APOGEIA

WG5.8 Safety and engineering in DULs

28.4.2022 Pirjo Rousu, University of Oulu

Pirjo Rousu, M.Sc. in Process Engineering, Industrial Management.

23 years of industrial experience in project and quality management. Diverse work experience from variety of business organizations in different leadership, management and development roles.

Project Manager at the university of Oulu, Faculty of Information Technology and Electrical Engineering (ITEE)

- Processing new ICT driven project ideas
- Leading project preparations
- Managing projects

Key Figures of the University of Oulu

- Established in 1958
- Total funding 240 M€
- 8 faculties
- 14 000 students
- 3 700 employees
- ~ 25 study programmes
- 22 international M.Sc. programs

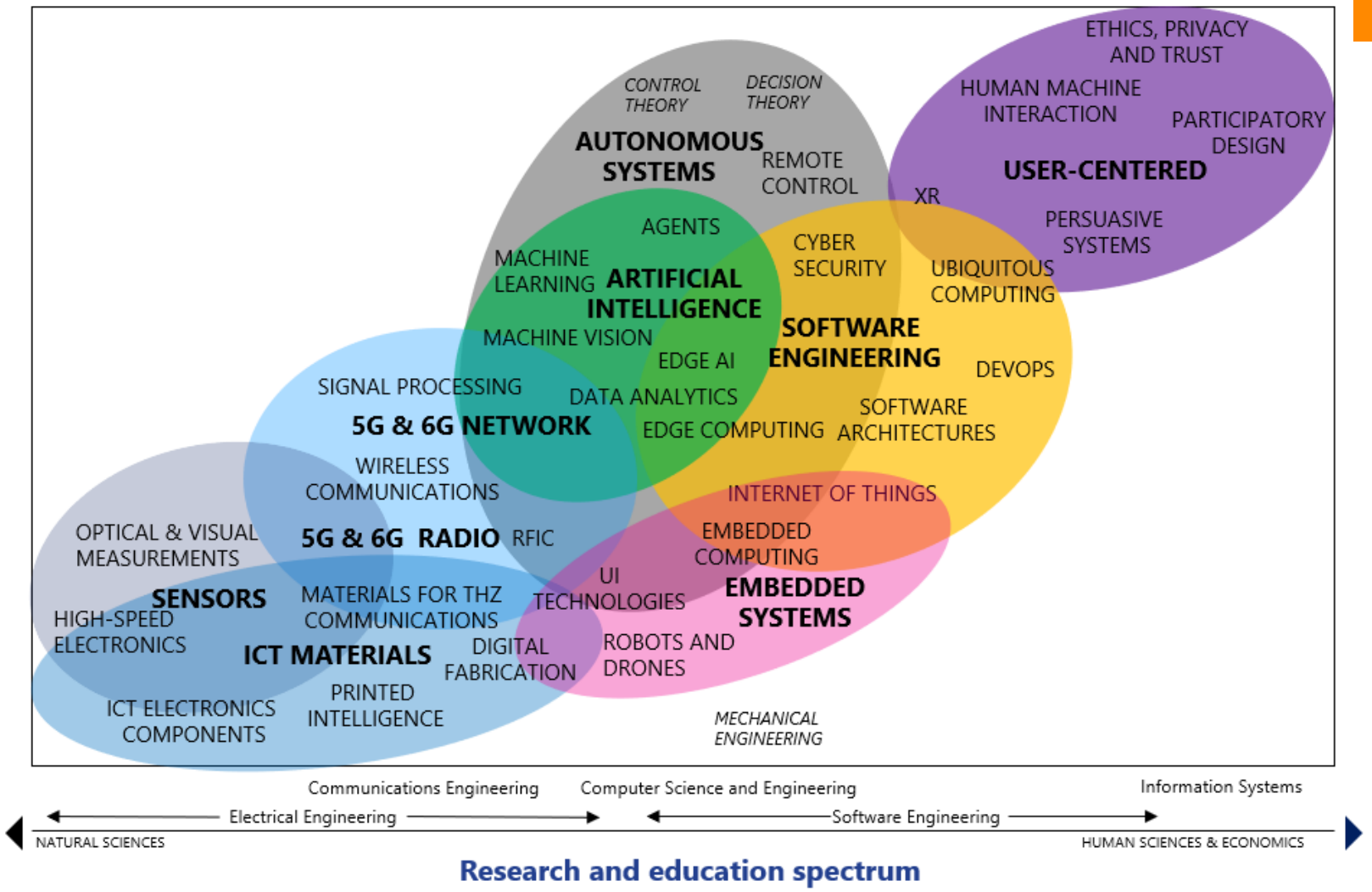
Faculties

- Oulu Business School
- Biochemistry and Molecular Medicine
- Humanities
- Education
- Science
- Medicine
- Technology
- Information Technology and Electrical Engineering (ITEE):
  - 12 Research Units

