WHY RESPONSIBLE INNOVATION?

THE DEFICITS OF THE R&I SYSTEM

- Need for governance mechanisms for outcomes of Science, Technology and Innovation
- Address market failures in order to deliver on societally desirable innovations
- Align science, technology and innovation policy with broadly shared public values
- Shift focus from technological potentials to societally desirable objectives
- Shift to open scholarship in order to make science better by improved reproducibility, efficiency and more responsiveness to societal challenges
- Implement anticipatory governance mechanisms in the policy making process by using a combination of foresight, technology assessment and normative (participatory)-value sensitive design.

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Presentation is based on 'Why Responsible Innovation' in: International Handbook on Responsible Innovation (Von Schomberg/Hankins eds). Cheltenham: Edward Elgar Publishing

1.FIRST DEFICIT: NO GOVERNANCE OF SOCIETALLY DESIRABLE R & I OUTCOMES

Three Market hurdles and *technology neutral* approach, with focus on safety and risk

No specific entry for public opinion in policy making

Contrasts with

Technology specific funding with a view on Economic benefits

Benefits= relative success on the Market

Professional bodies for Risk Governance but not for 'Benefit' Governance

2. MARKET FAILURE: NO DELIVERY ON SOCIETALLY DESIRABLE OUTCOMES

- 10% of the world's health research funding goes to 90% of the world's disease burden
- Reliance on philanthropy to compensate market failure: for example Malaria (Gates Foundation
- Negative relationship between strong patents and innovation (Stiglitz et al)
- Practice of weak patents and over patenting frustrates innovation (Stiglitz et al)
- Shrinking of knowledge commons
- Markets deliver only well on technologies with increased efficiency, not for transformative changes needed, notably with Sustainable Development as goal
- **Responsible Innovation, needs public investments to compensate for market failure**

3. NO ALIGNMENT WITH PUBLIC VALUES/EXPECTATIONS

Scientific and Technological advance: goal in itself
Innovation seen as inherently steerless and 'good'
Macro-economic justification of Research and Innovation

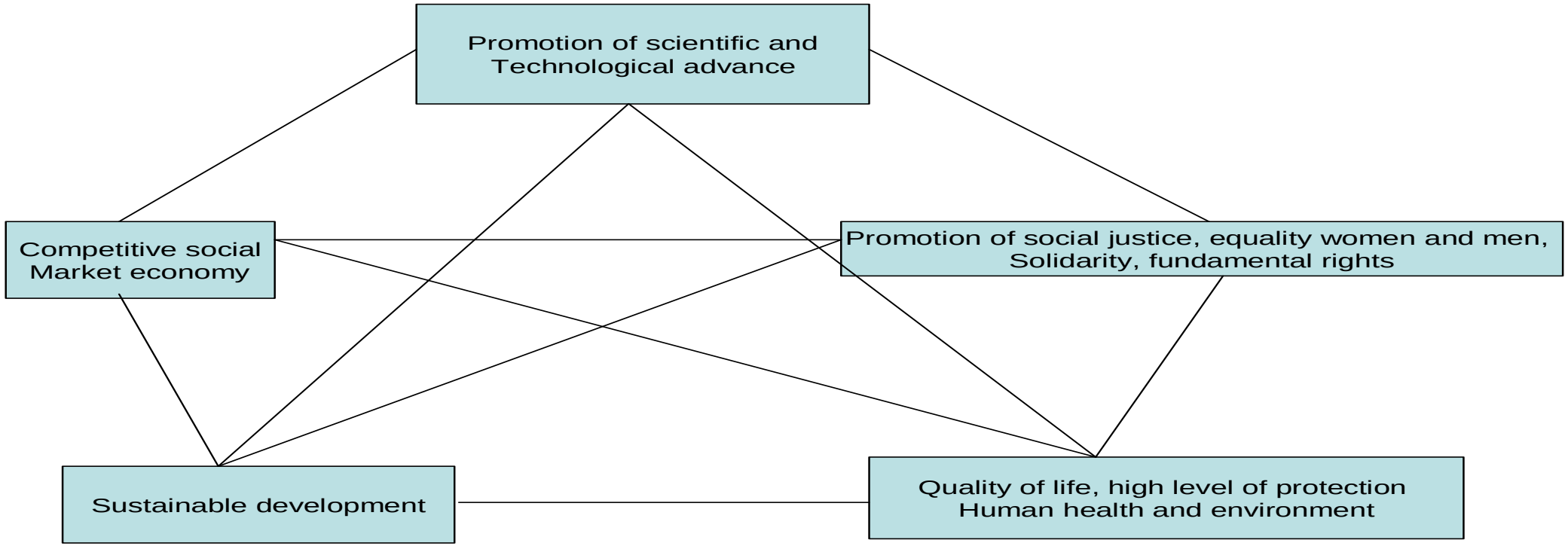
No justification for neither direction of R & I nor its purpose

