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moving ideas

Beyond incremental research: the science of creative thinking

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ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Fondazione Guglielmo Marconi

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A sound approach to scientific research

- Excellent knowledge of the state-of-the-art
- Very good knowledge of future trends
- Clearly identified research topics and goals
- Risk control and mitigation
- Tight time schedules
- Incremental results contributing to the evolution of the field
  - Easy to be accepted by the scientific and industrial communities
  - Impact in the short term
- In short: a tightly constrained exercise for 100% of the effort

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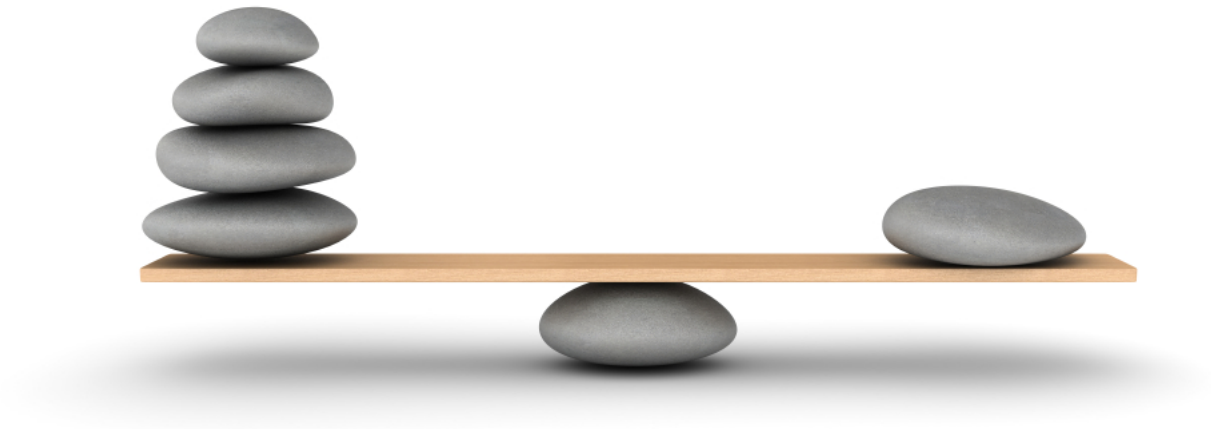
Maximizing efficiency

Any alternative balance?

- Exploration of innovative concepts

Short range 95-99%

Long range 1-5%



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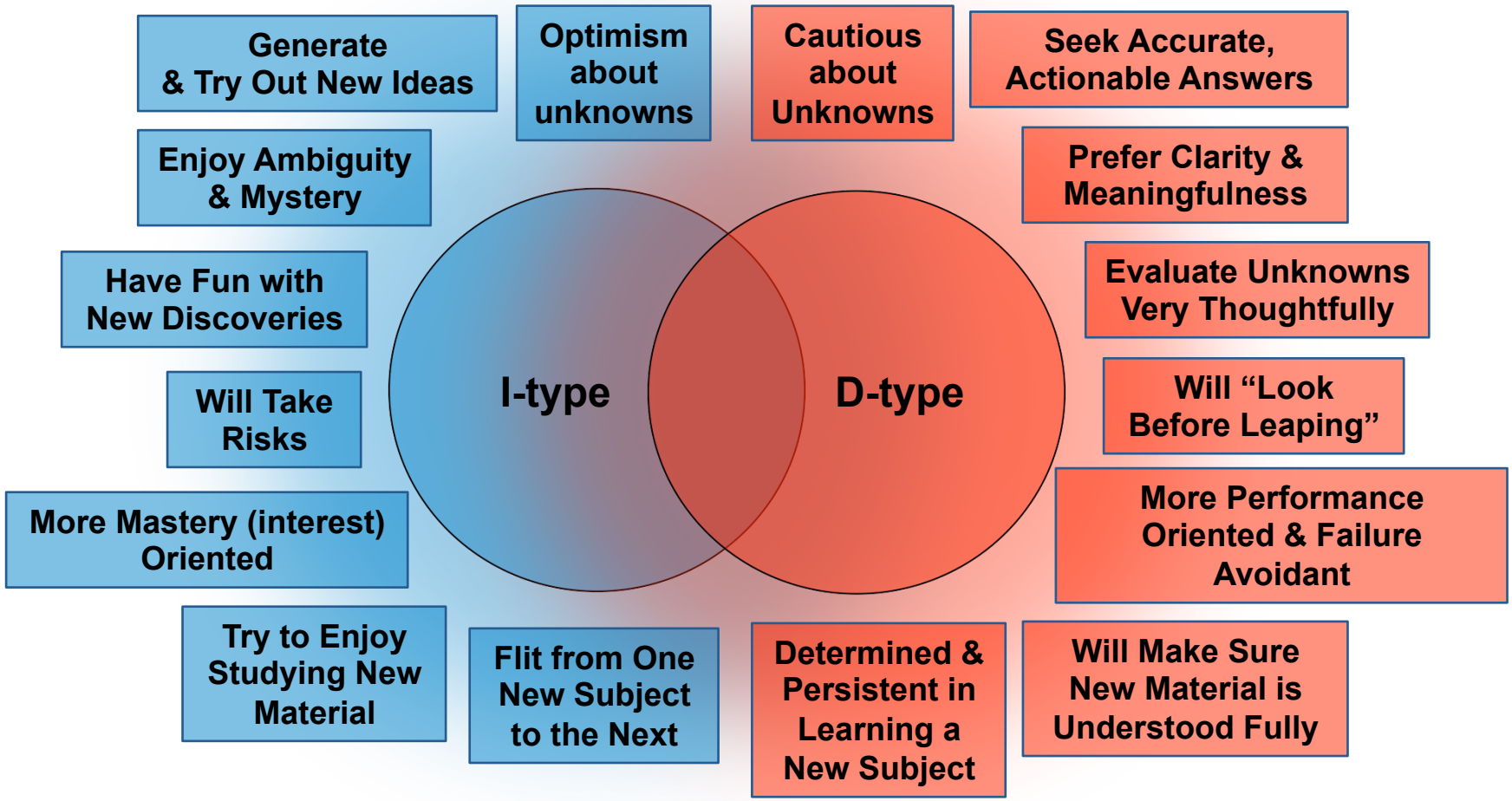
Interest vs. Deprivation



From J. Litman, "*Epistemic Curiosity: Its Role in Self-Directed Learning, Self-Regulation, Creativity and Problem Solving*" Learning and the Brain, 2016

