Opportunities and Challenges in the Digital Transformation of Higher Education in Finland

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University of Jyväskylä, Finland

Professor Pekka Neittaanmäki

Born in 1951, has had a distinguished career at the University of Jyväskylä, serving as a Professor of Scientific Computing from 1988 to 2022.

During this period, he also held the UNESCO Chair on Digital Platforms in Education and Healthcare from 2018 to 2022.

In recognition of his extensive expertise and contributions, since 2022, he has been appointed as a Senior Advisor at Lappeenranta University of Technology.

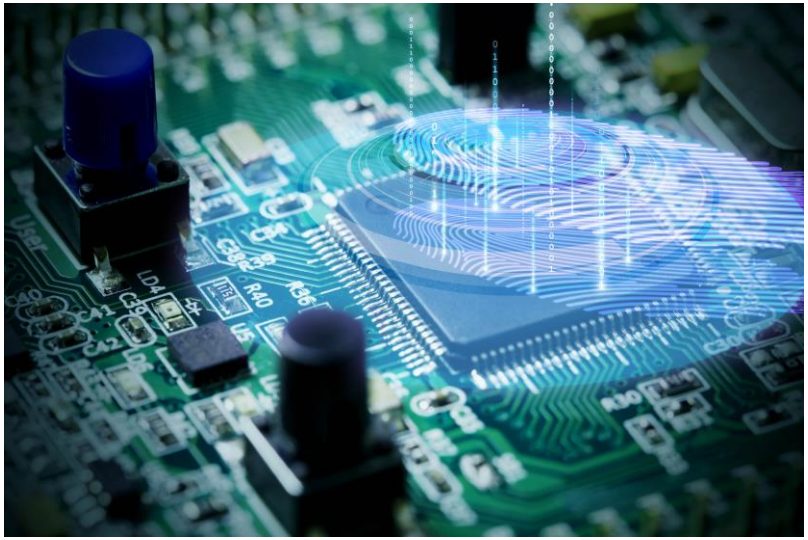
Over the course of his career, he has supervised an impressive number of 130 PhD students, showcasing his commitment to mentoring the next generation of scholars in his field.

United Nations
Educational, Scientific and
Cultural Organization

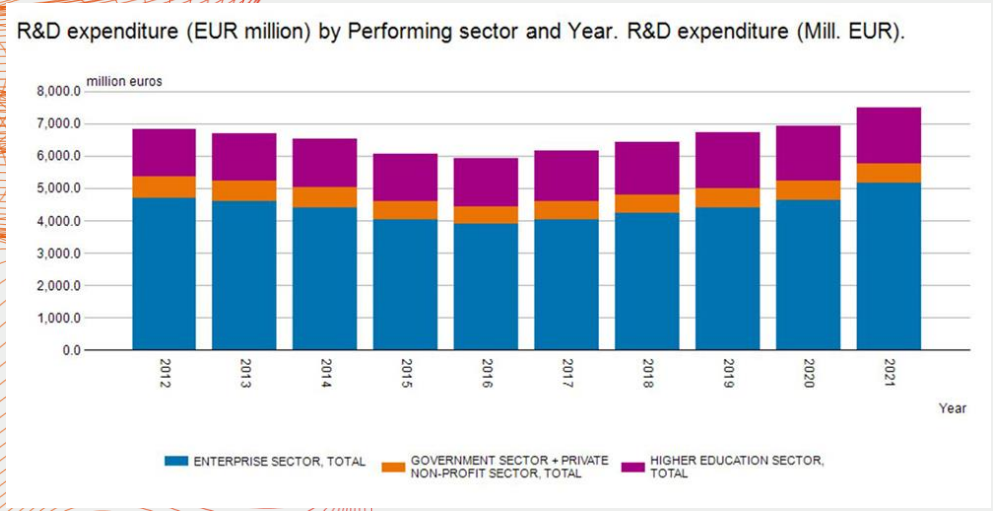
UNESCO Chair on Digital Platforms
for Transforming Economies,
University of Jyväskylä, Finland

Introduction

- **Technology and Education Intersection:** The dynamic interaction between technology and education.
- **Finland's Leadership:** Examining Finland's role in digital education, particularly through the University of Jyväskylä’s initiatives.
- **Opportunities and Challenges:** Pivotal opportunities and challenges in the future of higher education.



Finland's Investment in R&D



- Finland aims to increase its research and development expenditure to four per cent of GDP by 2030. For context, in 2021 the overall GDP share of R&D expenditure in Finland was 3.0 per cent (7.5 billion euros).
- Investment has fueled innovation across various sectors and industries, driving economic growth and creating new opportunities for Finnish businesses.

Finland's Leadership in Digitalization

- Finnish companies have become world leaders in digital technologies through the government's program.
- Cutting-edge innovations in areas such as artificial intelligence, 5G networks, and IoT have propelled Finland to the forefront of the digital revolution.
- Favorable environment for tech companies to thrive, attracting global investments and partnerships.

Finland's Sustainable Energy Solutions

Leadership in environmentally friendly energy production, with a strong focus on sustainability:

- textile fibers from wood cellulose
- circulation
- hydrogen technology

Innovative solutions for clean energy production, such as advanced biofuels, wind power, and energy-efficient technologies.

Positioned Finland as a pioneer in sustainable energy solutions, attracting international recognition and partnerships.

Development and Renewal of Finland’s Regions

- Economic boost through the government's program, with new industries and businesses flourishing and unemployment rates declining.
- Development and transformation of previously underdeveloped regions, creating a more balanced and thriving economy across the country.

