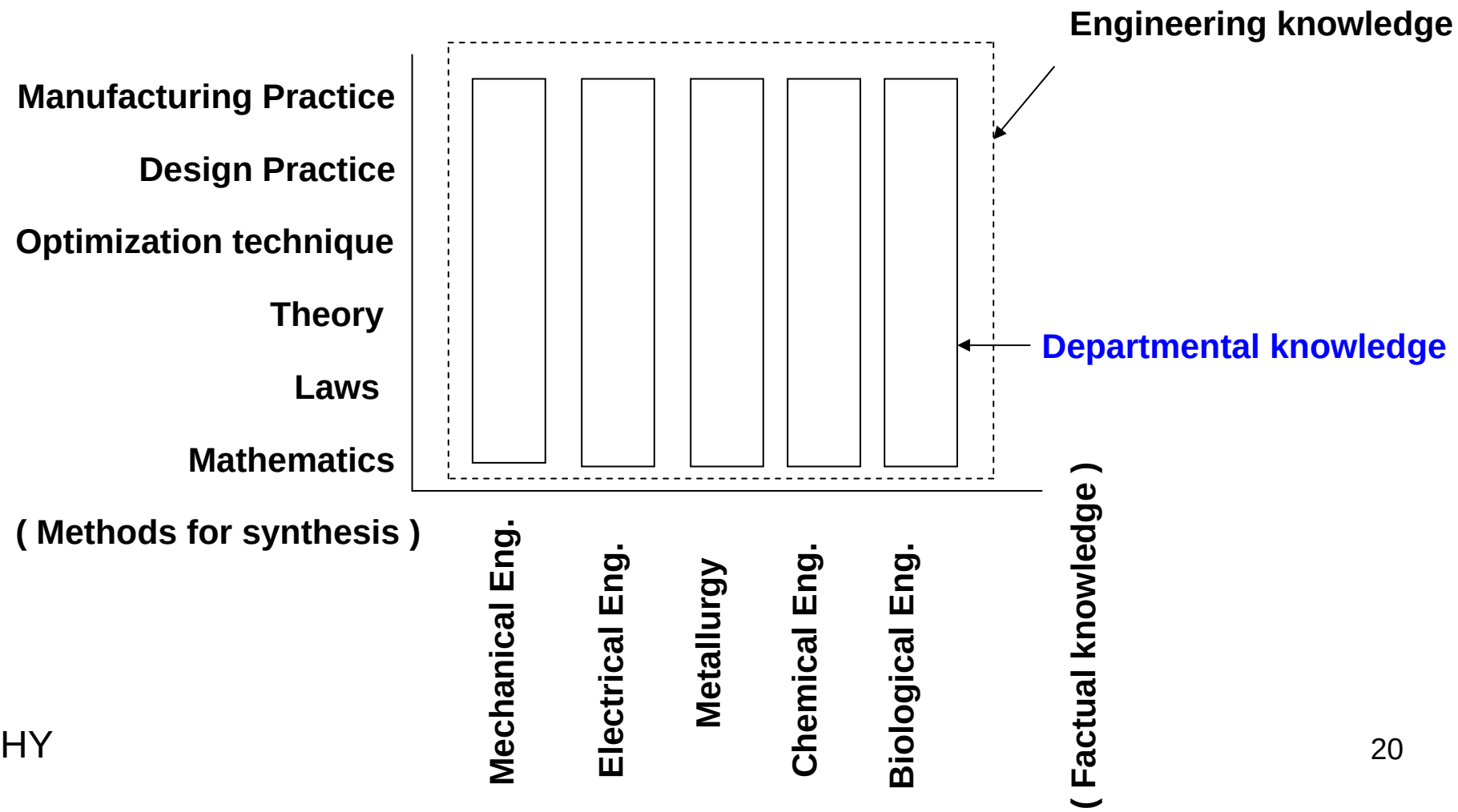
(4) Synthesis-oriented Education in Engineering

Two cases of education for innovation at University and Research Institute will be shown. The case of University of Tokyo is based on general design theory, which is extracting the commonality from disciplines of diversified conventional engineering departments. The case of AIST is education for post doctoral fellows, which offers opportunity of type-2 research.