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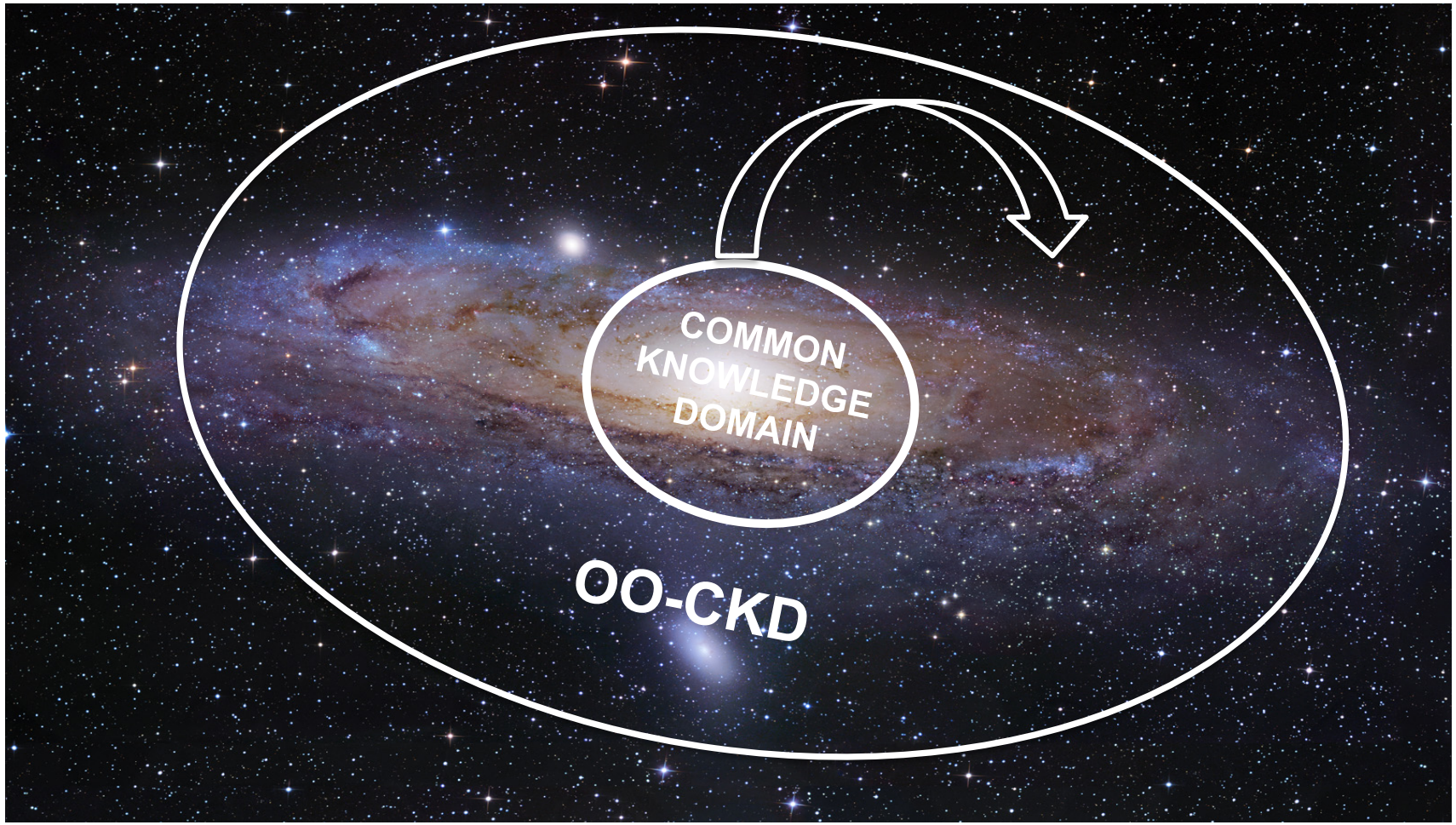
Orbiting OO-CKD



Exploring space Out Of the Common Knowledge Domain (OO-CKD) requires a creative thinking process!

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Evolving society and human skills

INDUSTRIAL SOCIETY

- STANDARDIZATION
- CONCENTRATION
  SYNCHRONIZATION

EDUCATIONxIND

- ROTE LEARNING
- SPECIALIZATION
- CREATIVITY FOR GENIUS

INFORMATION SOCIETY

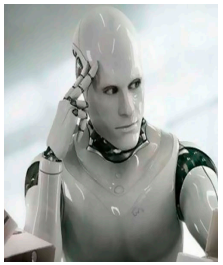
- PERSONALIZATION
- DISTRIBUTION
  S/T DESTRUCTURING

EDUCATIONxINFO

- FLEXIBILITY
- FILTERING
- CREATIVITY FOR DIGNITY

POST-INFORMATION SOCIETY

- HYPER-INTELLIGENCE
- HYPER-CONNECTIVITY



EDUCATIONxPOST-INFO

- A.I. CONTROL
- ENTREPRENEURSHIP
- CREATIVITY FOR SURVIVAL

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

Global Challenge Insight Report

The Future of Jobs

Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution

January 2016

The Economist 2015
Automated, creative & dispersed

The Economist Intelligence Unit

A report from the Economist Intelligence Unit.