Digital Learning Platforms and Online Resources

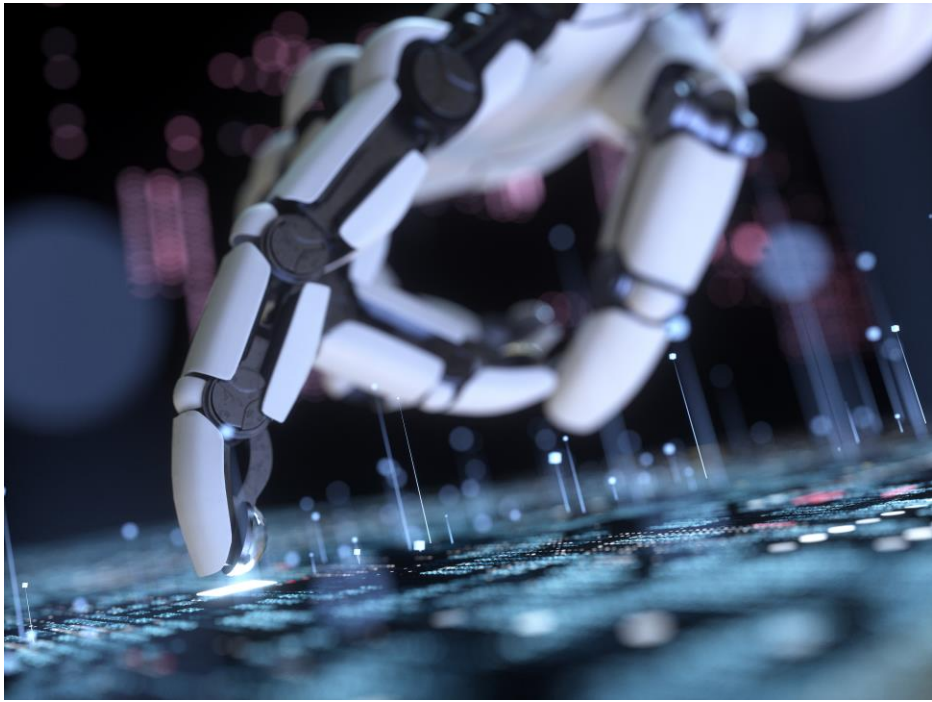
- More prevalent in Finland, providing access to learning materials anytime and anywhere.
- Encourage self-directed learning.

Collaboration between Educational Institutions, Employers, and Workers

- Important to ensure that learning opportunities are aligned with industry needs.
- Employers and educational institutions work together to provide relevant training and support for workers.

Background of Digital Transformation

- **Definition of Digital Transformation:** Integrating digital technology into all areas, fundamentally changing how organizations operate and deliver value.
- **Impact in Higher Education:** Rethinking curriculum design, delivery, and engagement with students and the community.
- **Significance for Finland:** Finland is renowned for innovative approaches to education, with institutions like the University of Jyväskylä leading in digital adoption.



The University of Jyväskylä’s Success Story in Digital Transformation

- **Faculty of Information Technology:** Known for cutting-edge research and development in digital learning tools.
- **Agora Center:** Focused on human technology and social sciences, promoting user-friendly technological innovations.
- **Multidisciplinary Research and Education:** Blends IT with healthcare, education, and social sciences, illustrating a commitment to solving real-world problems with improved outcomes.

UNIVERSITY OF JYVÄSKYLÄ
Faculty of Mathematics and Natural Sciences

INTERNATIONAL SUMMER SEMESTER
in Physics, Mathematics and Chemistry
August 1-31, 1991 • Jyväskylä, Finland

Would you like to spend a month in Finland?

Are you finishing your undergraduate studies or are you beginning your graduate studies?

The Faculty of Mathematics and Natural Sciences of the University of Jyväskylä organizes an International Summer Semester in August 1991. The semester offers you eleven courses in Physics, Mathematics and Chemistry. Enclosed you will find the detailed course program and the registration form. You may choose any courses according to your personal interest. It is recommended that you take at least two courses. Credit will be given in each course to those who pass the examinations successfully.

There is no participation fee for the school. The participating student will be accommodated free of charge in modern student apartments consisting of a bedroom and shared kitchen and bathroom. The University of Jyväskylä will also grant a scholarship of 350 FIM (approximately 100 US$) for each foreign student. The students have to pay their travel costs and living expenses.

The University of Jyväskylä is located in Central Finland, which is known for its beautiful lakes, ridges, fields and forests. The economy of Central Finland is based on modern pulp and paper industry. The city of Jyväskylä, having 65 000 inhabitants, has been the site of the World Cup Rally, the Rally of the Thousand Lakes, every August since 1990. Jyväskylä and its surroundings offer numerous free-time activities including tennis, golf, track and field, hiking, canoeing, fishing and lake cruises.

Deadline for the registration is March 31, 1991.

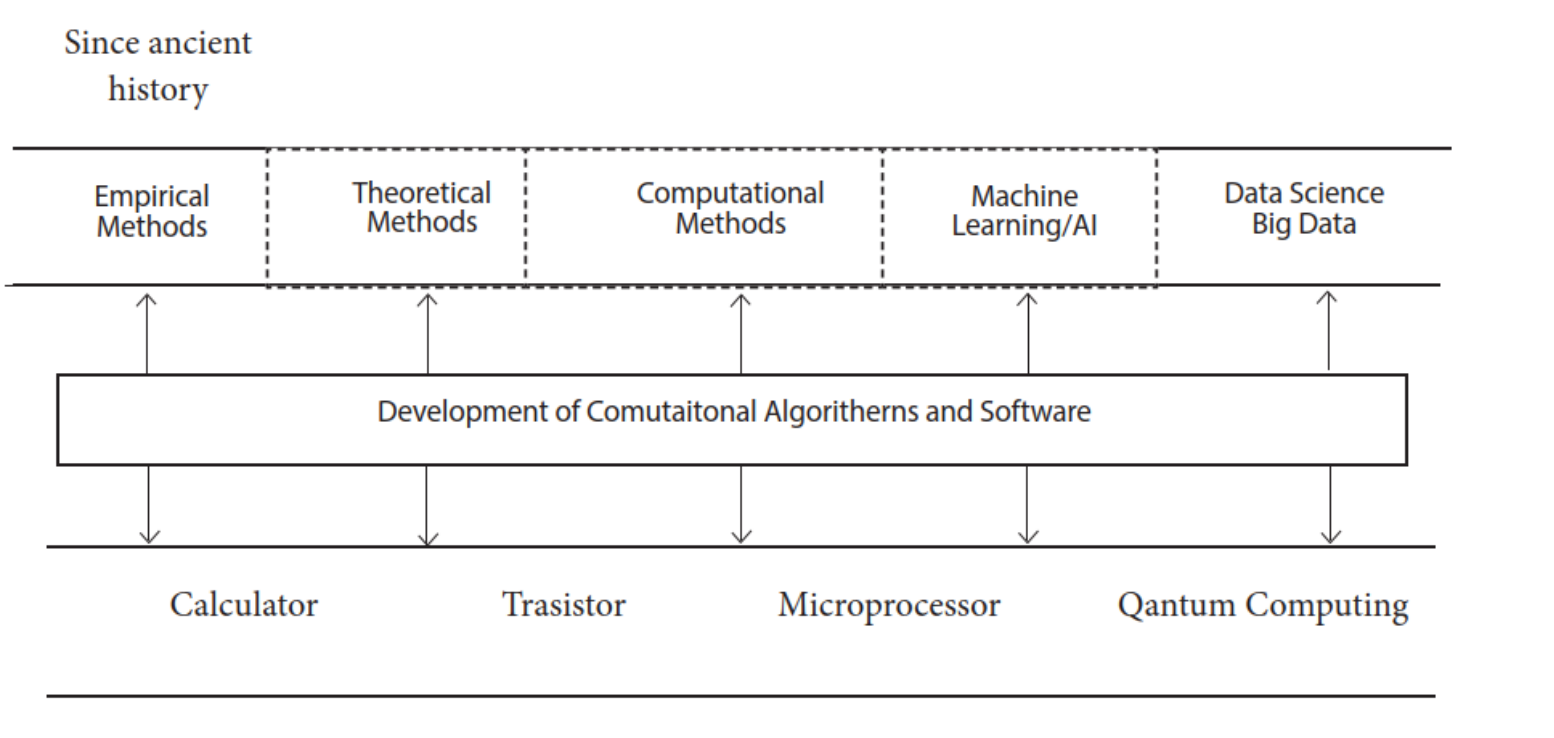
Organization:
Prof. P. Heiskanen (Mathematics)
Assoc. Prof. M. Marminen (Physics)
Assoc. Prof. J. Kuoppi-Tuminko (Chemistry)
M.Sc. Soili Leeldinen (Secretary)

