

The Knowledge Management & Technology Transfer

*benefits to society
from international scientific organizations*

Beatrice Bressan

Definitions

Outreach (*reach beyond*) is the act or process of reaching out which includes initiatives seeking to transfer knowledge and experience.

Technology Transfer is the process of transferring technologies, skills, or methods among institutions to ensure that scientific and technological developments are accessible to a wider range of users in order to be exploited into new products, applications, or services. It is considered a subset of:

Knowledge Transfer which starts with making science understandable to broad audiences and consequently is considered part of the outreach process.

In other terms

In the quest to find out what matter is made of and how its different components interact, high-energy physics needs very sophisticated instruments using technologies that often exceed the available industrial know-how.

Nobody would ever have thought that the quantum entanglement would find practical applications in the fields of cryptography and computing leading to the creation of new companies to secure information sharing.

Thanks to the technologies developed for the purpose of fundamental research activities, scientific laboratories have produced improvements in many other fields (cross-fertilization) and, in doing so, have benefitted **society**.



Knowledge transfer

Knowledge transfer is the last step of a knowledge process

From

The *knowledge creation*:
the individual learning process

to

the *knowledge acquisition*:
in a specific context: i.e. an organization

for

the *acquired knowledge*:
the transfer from the context to society.

Two case studies: from individual to organization

*The social benefits generated by the research and development at CERN (LEP)
Knowledge and technology management in the 5 LHC experiments (LHC)*