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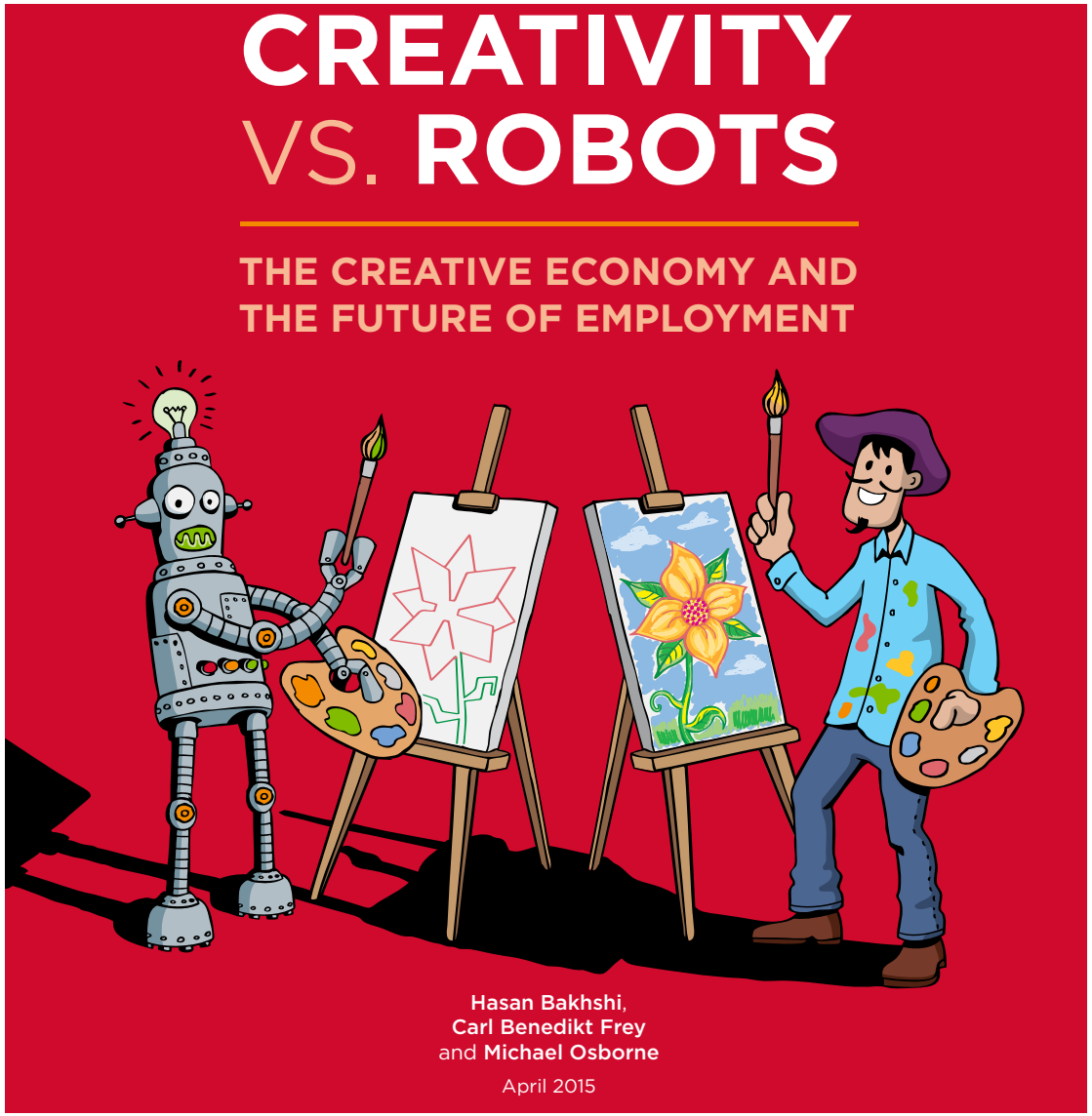
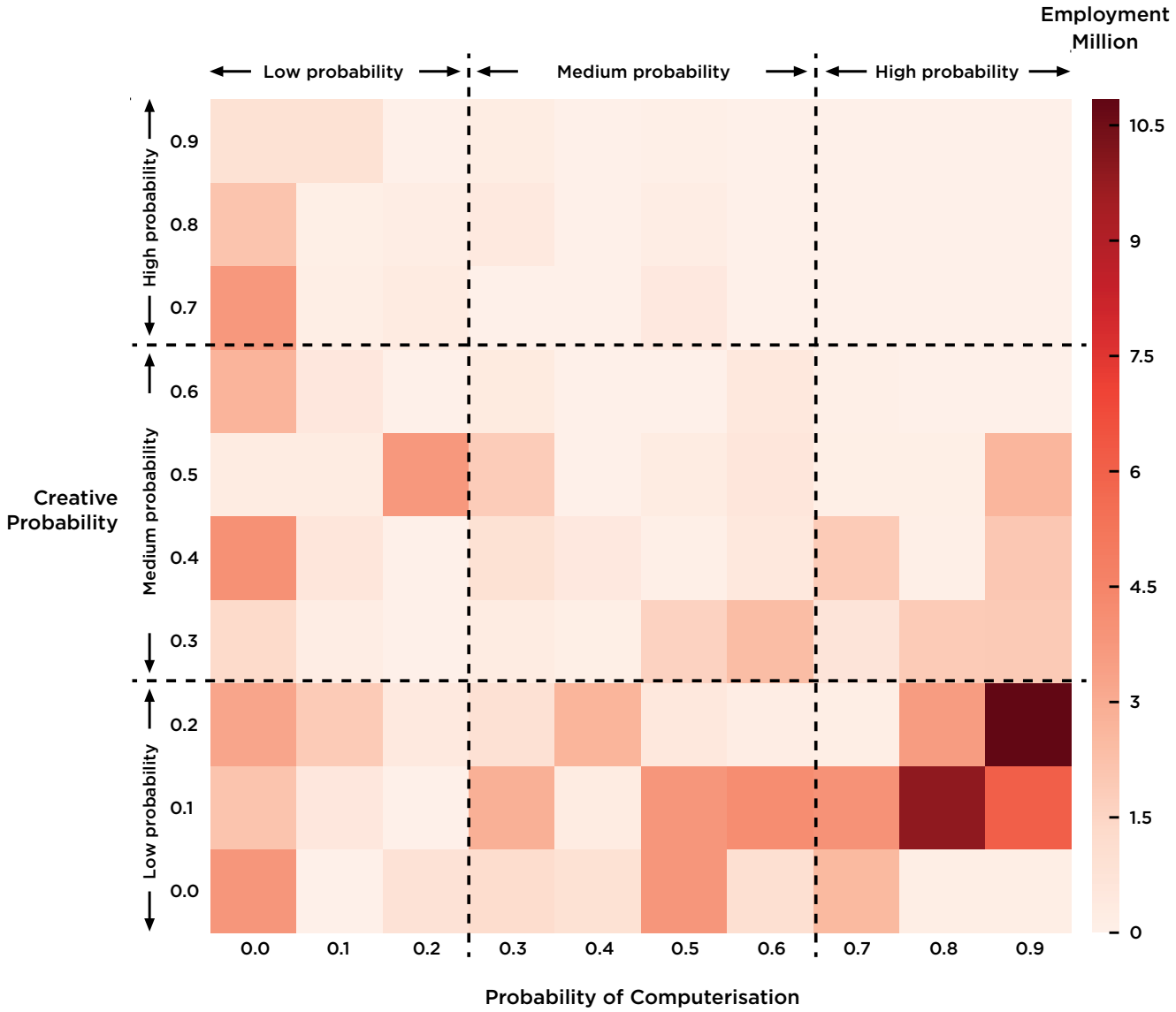
NESTA: Creativity vs. Robots
The future of employment (2015)



NESTA: Creativity vs. robots
Probability of computarisation (p. 16)