Responsible Innovation directs innovation towards societally desirable outcomes: innovation = manageable and (re-) directable.

Innovation to be aligned with public values which also drive other policies:- Quality of live, High level of protection of the environment, social market economy, sustainable development etc.

Grand Societal Challenges-SDG's- can serve as a focus

Figure 1. Normative anchor points derived from the Treaty on the European Union (Von Schomberg, 2012)



DEFINING RRI (VON SCHOMBERG, 2011)

Responsible Research and Innovation is a transparent,

interactive process by which societal actors and innovators

become mutually responsive to each other with a view to the

(ethical) acceptability, sustainability and societal desirability

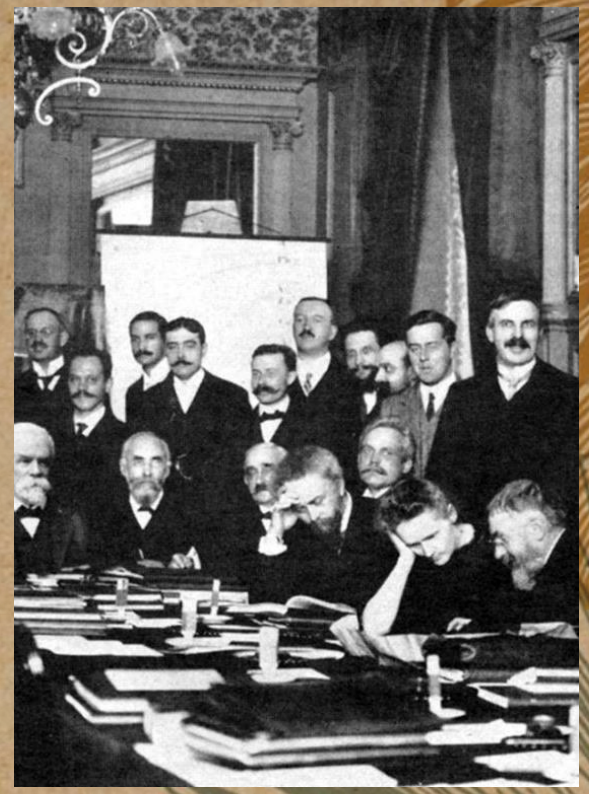
of the innovation process and its (marketable) outcomes and impacts

4 FOCUS ON SOCIETAL OBJECTIVE RATHER THAN TECHNOLOGICAL POTENTIALS

Responsible Technology Focus	Responsible Innovation focus
Identification of ethical, legal, social issues exploration of technological potential	Anticipatory governance: foresight on transformative change of sectors: energy, mobility, agriculture etc.
Stakeholder participation	Deliberative governance and commitment on societal objective
Identification of knowledge gaps and regulatory needs	Collective co-responsibility: codes of conduct, allocation and enabling of responsibility of actors
Ethics of constraint (prohibition, what we should *not* do)	Normative Design (what we do want and should do)