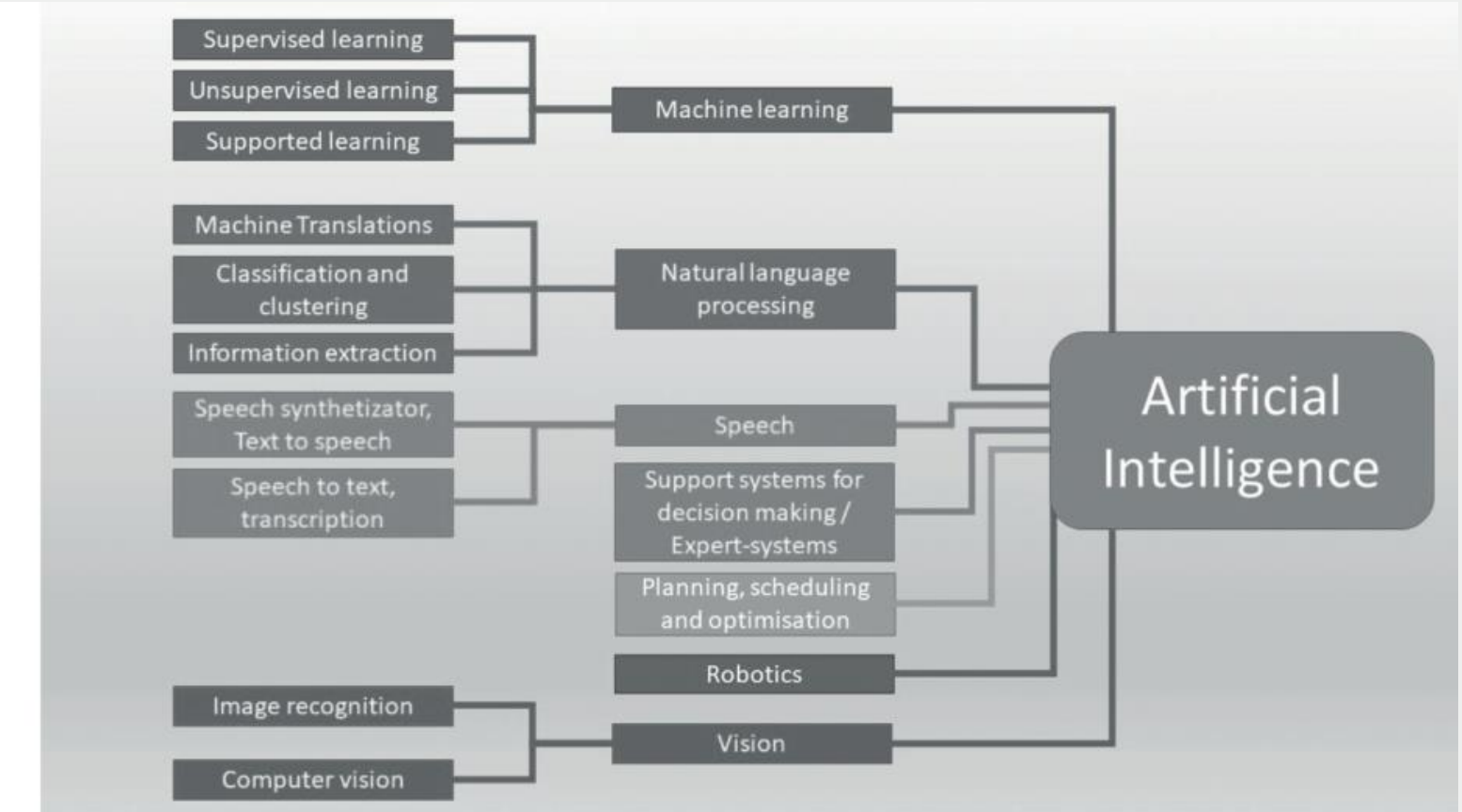
Summer Semester Address:
M.Sc. Soili Leeldinen
Faculty of Mathematics and Natural Sciences
University of Jyväskylä
P.O. Box 35
SF-40351 Jyväskylä
Finland

