

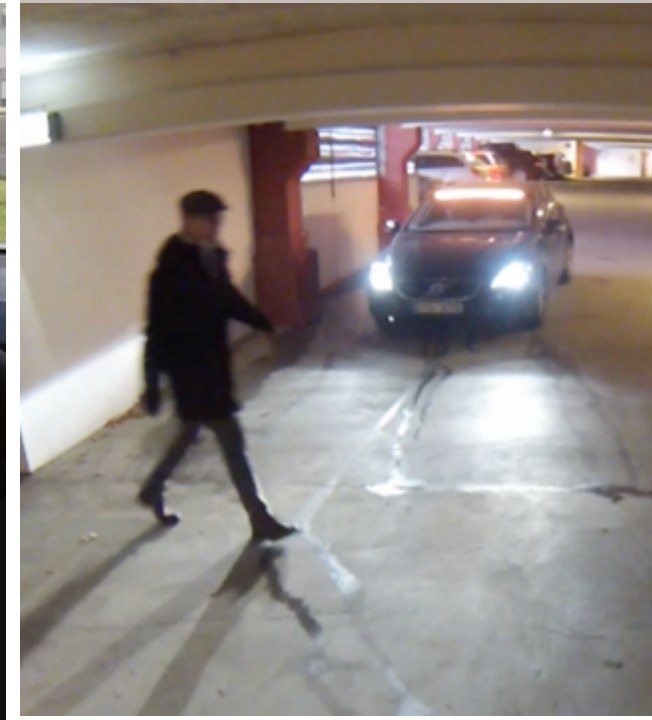
# Rethinking regulation in light of disruptive technologies

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# What is a disruptive technology?

*“A new technology that unexpectedly displaces an established technology”*

(Source: Clayton M. Christensen)

# Vehicles are becoming sophisticated



How do we ensure that “ever-changing, ever-learning” vehicles are safe?

