The transformation of research in the South: policies and outcomes

Strengthening the interactive capabilities of public research institutes: a case study of science councils in South Africa

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The presentation

- Examines how 5 **science councils** evince the 'interactive capabilities' to respond to demands of accountability to complex growth/development agendas
- A focus on national policy and organisational practice:
  - How organisational mandates are reinterpreted to respond to multiple imperatives, and the internal and external interface structures and mechanisms to promote and support interaction with public and private partners
  - How conditions in the NSI drive change, but may constrain building of interactive capabilities

=> Intervention at national policy and organisational levels?

A policy-oriented literature

- Growing body of research from innovation policy makers: how PRIs can play more effective role in economic development and how form more effective linkages with government, private sector and other knowledge actors.
- Reflected in academic literature in a number of countries: grappling with shifts in compact between knowledge institutions, public and private users and society

=> Contribute to this literature through examination of dynamics in SA context

Analytical framework

- Builds on and extends research on university-firm interaction in the South (Albuquerque et al 2015)
- Focus on substantive nature of universities and PRIs:
  - Substantive growth: driven by disciplinary fragmentation and complexity, change
  - Reactive growth: driven by government policy or labour/market demands
- Scientists: intellectual, financial and 'social development' imperatives drive interaction

⇒ Ability of PRI to respond to change, flexible in how organises, is critical

Dynamic interactive capabilities

- “the ability to learn from such interaction and to absorb the lessons and then to ‘recycle’ their products into the system” (Von Tunzelmann 2007, 2010).
- Capability of PRIs to build linkages to ensure flows of knowledge and technology between actors in the NSI
- Will to interact: reflected in mandates and strategic policy
- Capacity to build linkages: internal and external interface structures and mechanisms to promote and support interactive activities of scientists

Methodology

- In depth qualitative case studies of five science councils
- Macro-level:
  - Analysis of government policy documents and literature to situate in context of history and expectations
  - SETI reviews to triangulate history and organisational data
- Meso-level:
  - Semi-structured interviews with senior managers, heads of units (November 2012-October 2013)
  - Analysis of documentary sources

Historical trajectory and policy imperatives

- Dynamic interactive capability shaped by practices and priorities built up over time

⇒ Formal establishment in response to economic and political challenges in distinct periods?

1. Colonial origins, agricultural and mineral demand
2. Industrialisation and big science
3. Marketisation and public accountability

- 1994: radically new policy mandate requires reorientation and change:

1. Contribute to science and connect to global knowledge systems
2. Technology, innovation for global competitiveness and inclusive growth
3. Innovation of government and communities for inclusives socio-economic development

How do science councils balance multiple imperatives?

- Each articulated a distinctive balance of the threefold mandate in relation to their core disciplinary fields and research paradigms
- Grappled to balance simultaneous (and potentially contradictory) demands of financial, intellectual and developmental imperatives driving activity:
  - Tensions acute, expanded strategic mandate and agency role (repositories) a challenge, in financially constrained environment (CGS, ARC, MRC)
  - Clearer mandates where linked to mining and industrial value chains, but oriented more strongly to global competitiveness and scientific excellence, and driven more strongly by financial imperatives (Mintek, CSIR)

	CSIR: Multi-disciplinary, perform	Mintek Mission oriented MINING, perform	CGS Mission GEOLOGY, perform, repository	ARC Mission AGRICULTURE perform, repository	MRC Mission HEALTH perform, fund
Traditional mandate	Research and technological innovation to foster industrial, scientific development	Maximise the value derived from mineral resources	Survey for government and public	Commodity oriented: serve the needs of agriculture sector	Medical model: causes and treatment of disease
Main challenge to shift traditional mandate	**Impact** of R&D and technology transfer Strengthen **scientific** reputation	**Expanded mandate**: small-scale miners Strengthen **scientific** reputation	**Expanded mandate:** geohazards **Develop** scientific reputation	**Expanded mandate:** small farmers **Develop** scientific reputation	Health paradigm responds to main causes of ill-health Scientific reputation
Funding challenge **(Ave 30%**	Funding drives research agenda	Research for stakeholders versus public good	Core mandate as geoscience survey requires sustained	Small farmer mandate, repositories need	Balance of funding to intra- and extramural

Internal interface structures and mechanisms to promote balance and coordination

- Hybrid organisational models evolved over time
  - Matrix system at Mintek
  - CSIR: fragmented => new research impact areas, flagship programmes, strategic initiatives, multi-disciplinary collaboration
  - Missing internal interfaces – tacit and ad hoc, unstructured, based on individual relationships, CGS/ARC/MRC =>Fragmentation and lack of coherence and coordination between units, priorities

=> Models most structured and formalised with strategic mix of centralised and decentralised structures and decision-making mechanisms supported interaction to achieve strategic mandates more effectively

External interface mechanisms focused on knowledge and industry partners

- Formal contracts and MoUs around staff exchange and post-graduate education with universities (intellectual imperatives and global scientific mandate)
- Formal mechanisms for technology transfer, commercialisation and IP with industry partners (financial imperatives and competitiveness mandate)
- Repositories, regional offices, sales of products interfaces with clients and public to meet agency mandate
- Specific programme or unit (small business development, training and extension) with community, civil society and informal sector – missing structures, lack of integration

Incentive mechanisms tend to reward the scientific mandate

- Performance monitoring and promotion systems include criteria to promote interaction BUT balance between output indicators contested, systems not transparent and changed frequently
- Publications and contribution to science rewarded most highly
- Few incentives to reward patents or commercialisation, or interaction with small-scale producers and communities

⇒ In practice, most scientists driven by individual or unit interpretation of imperatives for intrinsic reward: "freedom to pursue one's research"

⇒ Substantive growth drives interaction most strongly

Systemic conditions in the NSI constrain

- Macro-level blockages constrain, despite best organisational efforts

1. Decline in core public grants => Financial imperatives drive scientists to seek private funding
    - Risk of funder driven research agendas => organisational incoherence and misalignment
    - Constrain solutions in public interest
    - Block funds for infrastructure and equipment/ maintenance of national collections
    - Lack of continuity risk to long term scientific work
2. Mission overload: initiatives from multiple government policy actors, constant cumulative addition of requirements without prioritisation, alignment or coordination; risk of duplication and fragmentation of effort
3. Potential risk for fundamental knowledge and technology generation capacity of science councils in NSI

Towards a stronger strategic balance

More effective balance of threefold mandate around core substantive role?

1. Incentivise **engaged science**:
   - Convince scientists of potential value of interaction
   - Draw on HE community engagement frameworks of “engaged scholarship” – national debate to promote ‘engaged science and technology’
2. Enhance **dynamic interactive capabilities**: science councils as active agents, balance functions in more strategic manner to manage potential tensions between multiple imperatives:
   - Strengthen internal coordination and alignment between business units and strategic goals
   - Prioritise and give authority to structures and mechanisms that support interaction
   - Incentives to promote individual will to interact and align strategically
3. Develop capabilities to interact with **marginalised and vulnerable** communities and informal sector actors:
   - Strategy aligned with existing mechanisms and funding, to extend benefits of research and technology towards inclusive development