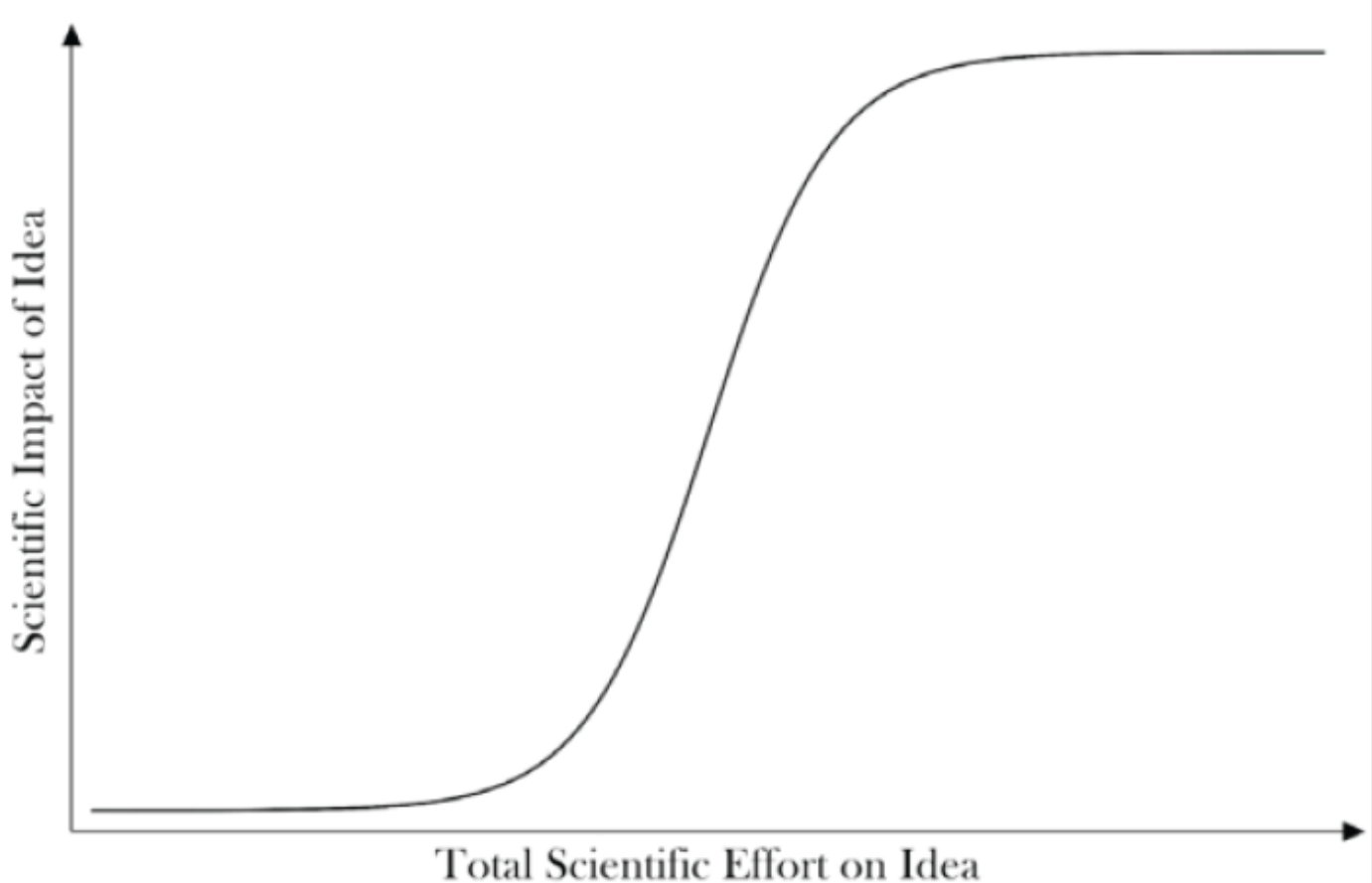
Telephone: 358-41-602283
Fax: 358-41-602201
Email: MLTH@FINLAND

