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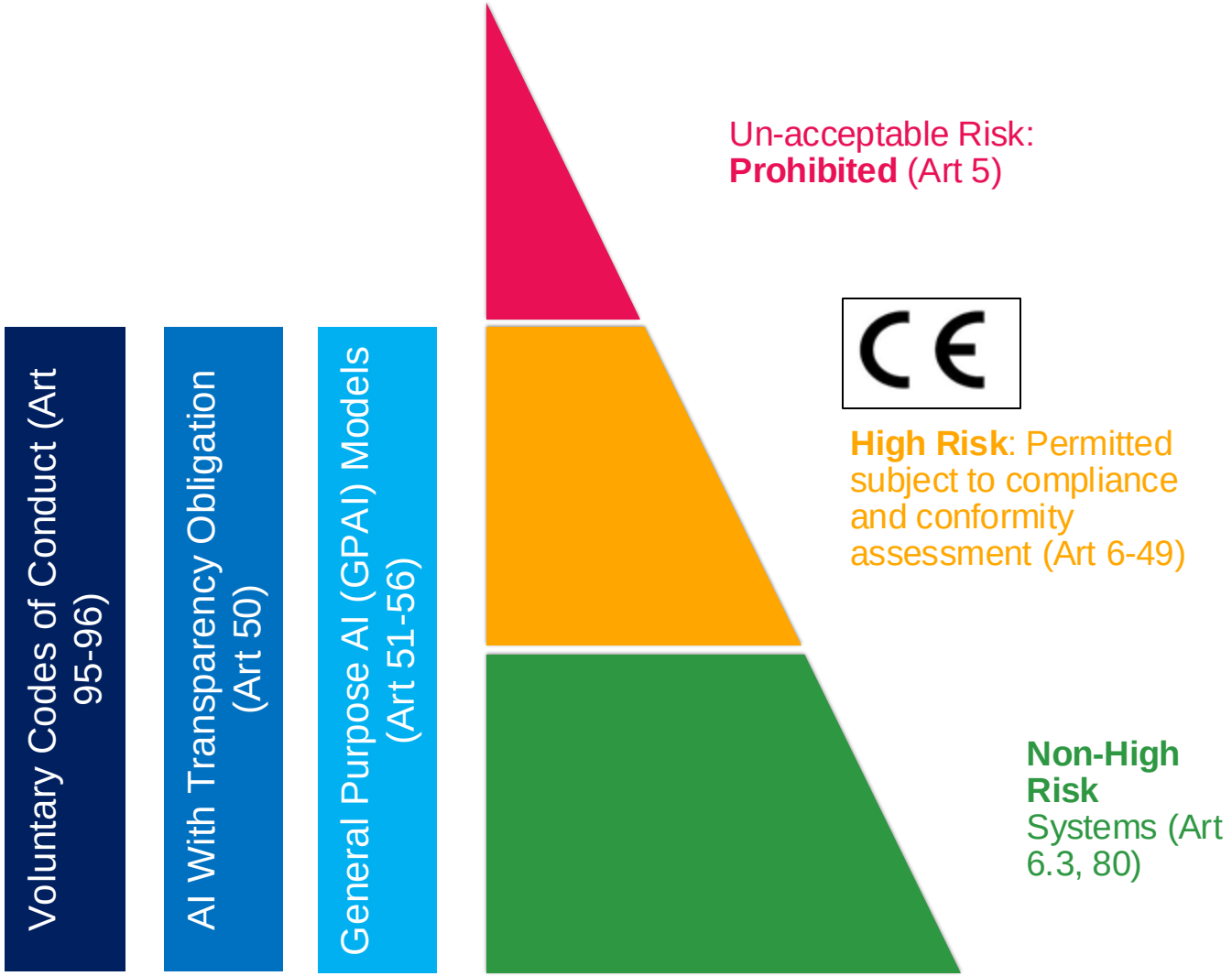
Ontology-based Approach for Mapping Concepts and Requirements from Regulations and Standards: The Case of the EU AI Act and International Standards

ADAPT Centre, Trinity College Dublin

Julio Hernendez – julio.hernendez@adaptcentre.ie
Delaram Golpayegani - delaram.golpayegani@adaptcentre.ie
Dave Lewis - dave.lewis@adaptcentre.ie

