



PATTERNS IN SCIENCE AND SOCIETY IN TRANSITION

Douglas K. R. Robinson (**TEQNODE** & **IFRIS**)

1st PACITA project conference
Technology Assessment and Policy Areas of Great Transitions
Czech Republic, March 13 – 15, 2013



TEQNODE Limited, a Paris-based consultancy and contract research org. founded by **Dr. Douglas K. R. Robinson** and **Prof. Arie Rip**

TEQNODE provides strategically useful technology intelligence on emerging research and development and the transformation of R&D into products and into society. It augments traditional market analysis by providing insight into emerging situations (where there is no clear market in place).



IFRIS is a new public research center in Paris-Est University specialised in social studies on innovation: www.ifris.org

IFRIS has about 180 members (of which 100 permanent researchers) From different disciplinary fields (sociology, history, economics, management, political sciences).

Positioning of this presentation

- For this presentation, I speak from the position of the production of new scientific knowledge & technologies
- (In my presentation tomorrow I will speak from the position of industrial innovation activities and user/society interactions)
- This brief presentation on recontextualisation links to a project in which TEQNODE participated for a governmental organisation interested in Valorisation of Science and Technology for Society (TA) with a view to potential Policy interventions (Governance).
- We saw that across Europe a recontextualisation of Science and Society was visible and manifesting in different ways.
- I close (if I have time) with a small description of Construtive Technology Assessment as a support system within this
- I have 12 minutes left so LETS GET MOVING!

OUTLINE

- Why Sci-Soc links are important
 - I zoom out and look at the value-chains transforming Sci Knowledge into technologies in society
 - Key point: A variety of arenas of assessment are involved in this process, shaping the trajectory of technology development and societal embedment
- Recontextualisation of science and society
 - Society (in many guises) is getting more involved at early stages
- TA and Governance implications for S&T knowledge production
 - This translates into specific pressures on research scientists and technology developers.
 - An opportunity for TA professional support?
- A close on Constructive Technology Assessment (if time allows)

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12 Minutes!
So let's get moving

Why are patterns of science and society important?

Value is created in the various interactions and co-evolutions!

Emerging Value Chains

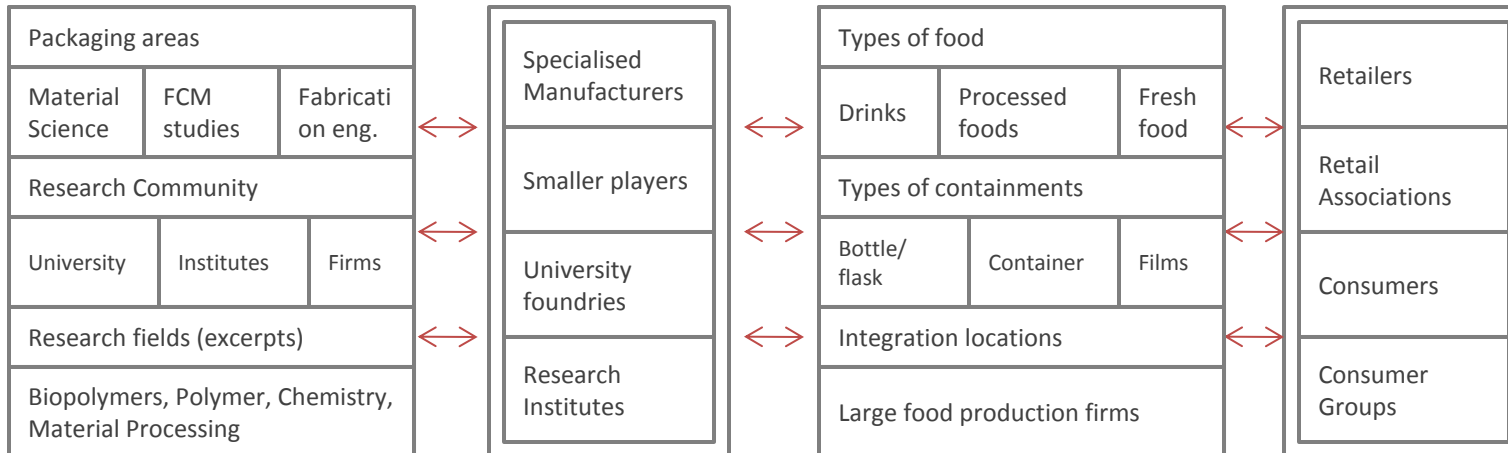


Packaging R&D

Packaging Manuf.