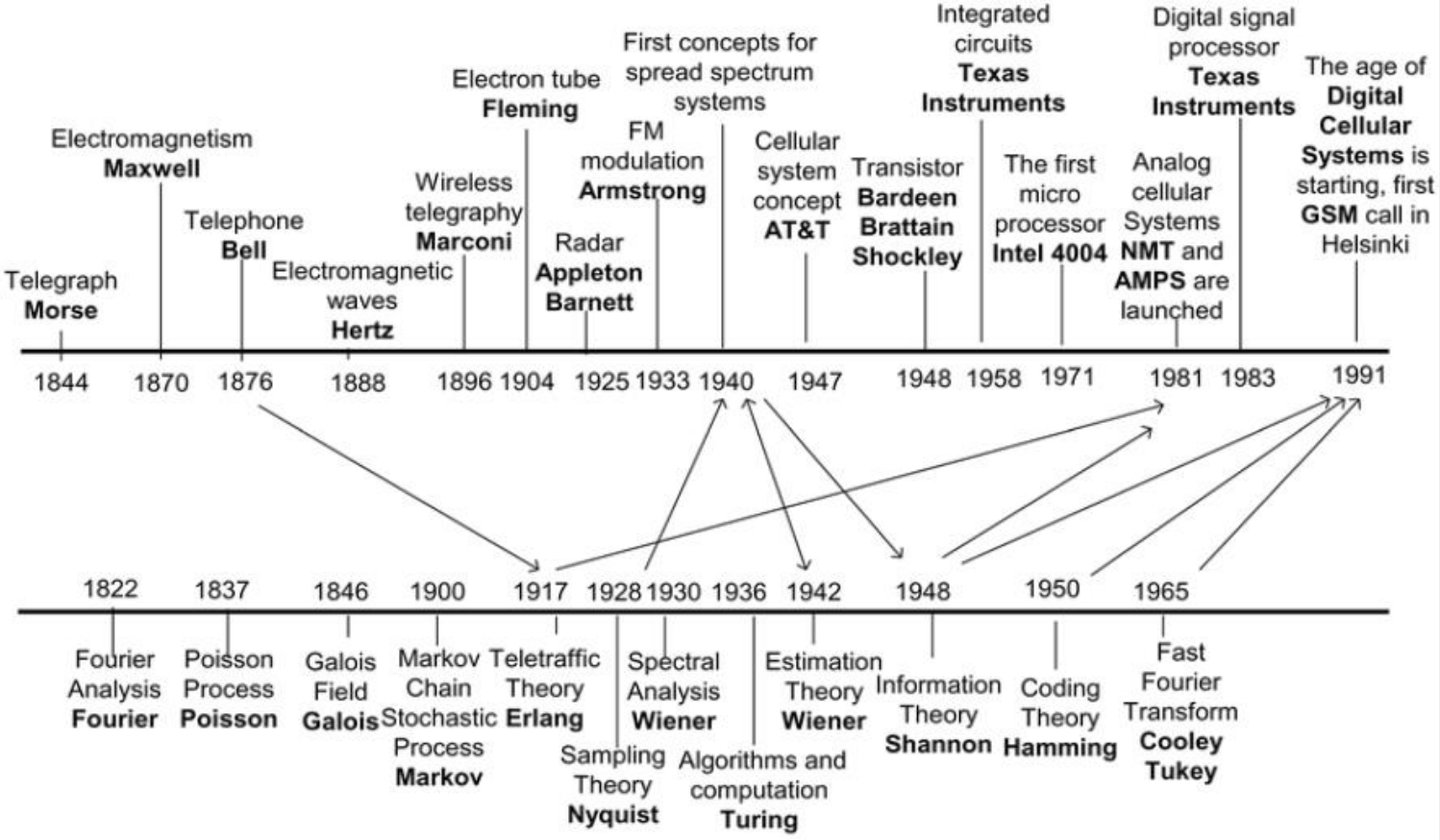
Opportunities Unleashed

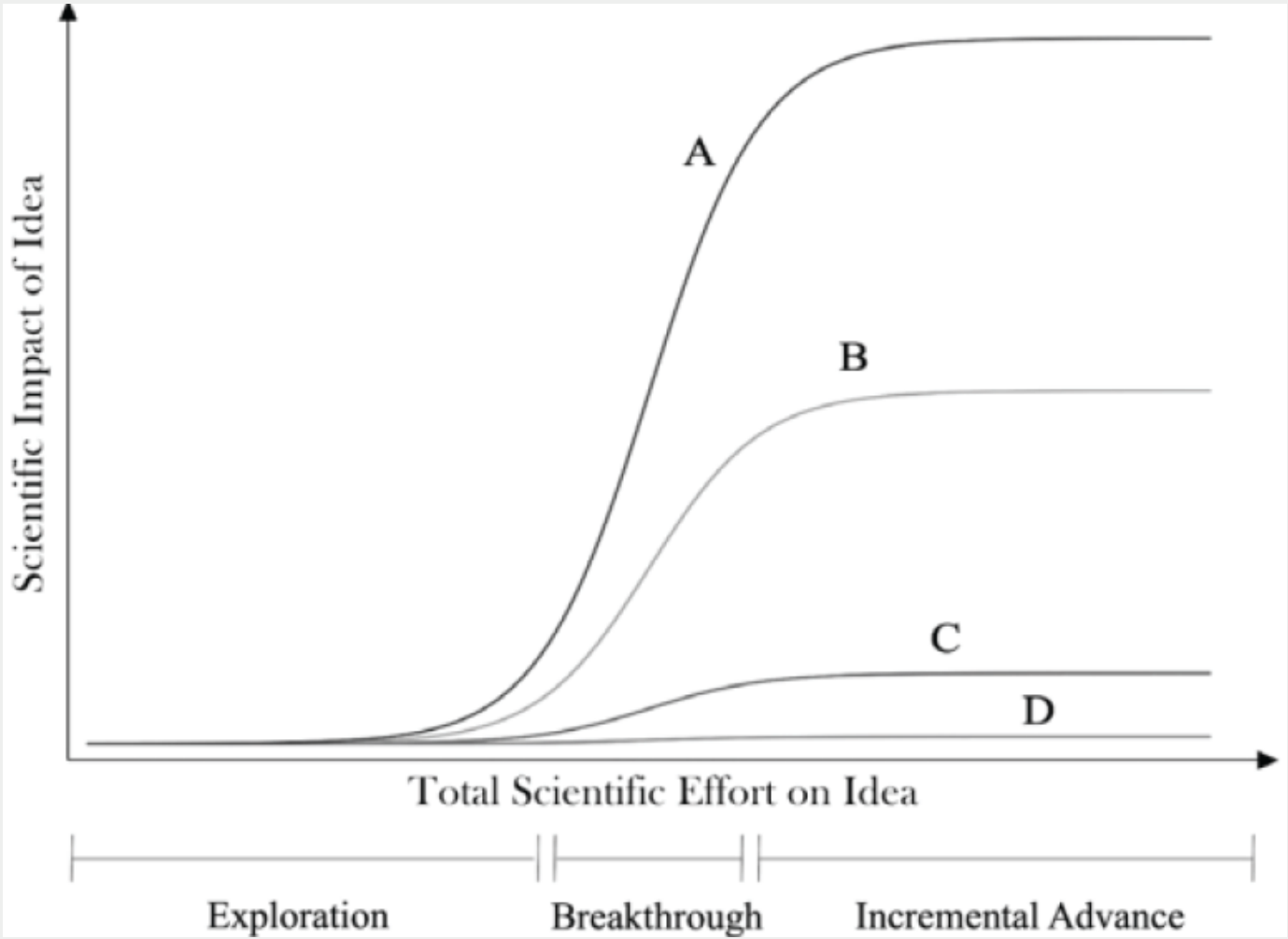
- **Enhanced Educational Outcomes:** Adoption of AI tools to tailor educational content to individual needs, enhancing learning experiences.
- **Virtual and Augmented Reality:** Development of VR and AR environments to simulate real-world scenarios for students in various fields.
- **Innovation and Societal Impact:** Projects like predictive analytics to improve student retention rates, extending educational reach globally.


Since ancient history
Empirical Methods
Theoretical Methods
Computational Methods
Machine Learning/AI
Data Science Big Data
Development of Comutaitonal Algoritherns and Software
Calculator
Trasistor
Microprocessor
Qantum Computing