Figure 5 **Computerisable vs. Creative, US**



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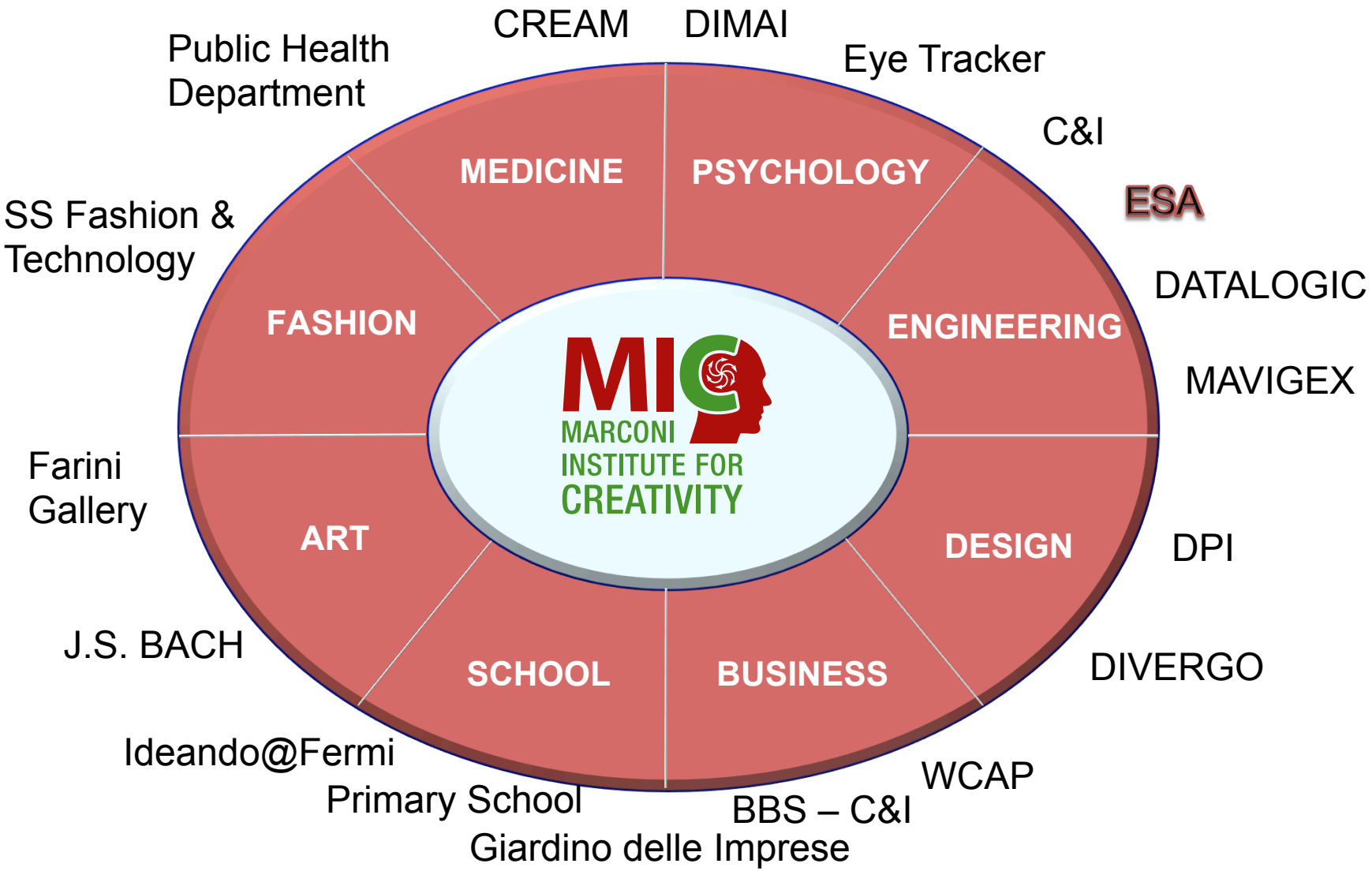
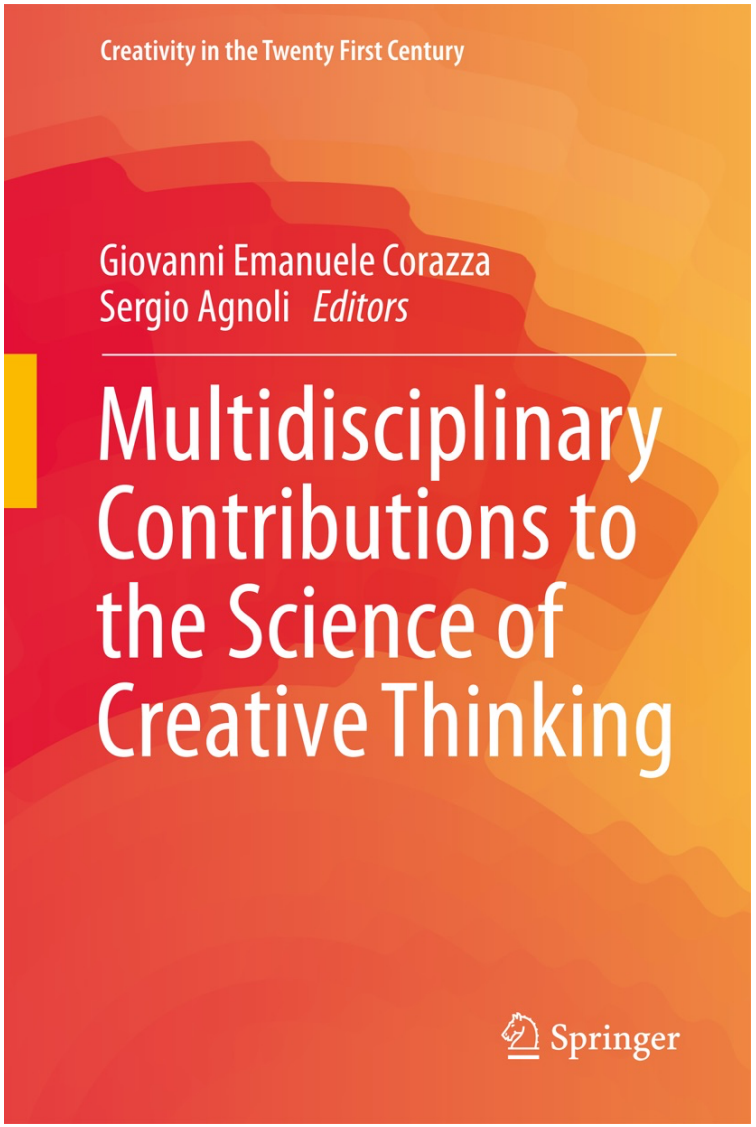
mic.fgm.it

Multidisciplinary activity



Multidisciplinary Contributions to the Science of Creative Thinking



Multidisciplinary Contributions to the Science of Creative Thinking – Bookmetrix Analysis

Downloads:

