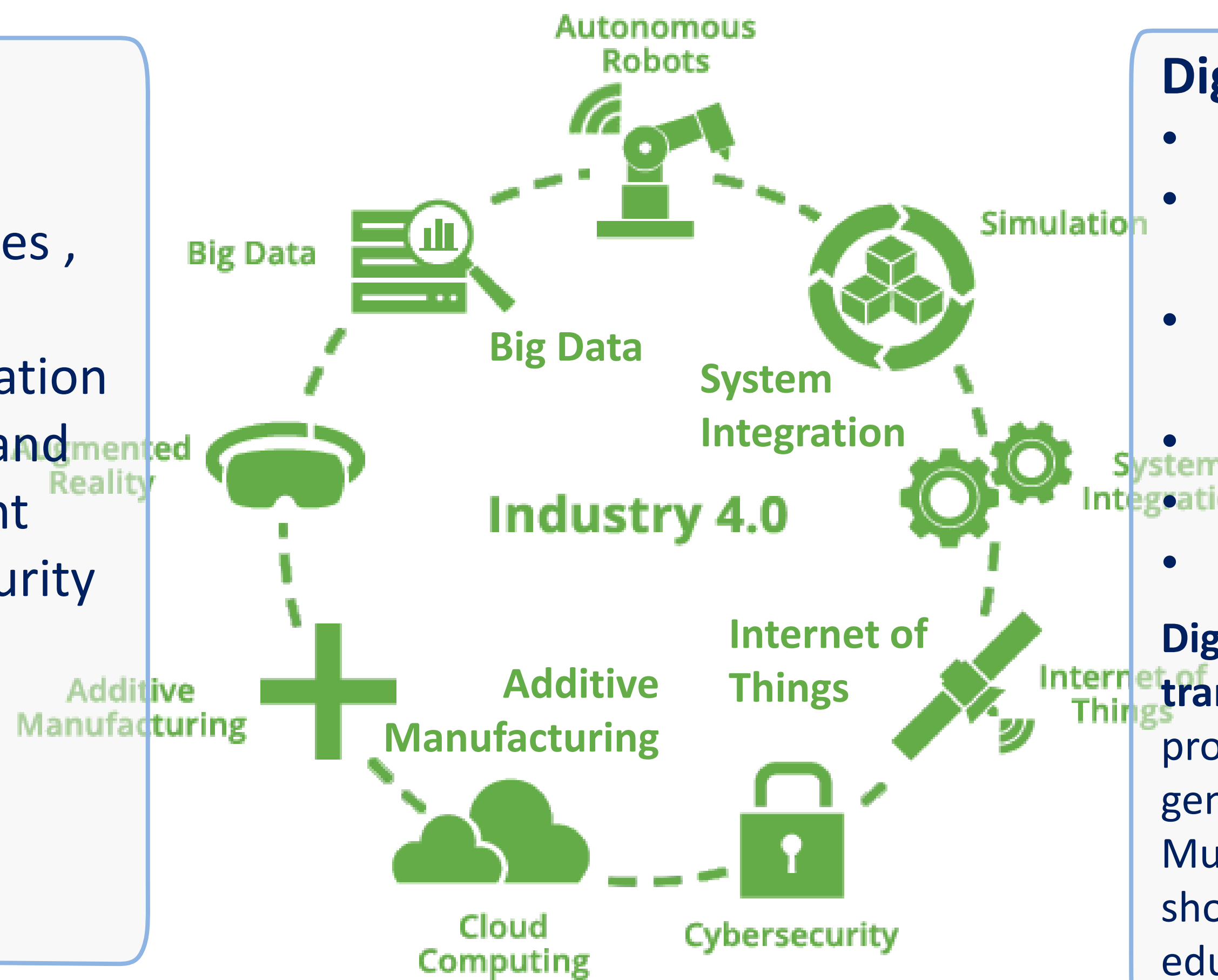# EDISON Data Science Framework (EDSF): Extension to address Transversal Skills required by Emerging Digital Transformation