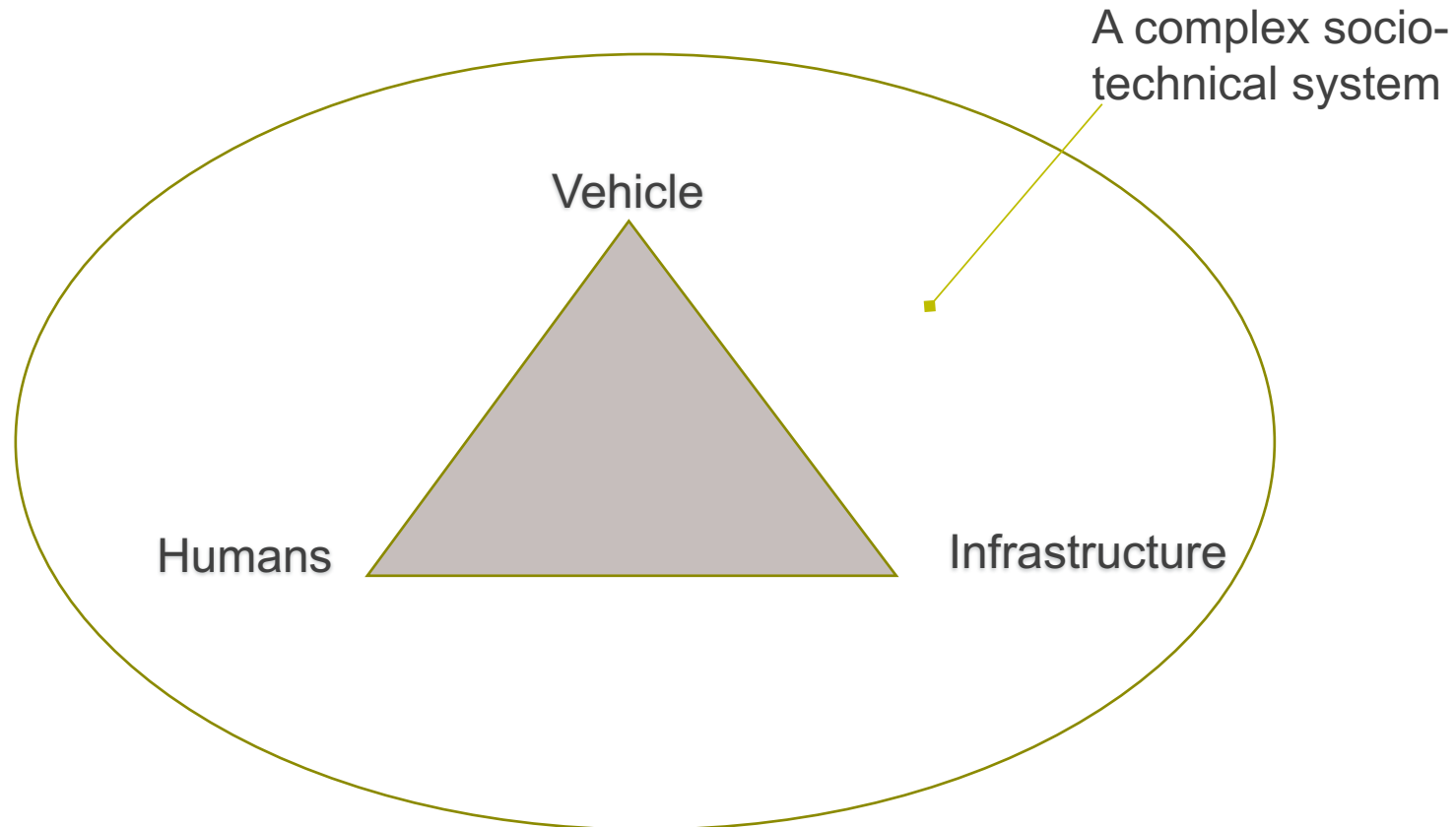
**Past:** Hardware enabled vehicles

**Future:** Software defined, ever-changing, ever-learning vehicles

**Today:** Software enabled vehicles

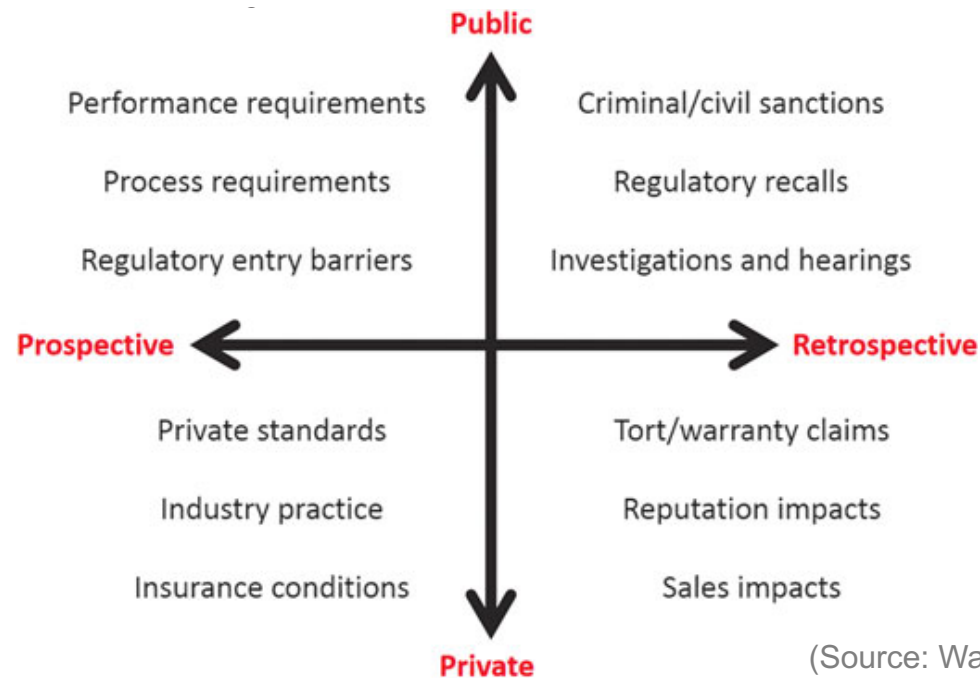
# Regulation is a way to assure safety

...but, with many stakeholders involved, it is unclear how the development of vehicles will turn out – making it difficult to predict the future.



Unpredictability makes regulation challenging.

# Different ways of regulating technology



	Driven by state actors	Driven by societal actors
Hierarchical, dominated	Command and control	Oligopoly
Heterarchical, non-dominated	State as primus inter pares	Self-regulation

(Source: Borrás & Edler, 2014)

When to intervene?

What to regulate?

Who to involve?

At what scale?

