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Constants and Variables in 30 Years of Science and Technology Policy

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Presentation for NISTEP 30 Symposium

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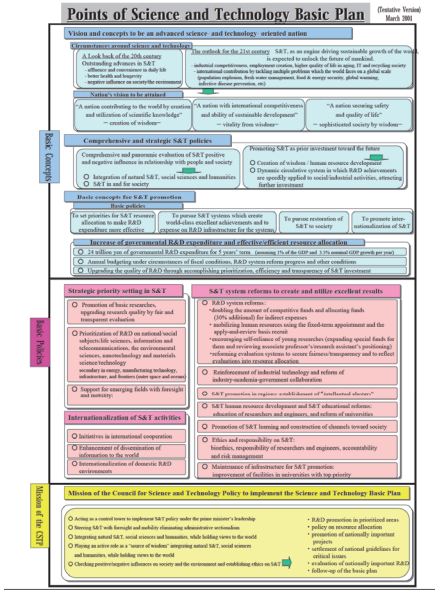
Some personal highlights working with NISTEP

NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY POLICY



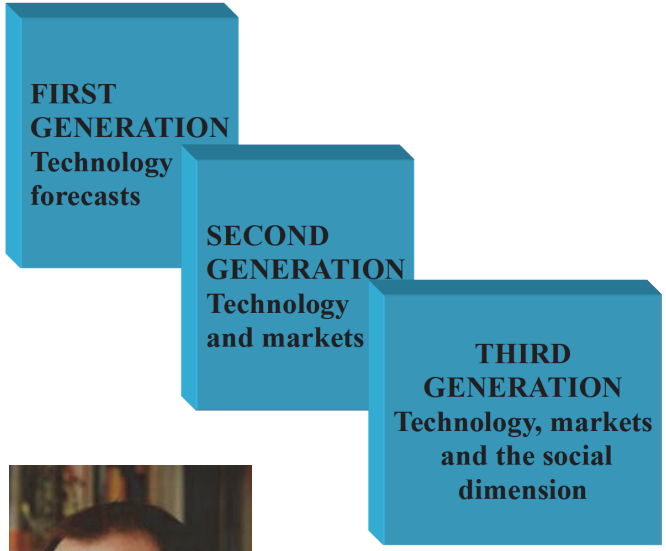
Working on Second Basic Plan as Honorary Fellow of NISTEP

Science policy advice in the UK and the work of PREST, 8-9 October 1998, **NISTEP 10th Anniversary Conference**

Challenging Europe's Research – Rationales for the European Research Area, **NISTEP 20th Anniversary International Symposium**, 14 November 2008

Cooperation agreement with PREST/Manchester Institute of Innovation Research

Three generations of Foresight



Evaluation of NISTEP with the late Hariolf Grupp

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The constant concerns of science and technology policy

- Some themes were high on the agenda 30 years ago and have been the subject of constant debate throughout the period
  - Concentration of resources between institutions
    - For example should a country merge or reorganize universities to create global research powerhouses?
  - Prioritisation between fields
    - Linked to the use of foresight but typically much less change in balance of funding than could be expected
  - Interaction between science and business
    - Economic agenda for research system is stressed by each incoming administration

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The returning themes of science and technology policy

- A second set of themes were prominent at the beginning of the period and then interest subsided only to return today
  - Mission-oriented innovation policy and grand challenges
  - Artificial intelligence

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Case 1: Grand challenges and mission-oriented research

- 1986 classic OECD reference Henri Ergas
  - Technology policy typology: mission-oriented versus diffusion-oriented
  - Group 1: France, UK and the US pursuing ‘big problem’ issues in defence and health Group 2: Germany, Switzerland, Sweden focus on making best use of technology
- 2008 Grand/Societal challenges entering lexicon of policy
  - Aim to provide coordination envelope for research & innovation policy; and
  - To connect more clearly to the interests of citizens
- 2017 Mission-oriented research key new element in European research policy following work of Marianna Mazzucato
  - From market failure rationale to market creation

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Basic Typology

- 1. Challenges which are potentially solvable and can be reduced to discrete of verifiable goals
  - Archetype moon landings
  - Recent example Ebola vaccine
- 2. Challenges where solutions are unknown and problems 'wicked' or 'messy'
  - Archetype Nixon's War on Cancer
  - Recent example initiatives on ageing but includes most societal challenges such as poverty, environment, public health etc

https://ec.europa.eu/info/sites/info/files/mission_oriented_r_and_i_policy-a_rise_perspective.pdf

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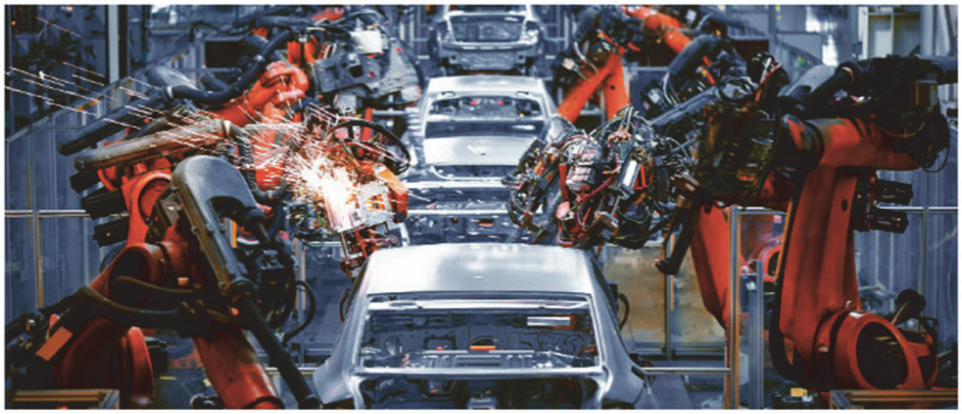
Operationalising challenges and missions

