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INICJATYWA DOSKONAŁOŚCI

Priority Research Area 5

Process automation and Industry 4.0

Part V

Gliwice 29.10.2020

Part V

- **Socio-cultural and methodological challenges of Industry 4.0**
- Design and construction (mechanical engineering and equipment construction, architectural design, industrial design)

POB5 - Process Automation and Industry 4.0

Part V

A. Socio-cultural and methodological challenges of Industry 4.0

Person representing the research team			Department	Length of presentation
Prof.	Beata	Pituła	Institute of Education and Communication Research	5 min
Prof.	Przemysław	Gębal	Institute of Education and Communication Research	
Prof.	Aleksander	Gwiazda	Faculty of Mechanical Engineering	3 min
Prof.	Damian	Gąsiorek	Faculty of Mechanical Engineering	
Prof.	Małgorzata	Dobrowolska	International Center for Interdisciplinary Research	5 min
Prof.	Aleksandra	Kuzior	Faculty of Organisation and Management	2 min

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SOCIO-CULTURAL AND METHODOLOGICAL CHALLENGES OF INDUSTRY 4.0

Beata Pitula, Przemysław Gębał

Institute of Education and Communication Research

———— Industry 4.0 - Society 5.0 - challenges

Industry 4.0 (society 5.0, post-digital society) mark a qualitatively significant change, which can be described as a „grand innovation”, which involves specific challenges for science and technology, namely:

- a) the need to adopt a specific methodology (trans-disciplinary one – the top-down approach) as a tool to study complex sociotechnical problems;
- b) changes in the way of science and technology operations - conducting research, dissemination of innovation, etc.

In consequence, the lack of an adequate response to these challenges on the part of science and technology leads to a kind of their "ideologisation" (similar to the situation regarding "sustainable development").

Industry 4.0 - Society 5.0 - answers

The adequate answers to these challenges concerning both social sciences (humanities) and technical sciences as their subject and object, concern:

1. implementation and development of research and education in the field of **STS (Science, Technology and Society)** - international and interdisciplinary programmes with technical and humanistic content (the Silesian University of Technology may be currently the only technical university in Poland in this area);
2. implementation in different types of sciences of the research procedures of creation and dissemination methods of their results, in accordance with the idea of **RRI (Responsible Research and Innovations)** or **Reallabor**.

Both these lines of action require close interaction between technical and social sciences.

Industry 4.0 - Society 5.0 - partners



Foreign partners:

1. Austrian Academy of Sciences, Institute for Technology Impact Assessment - Vienna
2. TU-Graz, STS Institute of Interactive Systems and Data Science
3. Industry 4.0 Cluster - Berlin
4. Karlsruhe Institute of Technology (KIT)
5. TAB TAB-Technikfolgenabschätzung Büro - Berlin
6. Czech Academy of Sciences, STS Research Department

Industry 4.0 - Society 5.0 - Implications and Relations

1. Communication processes in a network of machines, equipment and people
2. Technological revolution and individual development (exclusion or inclusion?)
3. Industry 4.0 and Society 5.0 and the development of (specialist) language education
4. The humanistic professional habitus of teachers in the context of technological progress
5. Euthyphro-eudaimonistic model of language teachers education in the context of the Industry 4.0 and Society 5.0 concepts (Gębał 2019, cf. Pituła 2010)

Transdisciplinary methodological approaches, educational and glottodidactic comparativism, intercultural research, Critical Discourse Analysis.

Industry 4.0 - Society 5.0 - Implications and Relations



Team representatives:

Dr Łukasz Kumięga, Dr Sławomira Kołsut,
Dr Monika Nawracka, Dr Anna Waligóra,
Dr Ewa Figas, Dr Eliza Borczyk, Elżbieta Kempny, MA
Zofia Chłopek, Prof. of SUT
Przemysław Gębal, Prof. of SUT


Foreign partners:

Austria, China, Croatia, Finland, Spain, Korea, Germany,
USA, Italy.