Packaging meets food

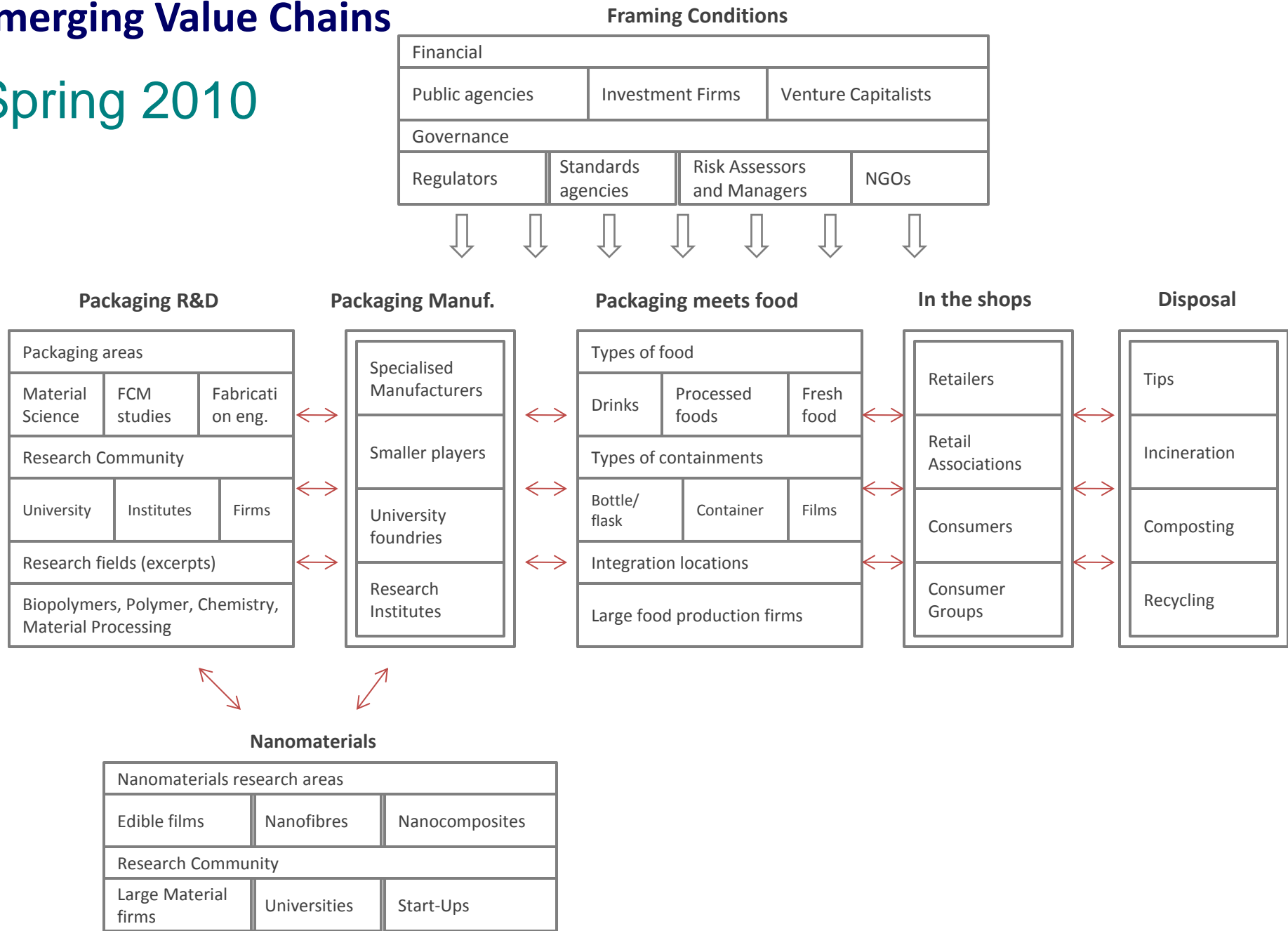
In the shops



Look at the current industrial value chain (here for food packaging)

Emerging Value Chains

Spring 2010



Adapted from: Douglas Robinson, Lu Huang, Ying Guo & Alan Porter (2010)
Forecasting Innovation Pathways (FIP) for New & Emerging Science & Technologies.

ARENAS of ASSESSMENT and SHAPING

Packaging Material R&D

Research (universities, private R&D labs) into new lines of packaging materials and fabrication processes, creating new knowledge. This arena includes traditional incremental improvements of materials (wood, glass, cardboard) as well as novel materials (nanocomposites, aerogels, preservatives etc.) Includes research in food-contact testing, material science and fabrication processes.

Up-valuing new material S&T

Conversion of new research results into something which can be taken further along the value-chain (a possible product). For food packaging this includes large firms, small technology based companies and SME's.

Packaging Manufacture

Production of food packaging with the traditional or novel material. Specialised packaging manufacturers populate this area (either in types of packaging - films, bottles OR in types of produce - fruit juice, dairy products etc.). Issues revolve around fabrication of the packaging and the relationship between packaging and food stuffs.

