The potential roles of STI policy governance in co-shaping the emerging new innovation ecosystems

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Governance and Relevance:
Towards a new generation of research and innovation policies

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Motivation

Several major change processes in society, economy, and major S&T domains

Making sense of these changes is necessary to devise adequate strategic responses, but it is a rather demanding task
- complex changes on their own, also interwoven

Types of transformative changes

Strategic responses
- new (or revised) policy priorities
- renewed (STI) policy governance sub-system(s)
- (co-)creation of new innovation ecosystems

Distinct governance approaches

    can be supported by

Different types of forward-looking activities (FLA)

Complex, interwoven change processes

- 3D printing and scanning
- Internet of Things, M2M and P2M communication
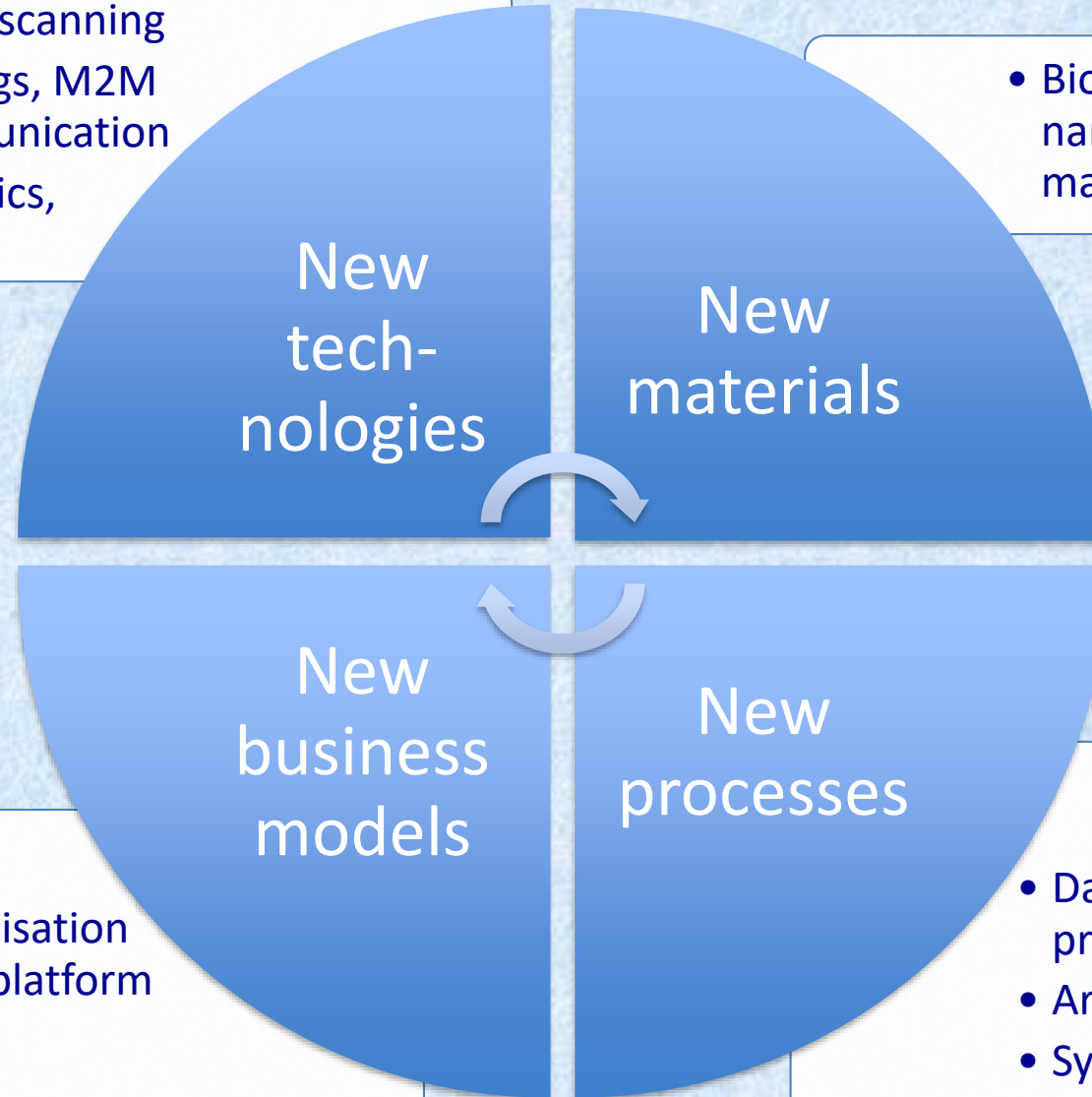- Advanced robotics, HMI

