Raw results: TG-IR Group Work

Group A

New applications with required Technologies/Abilities directly underneath: (priorities listed in front, 1= most important)

- Smart tooling (human equivalent)
    - (combination of sciences, AM, AI, sensors)
- "Automated" safety assessments
    - Robot – robotic vs human driven approach
- Safe and connected robots
    - Predictability, cognition, wireless communication
- **(3)** Seamless interaction (communication of intent, interpretation)
    - Models
    - Computing
    - Augmented reality, wearables
- **(2)** Cognition (Human? Robot ?)
    - 2020 : Humans > 2020 Perception, AI
- **(1)** Adaptive performance (teamwork, cycle time, sync)
    - Scene understanding, HMI
- Make it interdisciplinary to face the challenges (e.g. social sciences) adaptive robotics, mimic

Group B

New applications:

- Satellite manufacture
- Small lot size manufacture
- High value manufacture (Electronics)
- Demanufacture / Recycle
- Parts feeding / kitting
- Inspection for product quality
- Metal part manufacture / machining & 3D parts
- Convergence of manufacture + logistics
- Construction
- Agriculture / horticulture
- Food preparation / production

Abilities and Technologies (priorities listed in front, 1= most important)

- Tools with haptic feedback (2 votes)
- **(1)** Safe co-operation w/ humans **(9 votes)**
- Open control loops (1 vote)
- "Automate" programming (learning or CAD based?) (3 votes)
- Reliability (2 votes)
- Automatic perception (semantic) (0 votes)
- **(3)** Ability to adapt / recover from failure "Resilience" **(5 votes)**
- **(2)** Reusability / adaptability / reconfigure / flexible **(8 votes)**
- Tools for grasping – general, able to handle "blind grasping" (3 votes)
- Planning formable part assembly – e.g. wiring (3 votes)

- Autonomy (3 votes)
- Verification & Validation (2 votes)
- System that can adapt to human collaborator (1 vote)

Group C

New applications

- Collaborative robotics limited by size in some applications
- Exoskeleton (natural behavior)
- Go from lab to production lines
- Flexible grippers (or flexible methods to create grippers

Technologies / Abilities (priorities listed in front, 1= most important)

- **(1)** Fusing sensor (information, capturing semantics) in a fast way
- **(2)** Sensor integration in grippers
- **(3)** Integration of robots in production facilities

Group D

New applications: (priorities listed in front, 1= most important)

- **(1)** Automating the infeed and outfeed of existing automated production lines (argument: the production lines may be well automated but they are fed and unloaded by manual methods, etc.) **(8 votes)**
- **(2)** New applications in laboratory environments. Flexible, capable of addressing multiple situations. Capable of interacting with people standing, walking, sitting, and in wheelchairs. Capable of very precise movement and of discriminating very small payloads and contact forces and also capable (possibly with a change of configuration or tooling) of carrying large payloads. Self-setup based on context and environment. Autonomous (cognitive and self-servicing for power recharging etc.) **(5 votes)**
- **(3)** Inspecting the condition and carrying out of preventive maintenance on ageing buildings and infrastructure **(3 votes)**

Technologies and Abilities (priorities listed in front, 1= most important)

- **(1)** Need new validation tools and products to enable the validation of more sophisticated products including tools with enable the validation of human interaction **(9 votes)**
- **(2)** ROS Industrial as an adaptable operating system to enable the integration of diverse technologies and capabilities **(6 votes)**
- **(3)** Need more software which is “real world capable” and not just “lab capable). In EU we don’t have enough high TRL systems **(5 votes)**
- Need champions in customer plants to facilitate the transition from lower TRLs to TRL 9 (4 votes).
- Need more robust perception technologies, tactile, vision, etc., and real-time closed loop behaviors based on perception (3 votes).