Niche Markets

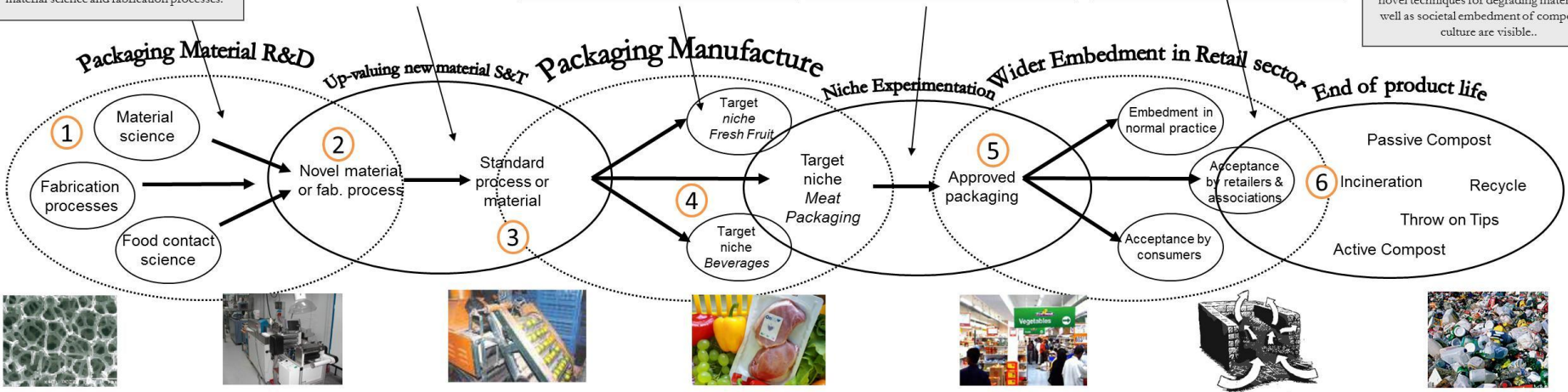
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Wider embedment

Product entry into markets. Uptake or rejection by consumers. Consumer culture plays a role here, along with safety perceptions, trust etc. Retailers and retail associations play a key role here, acting as gatekeepers between novel packaged foods and the consumers.

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Issues and dynamics effecting potential packaging innovation journeys through the IC+

Bioplastics R&D funding

Funding calls for bioplastic innovations are increasing, with some linked to nanomaterials. This provides resources but little guidance in R&D choices.

Novel food regulation

The recent collapse of the Novel Food Regulation in March 2011 means that nano-foods remain unregulated and are not subject to European labelling requirements

Food Contact Regulation

Plastic Implementation Measure (PIM) - 14262/10 The regulation on plastic materials and articles intended to come into contact with food, comes into force May 2011.

Nanomaterial toxicity?

Limited knowledge of fate of nanomaterials in the body and environment, including toxicokinetics. Some guidance exists (EFSA 2011).

Specific Economic Challenge

As the cost of fossil fuels rises, so does the production of petrochemical based plastic packaging. In addition, fines and penalties on food packaging waste in various countries

Diffuse Societal Demand

A broader more diffuse notion of sustainability and environmentally friendliness. Affecting consumer choices and increasing demand for alternatives

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Linear Model of Innovation places User/Society role **HERE**

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RECONTEXTUALISATION

Let's get back to S&T Production

Recent re-contextualization of science

Patient associations influence research agendas and engage in research themselves, undermining the exclusive rights of scientists

Technology Assessment, Ethical, Legal & Social Aspects surround ongoing science and technology (Human Genome Project initiated this)

New actors (e.g. patient associations), TA, ELSA
Strategic R&D programmes, centres of excellence and relevance
Public Research Institutes (late C19 onwards, then post WW2)

Knowledge production/
universities

1870

1945

1970

1985

2000

Outreach, public engagement – feedback into research agendas? (ex. interactive TA of GM vines)

Also **consultancies (and NGOs)** bridging science and the economy, science and the community

Increasing interactions between science and society

Authority over science (knowledge production) is also claimed by non-scientists (from USA Congressmen to patients and indigenous people);.