- Bio- and nano-based materials

New technologies

New materials

New business models

New processes

- Mass customisation
- Sharing and platform economy
- Servitisation

- Data driven production
- Artificial intelligence
- Synthetic biology

Pace of transformative changes

A) Fast and disruptive transformations
- new, often digital, business models, introduced by new players
- supersede existing businesses
- major repercussions on labour markets, skills needs, income distribution, privacy, safety, ethical issues, …
  $\Rightarrow$ wellbeing

B) Slow but equally transformative transitions of existing sectors (socio-technical systems)
- hard-wired systems with strong path-dependences
  (energy, mobility, …)
- more time to actively (co-)shape or prepare for these changes

Direction, scope, and speed of change, level of uncertainty $\Rightarrow$ different strategies and governance approaches

Ideal types of (STI) policy governance approaches

a) Responsive governance

aimed at being prepared for transformative changes and reacting to them in an appropriate way ⇒

- 'exploratory' FLA supporting flexibility and responsiveness
- co-operation with major actors and stakeholders is advantageous
- gradual changes in policy-setting and implementation processes

b) Co-creator governance

aimed at (co-)shaping the transformative changes ⇒

- a strong emphasis on 'normative' FLA to create new opportunities
- a close co-operation with all the major actors and stakeholders is a must
- radically renewed policy-setting and implementation processes
- experimentation plays a accentuated role

c) 'Wait and see' governance

Types of changes and governance approaches

Change/ Governance	Fast disruptive changes (A)	Slow transformative changes (B)
Responsive governance (a)	"Wait and react": adapt to changes by trying to minimise negative impacts in a broad sense and to exploit new opportunities to a lesser extent, given the pace of changes [Aa]	"Wait and prepare": more emphasis on being well prepared to exploit the new opportunities evolving, but not even taking major risks, let alone facing or creating uncertainty in a proactive way [Ba]
Co-creator governance (b)	"Keep pace": try to co-shape fast changes – largely driven by external factors – to the possible extent [Ab]	"Get ahead" of changes: take the driving seat, take considerable risks, or even create some uncertainty [Bb]

Types of forward-looking activities (FLA)

The aim of an FLA to support

- responsive governance ⇒ 'preparatory' (exploratory) FLA
  - what developments might evolve in the future
  - how to prepare for those futures (states of affairs)
- co-creator governance ⇒ 'directional' (normative) FLA
  - is a desired future feasible, what opportunities can be created
  - how to foster the desired changes

Path scenarios in both cases: what types of changes are needed, when, by whom

The level of participation

- expert-based
  - faster, less costly, no process benefits, no ownership and commitment to act upon the recommendations
- participatory
  - more time-consuming, more costly, process benefits, ownership and commitment to act upon the recommendations

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Preparatory FLA

Directional FLA

ILLUSTRATION: FAST DISRUPTIVE CHANGES

Digital platforms in services (Uber)

Change/ Governance	Fast disruptive changes (A)
Responsive governance (a)	• Defensive regulation by national and local authorities vs. liberalisation • Legal action by taxi drivers (often based on outdated regulation and closed markets) • Restrictive: Hungary, Netherlands, Spain, (Germany) • Liberal: California, Sweden
Co-creator governance (b)	• Adapting regulation (minimum social security standards, experimentation for automated driving) • Modernisation strategies of taxi drivers (more flexible schemes, emulating Uber) • Estonia, (Finland), Seattle, Washington (?)

Digital platforms in services (AirBnB)

Change/ Governance	Fast disruptive changes (A)
Responsive governance (a)	• Defensive regulatory response by local authorities to constrain operation of platforms (e.g. labour regulation, security standards, commercial regulation, taxation) • Paris, Berlin, Vienna, Switzerland
Co-creator governance (b)	• Experimental regulation to open up space for new accommodation services • Amsterdam, Hamburg

The role of foresight?