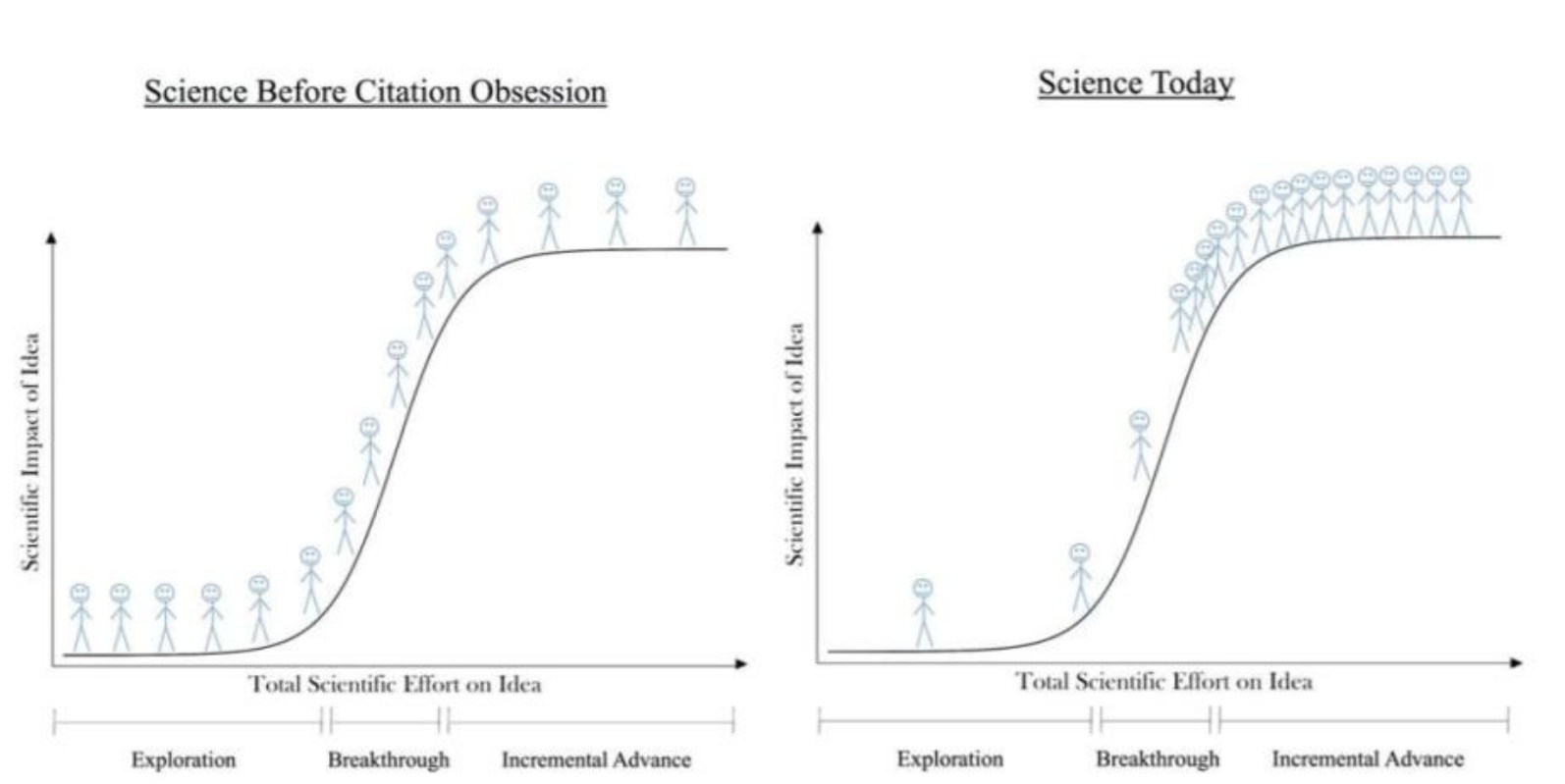

Supervised learning
Unsupervised learning
Supported learning
Machine learning
Machine Translations
Classification and clustering
Information extraction
Natural language processing
Speech synthetizator, Text to speech
Speech to text, transcription
Speech
Support systems for decision making / Expert-systems
Planning, scheduling and optimisation
Robotics
Image recognition
Computer vision
Vision
Artificial Intelligence


Scientific Impact of Idea
Total Scientific Effort on Idea


Telegraph
Morse
1844
Electromagnetism
Maxwell
1870
Telephone
Bell
1876
Electromagnetic
waves
Hertz
1888
Wireless
telegraphy
Marconi
1896
Electron tube
Fleming
1904
Radar
Appleton
Barnett
1925
FM
modulation
Armstrong
1933
First concepts for
spread spectrum
systems
1940
Cellular
system
concept
AT&T
1947
Transistor
Bardeen
Brattain
Shockley
1948
Integrated
circuits
Texas
Instruments
1958
The first
micro
processor
Intel 4004
1971
Analog
cellular
Systems
NMT and
AMPS are
launched
1981
Digital signal
processor
Texas
Instruments
1983
The age of
Digital
Cellular
Systems is
starting, first
GSM call in
Helsinki
1991
1822
Fourier
Analysis
Fourier
1837
Poisson
Process
Poisson
1846
Galois
Field
Galois
1900
Markov
Chain
Stochastic
Process
Markov
1917
Teletraffic
Theory
Erlang
1928
Sampling
Theory
Nyquist
1930
Spectral
Analysis
Wiener
1936
Algorithms and
computation
Turing
1942
Estimation
Theory
Wiener
1948
Information
Theory
Shannon
1950
Coding
Theory
Hamming
1965
Fast
Fourier
Transform
Cooley
Tukey


Scientific Impact of Idea
A
B
C
D
Total Scientific Effort on Idea
Exploration
Breakthrough
Incremental Advance

More than 20 Years in International Research Education

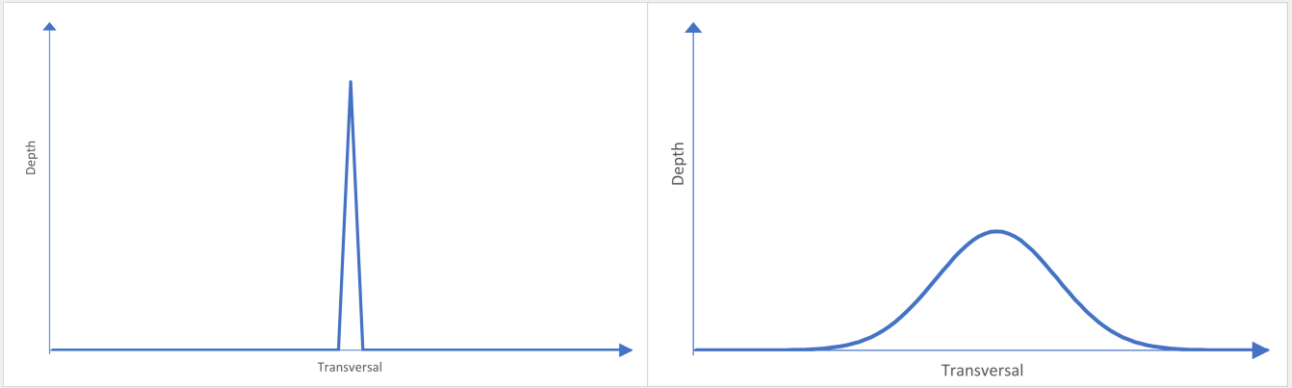


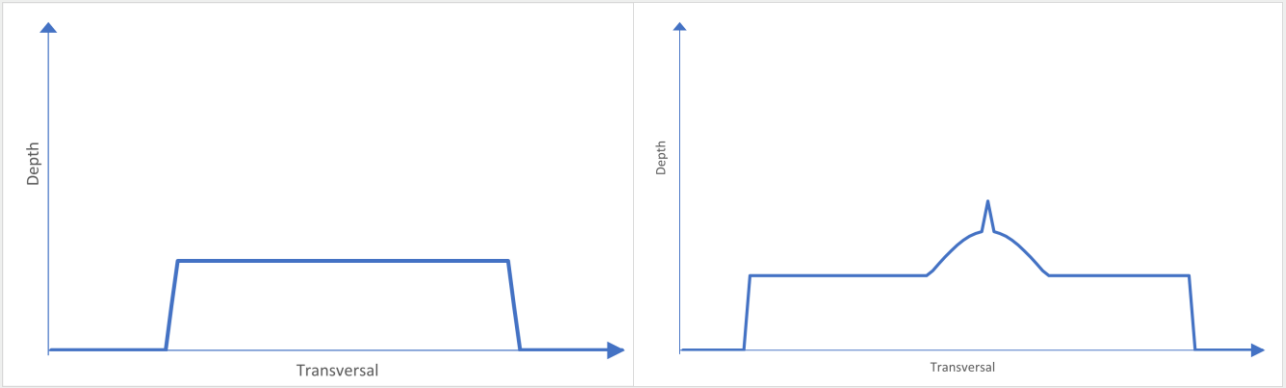
More than 20 Years in International Research Education

- 130 successfully doctorated PhD students
- Mentoring the next generation of top scholars, innovators and entrepreneurs
- Sharing good practices

More than 20 Years in International Research Education

- **Global Context:** Overview of 20+ years supervising doctoral students from diverse countries.
- **Double Dissertations:** Introduction to the model of double dissertations, increasingly popular and supported by the EU.
- **Diverse Student Origins:** Students hail from India, Israel, China, Nigeria, Pakistan, Tunisia, Ukraine, and Russia and more.