Aug 2015	236
Sep 2015	148
Oct 2015	194
Nov 2015	204
Dec 2015	1235
Jan 2016	9822

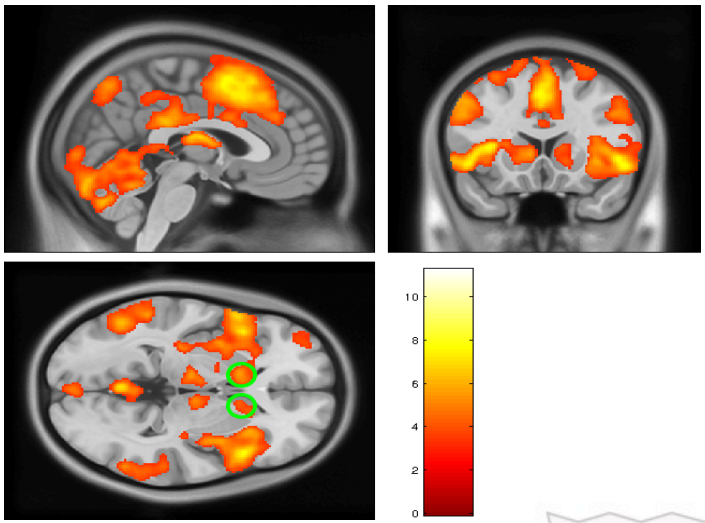
MIC recent references

- **Articles on International Journals:**
  - Corazza G.E. (in press). Potential originality and effectiveness: The dynamic definition of creativity, Creativity Research Journal.
  - Agnoli S., Franchin L., Rubaltelli E., & Corazza G.E. (2015). An Eye-Tracking Analysis of Irrelevance Processing as Moderator of Openness and Creative Performance, Creativity Research Journal, 27, 125-132.
  - Corazza G.E., Agnoli S., & Martello S. (2014). Counterpoint as a principle of creativity: Extracting divergent modifiers from 'The Art of Fugue' by Johann Sebastian Bach, Musica Docta, 4, 93-105.
- **Articles on International Conference Proceedings:**
  - Corazza G.E., & Agnoli S. (2015). On the impact of ICT over the creative process in humans, MCCSIS Conference 2015 Proceedings, Las Palmas De Gran Canaria.
  - Agnoli S., Corazza G.E., Runco M., & Bhattacharya J. (2014). Measuring Creativity through a Multi-sided Measurement Approach within Scientific and Artistic Domains, Proceedings of Torrance Center's First Annual International Creativity Collaborative (ICC), Athens, Georgia.
  - Agnoli S., & Corazza G.E. (2015). TRIZ as seen through the DIMAI creative thinking model, Procedia Engineering, 131, 807-815, Paris.
- **Books:**
  - Corazza G.E., & Agnoli S., Eds. (2015). Multidisciplinary Contributions to the Science of Creative Thinking. Singapore: Springer.
- **Book Chapters:**
  - Corazza G.E., & Agnoli S. (2015). On the Path Towards the Science of Creative Thinking. In G.E. Corazza and S. Agnoli (Eds.), Multidisciplinary Contributions to the Science of Creative Thinking(pp. 3-19). Singapore: Springer.
  - Corazza G.E., Agnoli S., & Martello S. (2015). Introducing Irrelevant Information in the Creative Process: the DIMAI model for Fashion Design. In Notebook on Culture, Fashion, and Society. Pearson - Bruno Mondadori. (in press)
  - Corazza G.E., Agnoli S., & Martello S. (2015). A Creativity and Innovation Course for Engineers. In Handbook of Research on Creative Problem-Solving Skill development in Higher Education. IGI Global (under review).
  - Corazza G.E. (2015). La scienza del pensiero creativo come acceleratore per l'innovazione industriale. In Culture del progetto e Industrie Culturali e Creative. (under review).
  - Corazza G.E., & Agnoli S. (2015). Il Marconi Institute for Creativity: Ricerca, formazione e consulenza per il territorio globale. In Culture del progetto e Industrie Culturali e Creative. (under review).
  - Corazza G.E., Agnoli S., (2015). The creative process in science and engineering. In T. Lubart (Ed.), The Creative Process: Perspectives from multiple domains. Palgrave Macmillan (under review).

Education/Training

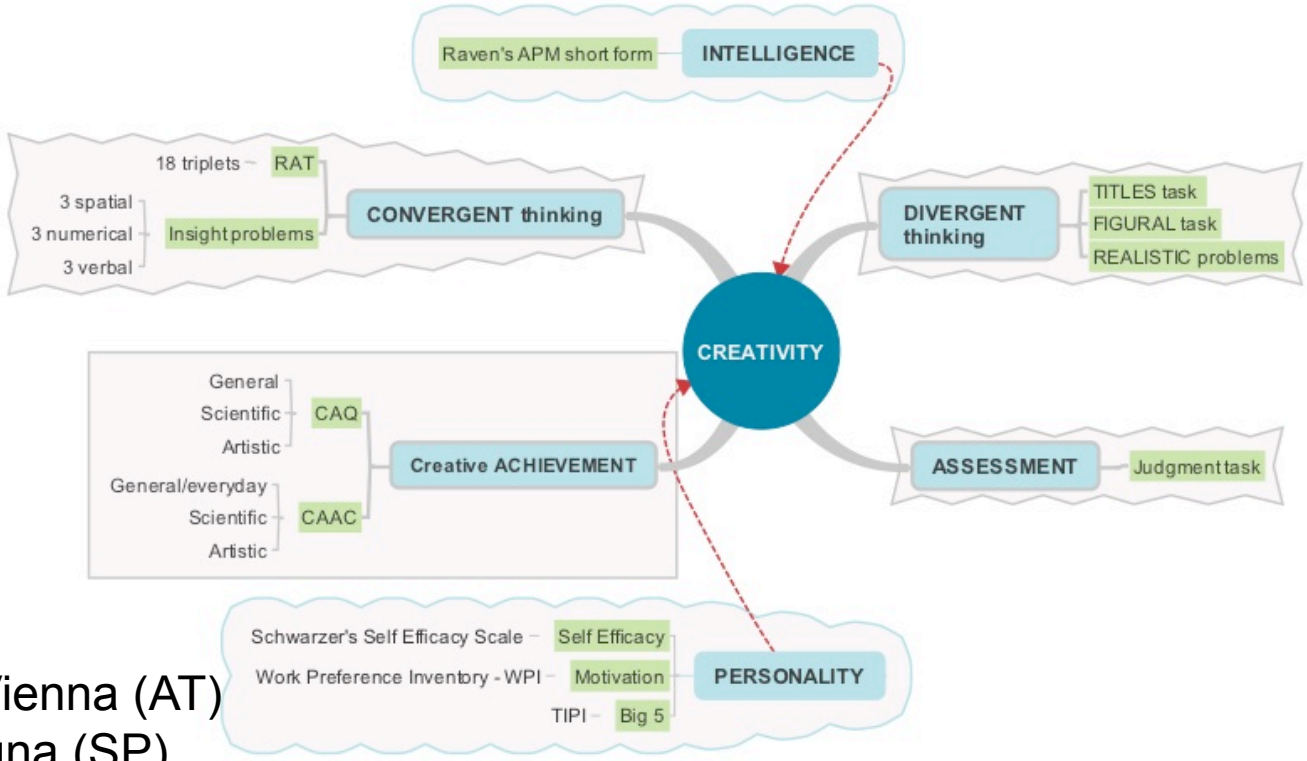
- Scienza e Applicazioni del Pensiero Creativo (4 CFU)
  - Laurea in Design del Prodotto Industriale
- Creativity and Innovation (3 CFU)
  - Master Degree in Telecommunications Engineering
- Creativity and Innovation (Master)
  - Master EMTIM BBU - Executive Master in Technology and Innovation Management
- Short courses on “Scientific Approaches to Creativity for Professionals”
  - ESA: ESTEC/ESRIN
  - Industry
- Primary schools, secondary schools