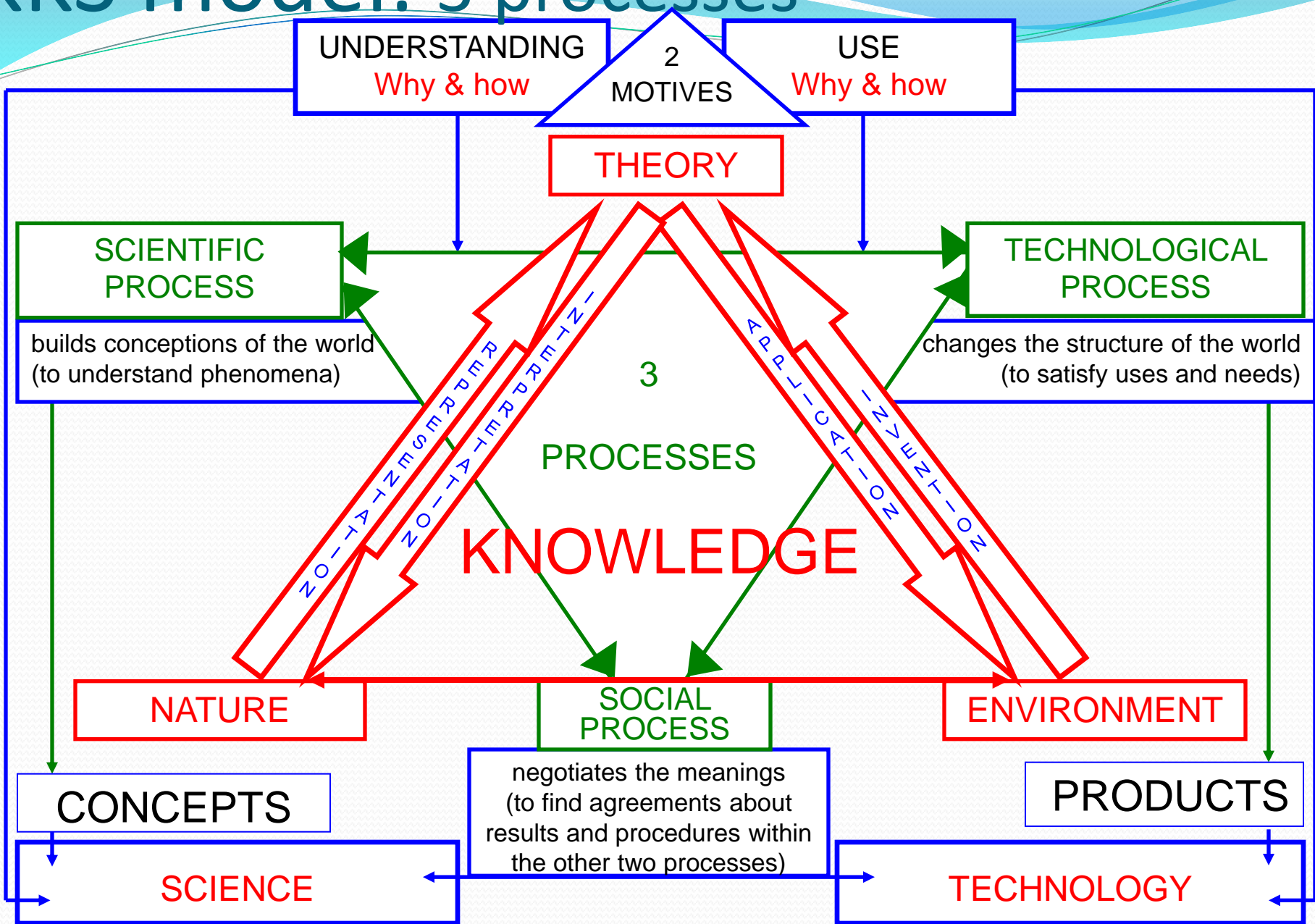
Objectives

- 1: What is CERN educational impact; what are the competitive core skills developed by people for the market value of Members States' industries?
- 2: How does exposure of people to CERN enhance their cultural and social dimension, and how does society benefit from this exposure?

Theoretical background

- 1: K. Kurki Suonio's model (KKS): KM in the individual learning process (**teaching in schools** - educational purpose)
- 2: I. Nonaka's model (IN): KM in a business organization (**innovation in industry** - productive purpose)

KKS model: 3 processes



IN model: 4 modes

SOCIALIZATION

The process of sharing experiences and thereby creating *tacit knowledge*.

Sympathized knowledge

EXTERNALIZATION

The process of articulating tacit knowledge into explicit concepts.

Conceptual knowledge

INTERNALIZATION

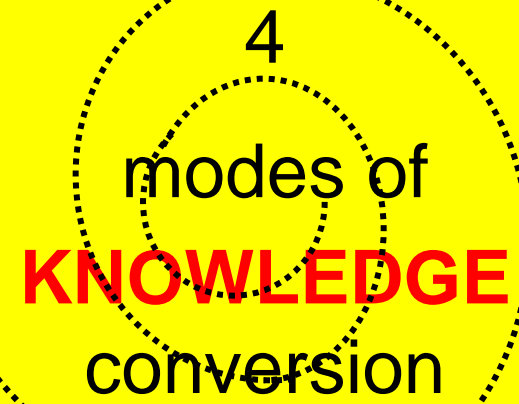
The process of incorporating tacit knowledge and verbalizing it as *explicit knowledge*.

Operational knowledge

COMBINATION

The process of systematizing explicit concepts into a knowledge system.