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SOCIO-CULTURAL AND METHODOLOGICAL CHALLENGES OF INDUSTRY 4.0

Aleksander Gwiazda, Damian Gąsiorek

Faculty of Mechanical Engineering

Introduction and characteristics of the Team

The challenges of Industry 4.0

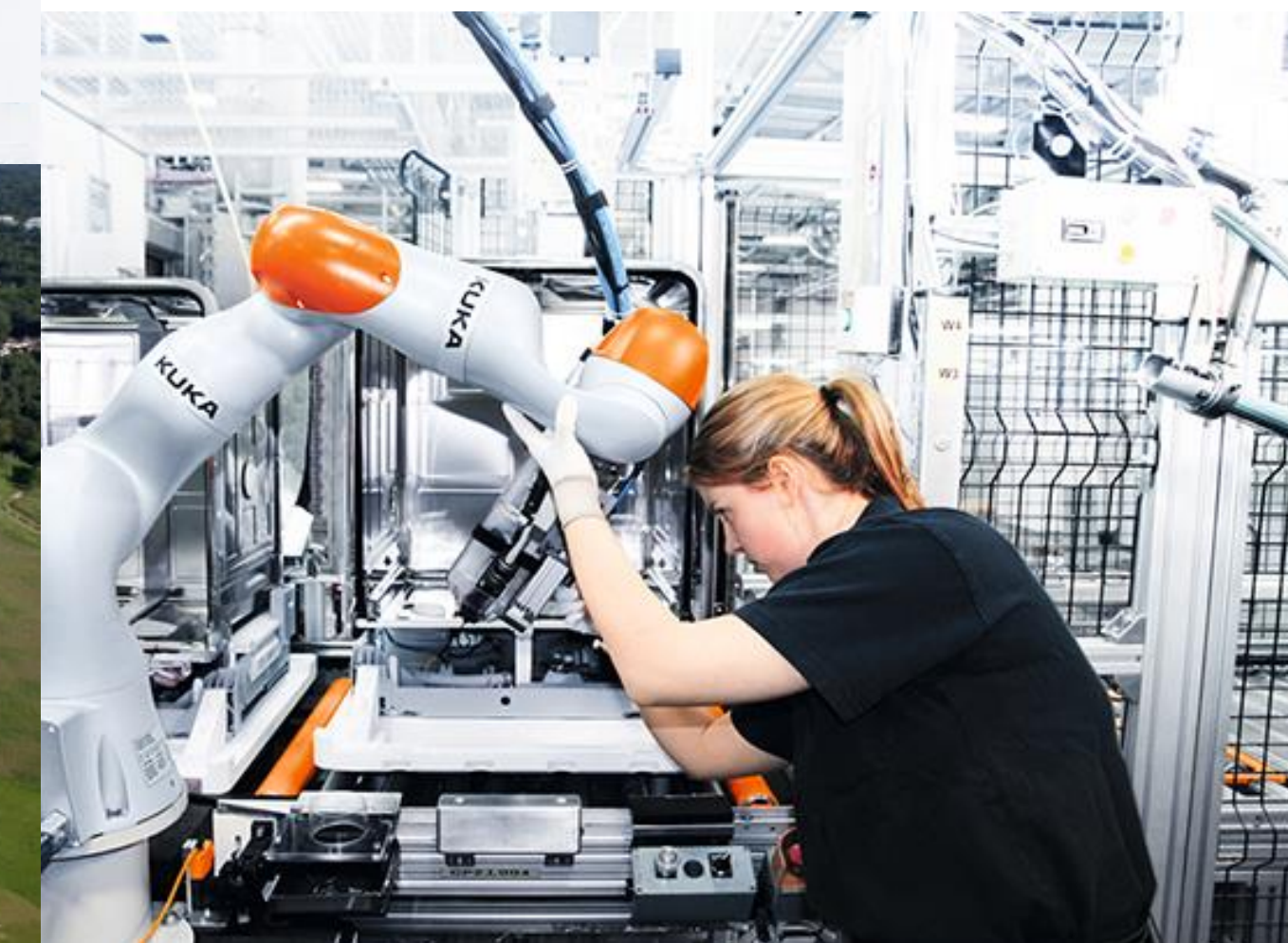
