

TECHNOLOGY FORESIGHT

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Overview

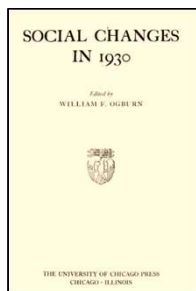
- Before TF
- Emergence of TF/ ForSTI
- Typical Features of TF Exercises
- Governance of TF
- TF and Sustainability

The Great Depression (1930s)

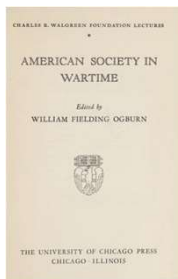
- USA “New Deal” initiatives – major efforts to upgrade infrastructure, modernise agriculture, create jobs...
- Examination of **effects of programmes**. Work on technological change and social indicators: W. F. Ogburn (theorist of Invention and “Cultural Lag”); reports such as the Research Committee on Social Trends, Technological Trends & National Policy (1937)
Technological trends and national policy, including the social implications of new inventions.
- Systematic, data-supported analyses of technology → Two aspects of **Technology Forecasting**: (1) development of features; and (2) uptake, diffusion and use.
- S. Gilfillan forecasting → set of futures studies.

From individual “genius forecasting” to teams using explicit data & methods.

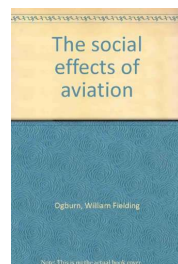
This early work did not use the terms “innovation”, “Technology Assessment” Foresight etc



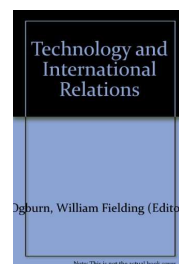
1931



1943



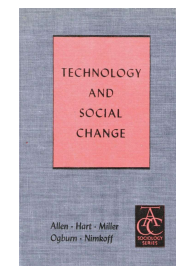
1947



1949



1955



1957



1970

Towards Foresight - postwar boom

1940s

World War 2: major role of science (radar, nuclear weapons, jet aircraft, rocketry...), and of systematic technical methods (Operations Research, Statistical Analyses, early Computing, etc)

1950s

Security dilemmas: development of new weapons systems and planning methods
Geopolitical competition: Space programmes

Development of tools for technology forecasting, and for wider “futures research”, much under auspices of US military programmes, RAND, etc .

1960s

Business and government agencies adopt forecasting and planning tools.
“Futures movement” – **alternative** futures. Many futures studies focus on technological change, using technology forecasting tools and/or scenario analysis . In contrast, influential works on global population growth and resources use, (e.g. *Limits to Growth*, 1972, applying computer modelling)

NASA uses and pioneers technology analysis techniques for planning space programme.

1970s

International development issues
“End of boom” in mid-1970s.

National-level “Foresight”: Move from NICs’ catch-up and imitation (the “future” is evident elsewhere, to leadership

Japan adopts Technology Forecasting tools – 1975 on

Foresight Programmes



Elements of a wide-spectrum TF Exercise

ACTIVITIES

- **Scoping** (*what is the main focus, what methods to employ?*)
- **Review and Horizon Scanning** (*what key trends, uncertainties, contexts?*)
- **Sourcing Expert Opinion** (*what opportunities, where, when, how?*)
- **Sensemaking** (*appraisal of alternative plausible future scenarios*)
- **Policy analysis** (*what policy mix, what responsibilities, when?*)
- **Recommendations and Reporting** (*how to communicate with what audiences?*)
- **[Evaluation** of impact of the work, determining next steps]

METHODS

- Stakeholder analysis, recruitment, Consultation
- Data analysis
- Trend analysis
- SWOT
- Delphi
- Scenario analysis
- Modelling
- Roadmapping
- MCA, etc
- Narratives, visualisations
- User interviews, document analysis

- Typically governed by a Steering Group, + Project Manager;
- (Often) Panels working on specific topics;
- Some activities may be outsourced
- Retain close contact with users;
- Engage major stakeholders so they have “ownership” and deep understanding