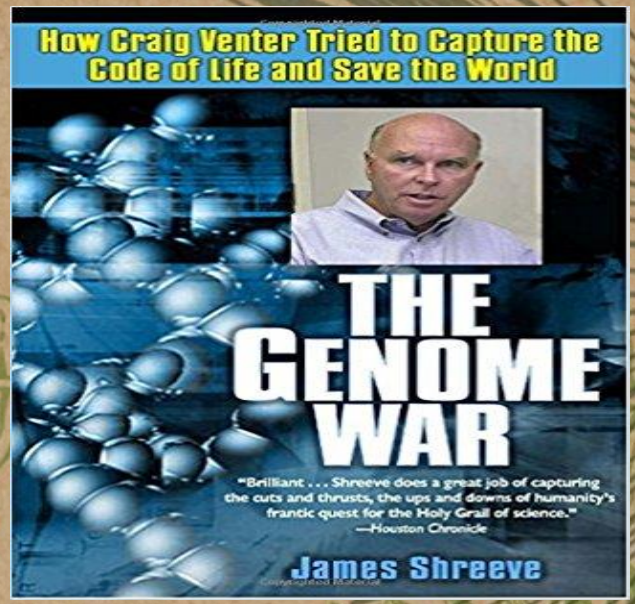
5. FROM (TOO) COMPETITIVE SCIENCE TO OPEN RESEARCH AND SCHOLARSHIP

- *Reproducibility Crisis in Science* : Survey of Nature (2016): 70 percent could not reproduce data of colleagues)- 'Science goes Wrong'(lead article Economist): 90 percent of snd stage clinical trials 'fail'.



Productivity Crisis in Science:

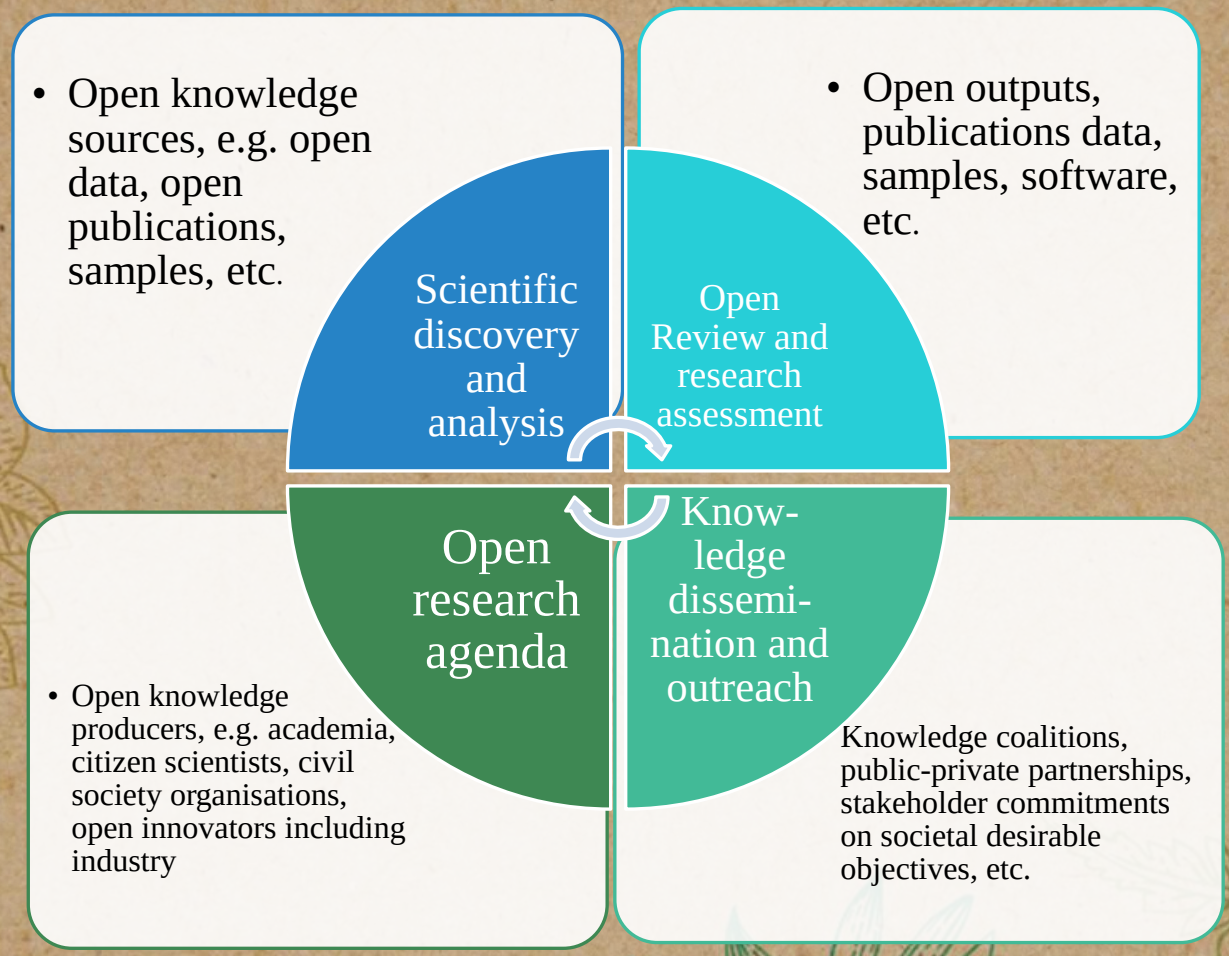
- The number of drugs approved by the US Food and Drug Administration (FDA) per US dollars(inflation-adjusted) spent on R&D has halved roughly every 9 years since 1950 (Bountra et al, 2017).