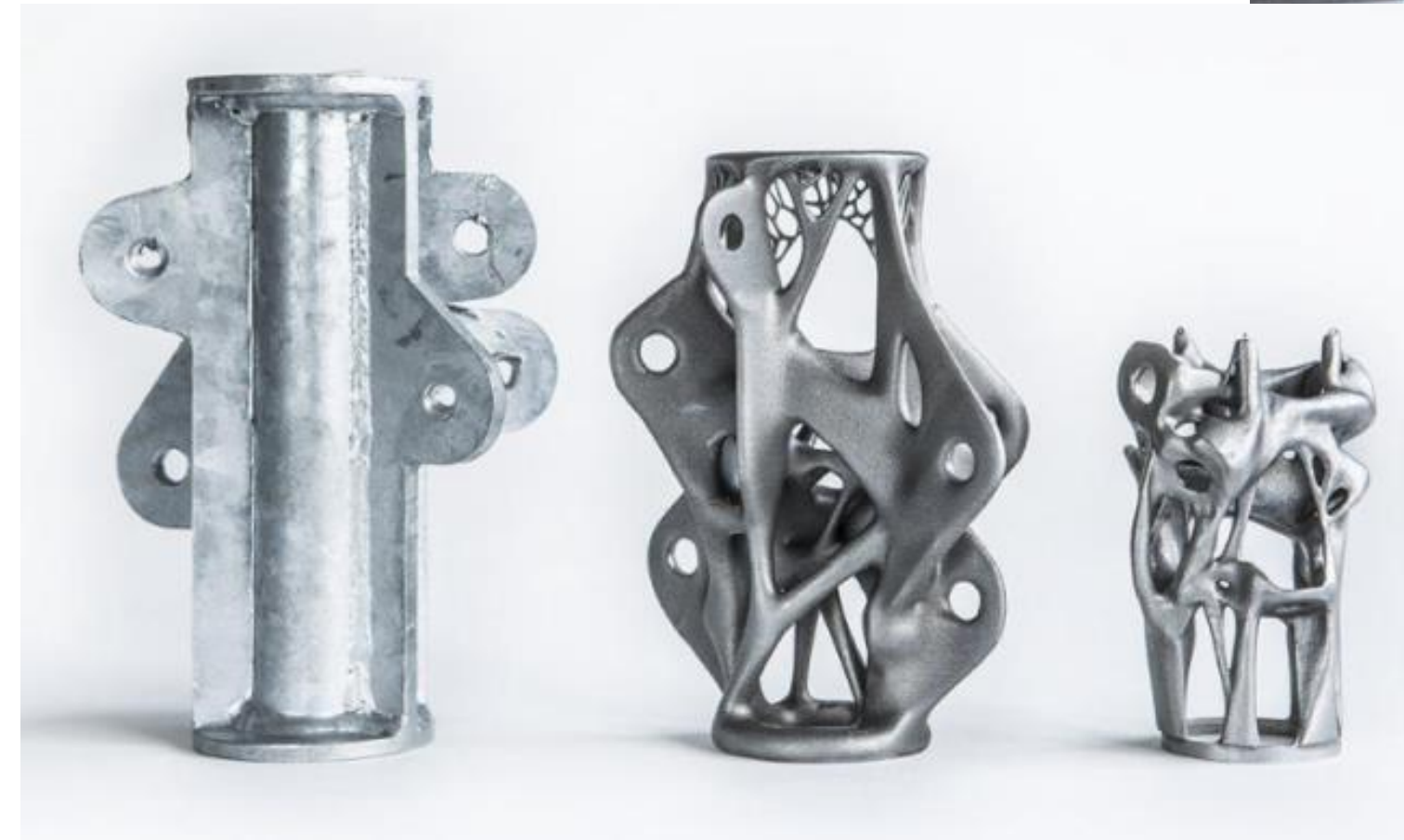
- the social challenges of Industry 4.0 (job losses, hyper-specialisation)
- cultural challenges of Industry 4.0 (product personalisation, new design)
- new design methodology (design to value instead of design to manufacturing)

