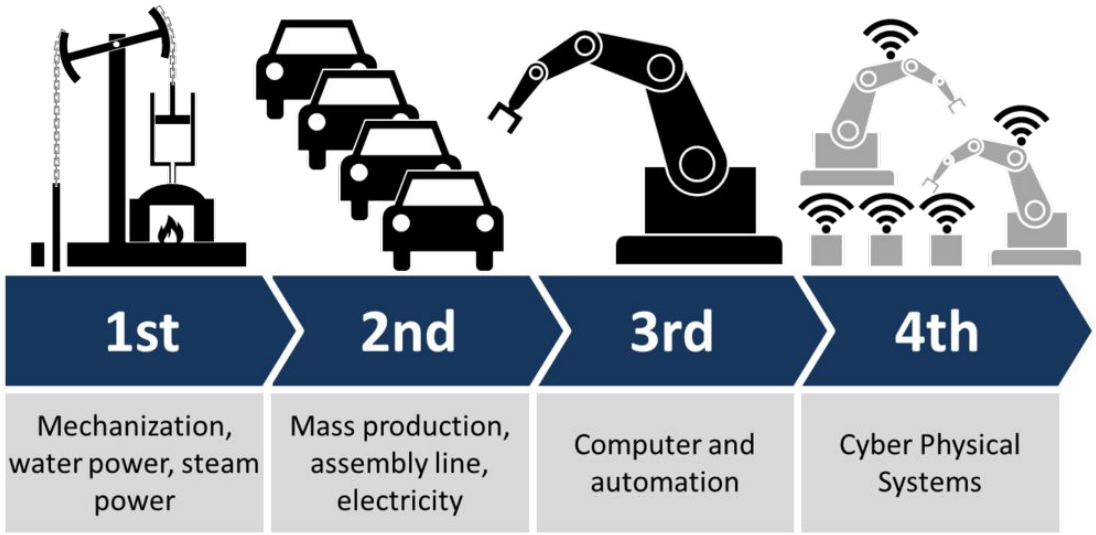
Conference Summary Report

on

Academia-Industry Matching Event
on the Mutual Impact of Industry 4.0
and High-Energy Physics
Slovakia, March 15-16, 2018

INDUSTRY 4.0

- high-tech strategy for German government (“Industrie 4.0”, Hannover Fair, 2011/13)
- “fourth industrial revolution”
- **automation** of **data exchange** in **manufacturing technologies**



INDUSTRY 4.0 in Slovakia

- **Smart Industry Strategy - Slovakia going digital** (Ministry of Economy: "a multi-layer concept representing digital adaptation of the Slovak industry, complemented with support for business, legal, and social capabilities for long-term sustainability)
- **Research and Innovation Strategy for Smart Specialisation of the Slovak Republic - RIS3** ("defines the direction for supporting research and development activities in Slovakia")
- **UCITT** - University Centre for Innovation, Technology transfer and Intellectual Property Protection at the Technical University of Kosice (+ USP Technicom)

INDUSTRY 4.0 in Slovakia

- **CMCT&II - Center of Modern Control Techniques and Industrial Informatics, FEEI, TU Košice** - a research and teaching center interconnecting the academia and industry in accordance with the Industry 4.0 concept (http://kyb.fei.tuke.sk)
- Responsible partner for cooperation of FEEI - TU Košice with CERN on Alice Experiment.
    - **Project name:** ALICE experiment at the CERN-LHC: The study of strongly interacting matter under extreme conditions
    - **Project status:** Basic research
    - **Research and development field:** Nuclear and sub-nuclear physics
    - **Team leader:** doc. Ing. Jan Jadlovsky, CSc..
    - **Project website:** http://alice-cern.fei.tuke.sk

HEPTech

- Led by the assumption that high-energy physics (HEP) provides an excellent environment for deployment of technologies of the fourth industrial revolution, **HEPTech (High-Energy Physics Technology Transfer Network Board)** and the **Technical University of Kosice** organized an academia-industry matching event on the mutual impact of Industry 4.0 and high-energy physics.

- This unique for Europe forum took place on **15-16 March 2018 in Stary Smokovec, High Tatras, Slovakia**.

Aim/scope of the AIME
(introductory event in a series)

Proposed during preparatory meeting on Industry 4.0 (June 6, 2017 in CERN)

- to familiarize the participants with the concept of Industry 4.0 (different ideas behind the term)

- to describe the practical application of the concept using:
  - knowledge technologies,
  - cyber-physical systems,
  - big data acquisition, archival, analysis and interpretation, visualization, real time processing (cloud computing)

  with the specific focus on **Slovak/Central European industry/academia**

Contacted groups

1. **HepTech** members
2. **CERN** (scientists/technicians responsible for development and maintenance of selected experiments at the LHC)
3. Slovak/Czech **universities and research institutes**: Technical University of Kosice, Safarik University Košice, Slovak Academy of Sciences
4. Prominent **technological companies** - suppliers of technologies for the individual aspects of Industry 4.0 (Siemens, IBM, CEIT etc.)
5. Slovak **statewide organizations/clusters** responsible for the development and popularization of Industry 4.0 (AT+R Cluster, Business and Innovation Centre Bratislava, University Science Park Technicom, relevant divisions/ directorates at the Ministry of Economy and Ministry of Education)

HEPTech

Academia-Industry Matching event on the Mutual Impact of Industry 4.0 and High-Energy Physics, took place on 15-16 March 2018 in Grandhotel Stary Smokovec, High Tatras, Slovakia.

