‘Lessons gained from conducting the R&D Surveys’

DST/NACI Workshop
23 March 2005

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HSRC Group: Knowledge Management

Social Science that makes a difference
CeSTII

CeSTII has been established to develop sustainable capability and capacity to

1. Perform the R&D, Innovation and other S&T Surveys

2. Analyse the resulting data

3. Participate in peer networks locally and globally

4. Provide other S&T policy support as needed
Main issues concerning R&D Surveys

- What questions is the Survey intended to illuminate?
- What is the Survey population?
- What is the sample frame?
- How is the Survey administered?
- What non-response rate is tolerable?
- Who has access to the data?
- Who gains value from the information?
R&D Survey questionnaire design

- ABS questionnaire as point of departure
- Survey 2002 augmented with mobility items
- Keep questions sharp and short
- Definitional issues – what counts as R&D?
- Impossible to have fool proof items
- Cannot query the database beyond its designed level of detail

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R&D Survey population

- All organizations that perform in-house R&D in the specified Survey period
- This population is unknown
R&D Survey sample frame

- All HEIs and Science Councils
- Purposive surveys of GOV, NPO AND BUS
- Augment with trusted secondary sources: HEMIS
  - Audited Annual Reports
  - Official grantee lists
- Referrals (awards; associations)
- Obtain information by use of conditionality (grantmakers; regulators)

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Survey administration

- Use all legitimate authority one can muster
- Develop telephone scripts for project staff
- Be conscious of the value of org time
- Postal, electronic, telephonic distribution
  - What can go wrong will go wrong
- Gray areas: software development; clinical trials; service sector generally
- Persist in chasing the response
- Absolute confidentiality

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Estimation and Imputation

- Current R&D = previous R&D * inflation
- Data either from previous or present surveys is the source for imputation
- Imputation can be for a non-response
- Imputation can be for a partial response
- Imputation from nearest neighbour
- Random imputation
- International best practice

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Lessons learnt 1

- In BUS the CFO is the key informant
- Many companies do not measure R&D expenditure. One measures what one values? (If you can measure it you can control it)
- Generally very positive toward Survey
- NPO key informant is CEO. Often negative ... ‘what’s in it for us?’
- GOV line departments very poor response. Institutes generally positive.

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Lessons learnt 2

- In HE the DVC Research is usually the key informant
- Considerable stress from merger process
- HEI MIS often poor
- High staff turnover a problem
- Smaller HEI unable/unwilling to respond
- Borderline institutions
- Phase Innovation and BUS R&D 2005
- Innovation targets CEO or plant manager
Where we are now

- Identified various ratios and constants
- Order of magnitude check: the Volvo calculation of HERD
- Researcher FTE and ISI volume
- For BUS economic cycle and R&D expenditure are linked
- Improved coverage of the service sector
- Stats SA and MSTI processes advanced
- Publication volume growing
- Partnerships: ITI, TUT, UCT
Our capability

- Survey 2004 performed in less than a year; BUS represents effort of some 400 firms
- Surveys henceforth annual
- SMRS on-line; built-in discrepancy rules
- In house data analyst: MS Access queries off SQL
- Staff registered for higher degrees (4)
- Collaborating with OECD, Stats SA, RICYT, Stats Canada, UIS, NEPAD, CSIR

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GERD:GDP (re-based)
(early) Implications for policy

- The greater the coverage, the greater GERD
- Expect GERD to saturate in next survey
- To grow GERD require more researchers
- State funding to Higher education as %GDP in decline

Social Science that makes a difference
Promoting Research at UJ

Michael Kahn
Centre for Science, Technology & Innovation Indicators

Presentation to Executive
University of Johannesburg
26 April 2005

Social Science that makes a difference
CeSTII

- Est. 2002 via DST ring-fenced grant in Knowledge Management research programme
- Research on the NSI, Information Society and KM
- Now into third R&D Survey; 1st Innovation Survey; 1st Knowledge Management Practices Survey
- Clients: DST, NACI, PNC-ISAD
- Partners & Collaborators: Stats SA, OECD, Statistics Canada, UCT, TUT, U Pta
- Developmental agenda
National System of Innovation

- Institutions and organisations and the interactions among them
- R&D as a central aspect of sustainable innovation
- R&D activity conditioned by path dependence (history) and operating environment
- R&D Surveys capture inputs to R&D
- R&D indicators - essential component for planning and benchmarking competitiveness

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Performing R&D Surveys

- Forty year history
- OECD Frascati Manual guidelines
- “R&D comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including the knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”
- Voluntary survey
- Grey areas: definition of R&D; borderline institutions; permanent and contract staff
What is measured?

- Expenditure – labour costs, capital and current
- Type – basic, applied, experimental dev’t
- Sources of funds
- Staff by activity; level; headcount; gender; FTE
- Research fields; Socio-economic objectives
- Location of research
- Research collaboration

R&D Surveys do not measure research outputs

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Main indicators of R&D

- GERD/GDP
- FTE Researchers/1000 employed
- R&D expenditure/Researcher
- Research output per Researcher
- Research impact factor
- Licences granted
- Patents applied for and awarded by location
- Royalties paid
- Etc.

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The story unfolds

DEPARTMENT OF SCIENCE AND TECHNOLOGY
National Survey of Research and Experimental Development [R&D]
[2003/04 Fiscal Year]
HIGH-LEVEL KEY RESULTS

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Main findings

- South Africa spent about R10.1 billion, or 0.81% of GDP, on research and development (R&D) in 2003/04.