The CREAM European Project



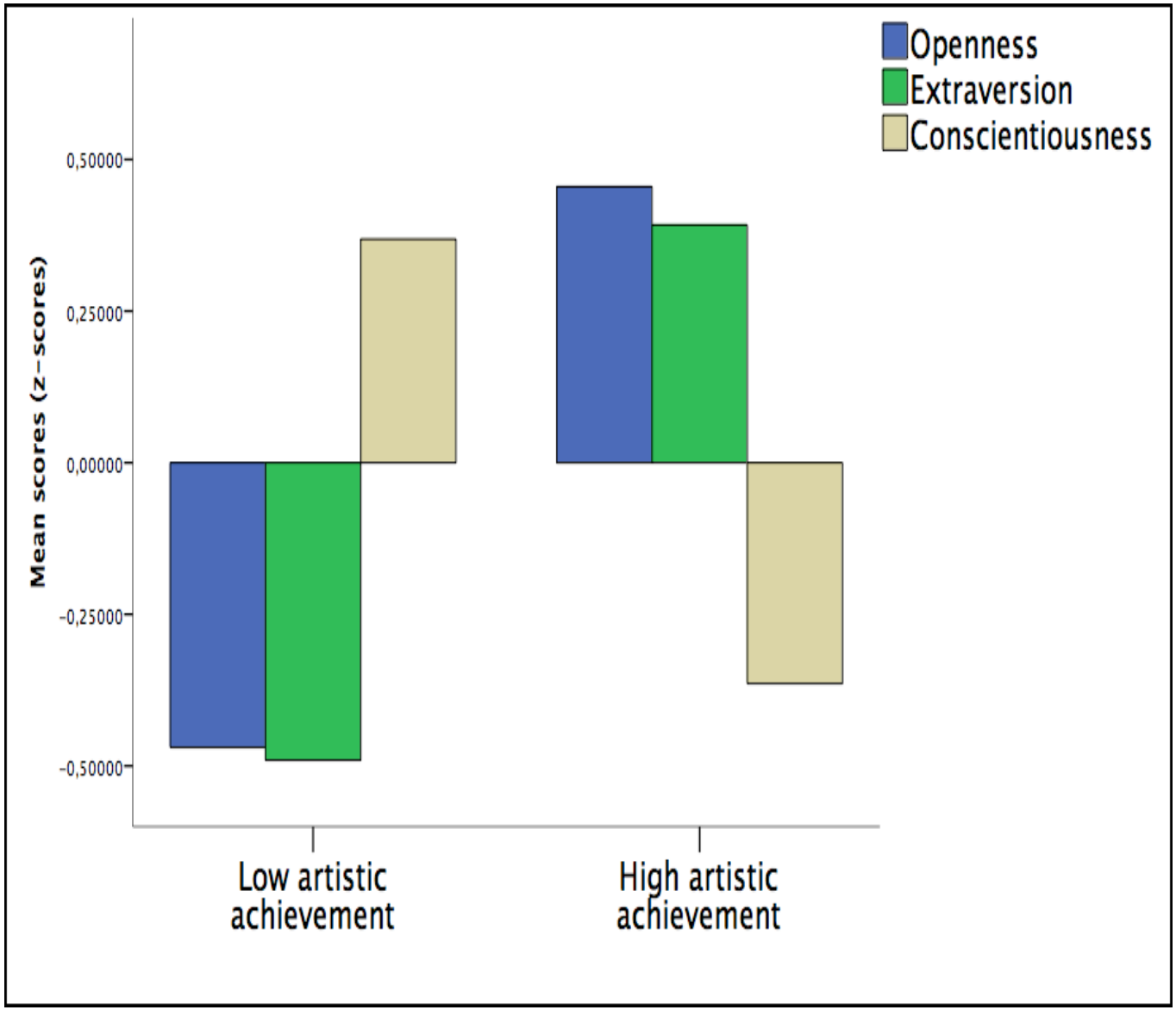
CREAM

CREATIVITY
ENHANCEMENT
THROUGH ADVANCED
BRAIN MAPPING
AND STIMULATION



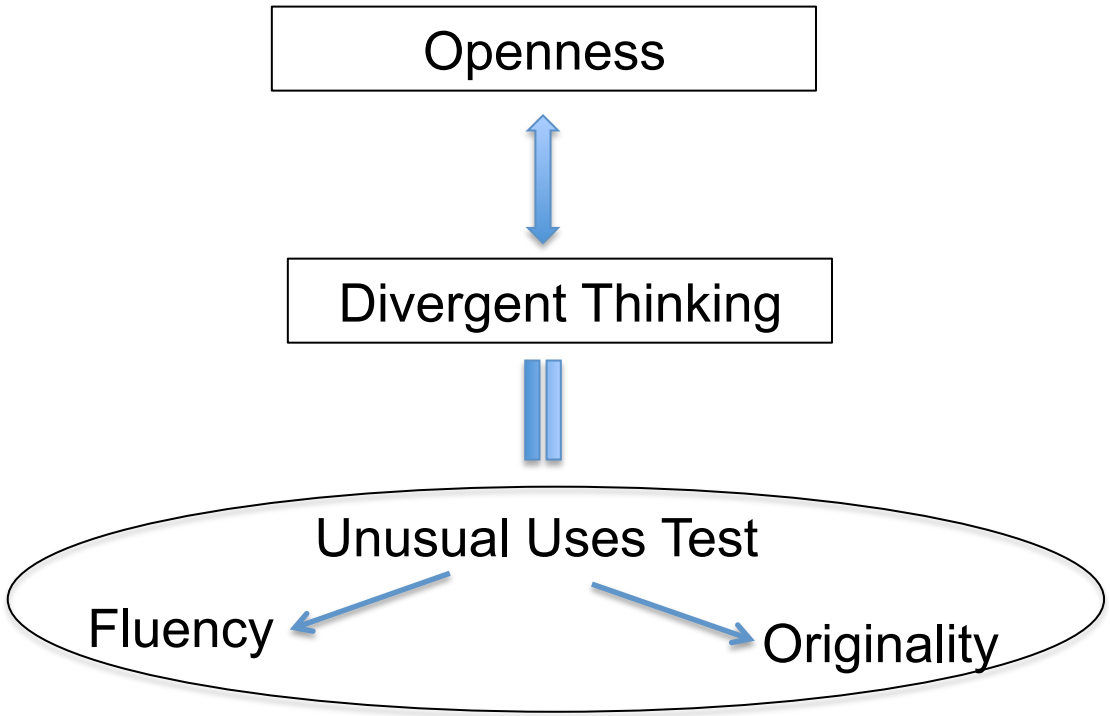
- University of Bologna
- FGM/MIC
- Goldsmith (UK)
- Engine (UK)
- GTECH (AT)
- Medical University of Vienna (AT)
- Universidad de la Laguna (SP)

