Research Centre for Engineering and Management of Innovation

## Contact details

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<thead>
<tr>
<th>Name</th>
<th>Research Centre for Engineering and Management of Innovation</th>
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<tr>
<td>Acronym</td>
<td>RESIN</td>
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<tr>
<td>Logo</td>
<td><img src="research_centre.png" alt="Research Centre logo" /></td>
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<tr>
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<td>Faculty / Department</td>
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<td>Director</td>
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### Areas of expertise

**Design and innovation tools:** tools, models and algorithms for PSS and LCM; ontology-based web applications; tools, models and algorithms for planning, analysis and design complex systems; tools for innovation engineering

**Smart technologies (CPS) (focus on industrial robotics and production):** smart units (sensors, actuators, etc.); plug and play fast reconfigurable smart control systems; intuitive human-machine interfaces

**Business innovation:** innovative clusters and smart specialization; innovation management; business competitiveness; knowledge management.

### Team and key skills

**Prof. dr. eng. Stelian BRAD**
Stelian Brad is full professor in engineering and management of innovation in the Department of Design Engineering and Robotics. He has a BSc in engineering design of production systems, an MSc in energy management, a doctorate in robotics and a doctorate in economics. Stelian Brad is scientific coordinator in engineering & management. His research focus is on structured innovation in management and design, complex system design and intelligent industrial robotics.

**Assoc. Prof. dr. eng. Mircea FULEA**
Mircea Fulea is lecturer within the Department of Design Engineering and Robotics. His research focuses on industrial software usability and product-service systems. He got a BSc in telecommunication, an MSc in multimedia systems and a PhD in engineering and management. He's also interested in organizational excellence, software programming, virtualization technologies and Linux-based operating systems.

**Assoc. Prof. dr. eng. Bogdan MOCAN**
He is lecturer in the Department of Design Engineering and Robotics from the Technical University of Cluj-Napoca. As member of RESIN, his current research focuses on manufacturing robotization, process and product innovation and integrated management systems. He got a BSc in engineering design, a Post Graduated degree in eco-management, an MSc in quality engineering and a PhD in industrial engineering. His key professional fields of interest are: robotics, process and product innovation, integrated management systems and quality management.

**Assist. PhD student Mircea MURAR**
Mircea Murar is research assistant in Department of Design Engineering and Robotics, and PhD student in RESIN. He has a BSc in power electronics and electric drives, as well as two MSc degrees: one in robotics and one in renewable energies. As a member of RESIN, his research is oriented towards embedded systems, programmable logic controllers, sensors, reconfigurable robotic cells, and smart factories.

### Infrastructure

**Robotic assembling system**

*Technical Characteristics:* ABB IRB 140 industrial robot; Outstanding position repeatability - ± 0.05 [mm]; Payload 5 [kg];
Number of axis: 6; IRC4 controller and specialized end effector.

**Robotic welding system**

Technical Characteristics: ABB IRB 1600 industrial robot; Outstanding position repeatability - ± 0.05 [mm]; Payload 5 [kg]; Number of axis: 6; IRPB 250 positioner; wire cutter and cleaning torch; IRC5 controller; Fronius TransPlus Synergic 4000 power source.

**Robotic handling and inspection system**

Technical Characteristics: ABB IRB 1600 industrial robot; Outstanding position repeatability: ± 0.05 [mm]; Payload 5 [kg]; Number of axis: 6; IRC5 controller; Optimaster LX400 vision system.

**Integrated system for intelligent manufacturing**

Technical Characteristics: Motoman SDA10D industrial robot (Slim, Dual-Arm Robot with “Human-Like” Flexibility); Outstanding position repeatability per arm: ± 0.1 [mm]; Payload per arm: 10 [kg]; Number of axis: 15; DX100 controller.

**Robotic handling and assembling system products**

Technical Characteristics: KR 5 sixx R850 industrial robot; Outstanding position repeatability: ± 0.03 [mm]; Payload 5 [kg]; Number of axis: 6; KR C2sr controller.

**Robotic assembly system**

Technical Characteristics: Robotstar SCARA type industrial robot; Outstanding position repeatability: ± 0.03 [mm]; Payload 5 [kg]; Number of axis: 4; controller.

**Intelligent robot hand with 3 fingers**

Technical Characteristics: payload 10 [kg]; Grip force 15 to 60 [N]; Closing speed 22 to 110 [mm/s]; Repeatability 0.05 [mm]

**Robotic handling and inspection system**

Technical Characteristics: Fanuc LR Mate 200iC with 6 DOF; Payload: 5 [kg]; Repeatability 0.02 [mm]; Vision system: colour.