# Examples of current regulations

## Self-certification in the US

- USA, Canada were only non-signatories to the UN 1958 agreement
- The manufacturer or importer of a vehicle or item of motor vehicle equipment certifies that the vehicle/equipment complies with all applicable safety, bumper and antitheft standards
- Authorities may conduct tests in cases of reasonable doubt

## Type approval in the EU

- Europe/EU Framework Directive 2007/46/EC based on UN 1958 agreement
- Confirmation that production samples of a design will meet specified performance requirements
- Process:
  - Application by the vehicle or component manufacturer
  - Testing by a technical service
  - Granting of the approval by an Approval Authority
  - Conformity of Production by the manufacturer in agreement with the Approval Authority
  - Certificate of Conformity by the manufacturer for the end-user

Current type approval in the EU is based on a command-and-control regulation strategy – detailed, requires a lot of knowledge and responsibility from authorities.

# Type approval in relation to fast software development

## Type approval in the EU today:

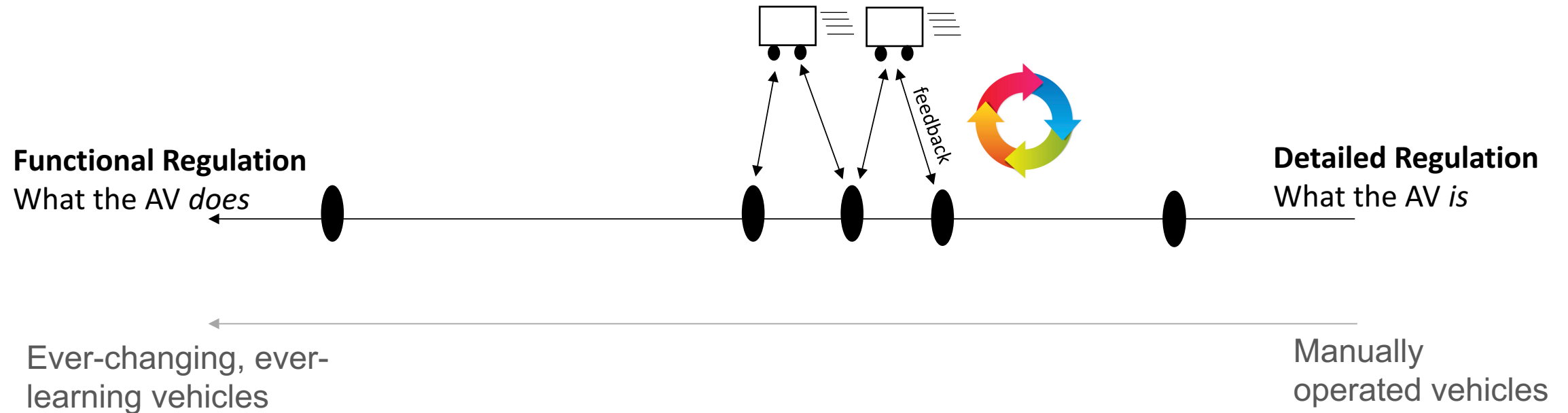
1. A static process for new regulation.
2. Authorities describe both “What” to test and “How” to test.
3. Approval based on a certain number of “type cases”.
4. Approval takes into account the component/vehicle.
5. A component/vehicle is approved once (and then “checked” at periodical technical inspections).

## Potential challenges:

1. Is not fast enough to capture the fast development of software.
2. Describing “What” and “How” does not leave enough play ground for innovation.
3. Proving that an AI-system works in a few cases does not tell how it works in other cases.
4. Does not take into account the system in which the vehicle operate (e.g., humans, infrastructure)
5. Does not have a continuous monitoring during the lifetime of the vehicle – changes are not captured.



# A shift towards a more functional regulation strategy

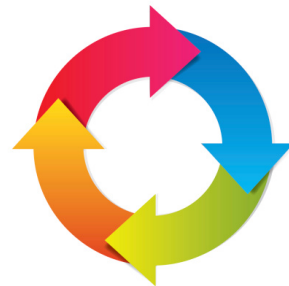




# Future regulation: Embrace flexibility

To balance innovation and safety, authorities need to:

- Adopt a system perspective.
- Be more proactive, less detailed – ask questions, not give answers.
- Embrace an iterative, learn-by-doing regulation strategy:
  1. Virtual testing
  2. Test-track testing
  3. Field testing
  4. Admission for certain areas



Regulation needs to be general enough to enhance innovation, but specific enough to ensure safety and give clarity to manufacturers.

<https://www.viktorias.se/projects/regulating-new-technologies-in-road-vehicles>

## THANK YOU!

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