(4) Synthesis-oriented Education in Engineering

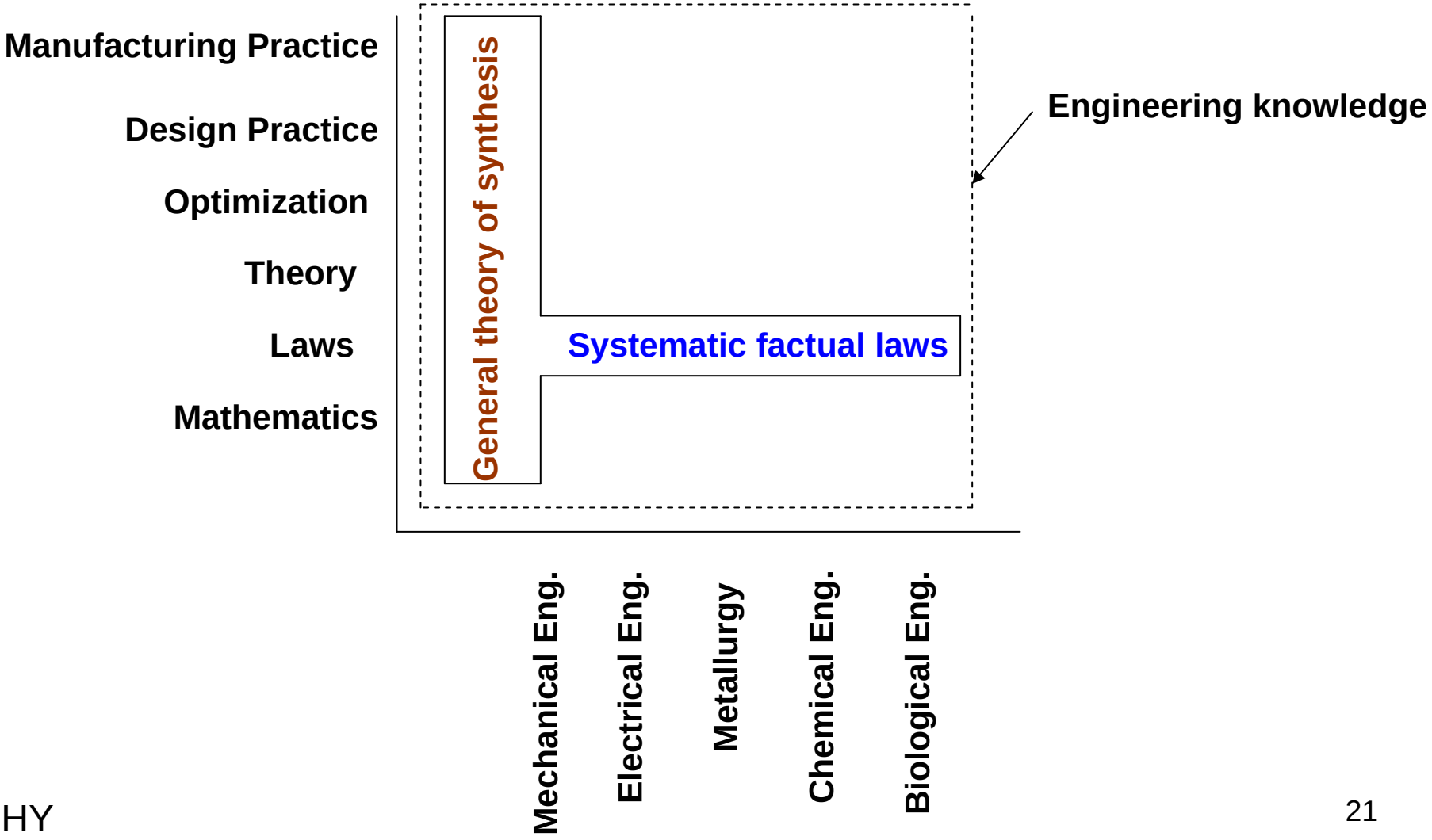
Traditional Departmental Curricula

which educate disciplinary specialists



An Inverted Curriculum

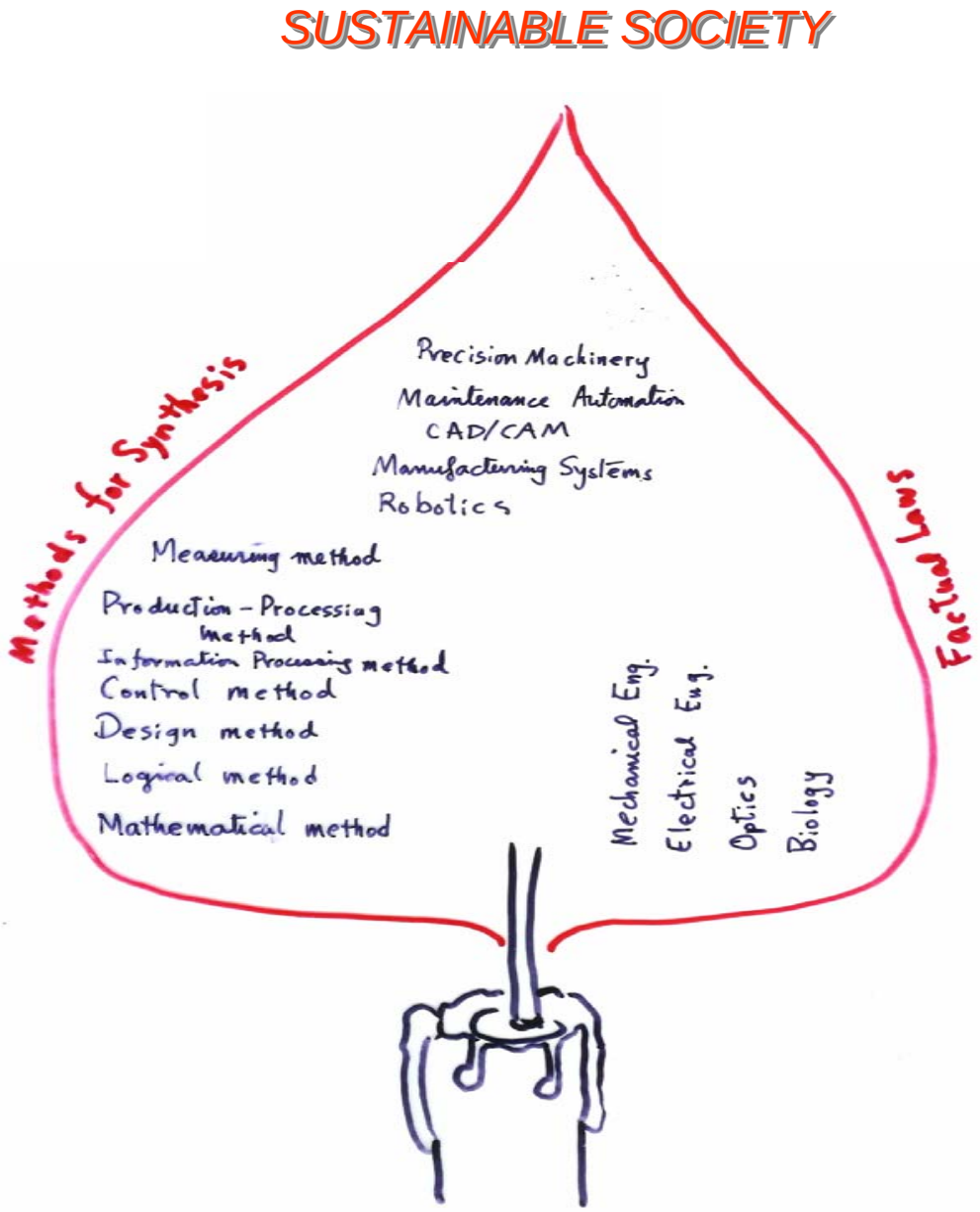
education for sustainable development (ESD of UNESCO)



A curriculum named "Flames"

炎のカリキュラム

(Factual Laws and Methods of Synthesis)



Actually practiced at the Precision Engineering Department, University of Tokyo for 1975 -1994.

