Regulations and Standards

Dependable and Deployable AI for Robotics

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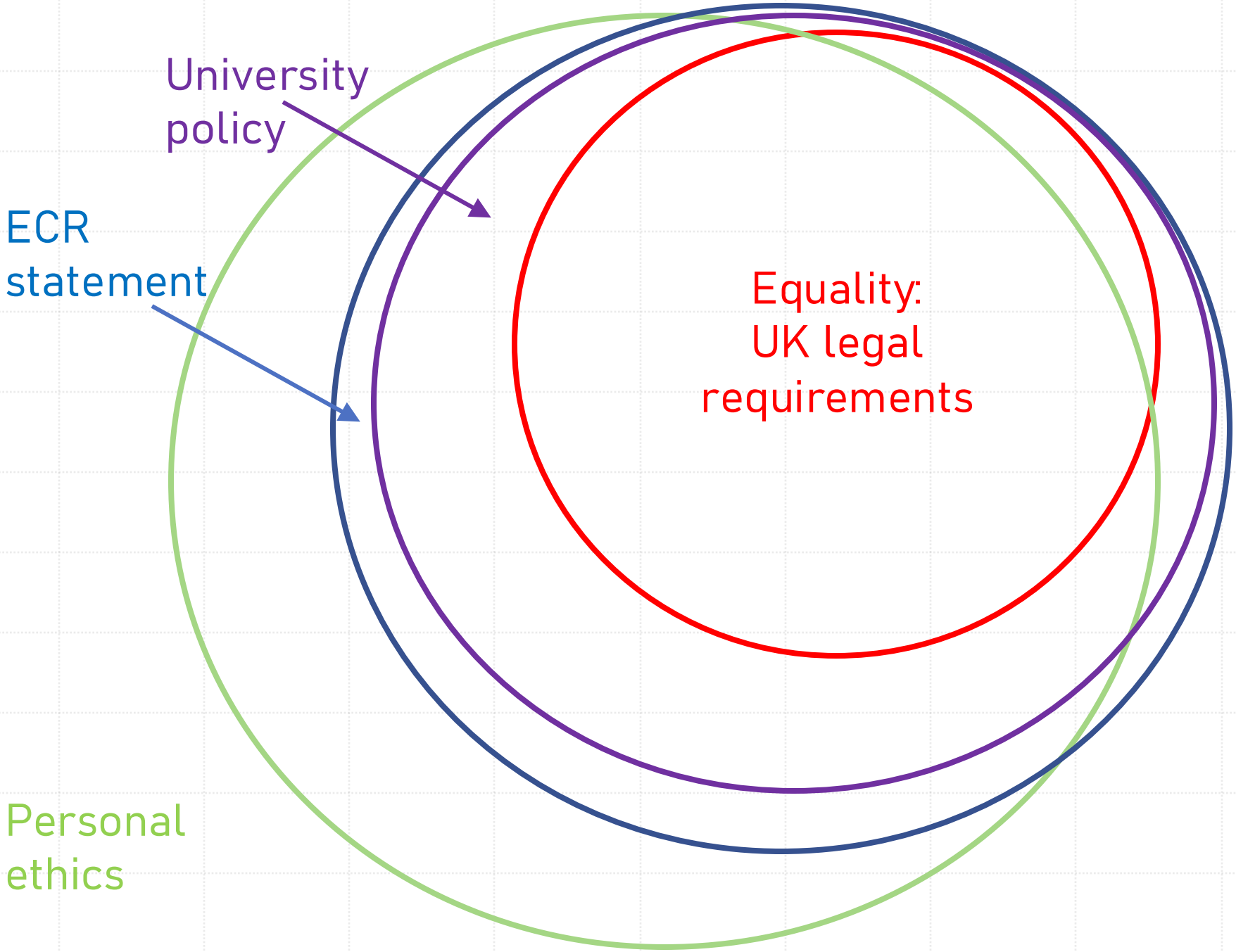
Responsible Research and Innovation