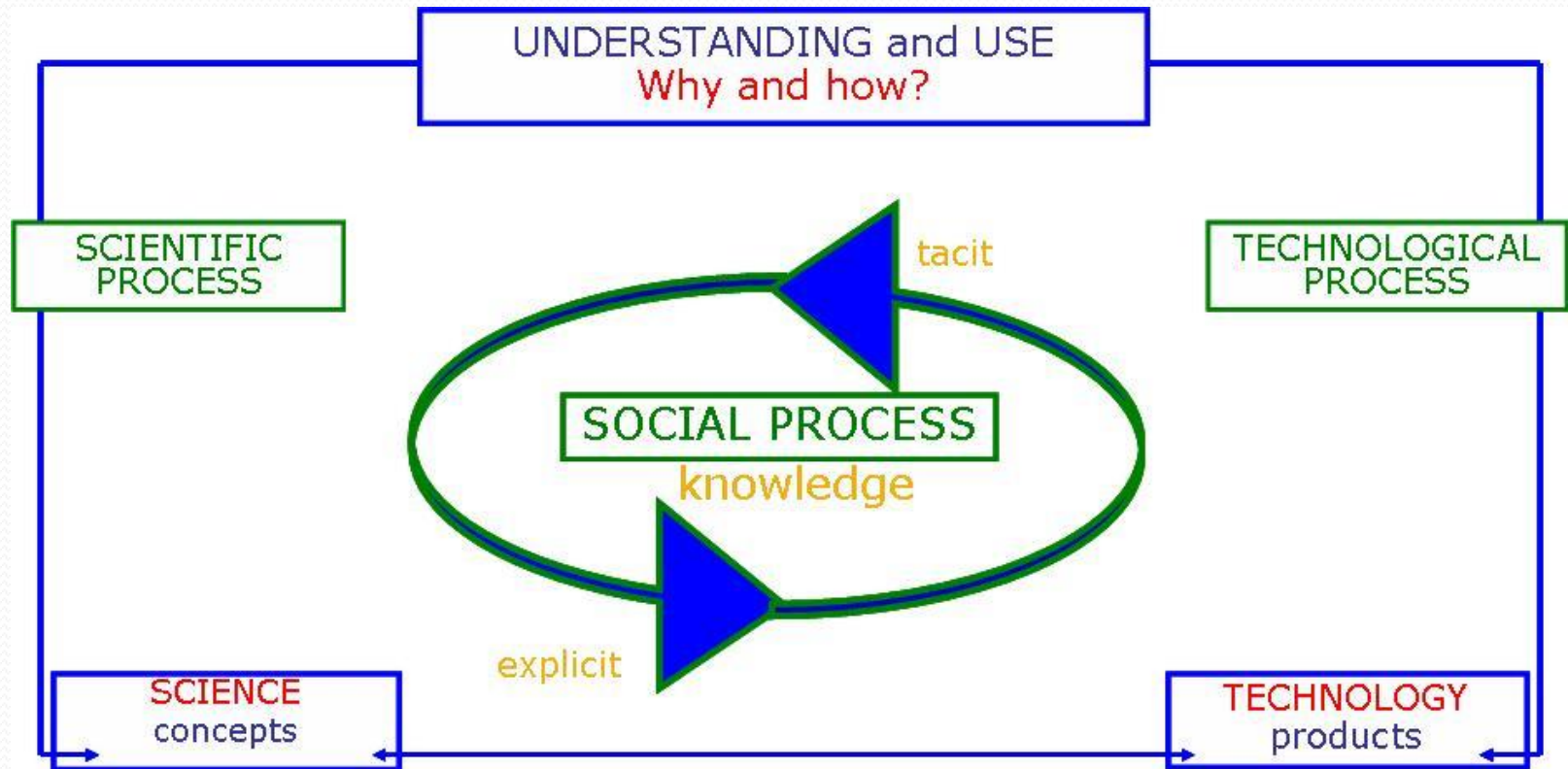
Systemic knowledge



Knowledge management model simplified

The two models are merged:

IN represents the description of the structure of the social process in the **KKS**



Knowledge creation and management in the five LHC experiments at CERN: implications for technology innovation and transfer, B. Bressan, K. Kurki-Suonio, J. Lavonen, M. Nordberg, H. Saarikko, M. Streit-Bianchi, CERN, 2008.

Some results (I)

Useful domains for future career

Domain of learning	Percentage %
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Management	30
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Physics	6
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Detector	4
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technology	
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Electronics	4
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Entrepreneurial behaviour

Career development	Percentage %
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Continue in university	72
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Work for a company	19
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Start a company	6
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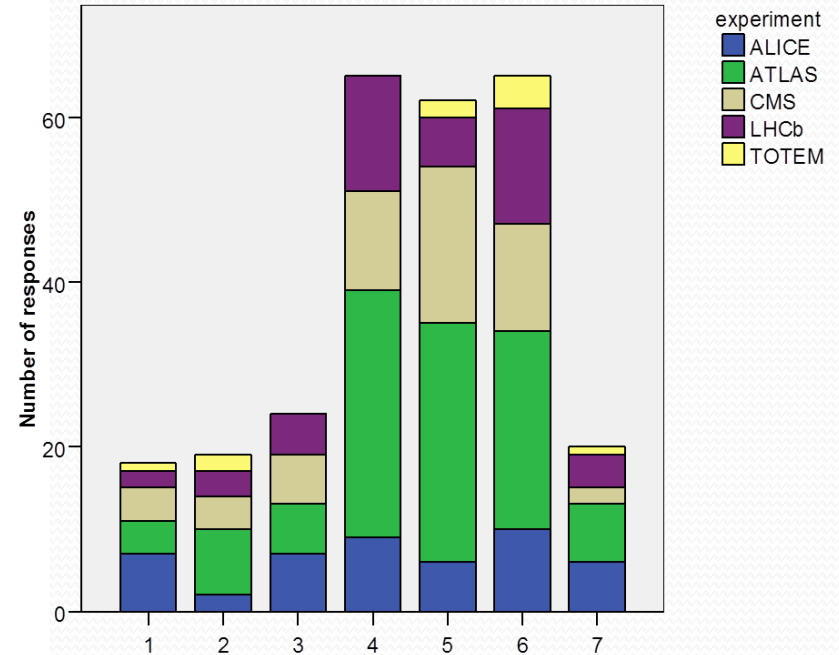
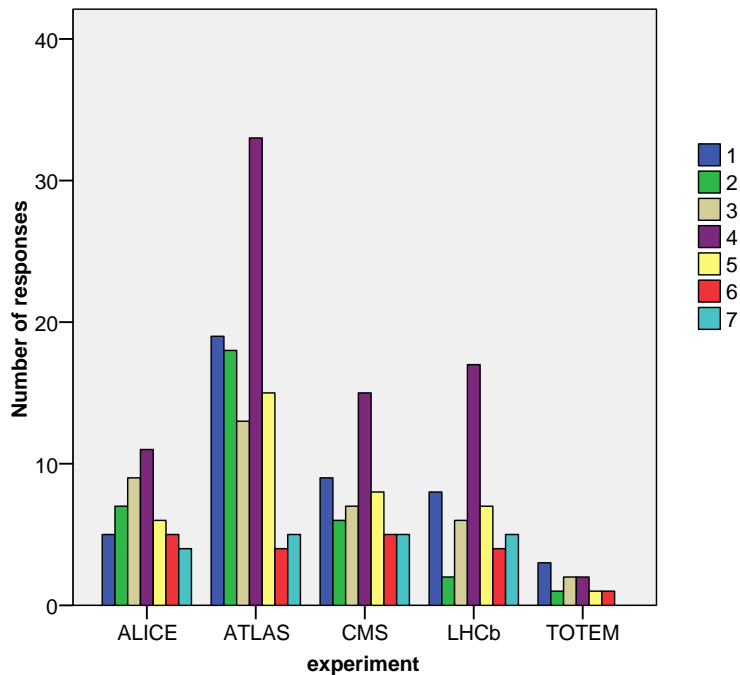
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Some results (II)