HEPTech

- The event attracted about **80 participants**, experts from business and academia. **Industry** demonstrated a very strong interest not only as a **high level of attendance (44%)** and a **number of speakers** but also with the sponsorship provided.

- The Enterprise Europe Network – Slovakia actively supported the forum and organized **25 bilateral face-2-face (B2B) meetings** to enable cooperation arrangements between interested parties.

HEPTech

Participants came from a number of countries:

- Slovakia
- Czech Republic
- Poland
- Hungary
- Romania
- Bulgaria
- United Kingdom
- Denmark
- Switzerland

Sessions

A Opening session

B Thematic sessions

1. **Cyber-physical systems** (CERN, ZTS VVU, ELI Beamlines, Siemens, CEIT)
2. **Modeling and simulation** (ESS, SOVA Digital, BSH, CEITEC, ZTS VVU)
3. **Big Data** (CERN, IBM)
4. **Internet of Things** (IBM, Siemens, Brno Univ. of Tech., Humusoft, S2Innovation)

Opening session

Opening session

- The participants received a warm welcome of the **Rector of the Technical University of Kosice, Professor Stanislav Kmet.**
- The HepTech Chairman **Jean-Marie Le Goff** of CERN introduced the network, its aims and activities, with the potential impact of Industry 4.0 applications on the European Strategy for Particle Physics.
- The opening session revealed the vision of the **Slovak Ministries of Economy and Education** on Industry 4.0, and the efforts of the **Business Innovation Centre in Bratislava** in providing new approaches and services for innovation management support to SMEs concentrated on their R&D activities and regional development.
- On this background, **the role of the Technical University of Košice and its science park Technicom** as an ecosystem integrating business, education, research and development was highlighted. In this context, the importance of the **TUKE Start-up Center** and **Incubator** was also acknowledged.

Thematic sessions

Cyber-physical systems

- The session on cyber-physical systems provided **examples of industrial control systems and detector control systems** of large experiments, such as **ALICE**, at the LHC accelerator at **CERN**, where the deployed technologies and their implementation share the design principles with Industry 4.0.
- Another example gave an overview of the **ELI Beamlines' 2-level distributed control system** and concentrated on the Data acquisition system, which had adopted some new industry approaches.
- **Siemens** presented its holistic digitalization approach over the entire product life cycle focusing on discrete industries.
- CEIT group introduced an **innovative automated logistics solution** involving interconnection of systems, on-line information exchange and constant optimization with gradual use of artificial intelligence.

Modeling and simulation

- The session on modeling and simulation concentrated on examples such as **computing for materials science** at the European Spallation Source ERIC and production process optimization based on digitalization and Industry 4.0 technologies in the Slovak industry.
- **The competence center for acoustics and vibration** of BSH company in Kosice highlighted the effectiveness of the experimental and simulation methods in the development of noise-vibration-harshness measuring stations in industrial production.
- **Brno University of Technology** introduced a demonstration testbed for Industry 4.0 that would contain both additive and subtractive machinery technologies, and would have a control system easy-to-extend and able to cooperate with other testbeds.
- The **company ZTS VVU Kosice** shared its experience in modelling of locomotion robotic mechanisms using geometric mechanics methods.

Big data

- The session “Big Data - Cloud computing” concentrated on **data analytics for the purposes of diagnostics and quality control**.
- A typical example in this context was a talk from CERN that outlined core components of **the CERN computing infrastructure** and their usage for storing, analyzing and distribution of LHC data. Details were given about individual building blocks also used outside CERN for Big Data, Data Mining and Data Analytics as essential technologies for the transition to Industry 4.0.
- Another talk from CERN introduced **ALICE O2 project**, exploring a new approach for handling large data volume in HEP experiments. The predictive maintenance software **solutions of IBM**, enabling access to multiple data sources in real time to predict asset failure or quality issues, revealed new horizons for academia-industry cooperation.

Internet of Things

- Industry dominated the session “Internet of Things”, where **IBM** showcased common solution design approaches for Industry 4.0.
- **Siemens** presented **MindSphere** - its offer for industrial IoT, illustrated with examples of machine connectivity, data processing, archiving and data presentation.
- The **Humusoft** company, based in Prague, introduced **ThingSpeak** - an IoT platform that uses MATLAB simulation software and collects and stores sensor data in the cloud.
- A talk from **Brno University of Technology** focused on embedded video processing for smart cameras.
- At the end of the session, the **TUKE’s research group** working on Industry 4.0- and CERN-related R&D presented its activities.

Diamond partners

SIEMENS

IBM

CLUSTER ATR

Additional information

Main website: https://indico.cern.ch/event/654636/

Detailed agenda: https://indico.cern.ch/event/654636/timetable/?view=standard

B2B website: https://industry40heptech-2018.b2match.io

TUKE-CERN collaboration: http://alice-cern.fei.tuke.sk

Organizing chairs:

On behalf of **Technical University of Kosice:** Dr. Slavka Jadlovska

On behalf of **HEPTech:** Dr. Jean-Marie Le Goff, Dr. Eleonora Getsova

Thank you for
your attention