- ***"Align R&I to values, needs and expectations of society"***

This is not just a voluntary choice:

- As a citizen of a country you are bound by legislation
- As a member of the University you are bound by governance
- Depending on your area of research you may obliged to observe formal standards

Let's start with a human right – equality


University policy
ECR statement
Equality: UK legal requirements
Personal ethics

Equality act 2010 –Protected characteristics

There are nine characteristics explicitly protected under the act:

1. Sex
2. Sexual orientation
3. Religion or belief
4. Race, including colour, nationality, ethnic or national origin
5. Disability
6. Pregnancy or maternity status
7. Age
8. Marital status
9. Gender reassignment status

Discrimination

Direct: treating someone unfairly because of a protected characteristic

Indirect: having a policy or process that has a worse impact on someone with a protected characteristic

True or false? The equality act means that under any circumstance, discrimination is illegal.

You're protected from discrimination:

- at work
- in education
- as a consumer
- when using public services
- when buying or renting property
- as a member or guest of a private club or association

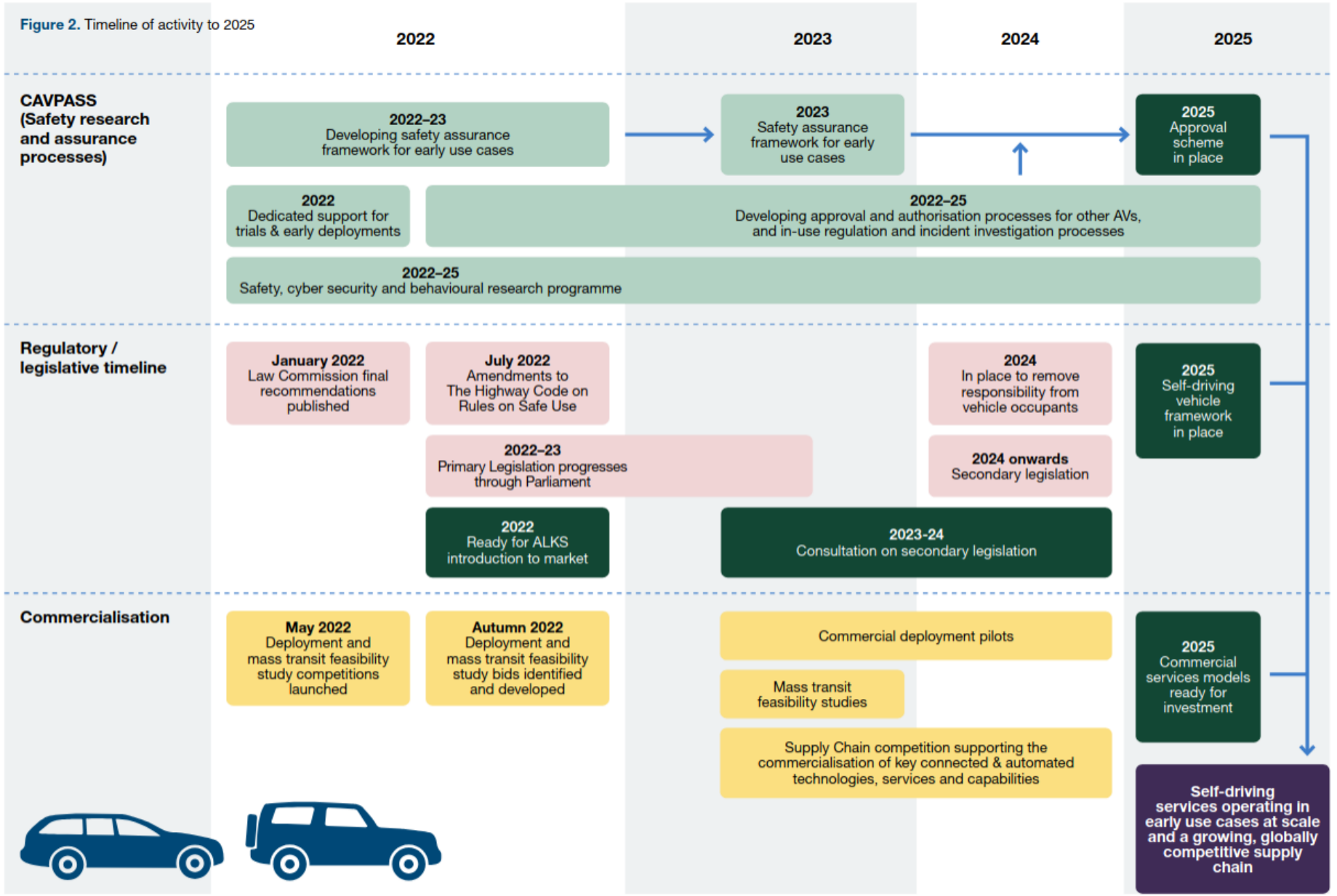
Regulations

- Regulations have legal force
  - In the UK: Primary legislation passed as an Act of Parliament
  - Secondary legislation: delegated to a person or body, e.g. Department of Transport
- Along with equality there are other broad legal areas that are relevant to R&I for robotics, e.g.:
  - Data protection
  - Consumer protection
  - Health and Safety at Work Act
- There is also legislation more specific to robotics, e.g.,
  - Automated vehicles act 2024
  - Supply of Machinery (Safety) Regulations
  - Air navigation order 2016 and associated regulations
- Currently (still…) in progress through parliament:

  Artificial Intelligence (Regulation) Bill

  Process of development can be complex…

Figure 2. Timeline of activity to 2025



https://assets.publishing.service.gov.uk/media/62ff438c8fa8f504cdec92df/cam-2025-realising-benefits-self-driving-vehicles.pdf

Let's look at the automated vehicles act –

- https://www.legislation.gov.uk/ukpga/2024/10/contents

Guidance

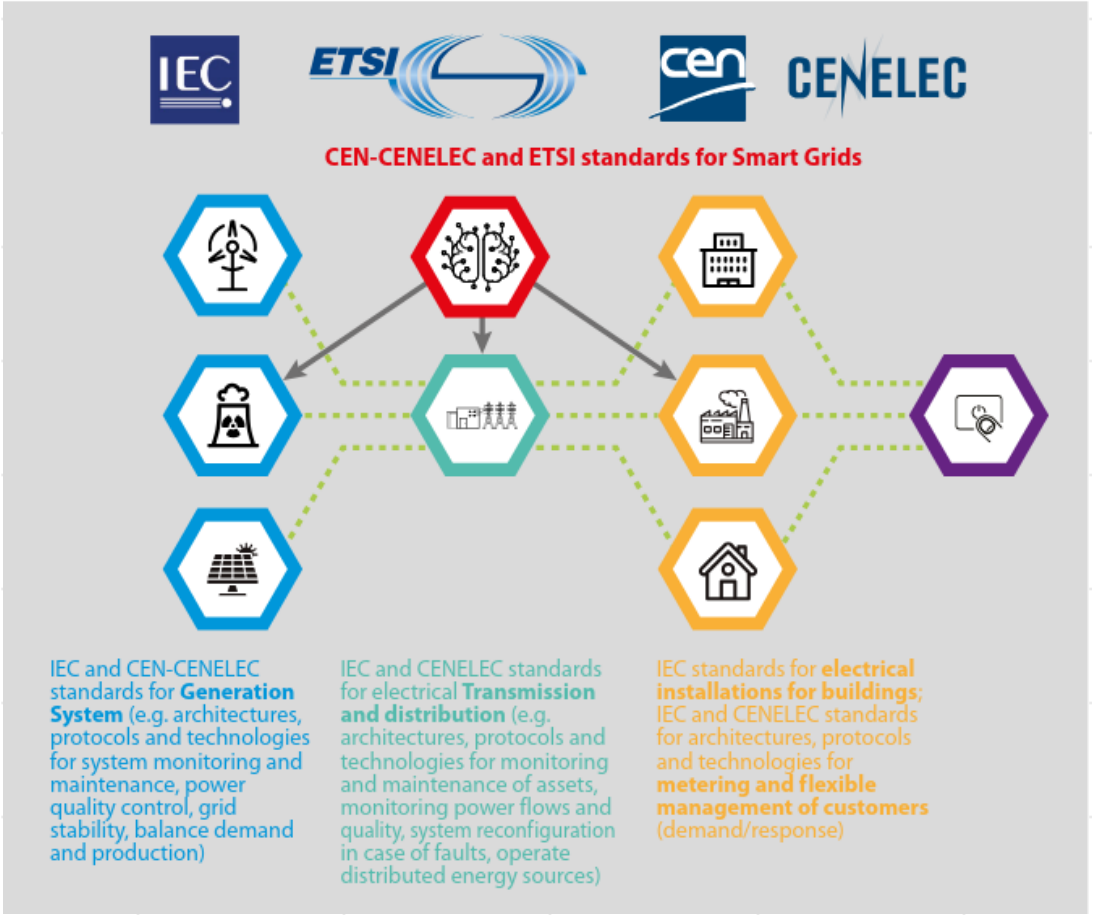
- Legislation may often be accompanied by guidance, suggesting how it should be applied
- E.g. https://www.gov.uk/government/publications/trialling-automated-vehicle-technologies-in-public