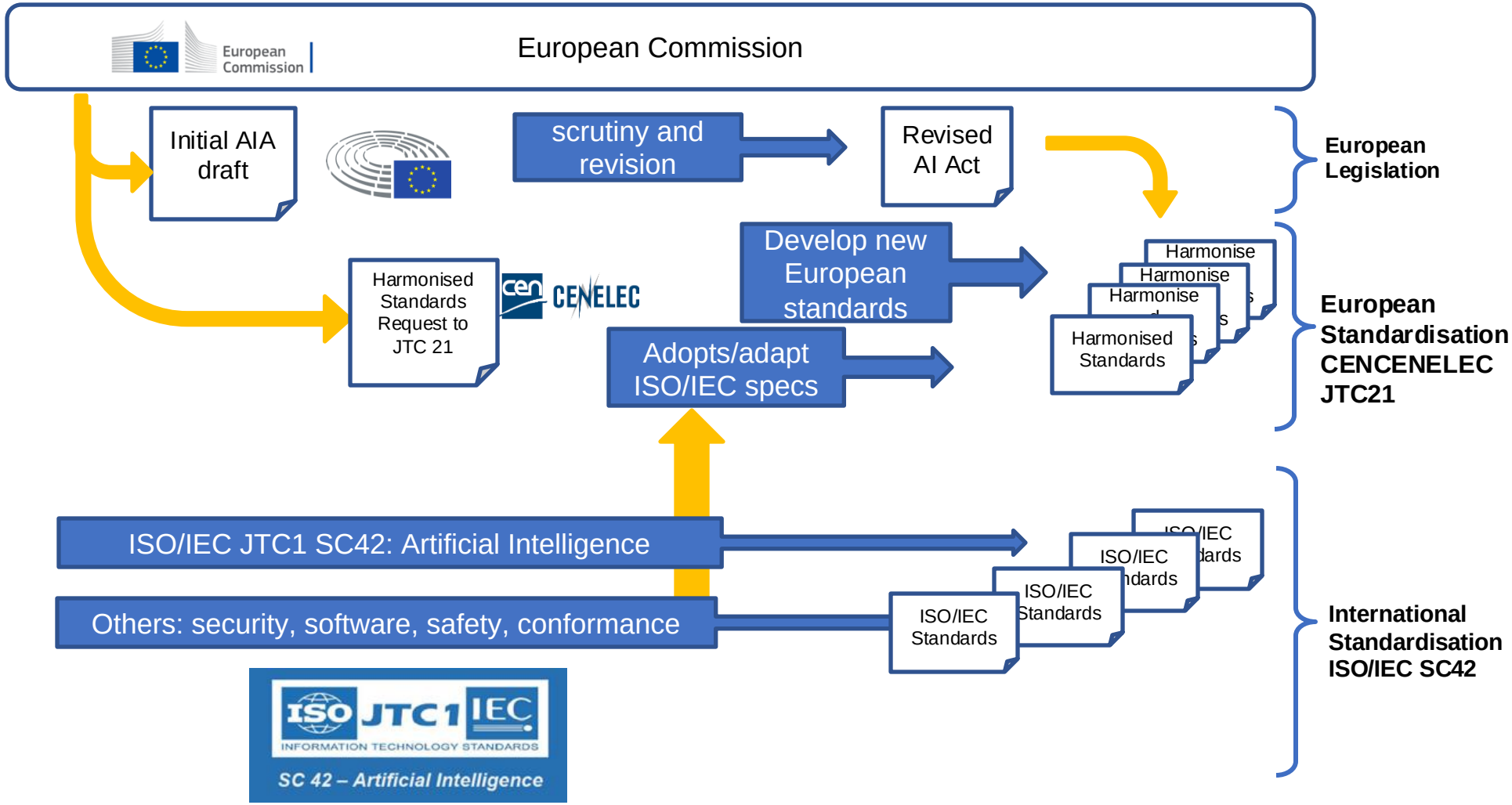
EU AI Act



- Aims to protect **health, safety** and **fundamental rights**
- Enable access to **EU single market** for AI products/services
- Part of New Legislative Framework for product health and safety harmonization across EU single market