Creativity profiling



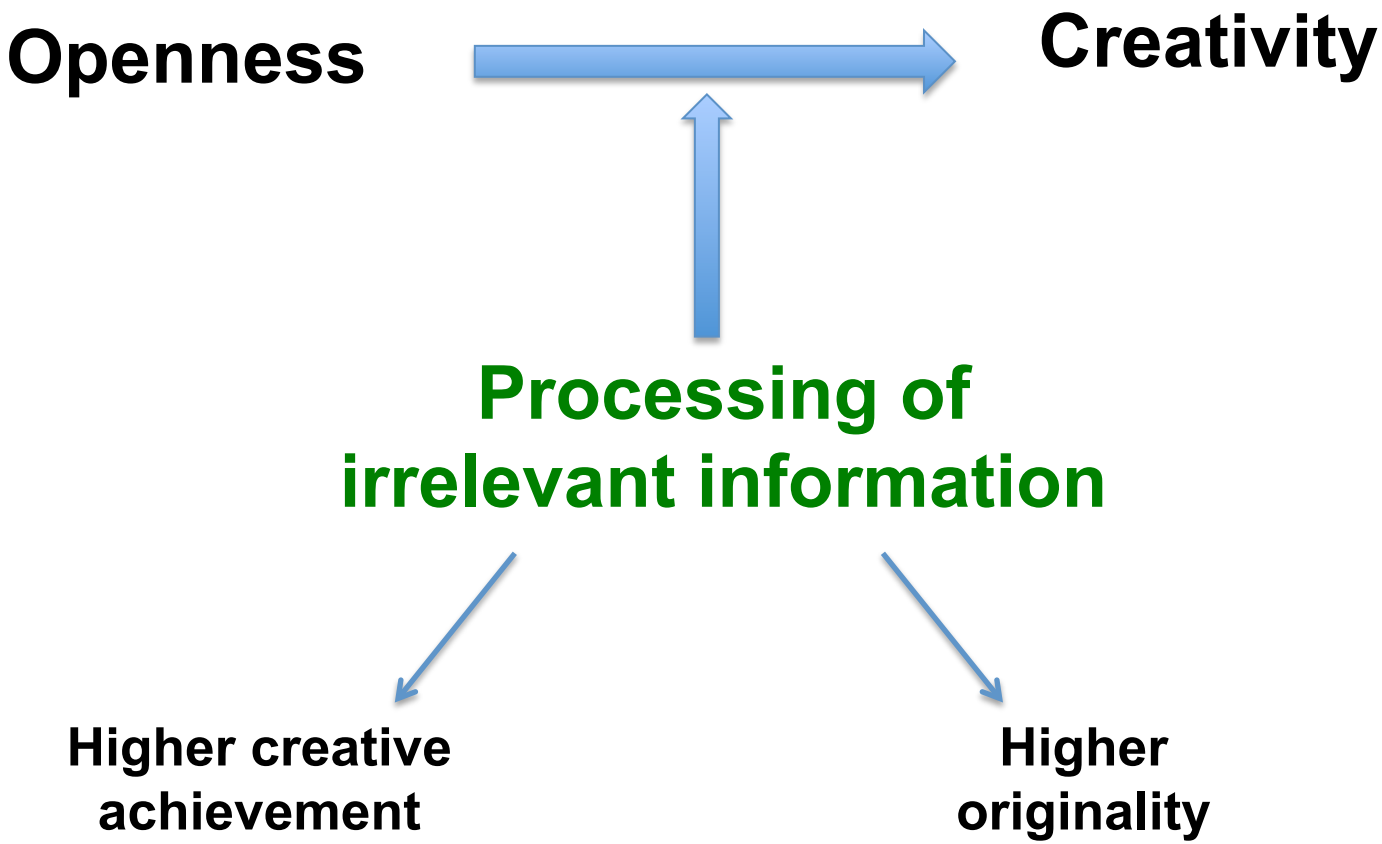
- **Openness:** intellectual curiosity, preference for novelty and variety over routine
- **Extraversion:** breadth of activities, surgency from external situations, energy creation from external means and interacting with people
- **Conscientiousness:** self-discipline, high control and regulation of impulses; preference for planned over spontaneous behaviour

MIC Study: Openness and Divergent Thinking



Visual version of the Unusual Uses Test (Torrance, 1974)
AoI: Area of Interest

Moderation effect



Agnoli S., Franchin L., Rubaltelli E., & Corazza G.E. (2015). **An Eye-Tracking Analysis of Irrelevance Processing as Moderator of Openness and Creative Performance**, *Creativity Research Journal*, 27, 125-132.

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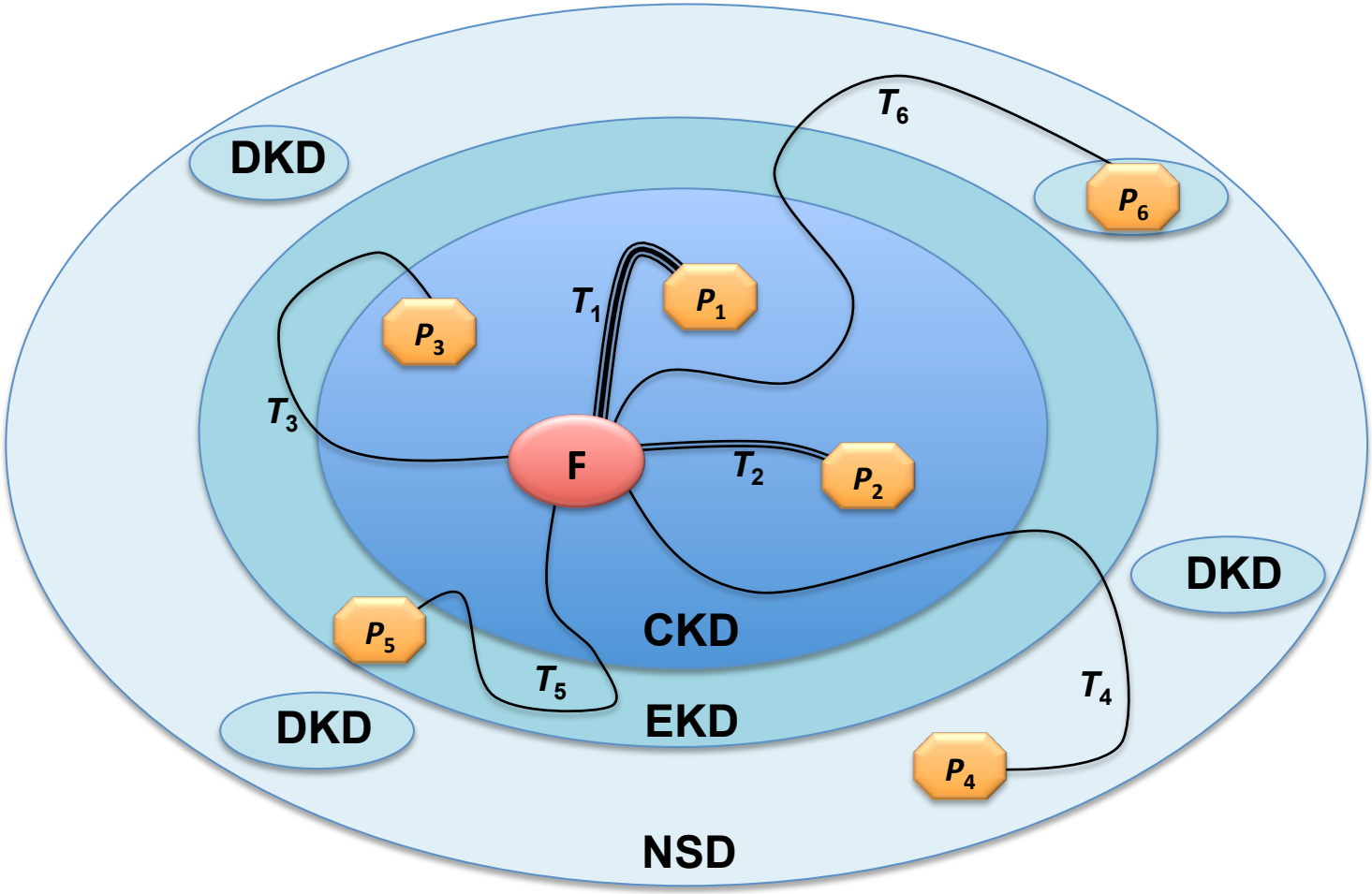
Multiple co-trajectories