Hardly any systematic foresight activities to address impact of digital platforms in services

- Foresight processes (participatory FLA) are too slow

Responsive Governance: Exploratory studies on current situation and potential consequences

- Some major national studies (CH, DE) and international studies (OECD)
- Background studies by cities (e.g. European Forum Vienna 2015)

Co-creator Governance: Experimental, real-time foresight („design foresight", Köhler et al. 2015, Tuomi 2013)

- Very few examples, Amsterdam: process with home sharing companies, joint website, etc.
- JRC (2017) policy lab on blockchain

ILLUSTRATION: SLOW TRANSFORMATIVE CHANGES

Automotive industry in the 20th century

Disruptive technological innovations in mobility: "horsepower" ➡ machine power

Competing technologies ➡ the combustion engine became the dominant design

Together with other innovations and driving forces ➡ a new techno-economic paradigm: "the age of oil and mass production"
major infrastructure projects, related services, regulations, financial innovations, education, …

1970s–1980s: incremental technological innovations, major organisational innovations

Automotive industry and mobility in the 21st century

Disruptive technological innovations in mobility
- autonomous vehicles (driving)
- electric vehicles
- new mobility models (car sharing, car ownership vs. use, …)

New players, introducing new business models

Closely related innovations and other changes are needed, as well:
- sensor and software technologies
- IoT
- physical infrastructure
- regulation (at national and supranational levels)
- insurance
- ethical issues (liability, privacy, who should be "saved" by the driving software in a dangerous situation, …)

Is a new a new techno-economic paradigm emerging?

Autonomous vehicles

Both responsive and co-creation governance can be applied

Hungary: "stay ahead of changes"

S&T focus, expert-based FLA (?)
- strong traditions in math ➔ IT

2015: Research Centre for Autonomous Road Vehicles (RECAR), Budapest University of Technology and Economics

A test track for driverless cars is being built, to be completed in 2020

Unique in Europe: OEM-independent capability for the testing and validation of connected and automated vehicles and systems
- Includes a Smart Test City, a high way with exit roads, tunnel

Zala Autonomous Vehicle cluster: IT firms, IT service providers, automotive firms