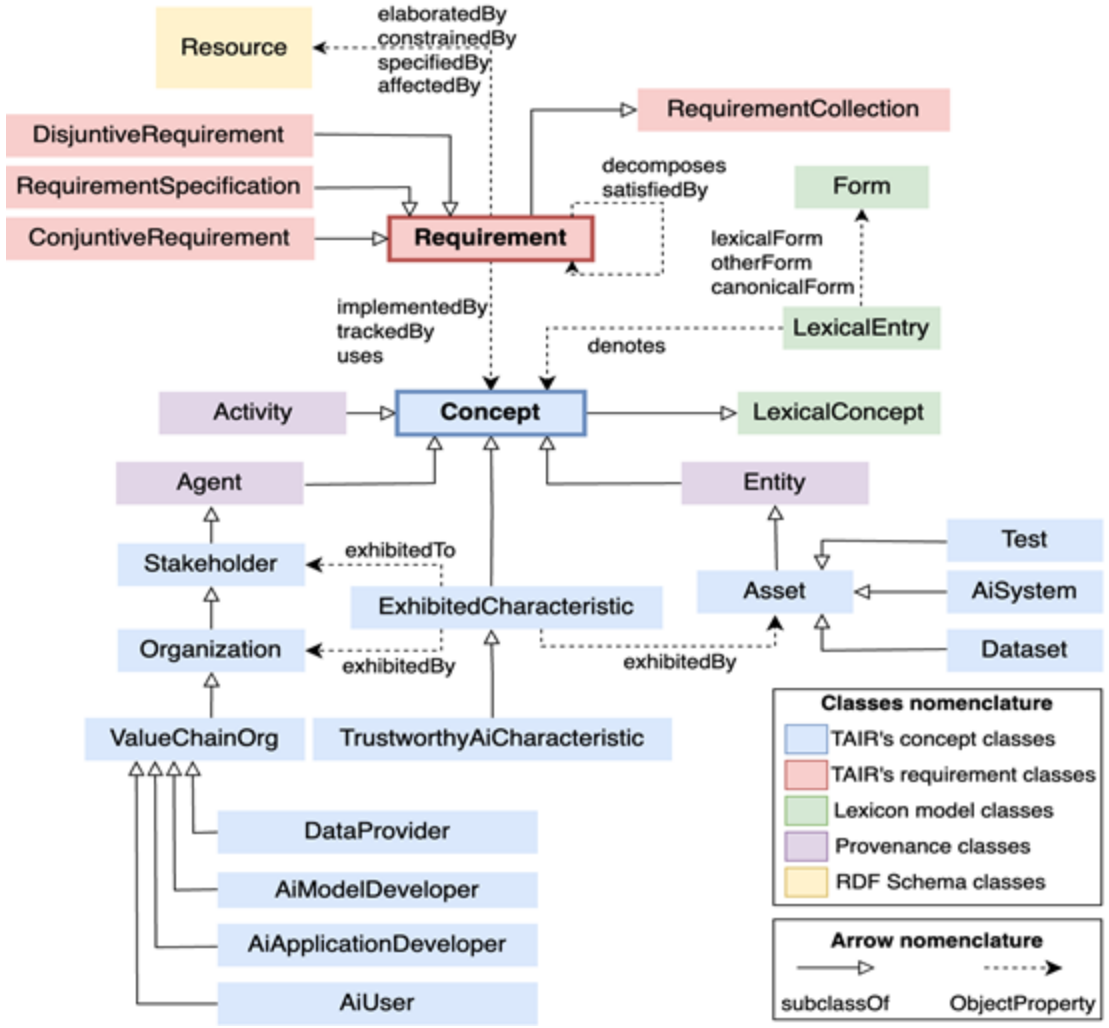
- A **Risk-based** approach to regulating AI
- Requires **product certification & surveillance** for high-risk AI system – Horizontal rules enforced Vertically/Sectorially
- Separate direct regulation of **General Purpose AI Systems**