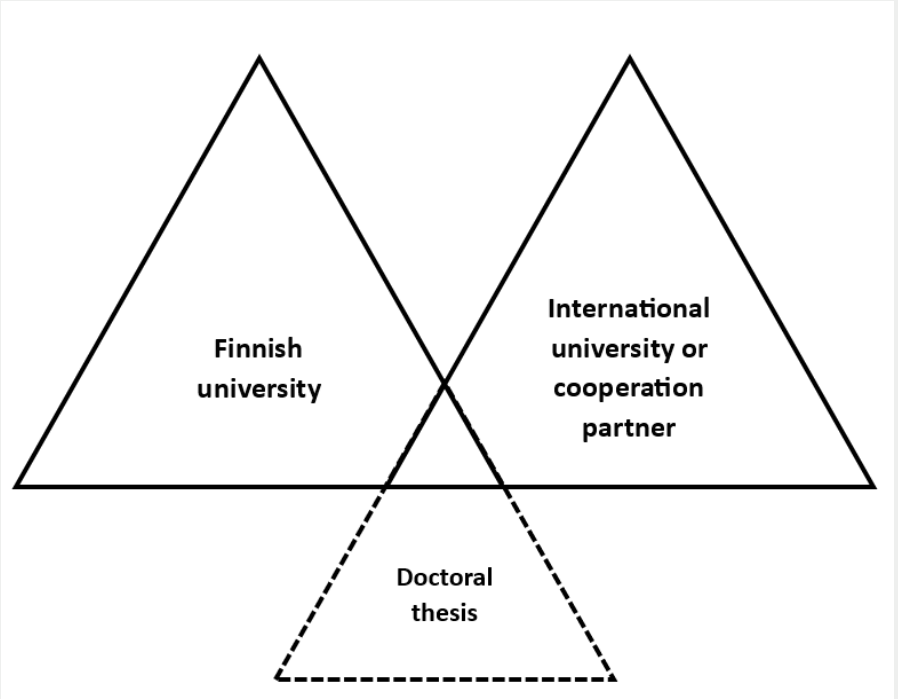
Classification of dissertation types

Classification of Dissertation Types

- **Tailored Objectives:** Dissertation objectives are tailored based on the student's educational background, ranging from scientific to applied research.
- **Supervision Roles:** Inclusion of home university representatives in the supervision process.
- **Educational Backgrounds:** Contrast between theoretical and practical backgrounds of students influencing their research directions.

More than 20 Years in International Research Education

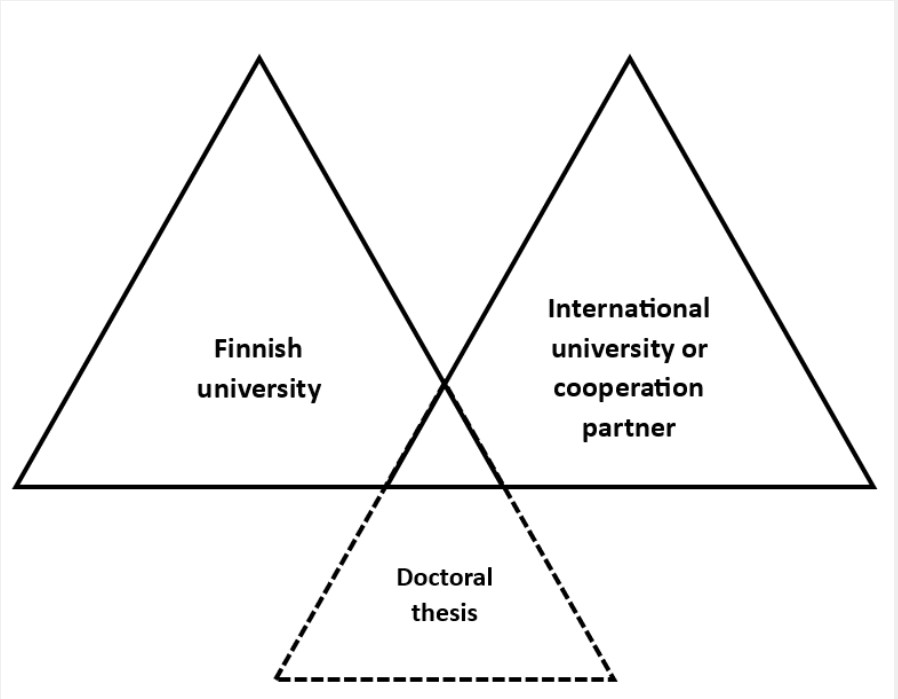
- **Cooperation Models:** Explanation of cooperation models with international universities focusing on specific scientific or technological areas.
- **Synergy Creation:** Details on the synergy created by combining different expertise areas from multiple groups.



Cooperation model in international doctoral dissertations.
The operating model has been based on the synergy of two or more groups, where different areas of expertise have been combined.

