Beyond incremental research: the science of creative thinking

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April 20, 2016
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
Maximizing efficiency
Any alternative balance?

- Exploration of innovative concepts

Short range 95-99%  Long range 1-5%
Exploring space Out Of the Common Knowledge Domain (OO-CKD) requires a creative thinking process!
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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

Automated, creative, & dispersed
The future of work in the 21st century
NESTA: Creativity vs. Robots
The future of employment (2015)

CREATIVITY VS. ROBOTS
THE CREATIVE ECONOMY AND THE FUTURE OF EMPLOYMENT

Hasan Bakhshi,
Carl Benedikt Frey
and Michael Osborne
April 2015
To further examine the characteristics of creative jobs, we plot the average median wage of occupations by their probability of being creative. We do the same for skill level, measured by the fraction of workers having obtained a bachelor's degree, or higher educational attainment, within each occupation.

Figures 6 and 7 reveal that while workers in creative occupations on average earn higher wages than individuals in the medium and low probability category, the relationship between the probability of an occupation being creative and the average income of people in such jobs has an inverse U–shape (look at the wages of occupations in the high creative probability segment). This relationship holds in both the United Kingdom and the United States, and reflects that some of the most obviously creative occupations, such as musicians, actors and artists, earn relatively low wages to occupations characterised by only high to average creativity – including IT specialist managers, barristers and judges, financial managers, and...
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
**Articles on International Journals:**

**Articles on International Conference Proceedings:**

**Books:**

**Book Chapters:**
• 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

- 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

Openness

Divergent Thinking

Unusual Uses Test

Fluency

Originality

Trait

Ability

Test

Performance

Visual version of the Unusual Uses Test (Torrance, 1974)
Aoi: Area of Interest
Openness \[\rightarrow\] Creativity

Processing of irrelevant information

Higher creative achievement \[\rightarrow\] Higher originality

- CKD: Common Knowledge Domain
- EKD: Evolutionary Knowledge Domain
- NSD: Non-Sense Domain
- DKD: Discontinuous Knowledge Domain
Creativity requires potential originality and effectiveness

The scientific approach to creativity: the DIMAI model
Expect the unexpected or you won’t find it
When there is no sun
we can see
the evening stars
Solving mystery generates enigma
Donkeys prefer garbage to gold
Ideas are worthless unless they pass into actions which rearrange the world
• 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 $+10[\text{mod}\_\text{tot}]$ 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
Thank you for your attention!