An Innovative Eco-System for Accelerator Science and Technology

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AN EMERGING ECOSYSTEM

The emergence of new technologies and innovative communication tools, permits us to transcend societal challenges. While particle accelerators are essential instruments to improve our quality of life through science and technology, an adequate ecosystem is essential to activate and maximise this potential.

Accelerators in the world

Materials science facilities are keys to the new economy

ORGANIZATION (decline)
BUSINESS (maturity)
TECHNOLOGY (growth)
SCIENCE (gestation)

Economic value added

1750s 1850s 1950s 2050s Year

INDUSTRIAL economy
INFORMATION economy
MOLECULAR (NBIC) economy

The Adaptive Enterprise
New media
Chips
Solid state physics
Operating systems
WWW
IT services
Portals
WWW
Information theory

*Nanotechnology
*Biotechnology
*Information technology
*Cognitive science
*Materials

~ 60 Photon sources
~ 3 Proton LINAC for Neutron Sources

Colliders
Radiotherapy
Medical Isotopes
Nuclear research
Non nuclear research

“Medical Applications”, by C. Biscari and L. Falta
CERN-2014-009
Hydrotherapy

Materials science facilities are keys to the new economy
Synergies between 4 main stakeholder groups, that together empower solution driven and results focused execution of projects.

Research Infrastructure (RI) and industries supported by the enlightened organizations and education, can generate a sustainable environment to serve this purpose.
Industries benefit from particle accelerator fabrication, operation and breakthroughs resulting from large neutron and light sources with the typical average proportion of industry use of neutron and light-based Large Scale Research Infrastructures in Europe today being 20%-40% in collaboration with academia, and 1%-10% purely proprietary use, depending on the type of LSRIs.
TRANSFER OF KNOWLEDGE & EDUCATIONAL PLATFORMS

Technology and knowledge transfer are the pillars of the development of this innovative ecosystem, using scientific communication, education and collaboration as their vectors.

• MOOC: e.g. Nordic Particle Accelerator Project
• Online lectures: e.g. ASP - synchrotron and neutron based diffraction and spectroscopic techniques
• Communication channels: e.g. Connecting Industrial R&D Staff to State-of-the-Art Neutron Methods by CERIC/ACCELERATE

Photons and Neutrons in the quest to solve societal challenges

Research infrastructures like Light Sources and Neutrons Sources are perfect tools for discoveries, e.g. COVID-19 structure, battery materials.

In this second ASP lecture serie, we focus on the description of such infrastructures and the power of photons and neutrons.

• Part A: From November 24 to December 15, 2020
• Part B: From January 12 to February 2, 2021

Images of Buddha using a Neutron Source and a Light Source
→ Whether the evolution takes a semantic or cognitive route or a combination of both, the future possibilities are probably beyond our imagination.

→ Access to knowledge has become simpler and large quantities of data can be exchanged in a timely manner.

→ Smart/agile data storage, formatting and standardization are required to establish a FAIR data principle.

• Data - DMSC, AI and ML applied to ESS accelerator
• Novel ways to communicate – www, VR, AR
NOVELS WAYS OF WORKING

- "Track It" aggregates and centralizes information
- In a collaborative environment

Training plans based on roles

Tell me what your role is, and I'll tell you what trainings you need.

Program Development
- Identification of ESS training needs
- Program Coordination
- Registration & Training Execution

Program Build-up & Setup
- Competence Management
- Certification Management

External Experts

Innovation procurement example
- Complex Integrated Control System
- Artificial Intelligence, Machine Learning, Deep Learning need to be accessed and implemented as much as possible
- ESS act as user and "Living Lab" for international experts in "Sandbox" projects
- First iteration: Alarms processing on collaboration with Lund University

Harvesting example
- A Beam Diagnostics Physicist has invented a Non-invasive Profile Monitor (NPM)
- It will be installed on three crucial positions on the beam to optimise beam focus
- The scientific development has been published
- A French company wish to initiate serial production
- IP shall secure ESS lifelong support
- De-risk through larger user community
NEXT STEPS

- Complete market survey of existing innovative tools, constraints and capacity from laboratories
- Build synergies and exchange good practices
- Develop a proof of concept to be benchmarked
- Develop Business cases
- Assess the socio-economical impact
- Disseminate/ Promote /raise public awareness
- Raise engagement in the innovative ecosystem model
- Feed-back loop / return on investment

 Prepare and implement a full-scale solution to enable the RI potential and impact.

See you on Wednesday in the zoom room to further discuss those matters: WEPAB407