Harmonised Standards and the AI Act



Trustworthy AI Requirements Ontology

- The TAIR ontology is a semantic approach to map concepts and requirements from regulations and standards
- Treat as an open Findable, Accessible, Interoperable, Reusable (FAIR) using Linked Open Data principles
- Proof of concept modelling of AI provider obligations of initial draft of the AI Act
- Mapped to concepts and requirements from
  - ISO/IEC 22989: AI Terms and Concepts
  - ISO/IEC 42001 AI Management System
- Site: https://tair.adaptcentre.ie



Extracting Semantics of Terms, Concepts and Requirements

Extract defined terms from Act as SKOS Concept Scheme (Art 3)

Separate atomic requirement statements from Act Provisions (Art 10.1 to 10.6) and add Requirement concept for each to a requirement collection

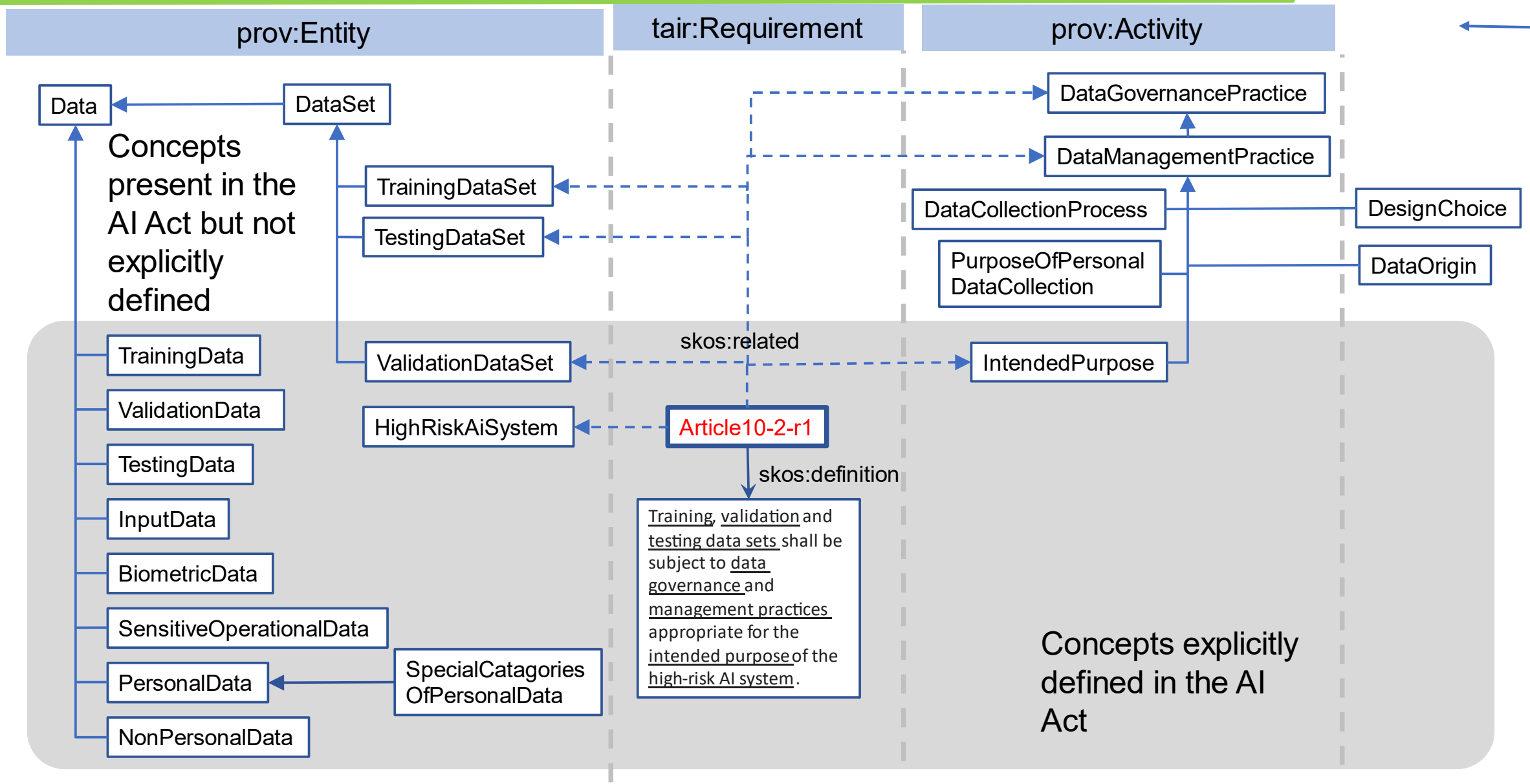
Extract and link concepts deemed relevant to satisfying each requirement into further SKOS concept scheme