ITEE RESEARCH UNITS

CAS	**CIRCUITS AND SYSTEMS** PROF. TIMO RAHKONEN
MIC	**MICROELECTRONICS** PROF. HELI JANTUNEN
OPEM	**OPTO-ELECTRONICS AND MEASUREMENT TECHNIQUES** PROF. TAPIO FABRITIUS
CWC-RT	**CWC - RADIO TECHNOLOGIES** PROF. MARKKU JUNTTI
CWC-NS	**CWC - NETWORKS AND SYSTEMS** PROF. JARI IINATTI
ACM	**APPLIED AND COMPUTATIONAL MATHEMATICS** PROF. KEIJO RUOTSALAINEN
BISG	**BIOMIMETICS AND INTELLIGENT SYSTEMS** PROF. JUHA RÖNING
CMVS	**CENTER FOR MACHINE VISION AND SIGNAL ANALYSIS** PROF. OLLI SILVEN
UBICOMP	**UBIQUITOUS COMPUTING** PROF. TIMO OJALA
INTERACT	**HUMAN COMPUTER INTERACTION AND HUMAN-CENTERED DEVELOPMENT** PROF. NETTA IIVARI
M3S	**EMPIRICAL SOFTWARE ENGINEERING IN SOFTWARE, SYSTEMS AND SERVICES** PROF. MARKKU OIVO
OASIS	**OULU ADVANCED RESEARCH ON SERVICE AND INFORMATION SYSTEMS** PROF. HARRI OINAS-KUKKONEN

ITEE RESEARCH FORMS A SOLUTION CREATION VALUE CHAIN



Research and education spectrum

BASIC RESEARCH

- 5G and 6G wireless communications
- virtual reality, applications & experiences
- artificial intelligence, including machine vision and exploitation, e.g., in emotion applications and disease analysis
- robotics and its various application areas
- analysis of large amounts of data
- cyber security
- software
- new materials and manufacturing methods of electronics
- engaging human sciences in the development of intelligent technologies.

Proposal preparation team

- CallioLab FINLAND
  Pirjo Rousu, Julia Puputti
- Boulby Underground Laboratory UK
  Tony Murphy
- LSC Laboratorio Subterraneo de Canfranc SPAIN
  JM Calvo
- LNGS Gran Sasso National Laboratory ITALY
  Gabriele Bucciarelli, Paolo Cavalcante
- LSBB Laboratoire Souterrain á Bas Bruit FRANCE
  Ignacio Lazaro, Daniel Boyer
- LSM Modane Underground Laboratory FRANCE
  Thierry Zampieri, Christophe Vescovi