More than 20 Years in International Research Education

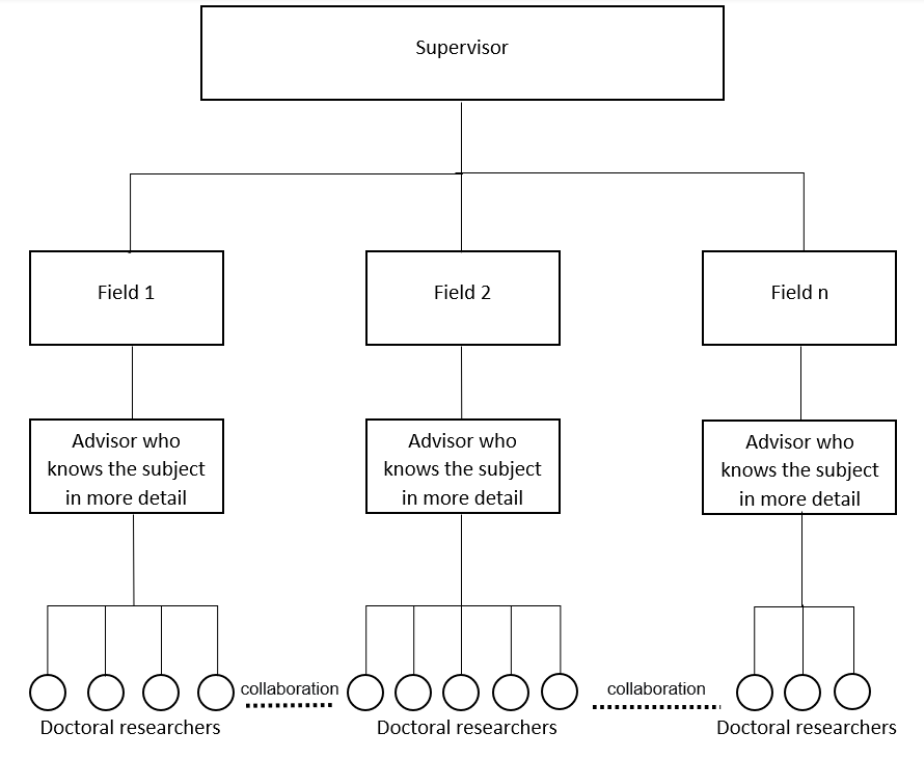
- **Collaborative Supervision:** involving local and international faculties.
- **International Roles:** international professors as part-time docents, researchers, or professors to enrich the educational experience.



Cooperation model in international doctoral dissertations.
The operating model has been based on the synergy of two or more groups, where different areas of expertise have been combined.

More than 20 Years in International Research Education

Supervision involves cooperation with the local university and international partners. International professors have been appointed as docents, researchers, or professors. Some of these are, for example, part-time (such as 20%) professors for five years.



Country analysis

- **India:** 3-5 universities; remotely completed master's studies as part of doctoral training; scholarships; high potential.
- **Israel:** Existing network; high level of expertise; technologies.
- **Russia:** Break in cooperation, but high potential.
- **Pakistan:** Existing network.
- **EU countries:** Double degree; EU projects; EU funding; high potential.
- **African countries:** UNESCO network.

UNESCO Chair on Digital Platforms for Transforming Economies

About The Host Institution: Lappeenranta-Lahti University of Technology

- **Academic Excellence:** Ranked among the TOP 300 globally by THE World University Rankings, offering diverse programs in technology, engineering, and more.
- **International Outlook:** Highly international environment with campuses in Lappeenranta and Lahti, promoting global research collaborations.
- **Innovation and Entrepreneurship:** Encourages real-world problem solving and supports numerous startups and innovative projects.
- **Research Focus:** Conducts cutting-edge research in energy technology, circular economy, and more, partnering with global industries.
- **Green Campus:** Recognized for sustainability efforts and commitment to UN's Sustainable Development Goals.
- **Partnerships and Networks:** Maintains strong connections with industrial and governmental bodies to enhance research and education.
- **Student Support:** Extensive support services including career counseling and academic advising for a holistic educational experience.

LUT University

Contributions to UNESCO Priorities

- **Outcome 1: Future of Inclusive and Equitable Quality Education:** Enhancing access to education through digital platforms, particularly in underserved regions, supporting UNESCO's global educational vision.

- **Outcome 2: Strengthen International Coordination for Achieving SDG4:** Focusing on international coordination and innovative research to implement the global education agenda.

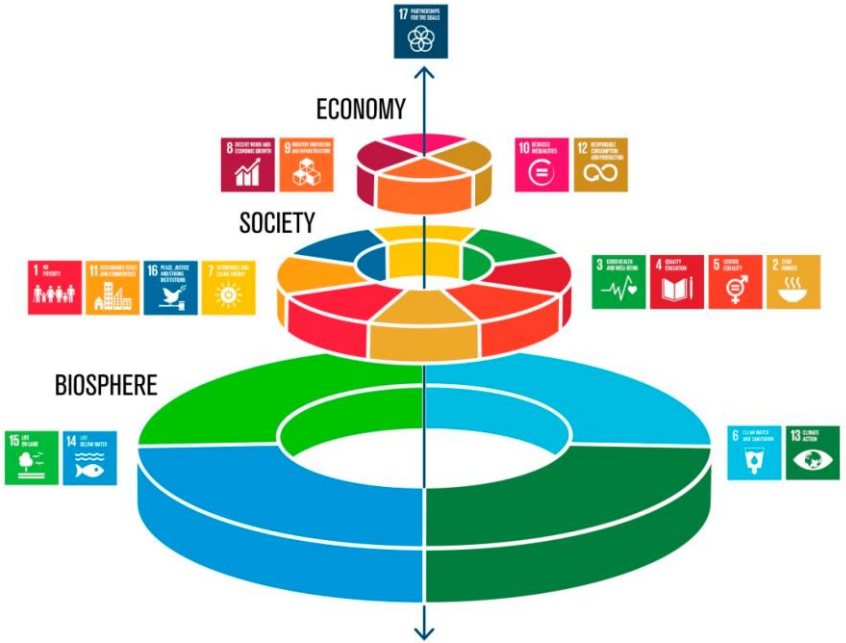
- **Outcome 3: Advanced International Collaboration in Science, Technology, and Innovations:** Strengthening scientific cooperation through digital solutions, advancing sustainable development globally.

Unique Contribution and Added Value

- **Digital Platforms as Economic Multipliers:** Facilitating participation of local and indigenous service providers in digital markets, promoting economic inclusivity.
- **Technological Integration for Enhanced Services:** Integrating AI into shared infrastructures to improve efficiency and affordability of essential services.
- **Strategic Alignment with UNESCO's Goals:** Supporting inclusive social development and fostering intercultural dialogue through lifelong learning opportunities.

Contribution to Sustainable Development Goals (SDGs)

- **Strategic Approach:** Accelerating progress through partnerships and knowledge sharing, leveraging digital technologies to drive sustainable development.



Navigating the Challenges

- **Sustainable Funding Models:** The need for continuous investment in technology upgrades and training, requiring innovative funding solutions.
- **Digital Literacy:** Programs to enhance tech skills of faculty and students, integrating digital literacy across all disciplines.
- **Balancing Technology with the Human Element:** Ensuring technology enhances rather than replaces human interactions in education.

THANK YOU FOR YOUR ATTENTION!

University of Jyväskylä, Finland

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