- Key steps in moving from macro-level challenge to workable mission
  - Establish level of granularity which is traceable to the high-level goal
  - Necessary to remain meaningful at political and societal level
  - Derive measurable/verifiable goals which allow resources to be coordinated and directed towards them
- Missions need infrastructural and behavioural change in tandem with scientific and technological innovation, in other words a mixture of supply-side and complementary demand-side market creating measures
- Challenges can be captured by fashion
  - eg Bird flu, and hence rigorous evaluation is needed
  - Normal for nature of challenge to evolve and hence need to build in element of flexibility

Case 2: Artificial intelligence



To Every Thing There is a Season – lessons from the Alvey Programme for Creating an Innovation Ecosystem for Artificial Intelligence

By Luke Georghiou
Filed Under: All posts, British Politics, Science and Engineering
Posted: May 15, 2018

- Artificial intelligence (AI) is new competitive battleground in nations' search for technological and economic advantage
- Echoes of 1980s when the first "AI Winter" ended with global responses provoked by Japan's 5th Generation Computing Programme focused on parallel computing

http://blog.policy.manchester.ac.uk/posts/2018/05/to-every-thing-there-is-a-season-lessons-from-the-alvey-programme-for-creating-an-innovation-ecosystem-for-artificial-intelligence/

Retrospective on UK's Alvey programme showed lessons for today

- Seven year pioneering real-time evaluation of UK's national initiative
- In AI area academic base was consolidated but little commercial follow-up
- Key failing was single instrument use of R&D programme
- Little done to complement R&D with essential parts of innovation ecosystem including
  - user engagement
  - enhancing the supply of trained people
  - fostering patient capital
- Result a second Winter only today relieved by new AI Spring but risk of hype remains

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Some comments on the evolution of evaluation methods in S&T Policy

- Core concepts largely unaltered in 30 years
  - Peer review remains predominant means of allocation of resources and ex post scientific review
  - Bibliometrics (citations and patents) remains predominant data source for analytics along with analyses of funding patterns
  - Econometric methods remain confined to higher levels of aggregation such as the broad case for R&D investment

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Nevertheless some technical changes

- Peer review is almost always operational in modified form with extended criteria to cover impact
  - Example of UK Research Excellence Framework (REF) exercise moving to 25% weighting for impact cases (but no methodological innovation)
- Bibliometrics has extended to measurements of researcher activity and impact online especially in social media (altmetrics)
- Economic methods are being better enabled by data analytics linking public databases (eg locational data)

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But more important developments in area of methods have been social

- ‘Democratisation’ of data
  - Data are now widely available to researchers and managers and no longer the preserve of expert analytical teams
  - Positive development in terms of countervailing expertise but opened door to inappropriate use
  - Now widespread use of bibliometrics in short-term assessment of individual performance including impact factor and ‘lists’
- Response from expert community in Leiden Manifesto (Nature 22.04.2015)
  - 10 principles emphasizing predominance of *qualitatitive* assessment *supported by* quantitative data

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Commercialisation of evaluation

- At start of period a clear separation between data providers, analysts and users
- Today convergence and confused lines with negative consequences
  - Increasingly publishers with vested interest in journal hierarchies are also controlling analytics
- University ranking tables
  - Compilers motivated to create volatility and hierarchies to drive their own business interests in selling services to those seeking improvement of position (despite general lack of movement)
  - Lack of transparency of data is key element
  - Major policy effects such as driving mergers in university systems
  - Weakening national ecosystems by driving convergence of missions and loss of variety

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Conclusions 1: Looking forward to the next decade

- Seems unlikely that the constants will change although the questions may widen
  - Does concentration mean specialization or interdisciplinary powerhouses
  - Is it possible to be more agile in prioritization?
  - Will a whole innovation ecosystem perspective relieve the excessive focus on ‘technology transfer’ from science to business?

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Conclusions 2: Will missions that go beyond S&T succeed?

- It is possible to achieve the wider policy coordination necessary for Type 2 missions to succeed?
  - Track record only exists for narrower S&T challenges
  - Yet most major societal challenges have strong behavioural, regulatory, skills and other elements requiring action beyond research and innovation agencies
  - Innovations in governance are also needed

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Conclusions 3: Is the present evaluation environment sustainable

- Technical challenge coming from the Open Science movement which will disrupt journal hierarchies and economies
- Some evidence that large publishers are anticipating change and focusing on transition to research services and analytics
- Key question is whether the research community and policymakers can re-learn life without micro-metrics?

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Final words

- By means of the perspective shown in this presentation I hope also to have shown that present day S&T policy can be informed by lessons from the past
  - A function for long-lived institutions is to act as the corporate memory of government and to seek to minimize the chance that past errors will be reproduced
- A clear conclusion is that there is a continuing vital role for the kind of evidence-based and autonomous research carried out by NISTEP
  - It is needed to keep the system honest and to ensure that the benefits from research and innovation are shared by citizens