Personal core of the project team

- Aleksander GWIAZDA, Prof. of SUT, Silesian University of Technology
- Mariusz HETMAŃCZYK, Prof. of SUT, Industry of Future Platform
- Dr. Eng. Małgorzata OLENDER, Silesian Centre of Industry 4.0 Competences

Characteristics of the work of team members

- management and culture of organisation
- augmented reality
- ergonomics and humanisation of work
- systems integration



Characteristics of the project under preparation

Recent work and projects

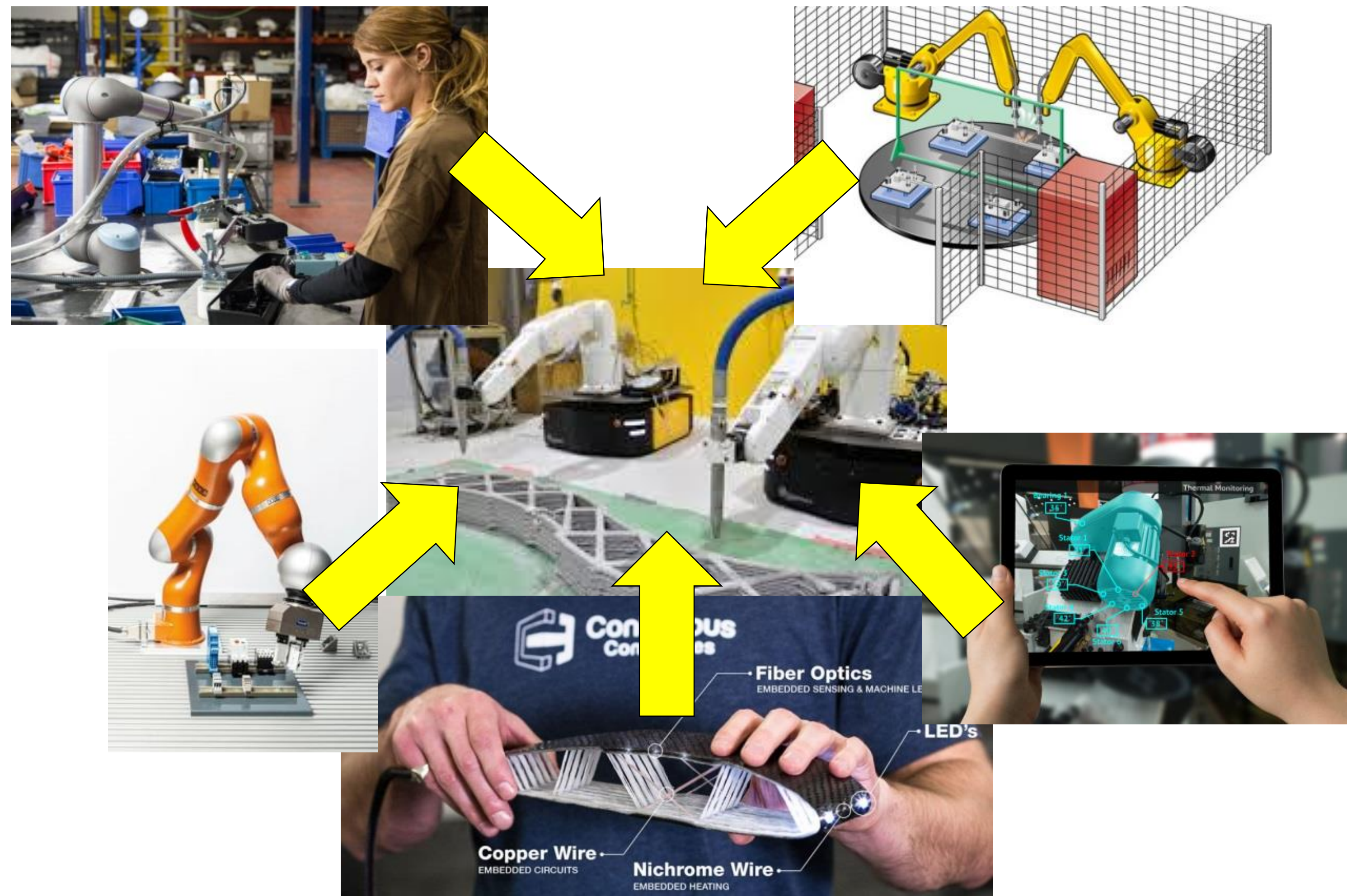
- Design of renewable systems
- Augmented reality
- Simulation of the technical systems operations
- Development of students' competences