TOWARDS OPEN SCHOLARSHIP, CONTINUED

- Multiple causes for both crises in Science:
- No Openness= no good verification
- No Openness= no societal robustness
- Productivity in 'Excellence' means- no productivity of societal relevant outputs- publishing in high impact journals takes precedence over societal relevance
- Competitiveness narrows range of societal relevance (big pharma studies only 50 out of 500 relevant kinases for diseases-Edwards(2016)

OPEN RESEARCH AND SCHOLARSHIP



STEP UP PROCESS: RESPONSIBLE RESEARCH:

'*GOOD SCIENCE ANYWHERE IS GOOD FOR SCIENCE EVERYWHERE*'

Credible reseach:

Standards of scientific integrity, codes for good research conduct

Responsive research:

open, collaborative and networked science

Responsible research:

anticipatory on outcomes and impacts

STEP UP PROCESS: RESPONSIBLE INNOVATION

'GOOD INNOVATION ANYWHERE, MIGHT BE BENEFICIAL FOR MANY, SOMEWHERE'

Credible innovation:

international standards, codes of conduct, ethical guidelines

Responsive innovation:

open innovation with broadly composed knowledge coalitions

Responsible innovation

mutual responsiveness among stakeholders with a normative commitment to address (a) societal desirable objective(s)