Article3-29	training data
Article3-30	validation data
Article3-31	validation data set
Article3-32	testing data
Article3-33	input data
Article3-34	biometric data
Article3-35	biometric identification
Article3-37	special categories of personal data
Article3-38	sensitive operational data
Article3-50	personal data
Article3-51	non-personal; data

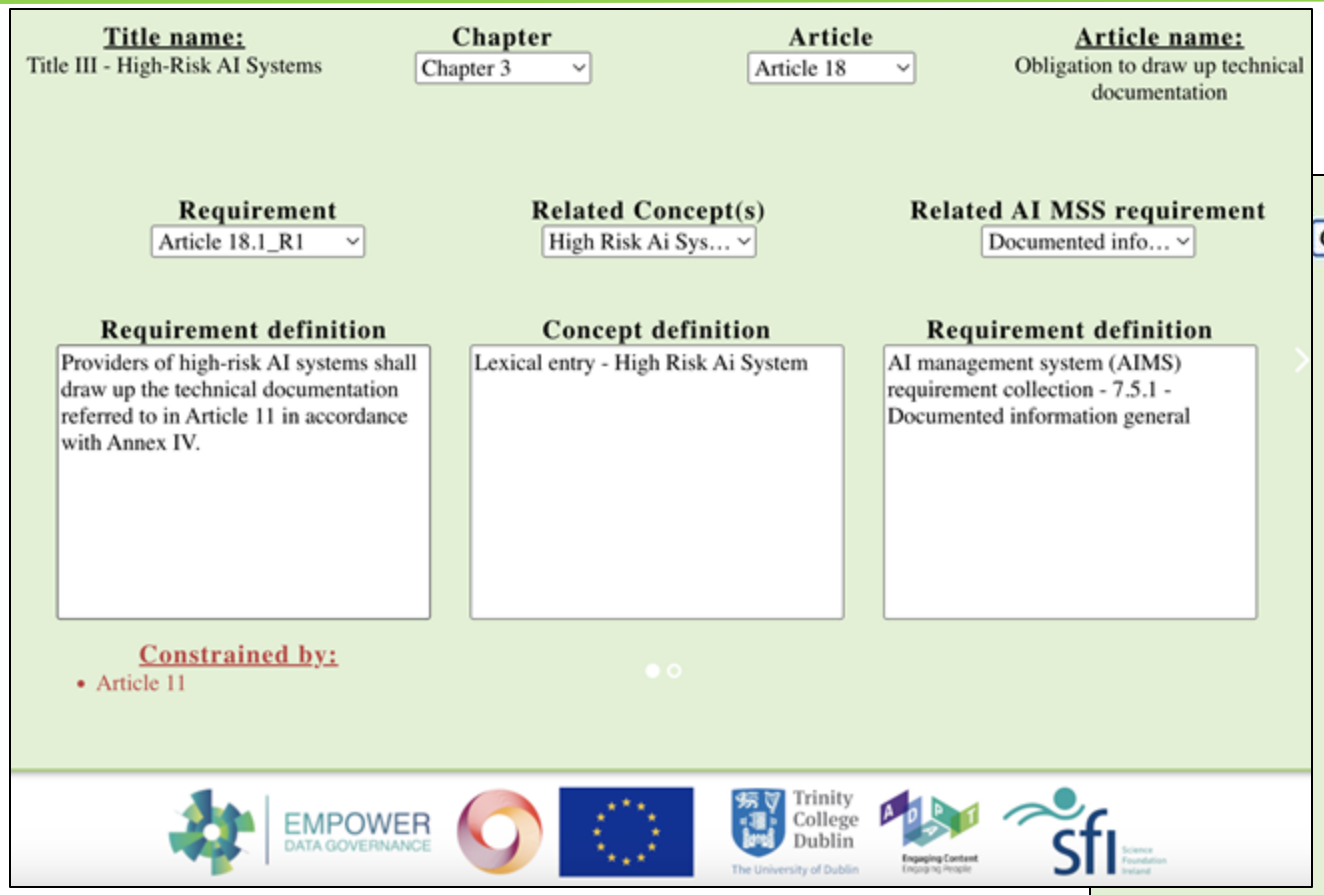
10.2. Training, validation and testing data sets shall be subject to data governance and management practices appropriate for the intended purpose of the high-risk AI system. Those practices shall concern in particular:
(a) the relevant design choices;
(b) data collection processes and the origin of data, and in the case of personal data, the original purpose of the data collection;
.....
(h)....