Digital Transformation of Science and Industry: Impact on Skills Demand

Industry 4.0 and Digital Transformation

Digital Transformation

- Digitation and IoT
- Digitalisation of Processes , Digital Twins
- Optimisation and Simulation
- Intelligent Information and Knowledge Management
- Data Management Maturity
- Digital Assets Manage
- Agile Data Driven Organisational Model
- Customer Experience
- People and skills

Autonomous Robots — Simulation — System Integration — Internet of Things — Cybersecurity — Cloud Computing — Additive Manufacturing — Augmented Reality — Big Data

Industry 4.0

Digital Competences and Skills

- Information and data literacy
- Managing data, information, knowledge
- Digital content creation, programming
- Digital security and safety
- Communication and collaboration
- Problem solving and critical thinking

Digital competence and skills are transversal: Their effect spans from direct professional activity at all levels to more general attitude and entrepreneurship skills. Multiple competence and skills groups should be targeted by (continuous) education and training

Data Analytics and Processes digitalisation are driving Industry 4.0

21st Century or Workplace Skills

Top Skills for Future Data Driven Industry and Research

- Complex Problem Solving
- Critical Thinking; Creativity and Innovation
- Design, System Thinking
- Cognitive flexibility, Cross-Disciplinary Ability
- Judgment and decision making
- Coordinating with Others, Negotiation
- Emotional Intelligence; People Management
- Service Orientation, Customer focus
- Global Perspective
- Working with tools and technologies
- Dynamic (self-) re-skilling
- Professional networking
- Ethics and professional code of conduct

Digital Competences and Data Literacy

- The Digital Competences for Citizens (DigComp 2.1, 2017)
- Important part of digital competences is understanding the role of data and processes related to data handling
    - In modern data centric applications
    - Social media
    - Industrial processes
    - Research
- New challenge: How data are used in AI based decision making and Digital Twin process control
- Special training and skills development must be focused on data processing and management issues
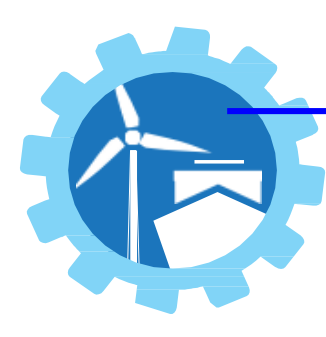

Data Management and Governance (DMG)

General Data Management and Governance (ref to DAMA-BoK)

- Introduction. Big Data Infrastructure and Data Management and Governance.
- Data Management concepts. Data management frameworks: DAMA Data Management framework, the Amsterdam Information Model. Extensions for Big Data and Data Science.
- Enterprise Data Architecture. Data Lifecycle Management and Service Delivery Model. Data management and data governance activities and roles.
- Data Science Professional profiles and organisational roles, Skills management and capacity building.
- Data Architecture, Data Modelling. Data types and data models. Data modeling. Metadata. SQL and NoSQL databases overview. Distributed systems: CAP theorem, ACID and BASE properties.
- Enterprise Big Data infrastructure and integration with enterprise IT infrastructure. Data Warehouses. Distributed file systems and data storage.
- Big Data storage and platforms. Cloud based data storage services: data object storage, data blob storage, Data Lakes (services by AWS, Azure, GCP). Trusted storage, blockchain enabled data provenance.
- Big Data Security and Compliance. Data security and data protection. Security of outsourced data storage.

Research Data Management and Stewardship

- FAIR principles in Research Data Management, supporting tools, maturity model and compliance, GO FAIR, GO TRAIN initiatives
- Data Stewardship and organisational data management. Responsibilities and competences
- Open Science and Open Data (Definition, Standards, Open Data use and reuse, open government data). Research data and open access. Repository and self-archiving services
- RDA products and recommendations: PID, data types, data type registries, others. ORCID identifier for data and authors
- Responsible Data Use (Citation, Copyright, Data Restrictions)
- Open Data services: ORCID.org, Altmetric Doughnut, Zenodo