Test track for driverless cars
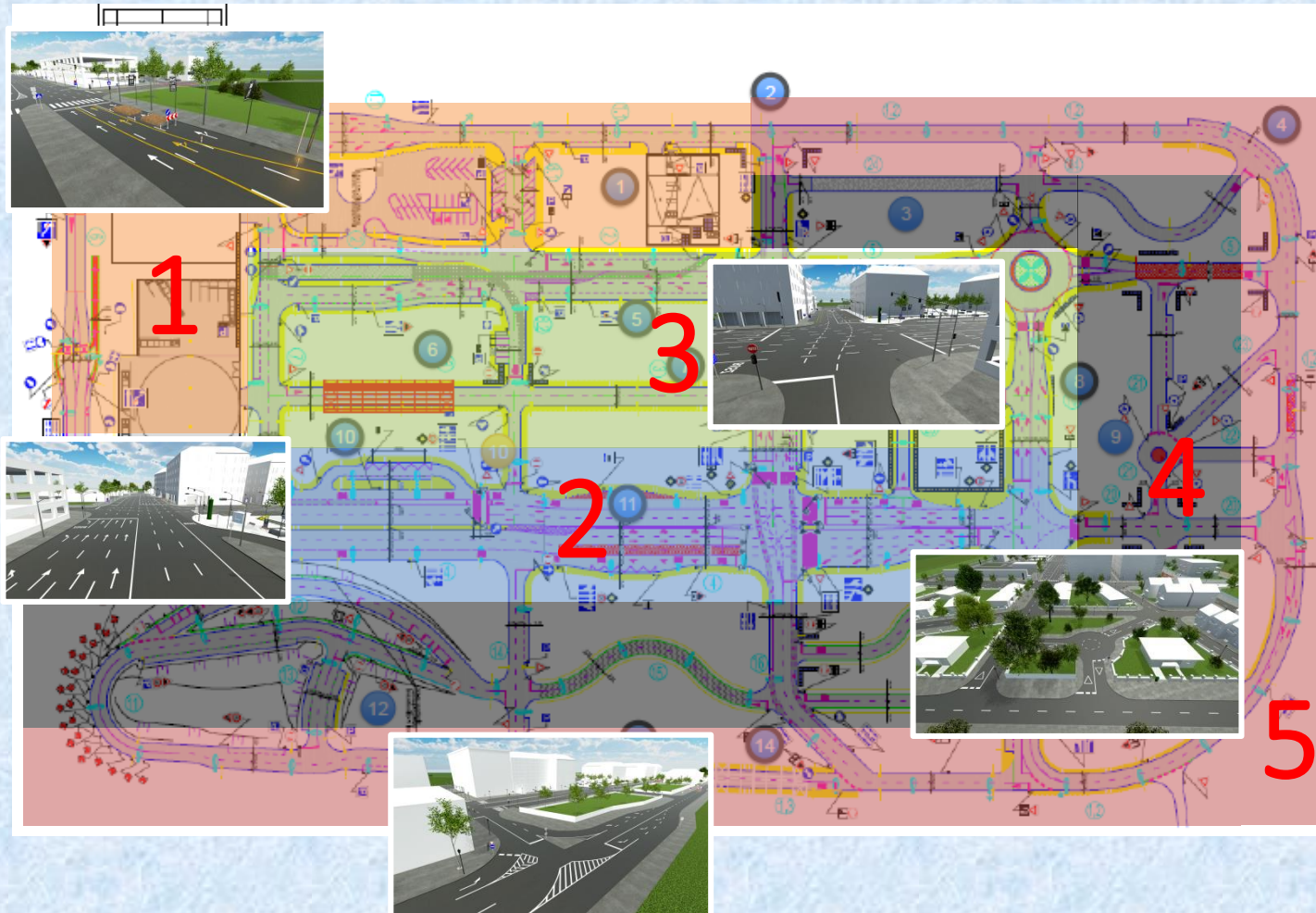
1. Low-speed, parking area
2. Multi-lane high speed area
3. Downtown area
4. Suburban area
5. T-junction area

DISCUSSION

FLA to support transformative changes

Different benefits should be expected from participatory expert-based FLA

Wide-ranging and far-reaching implications

A systemic approach
- considering multiple futures
- drawing on a diverse set of knowledge and experience

helps in dealing with complex changes

Major uncertainties

A shared vision, developed – and thus 'owned' – by the major stakeholders can reduce uncertainty

BUT: pace of changes, time needed for participatory processes

Different benefits should be expected from S&T centred FLA vs. FLA focussing on innovation systems

POLICY IMPLICATIONS

The importance of taking a multi-level perspective

National and regional innovation systems, together with their policy governance sub-systems, provide key framework conditions for addressing transformative changes

- fora for major actors to communicate, interact, and co-operate
- strategy-setting capabilities
- competences in using decision-preparatory tools, especially "futures literacy"
- regulations
- financial and other support

Yet, transformative changes manifest themselves most directly and most forcefully at the level of innovation ecosystems

⇒ That is the the appropriate level to attempt co-shaping the transformative changes to create new opportunities and/or finding appropriate governance responses

Diversity

Any given country or region is likely to be fairly diverse in terms of having Aa, Ba, Ab, and Bb "pairs" at the level of innovation ecosystems

$\Rightarrow$ National and regional policy-makers need to be aware of this diversity and find effective ways to assist in creating appropriate, and therefore diverse, governance approaches for these different innovation ecosystems

Policy experimentations

The chosen type of FLA and its main objectives need to "fit" the purpose (responsive vs. co-creator governance approach)

Further policy challenges

The importance of non-technological innovations

Regulation

- IoT, 3D printing, big data, large IT systems, AI, robotisation and the like raise major IPR, ethical, privacy, security and safety issues
- International (possibly global) harmonisation is needed

Policy orchestration

- Preparing for transformative changes requires a conscious cross-cutting approach
- Employment, education and training
- Sustainability, circular economy can be enabled by digitalisation
  e.g. via mass customisation, smart logistics, smart cities, smart homes

✂ How to achieve policy orchestration in the prevailing compartmentalised ('silo') structures?
  Finland?

Thank you!

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