This shift is visible in
science – society interactions

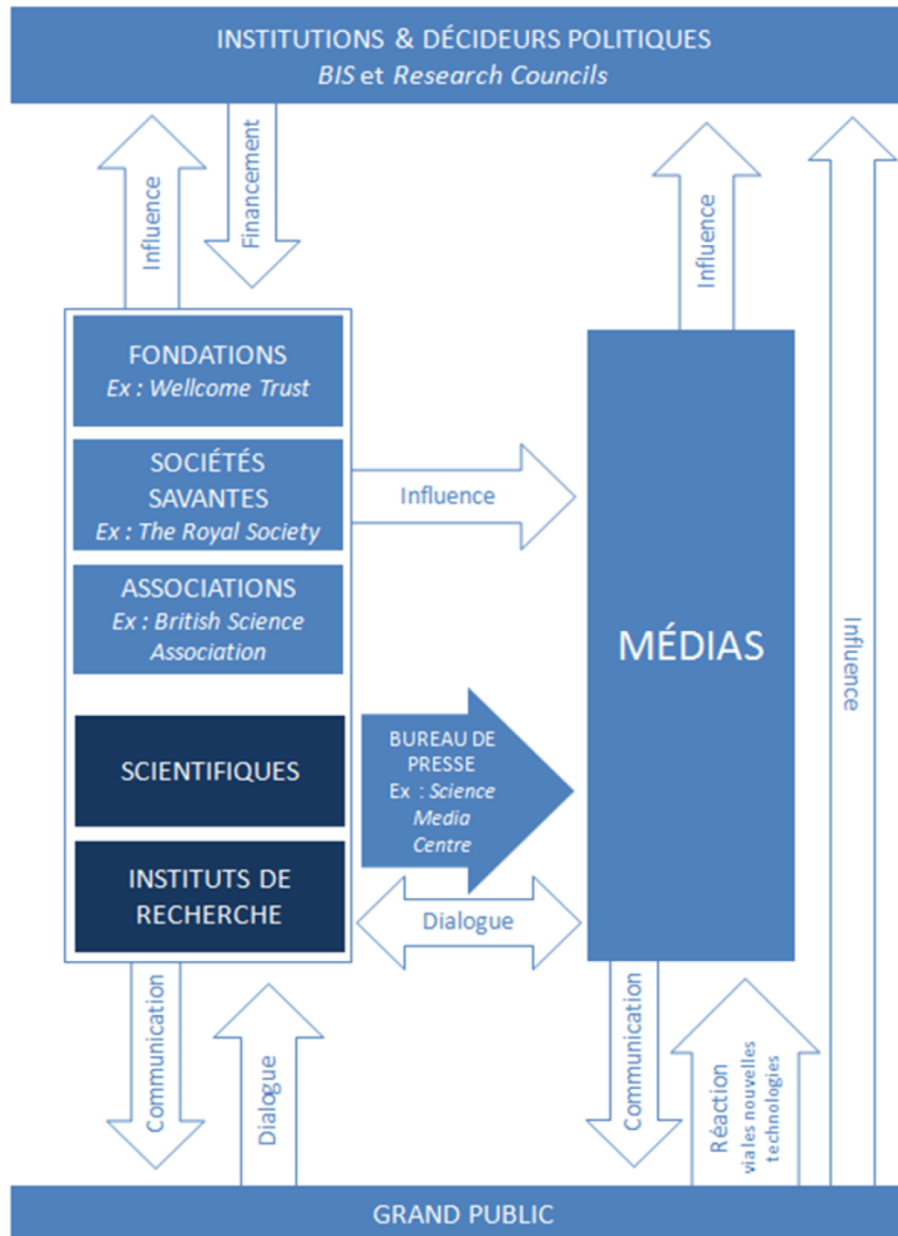
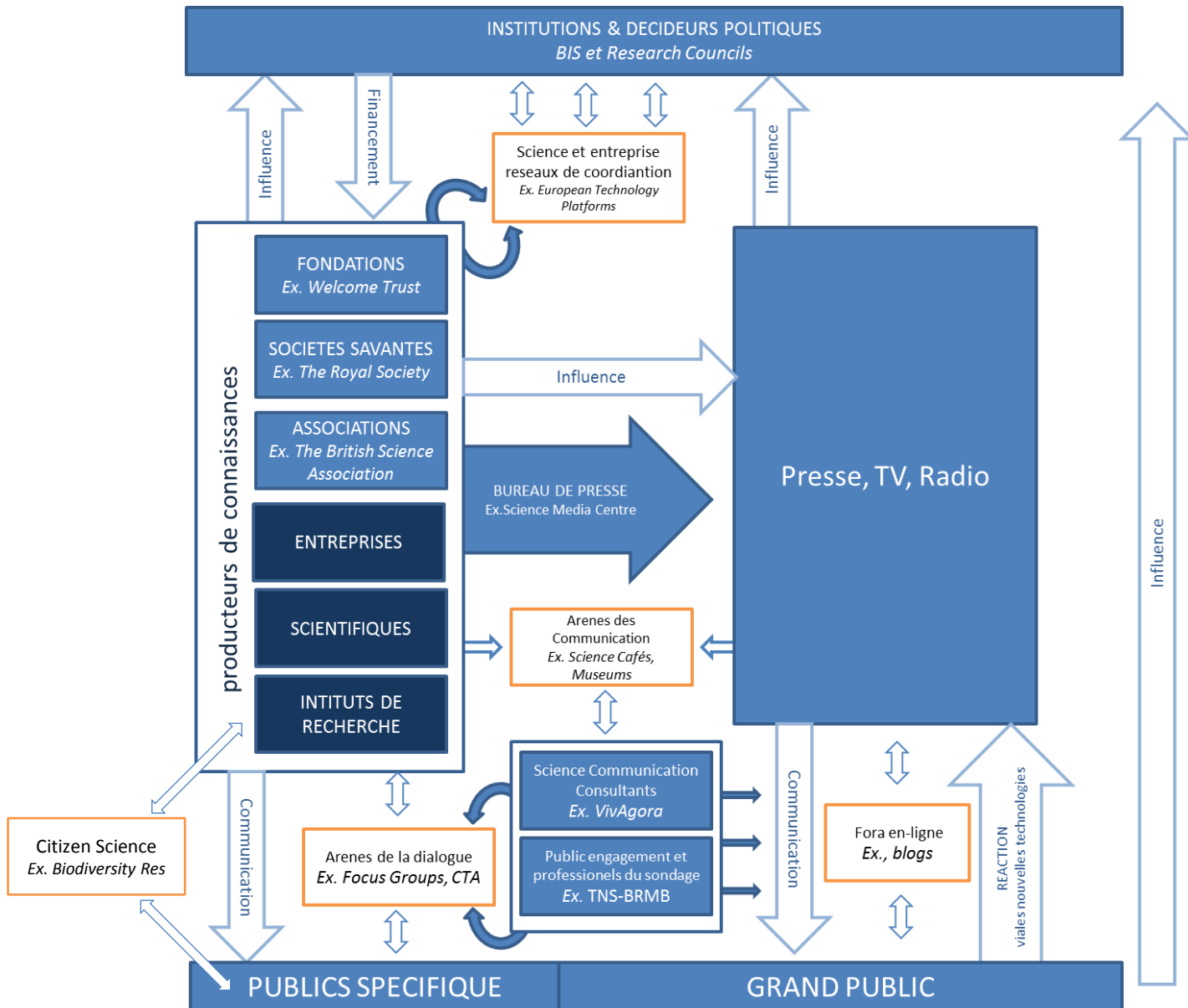