- CKD: Common Knowledge Domain
- EKD: Evolutionary Knowledge Domain
- NSD: Non-Sense Domain
- DKD: Discontinuous Knowledge Domain

Dynamic Definition of Creativity

Creativity requires potential originality and effectiveness

- G.E. Corazza (2015). Potential originality and effectiveness: The dynamic definition of creativity. *Creativity Research Journal,* submitted.

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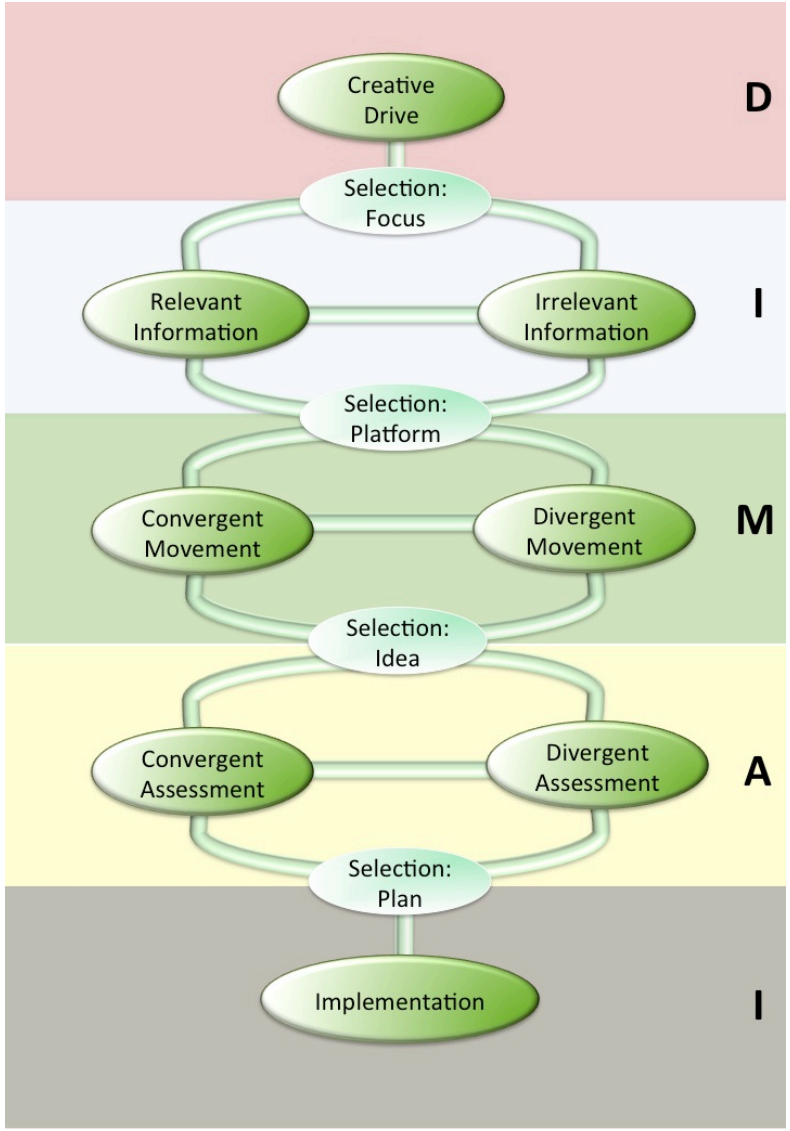
The scientific approach to creativity: the DIMAI model



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Driving your attention

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D: Drive

Expect the unexpected or you won't find it

I: Information

When there is no sun
we can see
the evening stars

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M: Movement

Solving mystery generates enigma

A: Assessment

Donkeys prefer garbage to gold

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I: Implementation

Ideas are worthless unless they pass into actions which rearrange the world

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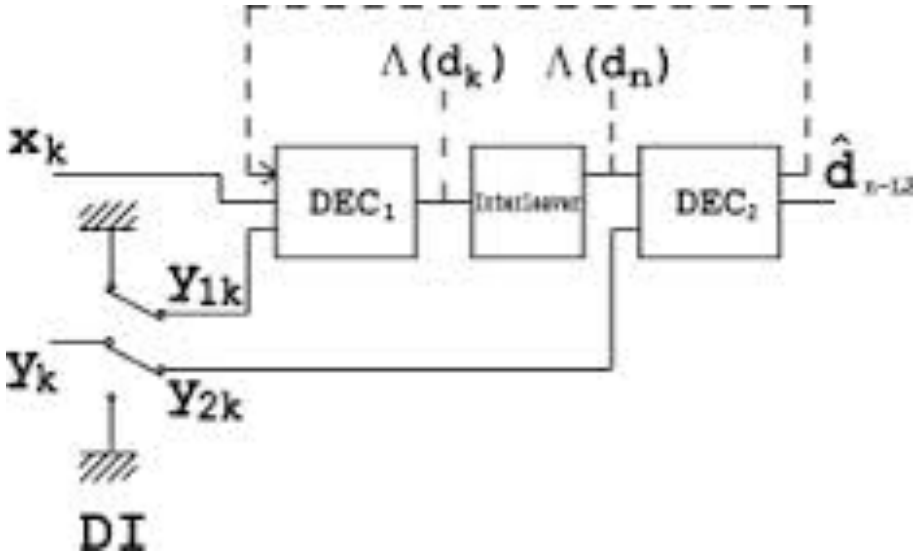
Claude Berrou

- Invention of the Turbo Decoder
- Metaphor
- Asymmetry



Creative cross-pollination

- Each person receives a numbered (X) sheet, and becomes a TX
- Write on the sheet
  - First and Last name, e-mail
  - Current preferred topic of scientific research
  - Principle underpinning topic
    - Law
    - Theorem
    - Physical property
    - Phenomena
    - …
- Exchange sheets with +10[mod_tot] rule:
  - Add 10 to your number, mod the total number of participants: find the RX of your sheet
- RX: write your topic and now imagine how the received principle can be used in your research

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Thank you for your attention!

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