Article10-2-r1	Training, **validation** and testing data sets shall be subject to data governance and management practices appropriate for the **intended purpose** of the high-risk AI system.
Article10-2-a-r1	[Data governance and management practices shall concern in particular] the relevant design choices
Article10-2-b-r1	[Data governance and management practices shall concern in particular] data collection processes and the origin of data, and in the case of personal data, the original purpose of the data collection

AI Act Art 10 Requirement Example



AI Act – Standards Mapping Browser



Demo site: https://tair.adaptcentre.ie/demo.html

Open Knowledge Graph

- From 15 Articles in initial draft of AI Act related to AI provider obligations
  - extracted 118 atomic requirements,
  - 46 defined term and 23 undefined terms
- ISO/IES 22989 yielded ; 106 defined concepts
- ISO/IEC 42001: 25 defined concepts
- Only 6 coinciding concepts: AI System; Risk; Training Data, ; Validation Data; Testing Data, Documentation

AI Act: Harmonised Standards Request to ESO

Requirement for European Standard https://ec.europa.eu/growth/tools-databases/enorm/mandate/593_en	Possible SC42 standards
Risk Management Systems for AI systems	ISO/IEC 23894 - Ai Risk Management
Governance and quality of datasets used to build AI systems	ISO/IEC 5259.1-5 - Data quality for analytics and machine learning
Record keeping through logging capabilities by AI systems	ISO/IEC 24970 — AI system logging
Transparency and information provisions for users of AI systems	ISO/IEC DIS 12792 - Transparency taxonomy of AI systems
Human oversight of AI systems	ISO/IEC AWI 42105 - Guidance for human oversight of AI systems
Accuracy specifications for AI systems	ISO/IEC AWI TS 25223 - Guidance and requirements for uncertainty quantification in AI systems & ISO/IEC AWI 23282 - Evaluation methods for accurate NLP systems
Robustness specifications for AI systems	ISO/IEC TR 24029.1-2 Assessment of the robustness of neural networks
Cybersecurity specifications for AI systems	ISO 27090, ETSI?
Quality management systems for providers of AI systems, including post-market monitoring processes	ISO/IEC 42001 AI management system & ISO/IEC 27001:2013 Information security management systems
Conformity assessment for AI systems	ISO/IEC DIS 42006 - Requirements for bodies providing audit and certification of AI management systems

ISO JTC1 IEC INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

- EC Request for Harmonized Standards from European Standards Organisations (ESO)
- Compliance by Providers conveys presumption of conformity
- Providers would remain responsible for satisfying Act requirements and harmonized standard remain under review
- If ESO unsuccessful, EC can define Common Specifications
- ESO may adopt existing international standards for AI processes or develop new ones – JRC reports:

https://publications.jrc.ec.europa.eu/repository/handle/JRC132833

https://publications.jrc.ec.europa.eu/repository/handle/JRC139430

CEN CENELEC ETSI

Open Knowledge Graphs for AI Act

AI Act Challenges	FAIR Open Knowledge Graph
AI Act is a Learning Framework	Provisional, extensible, progressively specific specifications
Standards in enforcement: vertical vs horizontal, product vs process	Mapping Act and harmonised standards into workable interoperability specifications
Complex value chains	Specialisable vertical models for permissionless innovation in different sectors
Need for broad stakeholder engagement	Open access specifications and compliance testing tools accessible for SME, NGO, public sector

Thank You – Questions?

Dave.Lewis@adaptcentre.ie

Track work at:

https://regtech.adaptcentre.ie/

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