Standards

- A standard is essentially a widely agreed way of doing something
- This can range from a 'de facto' standard that has emerged (e.g. QWERTY keyboard) to a 'de jure' standard which is endorsed by legislation
- Formal standardisation is done through Standard Development Organisations (SDOs), in response to specific industry or society needs
- SDOs adhere to a consensus building approach and fair development principles
- SDOs vary in geographic scope, technical scope, make-up, level of recognition...
- They may overlap in scope but usually have procedures to promote consistency
- Other than 'de jure' standards, compliance with standards is voluntary

Types of standards

- Terminology/semantic standards
- Measurement or test methods
- Specifications – interface, compatability, architecture
- Reference models
- Quality assurance processes
- E.g. standards required to turn on a lamp:



- https://www.etsi.org/images/files/Education/Textbook_Understanding_ICT_Standardization.pdf

Standards in the research process

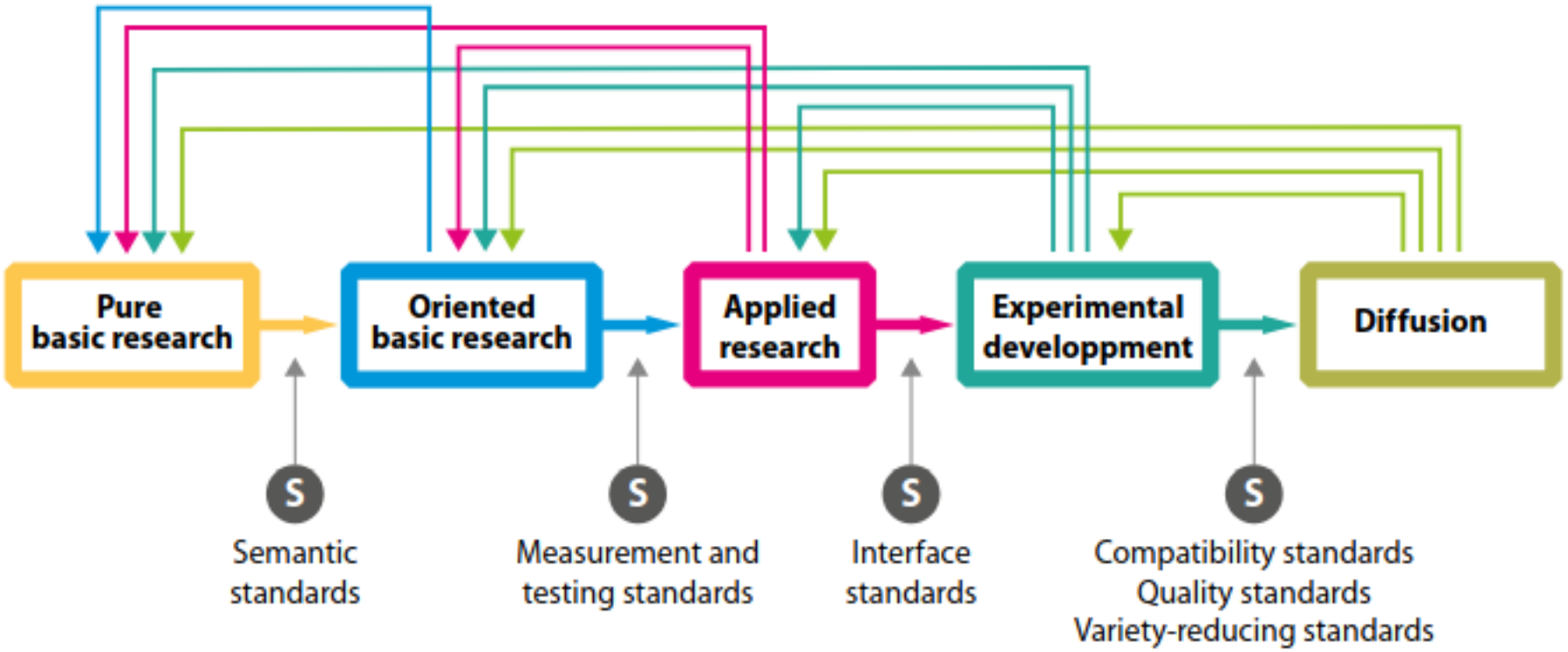


Figure 5.9: Various roles of different types of standards in the innovation process (Blind and Gauch 2009)

Standards

Responsibility in the process of standards creation:

E.G. for British Standards Institute:

- Anyone can propose a standard
- Anyone can comment on a proposed or draft standard
- Technical committees for drafting standards represent a broad range of interests
- Anyone can volunteer to join a committee (but needs to make a case for their selection)
- https://standardsdevelopment.bsigroup.com/Home/About

BS EN ISO 13482	BS EN ISO 13482 Robotics — Safety requirements for service robots Categories: Unclassified documents	AMT/10 Robotics	Proposal