Project concept within the sub-area

- a robotic nest for incremental manufacturing of composite parts
- cooperation with a human operator, also using augmented reality
- manufacturing of components being embedded systems (machine components, buildtronic)
- flexible system structure

Potential cooperating entities

- EMT Systems Sp. z o.o
- Axoma Sp. z o.o
- Vix Automarion Sp. z o.o.
- current partners of Department and Faculty



Summary



The implementation of the conceptual nest will allow to develop the mechanisms that characterise both the Industry 4.0 concept, as well as the Industry 5.0 concept,

including:

- additive manufacturing of composite parts in a flexible robotic production nest
- development of the principles of human-robot cooperation in the manufacturing process (assembling of warp elements)
- working out the concept and testing the impact of augmented reality on improvement of productivity of the sociotechnical system and overcoming the need for hyper-specialisation
- working out the concept of a new project based approach within new elements
- determination of the development directions for the investigated technology

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SOCIO-CULTURAL AND METHODOLOGICAL CHALLENGES OF INDUSTRY 4.0

Małgorzata Dobrowolska

International Center for Interdisciplinary Research



Social and Technical Sciences Conference: Scope of Co-operation for the Technical and Social Development



Sections:

- Section 1: International Interdisciplinary Team for Research and Publications
- Section 2: International Interdisciplinary Team for Implementation Projects
- Section 3: International Interdisciplinary Team for Inventions and Know-How
- Section 4: International Interdisciplinary Team for Experts and Knowledge Databases Networks
- Section 5: International Interdisciplinary Team for Priority Research Areas
- Section 6: Talent Hub
- Section 7: Engineering Business Lab
- Section 8: Engineering Business Club
- Section 9: International Forum for Support of High Carbon Sectors Transformation within the EU

Laboratories:

- Laboratory for Research and Analysis of Work Conditions of Industrial Occupations
 - a: Sub-Lab for Preindustrial Period Work Conditions Research and Analysis
 - b: Sub-Lab for Future Work Conditions Research and Analysis

Students' Scientific Circles:

1. Interdisciplinary Student Research Club of Patent Inventors
2. Interdisciplinary Student Research Club of Human Factor in Industry
3. Interdisciplinary Student Research Club of Heroes of Social Inclusion
4. Interdisciplinary Student Research Club of Managerial Competences of Future
5. Interdisciplinary Student Research Club „Psyche”



POB 5: Characteristics of works carried out and the Team

International Interdisciplinary Team for the Priority Research Area: Human Factor in Industry 4.0.

Section A - analysis and development of competences of the future

Section B - monitoring of Industry 4.0 professions and changes of the labour market in the context of Industry 4.0

Section C - professional problems and changes in organisations' management in the context of the 4th industrial revolution

Section D - functioning of the individual in organisations undergoing digital transformation



Published book volumes:

Volumes 1-3: Research and Analysis of Working
Conditions of Industrial Occupations
Part 1: The past, Part 2: The present, Part 3: The future

Top-scored publications:

1. Kowal, M., Sorokowski, P., Sorokowska, A., Dobrowolska, M., Pisanski, K., Oleszkiewicz, A., ... & Anjum, A. (2020). Reasons for Facebook usage: Data from 46 countries. *Frontiers in Psychology*, 11.
2. Sorokowski, P., Groyecka, A., Kowal, M., Sorokowska, A., Bialek, M., Lebuda, I., Dobrowolska, M., Zdybek, P. & Karwowski, M. (2020). Can Information about Pandemics Increase Negative Attitudes toward Foreign Groups? A Case of COVID-19 Outbreak. *Sustainability*, 12(12), 4912.
3. Pollak, A., Dobrowolska, M., Timofiejczuk, A., & Paliga, M. (2020). The Effects of the Big Five Personality Traits on Stress among Robot Programming Students. *Sustainability*, 12(12), 5196.
4. Dobrowolska, M., Ślęzyk-Sobol, M., Flakus, M., & Deja, A. (2020). Climate and Ties in Workplace versus Sense of Danger and Stress, Based on Empirical Research in the Aviation Industry. *Sustainability*, 12(13), 5302.
5. Tutak, M., Brodny, J., & Dobrowolska, M. (2020). Assessment of Work Conditions in a Production Enterprise—A Case Study. *Sustainability*, 12(13), 5390.
6. Dobrowolska, M., & Knop, L. (2020). Fit to Work in the Business Models of the Industry 4.0 Age. *Sustainability*, 12(12), 4854.

Current research:
Conducting research in 26 countries on future competences
and diagnostic tools for leaders, employees and HR professionals

Conferences cycle:
Conference on Social and Technical Sciences –
scope of cooperation for technological and social progress



**Licences and research works (NB)
related to Industry 4.0:**

1. Scale of the work safety and health climate
 2. Diagnostic tool for workers performing difficult and dangerous work in industry
 3. Psychological test to diagnose industrial rescuers. Implementation at the customer's premises
1. Employee appraisal systems

Projects:

Dialog 0331/DLG/2018/10 and Dialog 0012/DLG/2019/10
financed by the Ministry of Science and Higher Education

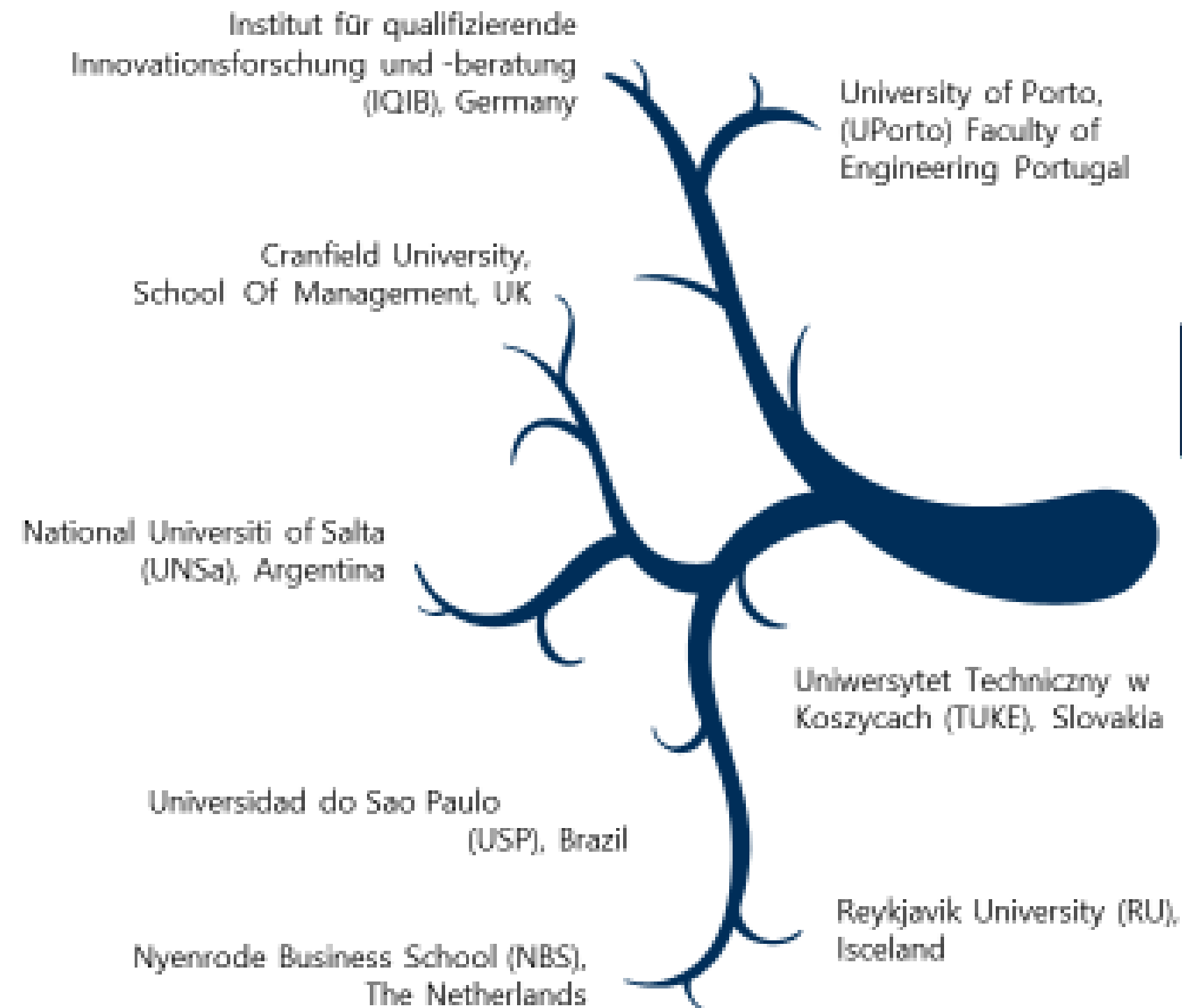
National and European patent applications:

- P. 428370 „Tool for carrying out psychological tests as part of professional suitability and qualification for work“
 - P. 428372 „Apparatus for measuring human psychophysical fitness“
 - P. 428373 „Apparatus to assess the coordination of divisibility and attention-grabbing in simulated difficult physical working conditions“
 - P. 428519 „Peripheral device to support psychological research“
 - P. 428520 „Device monitoring behaviour of a person subject to the diagnosis“
 - P. 428022 „Workstation safety conditions upgrade device“
 - P. 428020 „Device for carrying out psychological tests and quantitative examinations“
- Device for creating spatial visualization of images and charts for the education of visually impaired persons.

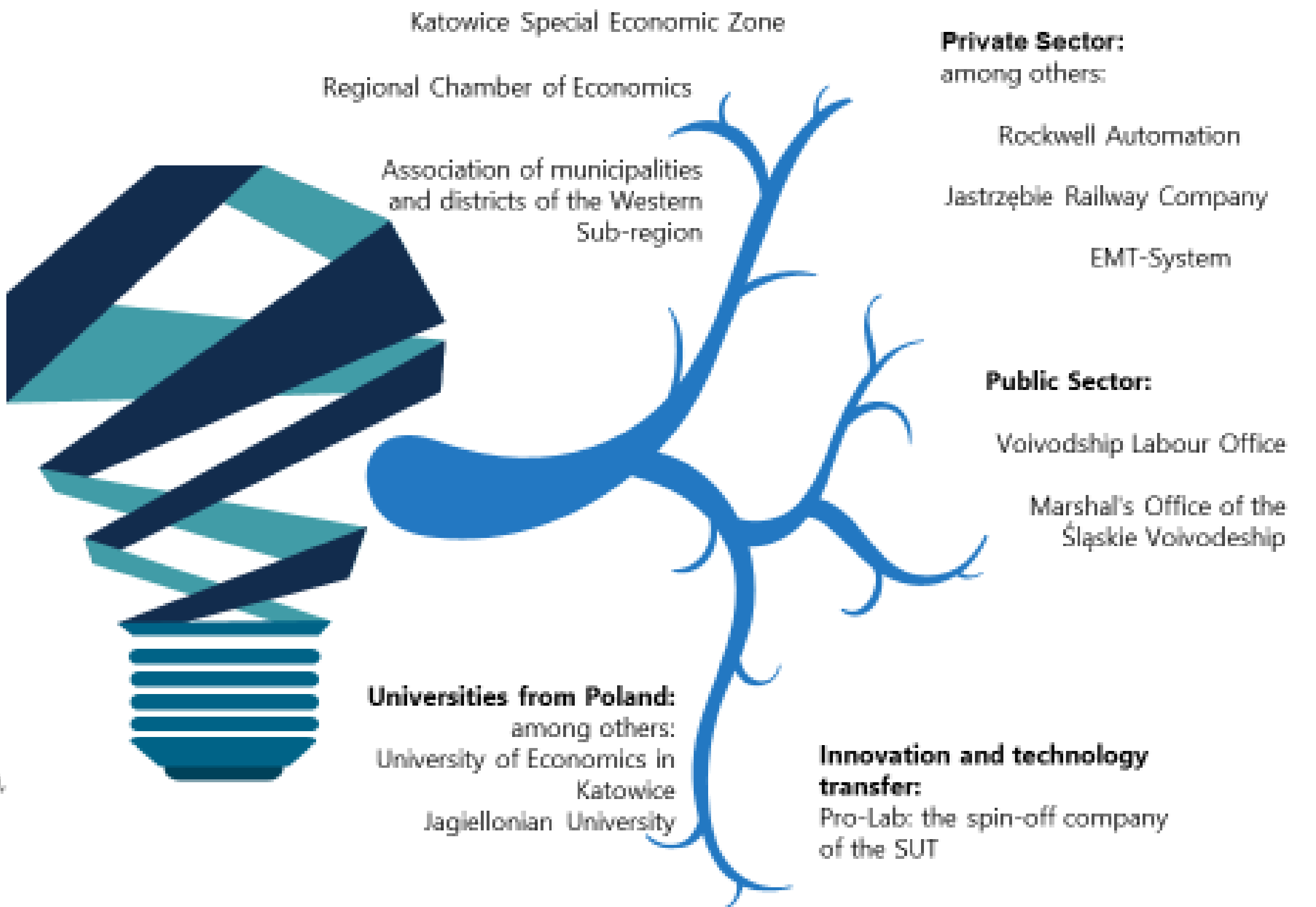


Cooperation with external partners

Academic Sector:



Social Sector:



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SOCIO-CULTURAL AND METHODOLOGICAL CHALLENGES OF INDUSTRY 4.0

Aleksandra Kuzior

Faculty of Organisation and Management

Research of the Department of Applied Social Sciences of the Faculty of Organisation and Management

Dr. Waldemar Czajkowski, D.Sc. Prof. of SUT; Prof. Dr. Pavel Fobel, D.Sc.; Prof. Dr. Daniela Fobelova, D.Sc.;
Dr. Bartłomiej Knosala; Dr. Aleksandra Kuzior, D.Sc. Prof. of SUT, Dr. Grażyna Osika, D.Sc. Prof. of SUT;
Dr. Barbara Przybylska-Czajkowska

- Ways of addressing moral issues in the emerging Industry 4.0 paradigm and its cultural and axiological aspects.
- Analysis of the Industry 4.0 development in the perspective of global technology development model.
- Predicting the cultural consequences of introducing Industry 4.0 basing on Marshall McLuhan's tetrad concept.
- Social implications of the Industry 4.0 implementation - resistance to change and the problem of technological unemployment.
- Humanistic and psychological aspects of human-machine interaction.
- Automation of HR processes, analysis of potential risks.
- Social innovation to support the implementation of Industry 4.0.
- The development of Industry 4.0 as a subject of public debate in democratic society.

Problem of technological unemployment

- Are we in danger of technological unemployment?
- Which professions are at risk due to computerisation and automation of work processes?
- What will be the professions of the future?

- Technological unemployment results from the technical progress and development of modern, innovative technologies, which - when implemented in various branches of industry and services - usually cause a lower demand for human labour. Activities previously performed by humans are now performed by highly efficient machines. Automation and robotisation of industry and services result in lower demand for workforce.