**PLCs:** Siemens S7 300 modular systems, with programming facilities (including WinCC Flexible), sensors etc.

### Development strategy

Our mission is to contribute to the enhancement of the specific know-how which ensures the creation and implementation of highly competitive innovations in complex problems of engineering and management. This is done by means of research projects, consulting and training. Cooperation within national and international networks, clusters and other forms of partnerships for research, innovation and education is also considered. We look for combining creatively our core knowledge and expertise to create niche solutions in various application fields: intelligent robotic units and intelligent industrial robotics (since 1997); intelligent management of organizations (since 1999); sustainable intelligent industrial products and processes (since 2003); smart regional development (since 2001); intelligent management of water resources (since 2011). We will also look in the future for application opportunities in intelligent medical units and eco-intelligent building units.

### Representative projects

**Design and innovation tools:**

**MARKET IT – “Demonstrating the industrial validity and market feasibility of IT Tool to support SMEs in systematic innovation processes”,** (2012 – 2013), FP7, Grant Agreement no. 311517.

**TECH-IT-EASY – “IT Tool to Support SMEs in Systematic Innovation, Based on Consolidated Methodology and Innovation Knowledge Domain Structured through Specific Ontologies”** (2009-2011), FP7, Call SME-2008-1, Code 232410

Smart Redesign of Clamp-hook Tool to Achieve a Mass Reduction with 70%, CSi Industries B.V. Holland, 2013111902 (2013-2014)

**Smart technologies (CPS):**


Finishing Robotization of Vilmar Chairs using IoT and plug-and-play smart reconfigurable process control unit, Becker, Code 3101 (2013-2014)

**Business innovation:**


Smart Specialization Strategy on Clusters, ADRN-E, Code 3999, (2013)
Significant results

The most representative publications of the past 5 years

**Smart technologies (CPS):**


**Design and innovation tools:**


**Business innovation:**


Remarkable results achieved in the projects in the last 5 years – international patents, products used by beneficiaries, technologies adopted by companies

**Patents:**


**Software implemented in companies (national and international):**

business eXXplorer :: expert system for assessing business excellence
qost eXXplorer :: expert system for quality cost management
inovex :: software platform for supporting knowledge management and process innovation (TRIZ-M; ARIZ-M; USIT-M; ASIT-M)
MaPE :: expert module to assess the market value of innovative products and services
TECH-IT-EASY :: ontology–based web software platform for systematic product innovation (ontologies are focused on electromechanical field)
MARKET-IT :: web application of advanced web semantic technologies to support the innovation processes in SMEs
Pattern eXXplorer :: expert system for optimizing box arrangements in robotic palletizing applications and sales support tool

Technology:
SMART_R :: smart units and reconfigurable controller with plug-and-play capability

The offer addressed to the economic environment

<table>
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<tr>
<th>Research &amp; development in core areas</th>
<th>Tools and approaches for complex system analysis, planning and development Tools and approaches for complex product and process innovation and development Tools and approaches in engineering design and innovation Product-service system design Algorithms for information creation and management in smart factories Structured innovation in management</th>
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<td>Research &amp; development in applied fields</td>
<td>Development of software tools to implement methods of innovation and competitive engineering, expert systems in product innovation and process innovation Product-service systems in software development and green design Integrated innovation management systems, LCM and LCC Information creation and management in industrial robotic systems Smart units in manufacturing, building management, water management</td>
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<td>Consulting</td>
<td>We provide various types of consulting services on innovation and competitiveness issues. They include innovation audits, intellectual property reviews, business reviews, technology reviews, competitiveness assessment, smart strategy development, process innovation, lean production, LCC, etc. Most of the consulting services are customized to requirements.</td>
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<td>Applied engineering services</td>
<td>Industrial robot and PLC programming (ABB, Motoman, Fanuc, Kuka, S7 Siemens) Applied robotics and manufacturing robotization (all sort of industrial applications) Competitive design of robotic systems (e.g. intelligent complex end-effectors, robot-process interaction, user-robot interfaces, intelligent axes)</td>
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<td>Training</td>
<td>Management of innovation and innovation management systems Microeconomics of competitiveness (delivered in affil. with Harvard Business School) Product manager (both the training and assessment of product managers are based on the corresponding Romanian occupational standard) Design for innovation and competitiveness; Design for life-cycle</td>
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1. TECH-IT-EASY – web platform software to support product innovation

2. INOVEX – software platform to support knowledge management and innovation processes
3. qosteXXplorer – expert system for managing quality costs (planning, monitoring, control)

4. MARKET-IT - web application of advanced semantic technologies to support the innovation processes in SMEs
5. SMART_R – reconfigurable smart units for control