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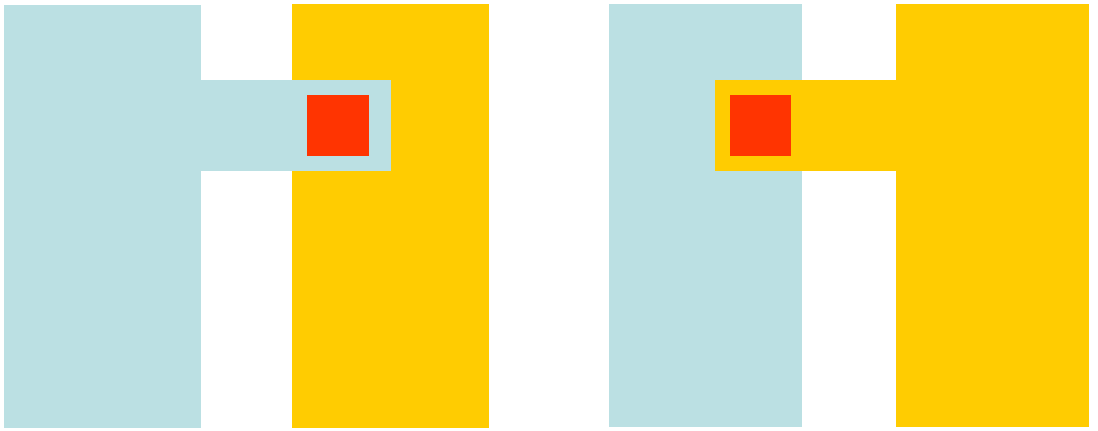
(5) Entrepreneurship

In Japan, social and economical condition for young people to challenge for entrepreneur is not good. We are now developing it in the system of education and university-industry cooperation.

Development of Types of University-Industry Cooperation

Two dimensional cooperation

Three dimensional cooperation



Type-A Univ. in Company **Type-B Company in Univ.**

Researchers from university and company live and work together within a laboratory.

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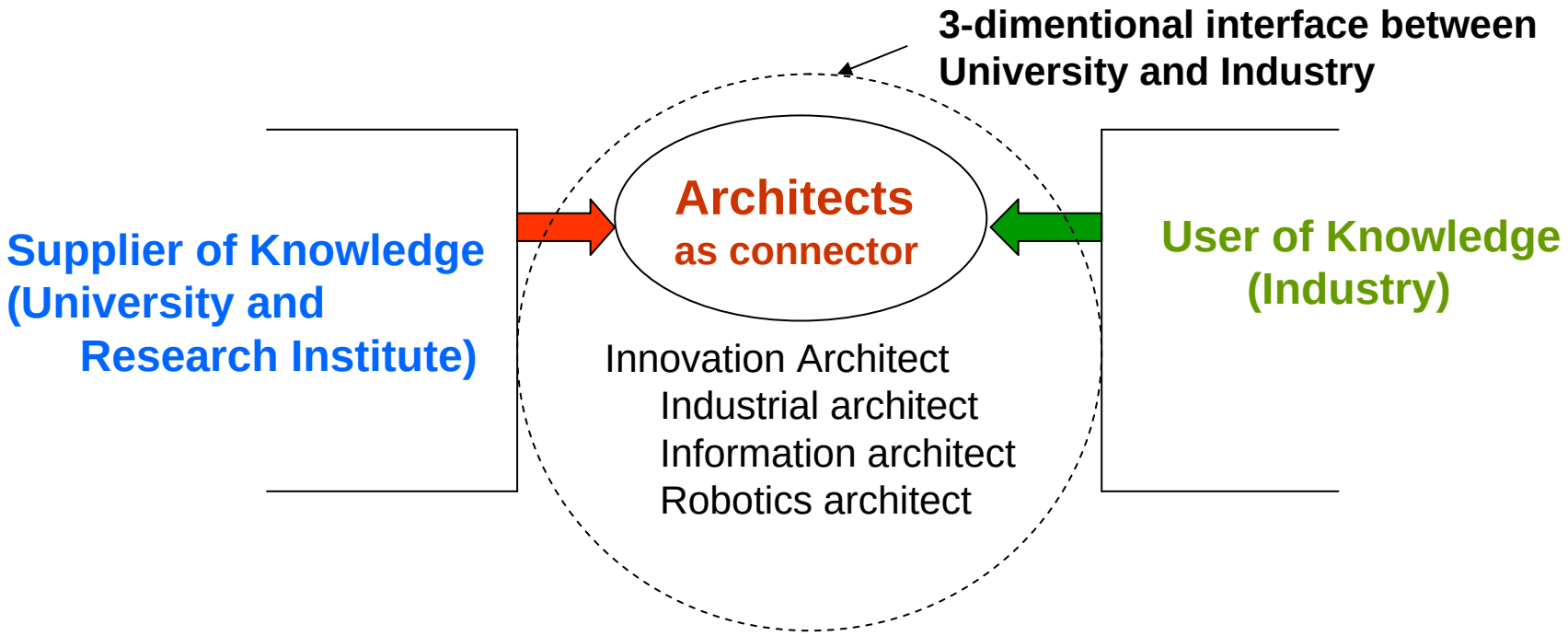
Architects in 3-dimensional Interface between University and Industry