Increased opportunity to find a job in companies

Researchers and industry: mutual learning



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Social process & knowledge transfer

Knowledge transfer plays a mediating role between:

Social Capital constructs

Competitive Advantage outcomes

social interaction

relationship quality

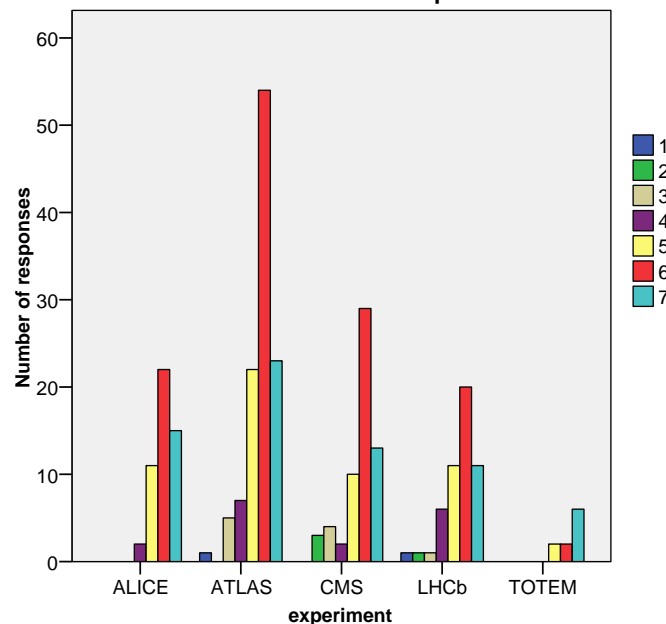
network ties

invention development

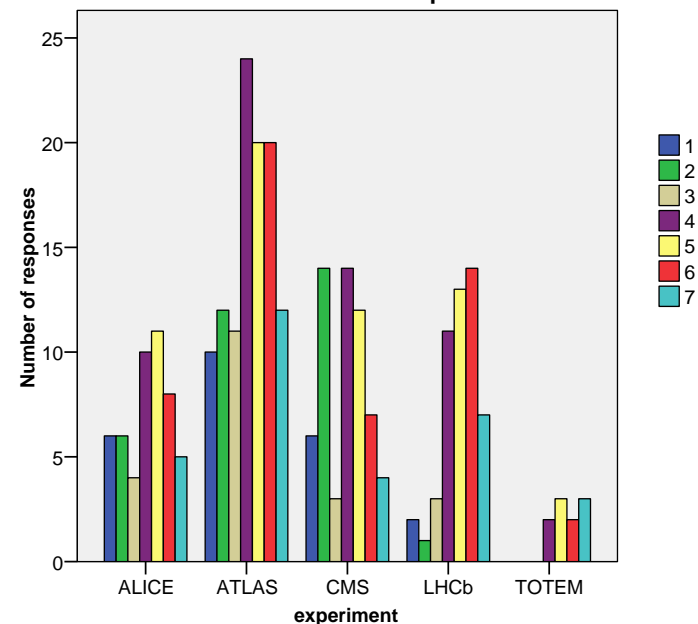
technological distinctiveness

this is contributing to innovation to industry and benefits to society.

Within each LHC experiment



Between the LHC experiments



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Conclusions

3 **Characteristics of the social process** encouraging the advancement of the scientific and technological processes to generate innovation:

1. Acquisition of diversified knowledge,
2. Development of new interests thanks to interaction,
3. Acquired knowledge into practice.

3 **Types of direct benefitting to society** from research:

1. Entirely new fields of applied technology may be created entirely (*Touch-screen*),
2. The pioneering technology created may solve technical or social problems (*World Wide Web*),
3. Acquired knowledge may be applied in other domains (*Medical Applications*).

Target audience