Schéma 1 : modèle britannique de communication scientifique (Science et Technologie au Royaume-Uni Numéro spécial 1Septembre-Octobre 2011)
 Crédit : Service pour la Science et la Technologie- Ambassade de France à Londres

Science and Society Interaction in the UK visualised in sciela issue produced by the French Embassy in the UK.

Is a reasonable picture as far as it goes (it is an interesting special issue by the way by the Service for Sci and Tech in the French Embassy in London, but integrating less traditional forms of interaction:

IS ONLY PART OF THE PICTURE



We see a number of different types even within this focused area of science and society interaction.

Preliminary findings:

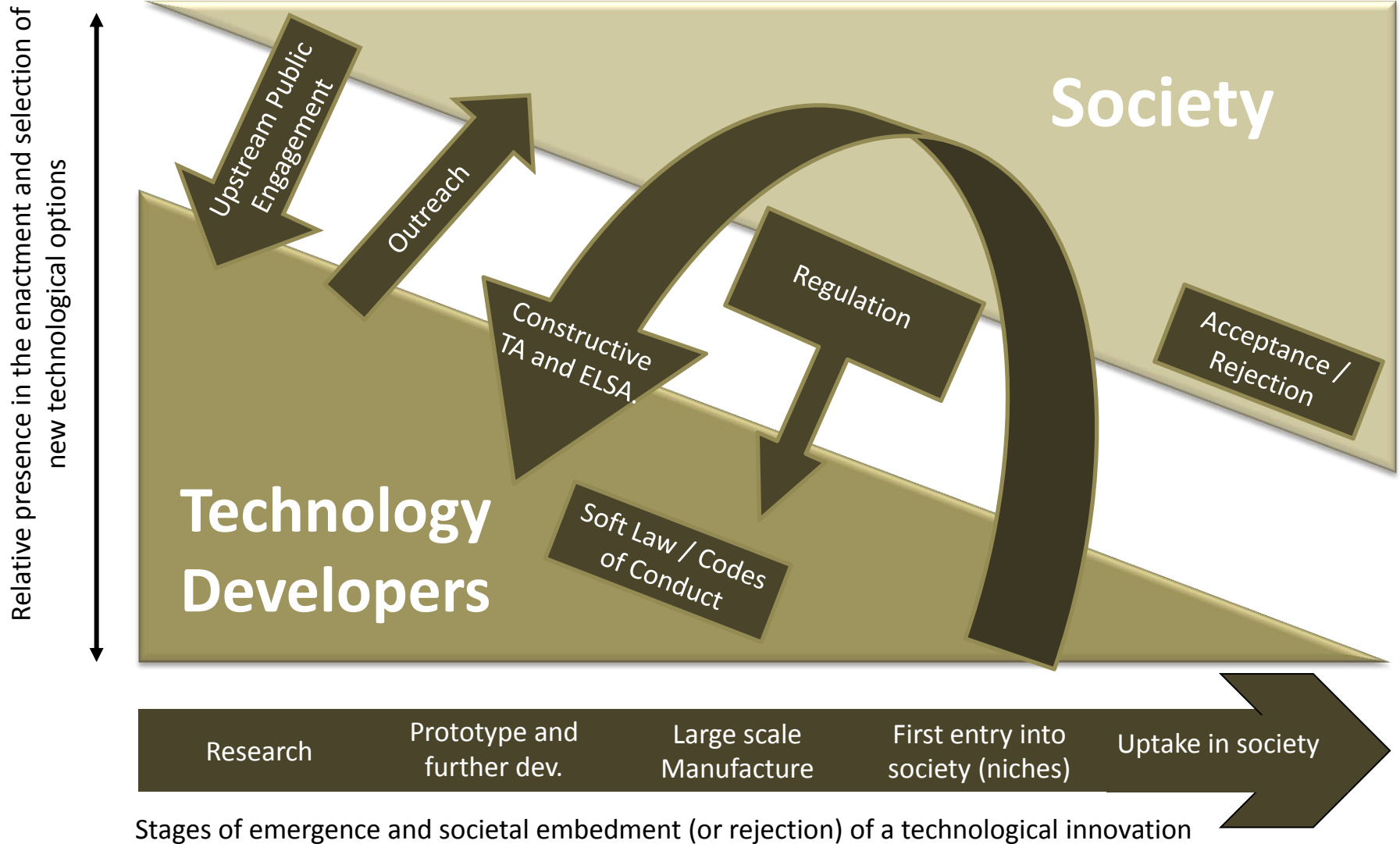
Recontextualisation is happening in a number of ways