BS ISO 21423	Robotics — Autonomous mobile robots for industrial environments — Communications and interoperability Categories: Unclassified documents	AMT/10 Robotics	Drafting
BS EN IEC 63439-2-1 ED1	BS EN 63439-2-1 ED1 Robotics for electricity generation, transmission and distribution systems. Part 2-1: General Technical Requirements for UAS for Overhead Power Lines Inspection Categories: Manufacturing engineering | Industrial robots. Manipulators	AMT/10 Robotics	Public comment

Some specific issues around regulation and standards in robotics:

- Unique aspects: evolving risk, lack of end-user knowledge
- Standards address risk assessment and safety requirements capture but not whole life-cycle, e.g., operation, decommissioning.
- Lack of guidance on competence of individuals involved in lifecycle stages
- Cybersecurity standards not well tailored to robotic system diversity and adaptability
- Machine control standards don't address AI & ML, e.g., requirements for data quality, model explainability, mitigating bias
- Unique risks in complex environments e.g. agriculture
- Safety implications – variety of applications, situations, operating environments and level of interaction with humans
- Integration risks
- Potential for misuse
- https://www.automaatioseura.fi/site/assets/files/4501/sias_2024_paper_42.pdf

For Monday's session

- In pairs, pick a current topic relevant to responsible research in AI for Robotics
- Research the current status or debate in this area and prepare a short presentation
- Some suggested topics (or suggest your own):
  - Consequences of the introduction of foundation models in robotics
  - Application of robotics in warfare
  - Innovation outpacing regulation and standards
  - Privacy implications of social assistive robotics