- The 2003/04 figure represents an improvement from the 2001/02 survey which found R&D expenditure to be R7.8 billion or 0.76% of GDP.

- The National R&D Strategy targets spending 1% of GDP on R&D by 2008.

- South Africa has a total of 25 185 full time equivalent (FTE) R&D personnel.

- About 40% of these personnel comprise the 14 129 FTE researchers or academically qualified people.
- Women researchers now comprise 38% of the total researchers compared to 11.2% in Japan, and 28.4% in Norway.

- The business sector is the major performer of R&D in the country and performs 55.5% of all R&D undertaken.

- The higher education sector undertakes 20.3% of national R&D.

- Government performs 21.9% of the total but finances 28.1% of total R&D.
GERD/GDP

OECD (2005) Main S&T Indicators (pending)

Social Science that makes a difference
Number of Full Time Equivalent (FTE) researchers per 1000 total employed in 2003* [International Comparisons]

* for latest year available

<table>
<thead>
<tr>
<th>Country</th>
<th>Researchers per 1000 Total Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>10.6</td>
</tr>
<tr>
<td>Japan</td>
<td>9.9</td>
</tr>
<tr>
<td>Norway</td>
<td>8.7</td>
</tr>
<tr>
<td>France</td>
<td>7.5</td>
</tr>
<tr>
<td>Russia</td>
<td>7.4</td>
</tr>
<tr>
<td>Australia</td>
<td>7.3</td>
</tr>
<tr>
<td>South Korea</td>
<td>6.8</td>
</tr>
<tr>
<td>Spain</td>
<td>5.1</td>
</tr>
<tr>
<td>Argentina</td>
<td>2.2</td>
</tr>
<tr>
<td>China</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Fig 4:
Fig 5: Women researchers as a percentage of total researchers (headcount) 2005* (International Comparisons)  
* or latest year available.
Constraints to moving country rank

- Static flows from school to research careers
- Static number of FTE Researchers
- Therefore static absorptive capacity and static outputs
- Global competition for skills
- Playing in global markets requires R&D commitment
- The need for a joined-up high level skills approach across government

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Fig 7: Performance of R&D by Sector (South Africa, 2001 & 2003)

- Not-for-Profit
- Higher Education
- Government
- Business

PERCENTAGE SHARE OF PERFORMANCE

2001

20.0
53.7
25.3

2003

21.9
55.5
20.5
**Fig 9:**

Expenditure on R&D by major research field  
(South Africa, 2001 & 2003)

<table>
<thead>
<tr>
<th>Field</th>
<th>2001</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>9.3</td>
<td>7.6</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>20.7</td>
<td>21.9</td>
</tr>
<tr>
<td>Engineering Sciences</td>
<td>20.2</td>
<td>24.8</td>
</tr>
<tr>
<td>Applied Sciences and Technologies</td>
<td>15.2</td>
<td>10.1</td>
</tr>
<tr>
<td>Information, Computer, Communication, Technologies</td>
<td>13.7</td>
<td>10.5</td>
</tr>
<tr>
<td>Social Sciences and Humanities</td>
<td>10.7</td>
<td>11.9</td>
</tr>
<tr>
<td>Medical and Health Sciences</td>
<td>10.2</td>
<td>13.5</td>
</tr>
</tbody>
</table>
Fig 11:

Basic research as a percentage of GDP 2003* (International Comparisons)

*or latest year available

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>0.53</td>
</tr>
<tr>
<td>United States</td>
<td>0.49</td>
</tr>
<tr>
<td>Australia</td>
<td>0.4</td>
</tr>
<tr>
<td>Japan</td>
<td>0.39</td>
</tr>
<tr>
<td>South Korea</td>
<td>0.38</td>
</tr>
<tr>
<td>Norway</td>
<td>0.24</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0.19</td>
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<tr>
<td>Russia</td>
<td>0.18</td>
</tr>
<tr>
<td>Spain</td>
<td>0.16</td>
</tr>
<tr>
<td>Argentina</td>
<td>0.1</td>
</tr>
<tr>
<td>China</td>
<td>0.07</td>
</tr>
</tbody>
</table>
Who spends what?

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Where are the ‘Researchers?’

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* Provisional data
Moving rank (1)

- Establish a strong sense of mission
  Role for Council? Stakeholder representation
- Create a guiding coalition
  Who are the research leaders? Task Team: Academic
- Vision and strategy
  Sharper focus - research strategy?
  What are the competitive advantages?
  Possibilities w.r.t. customers, clients, competitors and collaborators
- Communicate, communicate, communicate
  What is the intent, and why? Stakeholder participation

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Moving rank 2

- Empower and reward the Researchers
  Teaching loads; performance awards
- Generate short term wins
  Support for PhDs and Post-doctoral fellows (financial and cultural)
  Support niche areas with facilities
- Consolidate and promote further gains
  Ensure consistent and joined up U J policies
- Strengthen research culture
  Celebrate research achievements
  Highlight research on the web site

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A confluence of possibilities

- Council Research Prize – social responsibility
- Vice Chancellor’s Research Prize – competitive research
- Status of the DoE publication award
- Link promotion to excellence in research, teaching and community service (weighted?)