- **Increase in Science Communication in National Science Strategies**
- **Interactive/Constructive Technology Assessment** organised by Parliamentary TA organisations (Rathenau, Danish Parl. TA) or social scientists (TA-NanoNed, INRA-iTA) bring Specific Publics into science and technology options assessment.
- **Social Scientists playing a role** in Ethics, Social and Legal Aspects (programmes in UK, DE, CH, NL and FR).
- **Social Media** and unique methods for discussing and promoting science becomes a dialogic space plus a mechanism of transparency
- **Science Media orgs.** And consultancies play a strong role.
- **Citizen Science** (biodiversity case AND protein modelling case (through computer game))
- **Museums as actors** rather than just mediators shaping and creating spaces for engagement (Biodiversity)

Occasions of recontextualisation are
entwined with shifts in S&T
governance

For example see Responsible
Research and Innovation

Responsible Research and Innovation



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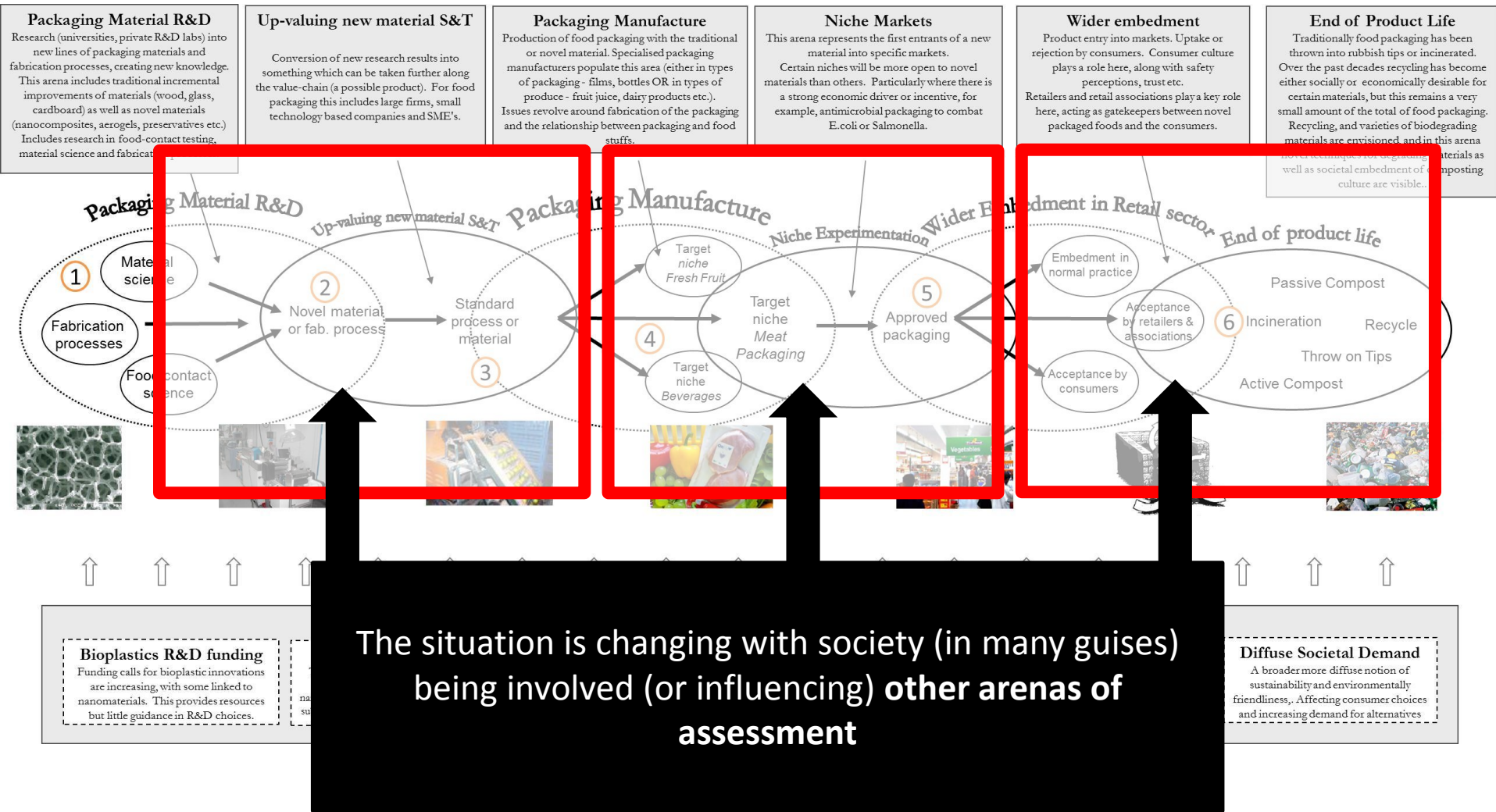