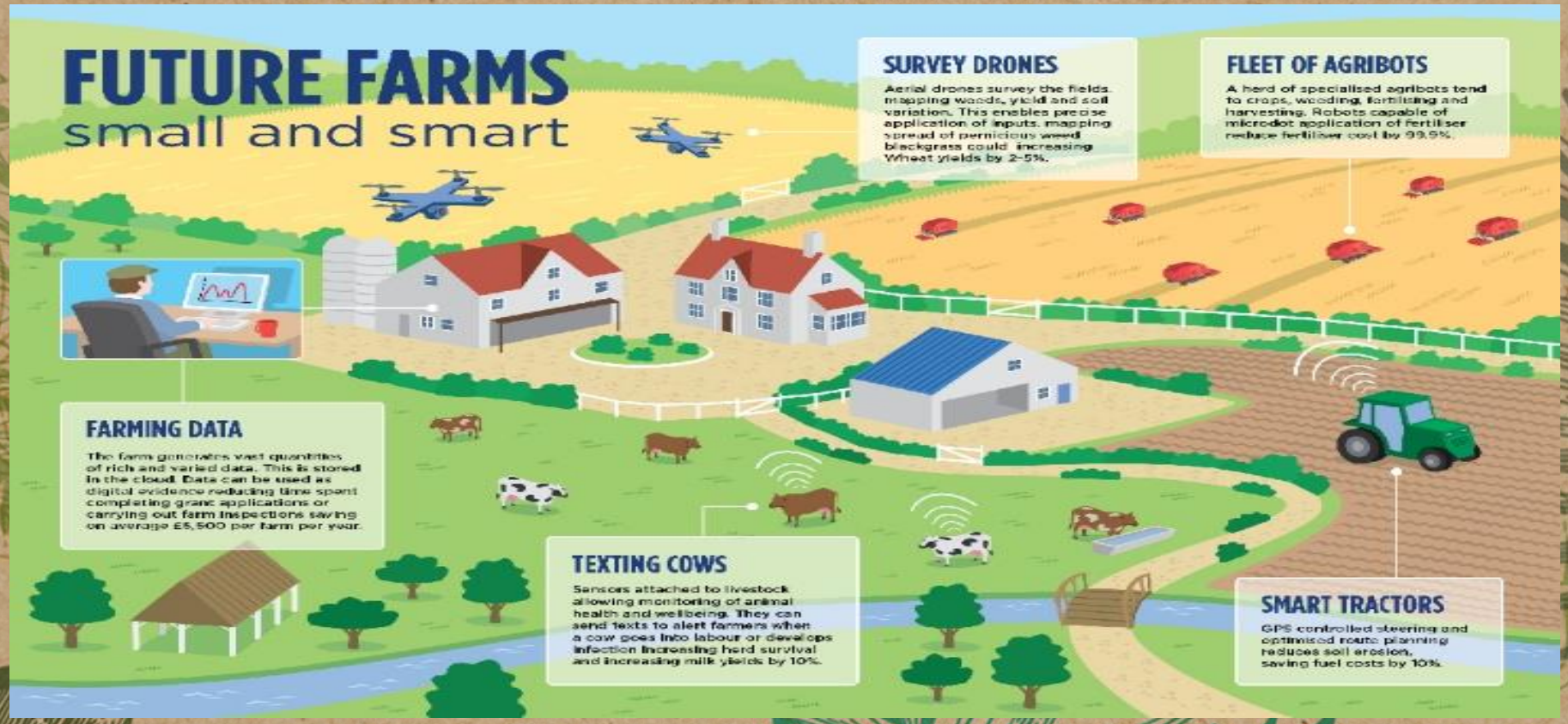
OPEN RESEARCH AND SCHOLARSHIP

- Open research and scholarship as a remedy for:
- Efficiency of Science
- Reproducibility of Science
- Productivity and Societal Responsiveness of Science

- Definition: ‘sharing knowledge and data as early as possible in the research process in open collaboration with all relevant knowledge actors’. (von Schomberg- Handbook on RI, 2019)