Architects know both research frontiers and user's demands (like building architects).
Architects are either employed by or independent of research institutes.
Architects who are matured may run their own companies.
Architects are educated in the 3-dimensional interface.

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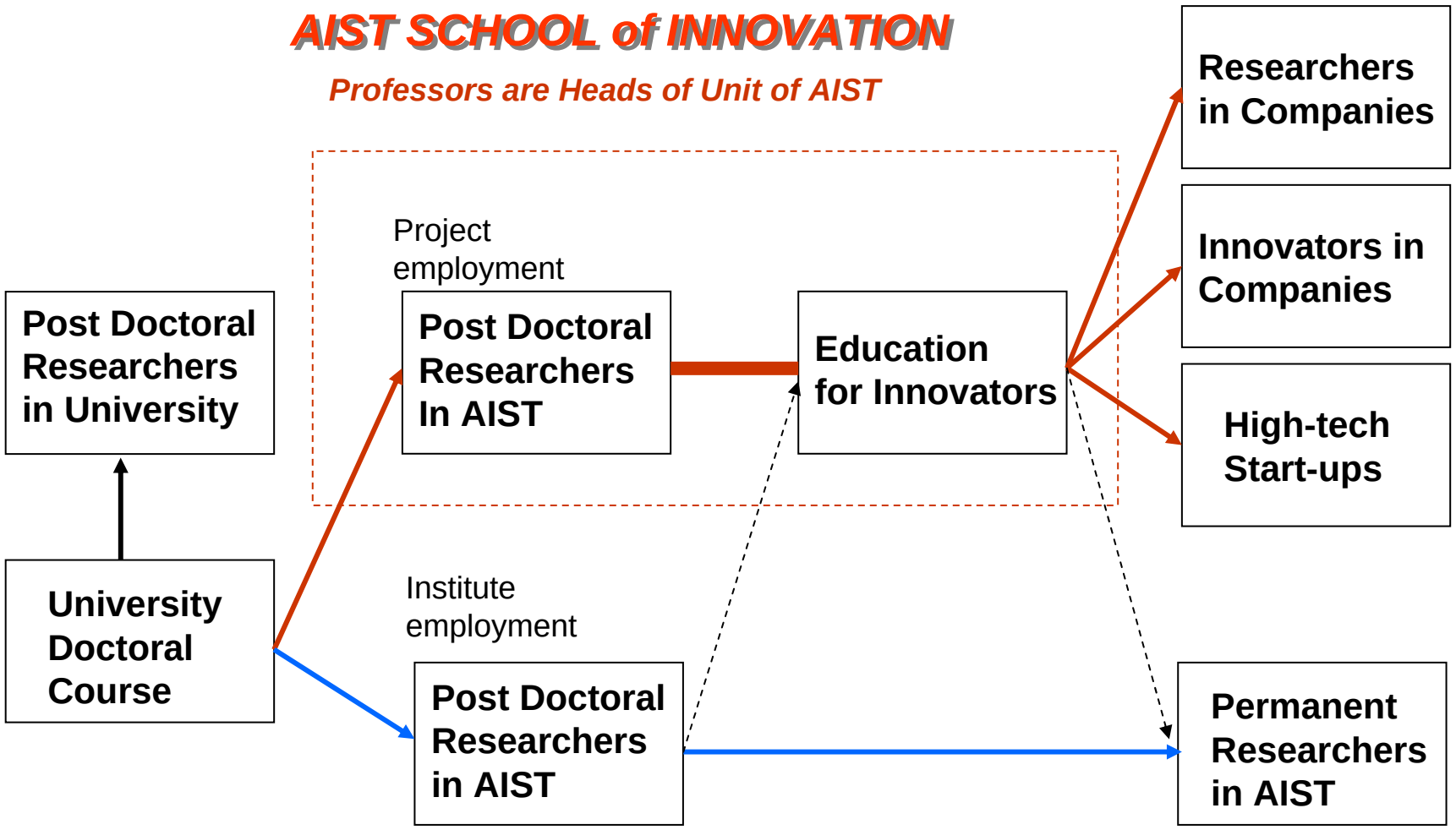
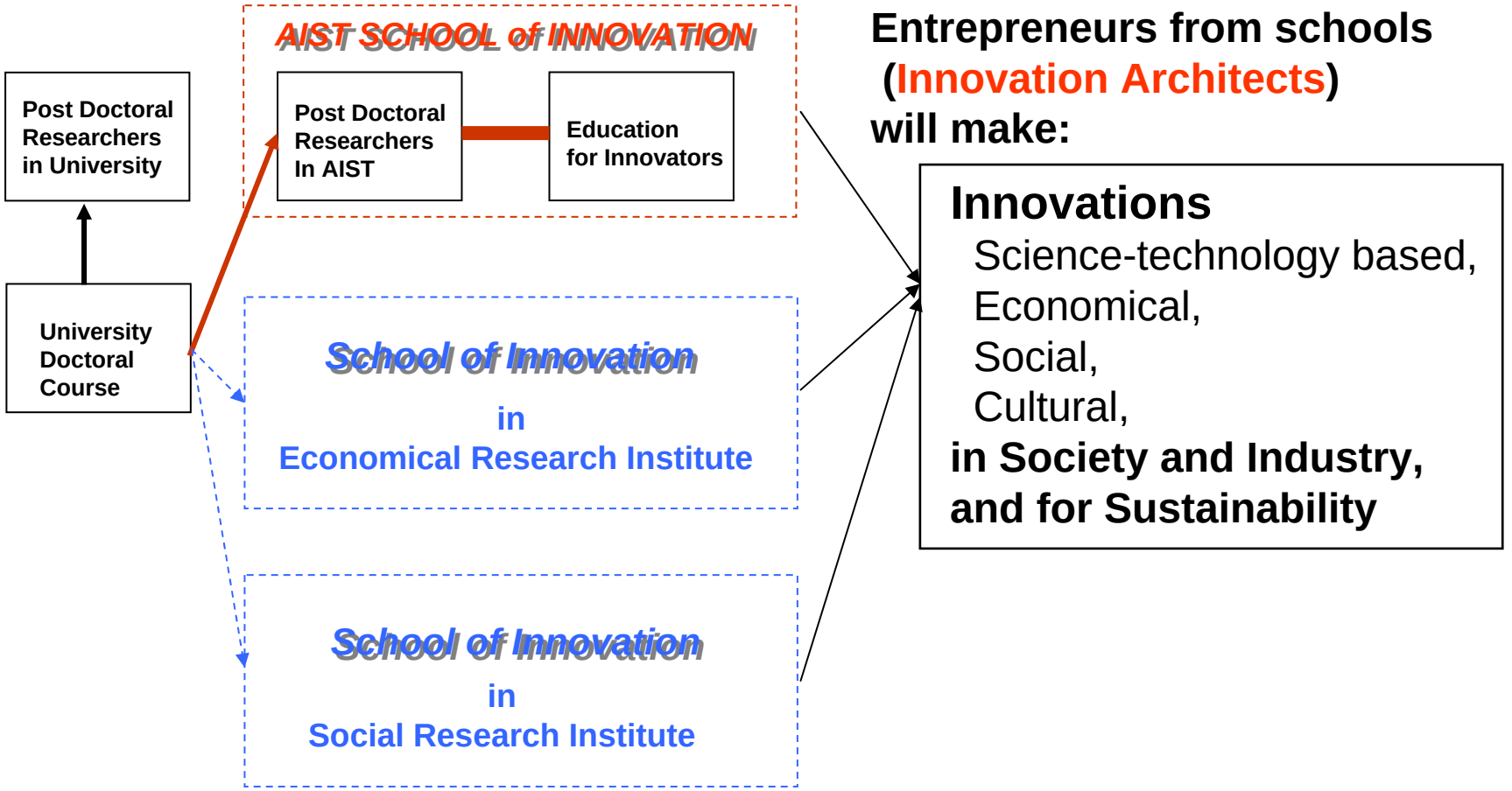
Education for Innovators in AIST



Schools for Innovative Entrepreneurs



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