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ARENAS of ASSESSMENT and SHAPING



So a challenge for TA generally

Has to be distributed or at least sensitive to the
different contexts of many (and varied)
assessment arenas

Governance is distributed (unevenly, with
different power relations)

So what does this mean for **TA** and
Governance of S&T PRODUCTION?

(IN BRIEF)

Distribution of Technology Assessment Labour

For new technologies (like nanotechnology) the situation changes – the societal side is becoming involved at earliest stages thru anticipation.



Concerns

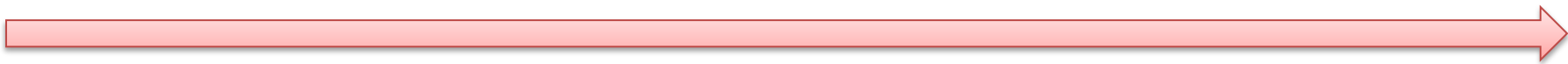


Promises solutions



lucrative

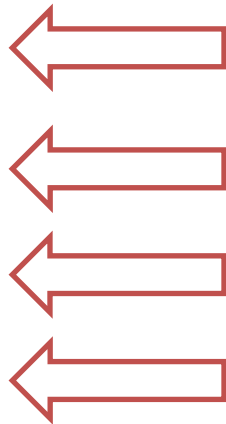
Consumers



Research

Product

Time



a pressure to translate research into **applications**

a pressure to **be strategic**, (roadmapping & agenda building)

a pressure to be transparent & **pay attention to various publics**

a pressure to **engage** with ELSA and TA (responsible R&D)

Under **New**
Pressures

Support Systems for Anticipatory TA is needed

This conference reveals a number of elements for this. Things like Constructive Technology Assessment and FTA can help here.



Concerns

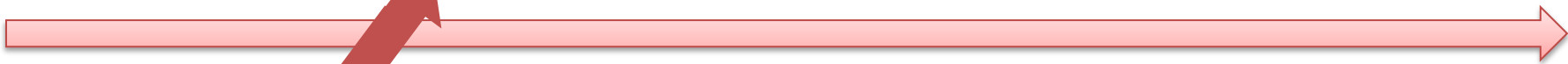


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**ORCHESTRATE
BRIDGING
OPPORTUNITIES**

Support system for connecting (or bridging) the worlds of societal aspects, innovation and research related to nanotechnologies.

And to do so in a future-oriented way that anticipates/speculates in a controlled way how developments may unfold

An opportunity for TA
practitioners!

An approach I have been involved in is CTA

(present if time allows)

Constructive

Technology

Assessment

FUNCTIONS

Constructive

Embedded in ongoing dynamics and influencing design processes

Technology

Technology as evolving socio-technical networks

Assessment

Broadening design processes based on knowledge of ST dynamics including actor dynamics

CHARACTERISTICS **FUNCTIONS**

Constructive

Embedded in ongoing dynamics and influencing design processes

Aware of context and interacting with context

Technology

Technology as evolving socio-technical networks

Aware of socio-technical dynamics, such as co-evolution, sociology of expectations, entanglements

Assessment

Broadening design processes based on knowledge of ST dynamics including actor dynamics

Understanding of actors assessment worlds and their link with (a) each other (b) with the technology and (c) the broader context of science, technology and society

FUNCTIONS

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Understanding of actors assessment worlds and their link with (a) each other (b) with the technology and (c) the broader context of science, technology and society

SOME ELEMENTS

Embedment of STI insights into ongoing dynamics

Context relevant dynamics. For NANO:

Models and mechanisms for understanding and revealing assessment worlds and value structures