6 LACK OF FORESIGHT AND NORMATIVE DESIGN

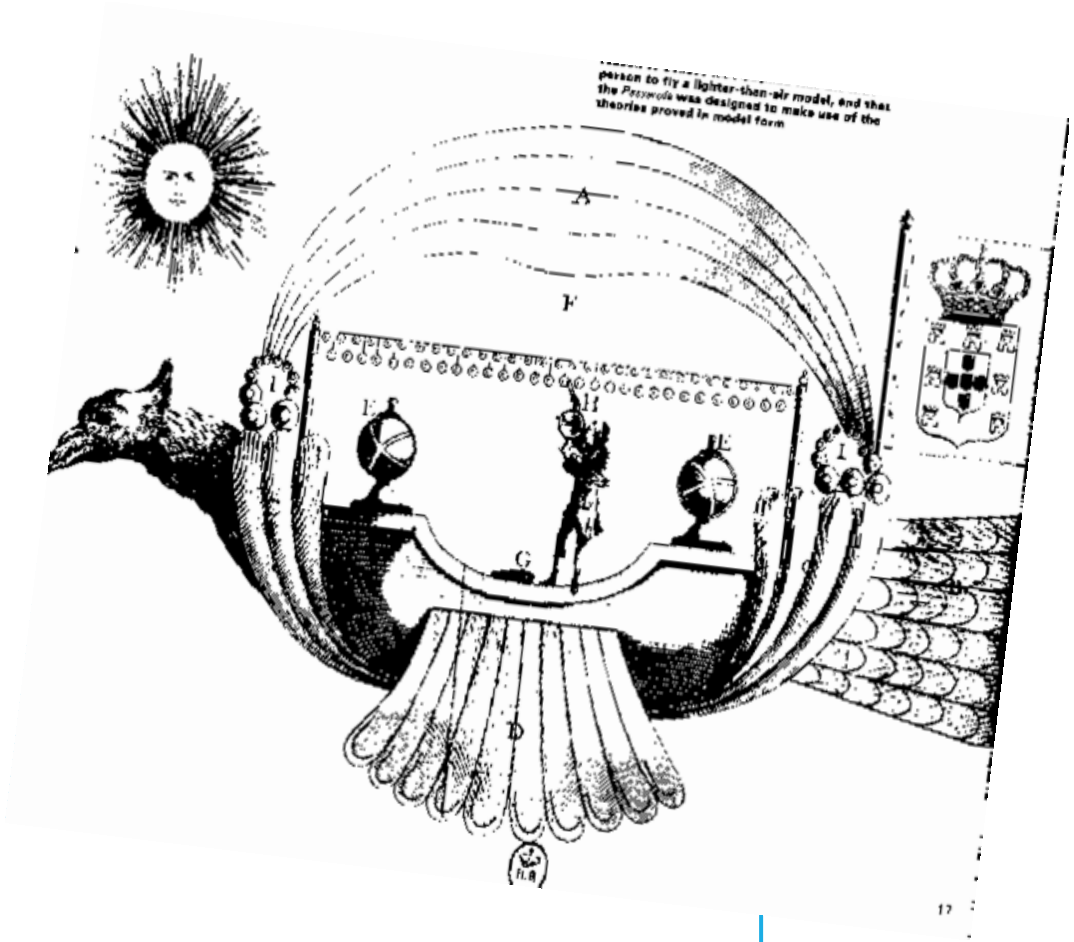
Alternative shaping of technology by Foresight



ALTERNATIVE SHAPING OF PRECISION AGRICULTURE

Factors for 'shaping' the technology	'Responsible Innovation'	Global-market driven innovation
Stakeholder involvement	Involving all producers/users	Technology push by big agribusiness
Societal objective	Determined by common stakeholder commitments	Technology and market-efficiency driven
Overall-technology design	Normative design with determining factors such as data ownership, scale of use, privacy by design approaches etc.	Fragmentary, sequential technology introduction whenever they become available
Access to resources	Public authorities enabling access to resources including to small farmers	Resource access inequalities remain unaddressed
Data- access and ownership	Data ownership with farmers	Data ownership primarily with big agribusinesses
Economic policy	Aligned to socio-economic needs, business models based on sharing of data	Business models based on centralised data systems in big agri-businesses, early technological fixes
Governance	Codes of Conduct, Public-Private Partnerships	Global markets driven