Safety and engineering in DULs - Objectives

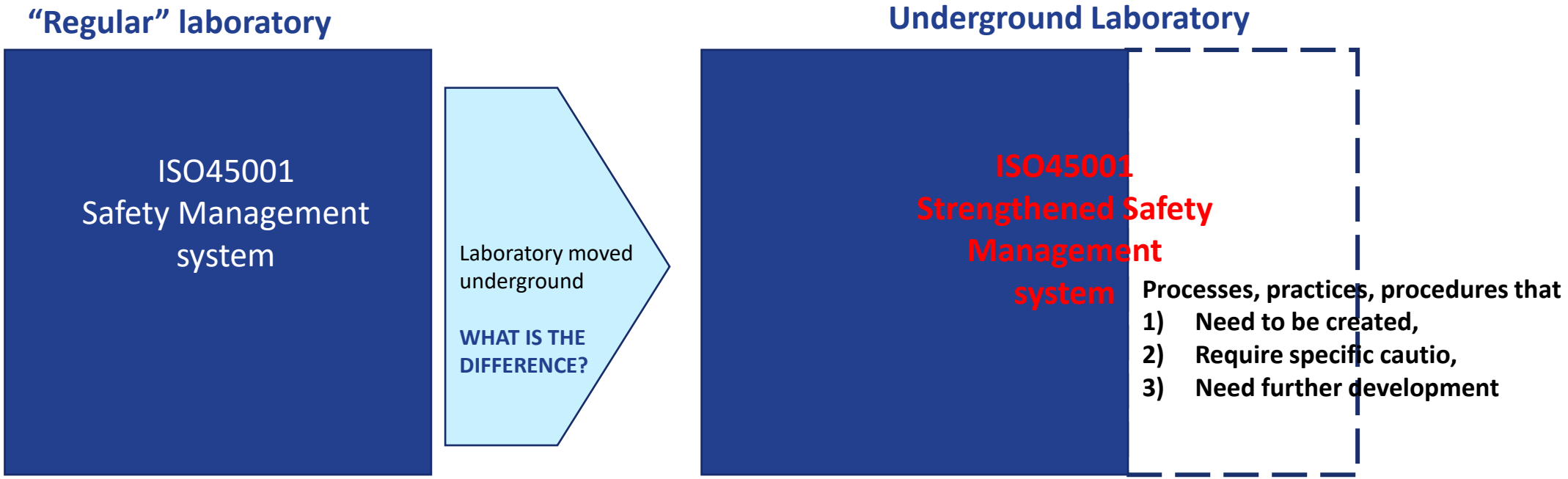
Study and disclose innovative safety procedures and technical solutions to improve safety in underground research laboratories (URL) and to foster safe working culture.

Description of Work

- An OH&S management system provides a framework for managing OH&S risks and opportunities.
- Efficient and effective OH&S management system consist of safety practices and procedures.
- In the underground environment the safety is in many cases confirmed and controlled by technical solutions and systems.
- In the APOGEIA innovative safety practices, procedures and technical solutions are studied and shared between URLs safety experts also involving industrial partners, SMEs and start-ups to cooperate.

1. The difference of ISO 45001 safety mgmt systems btw laboratory in regular environment vs. underground

- Most organisations have (integrated) Management Systems (HSEQ)
- Standard ISO 45001:2018 Requirements for occupational health and safety (OH&S) management systems



Differences e.g: 1) Underground **facilities** (access, tracking people, wireless communication...) 2) **human resources, laboratory staff, operators** (induction, personal protective equipment, emergency procedures...), 3) **tools, equipment, instruments**, 4) **Law and regulations to comply** etc.

2. Compilation of OH&S risk register

i. Identification and collation of the most significant health and safety risks for each of the underground facilities.

ii. Compilation of the overall risk register.

iii. Document the associated mitigation measures.

iv. Improve the mitigation measures for a selection of risks.

- eg. Access and egress u/g, emergency evacuation procedures, air/gas/fire monitoring techniques, people tracking/tracing u/g, occupational health surveillance.

3. Co-development of safety solutions with industrial partners, SMEs and start-ups

- URLs have specific more demanding safety requirements.
- Niche market provides business opportunities for SMEs and start-ups.
- URLs & specialized companies co-develop tailor-made safety procedures and technical solutions.
- Design and validation of proof of concept (POC).

4. Testing and implementing innovative safety solutions

- URLs will test and implement practices/procedures/technical solutions to address/improve the mitigation of the identified significant risks (task 2).
- POCs are tested to demonstrate their feasibility.

5. Thematic training workshops for safety engineers

Workshops are open for industry partners, SMEs and start-ups locally and nationally. They are utilized to promote the use of URLs for business purposes like development and testing of safety solutions.

- Boulby “Mutualism between research and mining operations”
- Gran Sasso “Safety Systems in underground Laboratories”
- Callio Lab “Business use of underground facilities ”
- LSBB “Radon management for low background noise research”
- Canfranc “Mutualism between research and multinational road tunnel operations at Canfranc. ”
  e.g. Virtual reality and simulation on safety training.

On-site
Remote

Deliverables

1. OH&S safety manual study report. A list of OH&S technical solutions, practices, procedures that in the regular laboratory are missing or require additional actions, need specific caution or further development.
2. The overall risk register for underground laboratories.
3. Improved risk mitigation solutions. Definition of new solutions that improve the mitigation of the impact of the identified significant risks.
4. POC setup for technical solution validation in relevant environment.
5. Workshops grey papers. Workshop specific reports summarizing the content and the outcome of the thematic training workshop.

Thank You!