INSERTION

EMERGING IRREVERSIBILITIES

CTA WORKSHOP TECHNIQUES

MULTI-LEVEL ENTANGLEMENTS

ENACTOR/SELECTOR

ARENAS FOR PROBING & LEARNING

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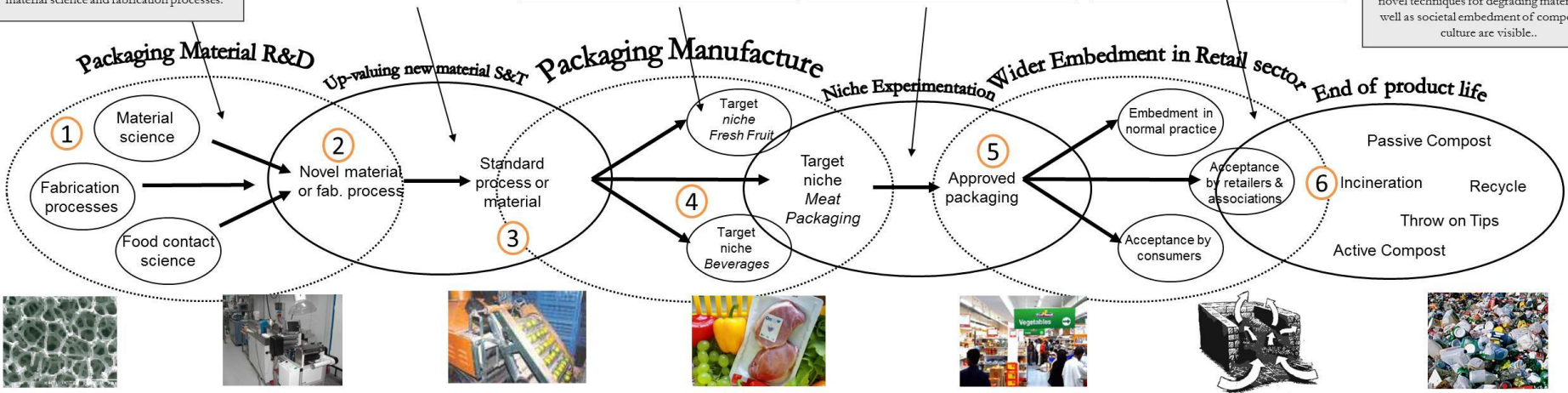
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CTA Projects, located in world of S&T production, anticipating on how technologies will co-evolve with different arenas of assessment (at different stages of development)

Van Merkerk & Robinson 2006
Technology Analysis and Strategic Management
LAB-ON-A-CHIP

Robinson D. K. R., Huang L., Guo Y. & Porter A. L. (In review 2011) Forecasting Innovation Pathways (FIP)
NANOBIOSENSORS

Robinson & Propp 2006
2nd FTA conf.
2008 TF&SC on multipath mapping
LAB-ON-A-CHIP



Robinson 2010 PhD Thesis
SIRNA DELIVERY

Te Kulve 2011 PhD Thesis
FOOD AND PHARMA



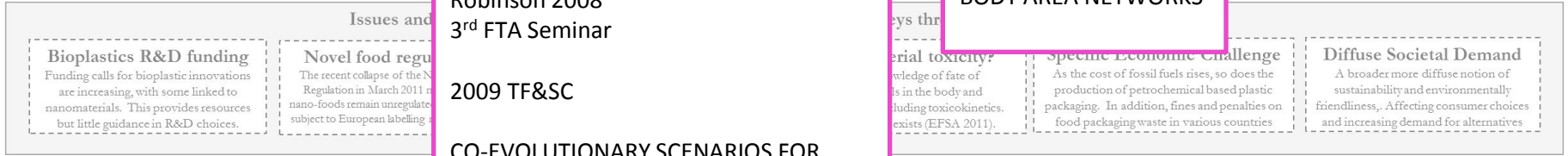
Robinson D. K. R., Huang L., Guo Y. & Porter A. L. (In review 2011) Forecasting Innovation Pathways (FIP)
DEEP BRAIN IMPLANTS

Elwyn et al 2011
Journal of Evaluation in Clinical Practice
MEDICAL INFORMATICS FOR HEART DISEASE

Parandian PhD Thesis forthcoming 2011
LARGE AREA ELECTRONICS
BODY AREA NETWORKS

Robinson 2008
3rd FTA Seminar
2009 TF&SC
CO-EVOLUTIONARY SCENARIOS FOR NANO GOVERNANCE

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DEVELOPMENT AND DEPLOYMENT AGENDA

Research into
OPERATIONALISING CTA-
type activities AND linking it
up to actual decision
making that shapes
development
(some progress already visible)

Context aware
application of
insights into science
and technology
dynamics

Improved models and tools
to explore valorisation
processes of various actors
(Assessment worlds,
values and routines)



SOME ELEMENTS

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CTA WORKSHOP
TECHNIQUES

Context relevant
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