PASSAROLA-
'UGLY BIRD'



"A machine for sailing through the air" 1702

BENEFITS AND RISKS OF THE PASSAROLA

Benefits: 'Manage 200 leagues a day'
'Bring far away countries news and orders'
'The furthermost regions will be discovered, to the Portuguese nation's benefit'

Risks: 'many crimes will be committed, as (…) to easily flee from one country to another'

Recommendation to the king: "its use will have to be limited"

	‘Responsible’ State	‘Responsible’ Market	Responsible Innovation
Scope of Responsibility of Government	Outcomes and Risks	Risks	Outcomes and Risks
Regulatory oversight	State	Market-hurdles	Public-Private
Socio-economic assessment for Governance	Benefits for the State	Macro-economic/competitive advantage	Social desirability
Governance priorities	Control/Security/Access to resources	Speed of innovation uptake	Responsive to public values
Research/Inno-vation Policy	Technological superiority over competitors	Key-Tech oriented	Societal challenge oriented/Mission oritented
Threats for ‘irresponsible innovation'	‘Policy Pull’ Lack of Foresight	Technology Push, Ignorance of Ethical values	Collective Co-Responsibility!
Ethical constraints	Moral constraint of the ‘governor’	Ethical constraints of the market	Ethics as driving force!

THE RRI MATRIX: IMPLEMENTING RRI: IDENTICAL COLOUR=PRODUCT/PROCESS QUESTION

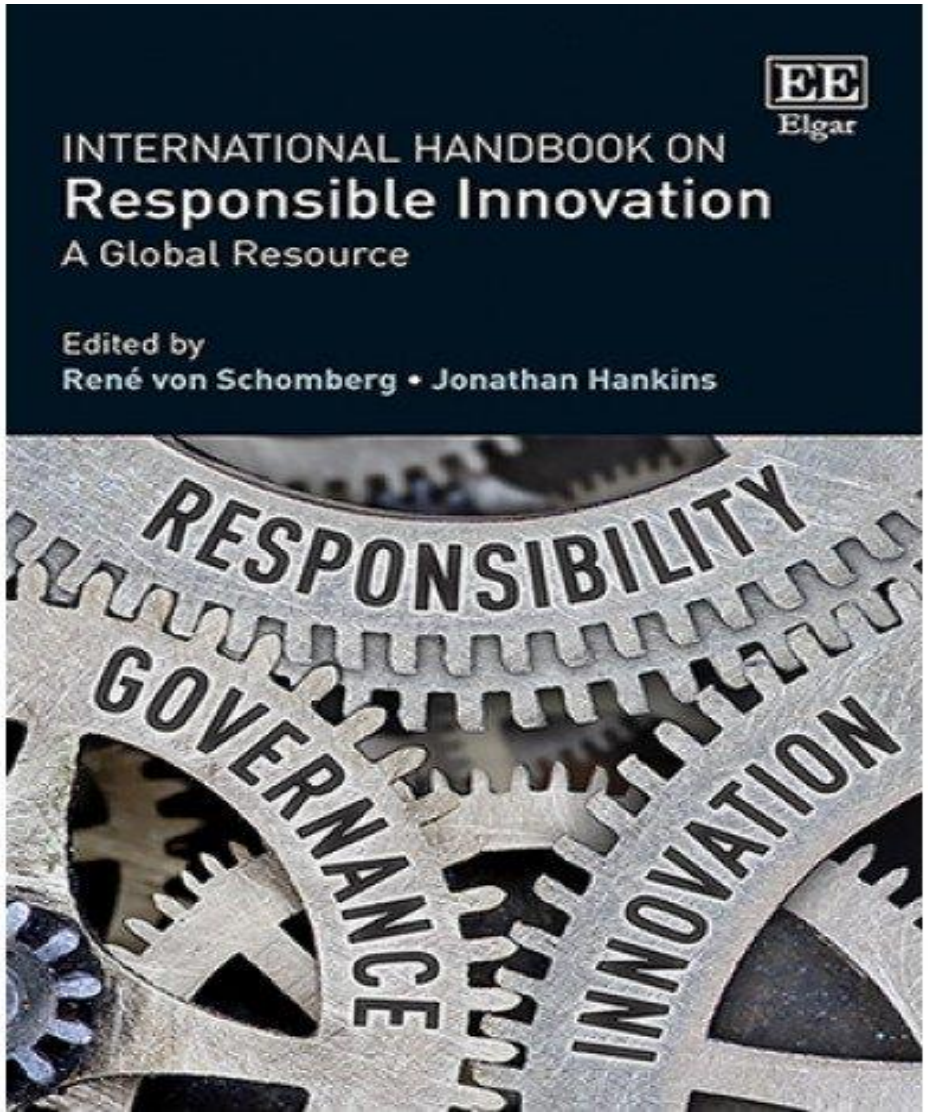
Process dimen-sion	**Pro duc t dim ensi on**	**Technology Assessment and Foresight**	**Application of the Precautionary Principle**	**Normative/eth ical principles to design technology**	**Innovation governance and stakeholder involvement**	**Public engagement**
Technology Assessment and Foresight		X	Development of Procedures to cope with risks	Which design objectives to choose?	Stakeholder involvement in Foresight and TA	How to engage the public?
Application of the Precautionary Principle		Identification of nature of risks	X	Choice and development of standards	Defining proportionality: how much precaution?	How safe is safe enough?
Normative/ethi cal principles to design technology		"privacy" and "safety" by design	Setting of risk/ uncertainty thresholds	X	Which principles to choose?	Which technologies for which social desirable goals?
Innovation governance models and stakeholder involvement		Defining scope and methodology for TA/Foresight by stakeholders	Defining the precautionary approaches by stakeholders	Translating normative principles in technological design	X	How can innovation be geared towards social desirable objective
Public Engagement and Public Debate		Defining/choic e of methodology for public engagement	Setting of acceptability standards	Setting of social desirability of RRI outcome	Stakeholders roles in achieving social desirable outcomes	X