TF/ForSTI for Policymaking

- STI issues are critical for sustainable development.
 - Many aspects of STI are relevant to many different parts of government, and across the national innovation system: *Where are opportunities? What are our capabilities?*
 - Many stakeholders are affected – and key expertise and knowledge may lie outside of government *Where is the knowledge and the power to act?*
 - While present-day action is necessary, and many decisions cannot be deferred, consequences may be very long-term *Awareness that the long-term is critical.*
 - Medium- and longer-term evolution of STI will substantially affect opportunities and challenges confronted by policymakers : no Business-as-Usual *Alternative futures.*
- TF/ForSTI helps address the policy challenges by
 - Sharing knowledge of STI, developmental issues, and policy processes across actors in (different parts of) government and the wider innovation system
 - Examining alternative futures and working towards sharing common appraisals of routes to sustainable scenarios
 - Informing policy decisions with expert knowledge and understanding of critical issues
- Complementary with other types of undertaking, such as TA (problems as well as opportunities)

Establishing Governance of TF - Options

- **One-off** or Pilot Exercise VERSUS **Ongoing** Activities?
- What Combination of **In-house** unit(s) VERSUS **outsourced** activities?
 - The main coordination and integration of work may be carried out in-house, or contracted-out (e.g. to academic or consultancy bodies).
 - An ongoing unit in the main Ministry or Agency responsible (and perhaps units in other relevant Government departments, e.g. Education, Science, Agriculture) may organise specific projects, or undertake continual activities – e.g. horizon-scanning (“vigilancia”) for important trends and developments affecting responsibilities, training, etc.
 - An “arms-length” TF organisation may be set up to support Government widely. This may also undertake TA and other STI activities (e.g. funding, training).
 - Whatever model is pursued, it is usually necessary to draw on some external expertise. Specific tasks may be outsourced to organisations with relevant data or other resources.
- Vital to engage with senior policymakers - to have “champions” and informed voices at high levels; and to liaise with major stakeholder groups.
- Scope for collaboration with work at different levels of government (e.g. regions), and internationally. **Local conditions (and knowledge) are critical**, and “one size fits all” does not apply. But there is much scope for learning from experience, pooling (some) resources, etc.

TF/ForSTI and Sustainable Development

- 3 Pillars: economic development, social inclusion/social development, and environmental sustainability. Much early TF prioritised economics, focusing on technology opportunities and improving innovation systems.
- Scope for reorienting innovation systems to be more supportive of social and environmental sustainability.
- One central theme in environmental sustainability is mitigation of further Climate Change (decarbonisation) and adaptation to ongoing Climate Change (dealing with “new normal”). [*Ecosystems – forests, peat, etc. – are important and also need STI support.*]
- Mitigation efforts include shifts in energy production, distribution, and consumption. More than just a matter of new technological choices, but STI play huge roles in many elements of transition.
- Adaptation to changing temperature, water availability, threats of fire and flood, etc. will be required throughout much agriculture, construction, industry and everyday life. STI roles again.
- TF (and TA) can help address these issues, providing long-term and systemic appraisal of the economic, social and environmental sustainability transitions required to realise desirable and sustainable scenarios.

Conclusions

- **TA** emerges largely as a result of wide public/expert concern with *problems* in the consequences of technology application (initial focus on impacts rather than STI development).
- **TF /ForSTI** and use of systematic methods to examine analysis of STI futures emerges as major new technologies are emerging, and/or STI is called upon to (help) address *opportunities* and identify problems in capabilities. **TF programmes** used by states aiming to catch-up or overcome deficits via R&D and wider innovation system intervention. Initial focus was very much on economic goals, with social and environmental issues often seen as sources of demand or resistance to change.
- TF is increasingly applied to **Grand Challenges** – including those associated with social and environmental sustainability - rather than simply catch-up and deficits. Need to examine whole system rather than simply look for “tech fixes”. This requires wider participation and engagement,
- There is some convergence of TA and TF – including shared attention to technology development as well as choice, use and regulation, though vary in terms of focus (shorter- vs longer-term) and their main users and uses.



End of Presentation
– thanks for your attention!