RESPONSIBLE INNOVATION: THIS WOULD BE IT!

- Redefining Public-Private Relationship to address Market-failure, notably on public goods
- Commitment of stakeholders on societal desirable goals(not achievable through Market-innovation only)
- Implementing Foresight (e.g. Anticipatory governance within policy making for alternative shaping of socio-technological systems, e.g. Agriculture, Mobility, Energy
- Co-designing and Co-development of open research agenda's and open collaboration
- Normative- value sensitive-design of technology: Ethics as driving force!
- Organising collective-co responsibility: Codes of Conduct, Standards, Certifications, Third-party verifications
- (Long-term) Sustainability-Compliance (so not internal system efficiency innovations through the market)

NEW PARADIGM REQUIRES INSTITUTIONAL CHANGE

- 1. Institutional change in the Scientific System: rewards/incentives and funding priortorised for open scholarship; shifting the focus from publishing as fast and as much as possible *to sharing knowledge as early as possible and with all relevant knowledge actors*(open, collaborative networked science)
- 2.Institutional change by redefining public-private relationship: addressing market failures, social commitment of stakeholders
- 3. Organising collective co-responsibility through constitutional change: market standards for RRI, certification, codes etc
- 4 Anticipatory governance (TA and Foresight) for alternative shaping of systems of agriculture, energy etc, in pre-legislative and legislative context: Ethics(Normative design) as driving force not only as evaluative constraint



The International Handbook of Responsible Innovation is thus a guidebook for a shift in stance toward collective accountability for the products and consequences of our own ingenuity.'
– Daniel Sarewitz, Arizona State University, US

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On Responsible Innovation, open science and ethics: please send me your comments!

Thanks for your attention