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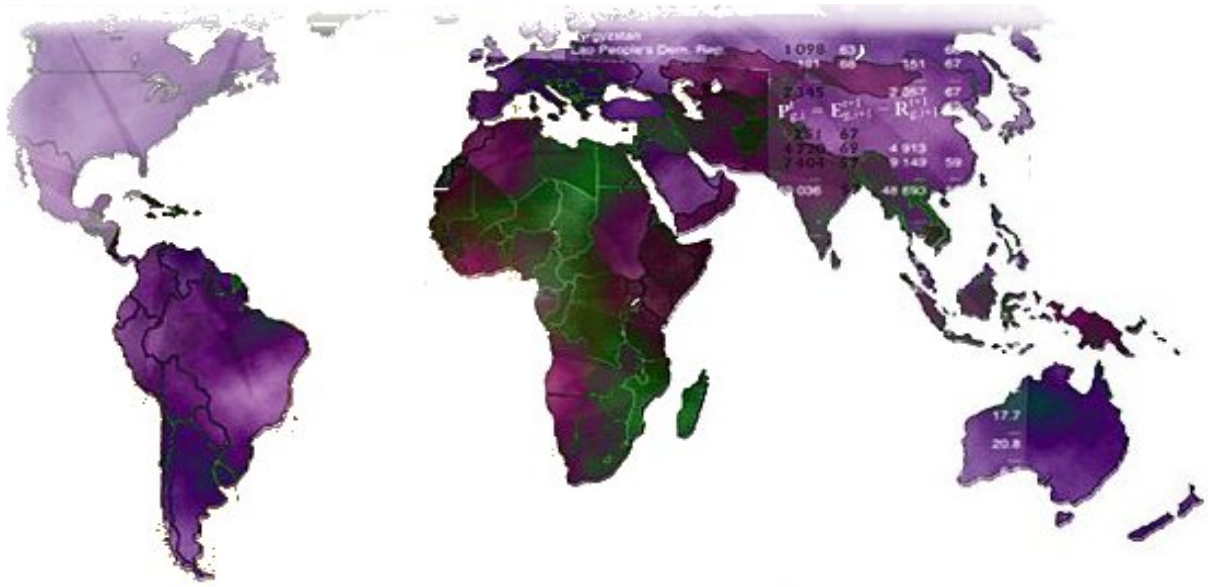

Introduction to Guide on the Conduct of an R&D Survey in Developing Countries

VI Science and Technology Indicators Harmonization Workshop
Asunción, Paraguay
4-5 December 2012

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Outline

- About the Guide
- Contents of the Guide
- Way forward

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About the Guide

- Experience acquired through the UIS work, through STI stat workshops and other meetings around the developing world.
- UIS Technical Paper on Measuring R&D: Challenges Faced by Developing Countries (UIS, 2010)
- Annex to the Frascati Manual: Measuring R&D in Developing Countries (OECD, 2012)

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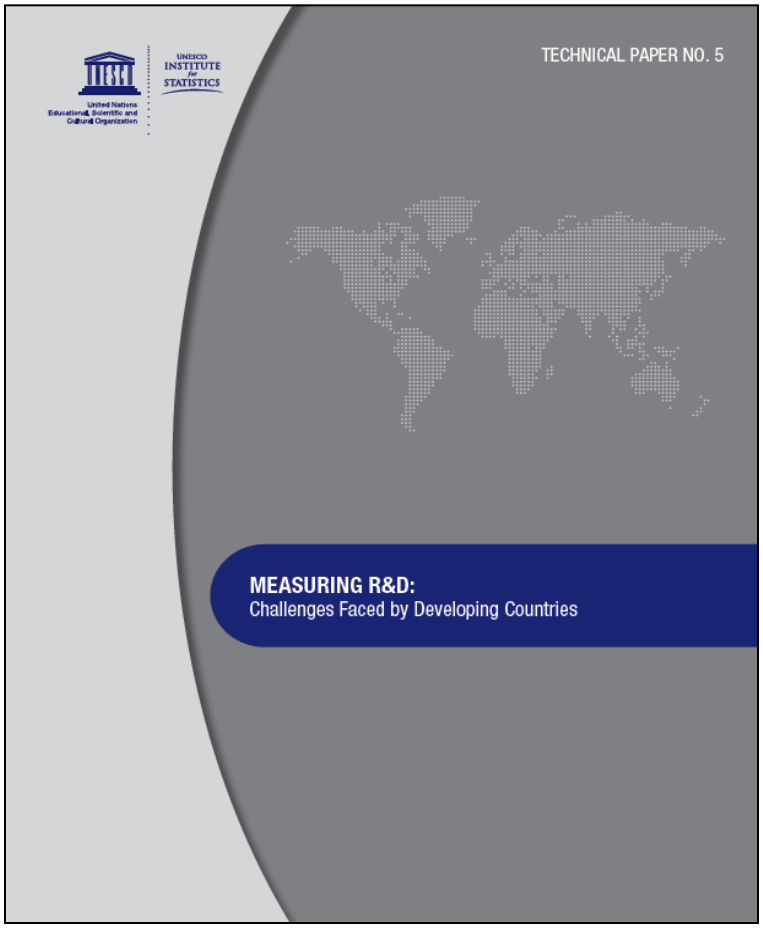
About the Guide cont..



UIS TP5: EN: http://www.uis.unesco.org/Library/Documents/tech%205-eng.pdf

SP: http://www.uis.unesco.org/Library/Documents/TechPaper5_RD_SP_finalwc%20(2).pdf

FM Annex:
http://www.oecd.org/science/innovationinsciencetechnologyandindustry/49793555.pdf

About the Guide cont..

UIS Technical Paper on Measuring R&D: Challenges Faced by Developing Countries

Chapter 8: Thinking ahead - Other products

- Redefine the concepts of scientific and technological activities (STA)
- Better integrate education statistics with R&D statistics
- Hands on guidance on how to set up and carry out an R&D Survey in developing countries …..
…… could include topics such as questionnaire design, pilot testing, survey procedures, imputation methods, model questionnaire ……..

About the Guide cont..

Objective: to offer practical advice to assist R&D Survey practitioners.

Contents of the Guide:

1. About the Guide
2. Innovation policy and the role of R&D
3. R&D indicators for evidence-based policy making
4. The R&D Survey: governance, logistics and process
5. Survey procedures for the sectors (will be presented under 4)
6. Survey data management (will be presented under 4)
7. Model questionnaires and Instruction manuals

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The R&D Survey: governance, logistics and process

- **The R&D Survey as a Project**: The R&D Survey is a project studying peer institutions of the national innovation system (NIS).
  - A project is a process of change involving the application of resources over a fixed period of time.
  - Has a clear beginning and deadline.
  - Logical sequence, defined objectives, verifiable indicators, specified deliverables.
  - Agreed budget and human resources.
  - Mechanisms for learning and adjustment.
- The R&D Survey is conducted over a fixed time period, and make use of various resources, involve its own learning processes, and result in a final product (the R&D Survey Report).

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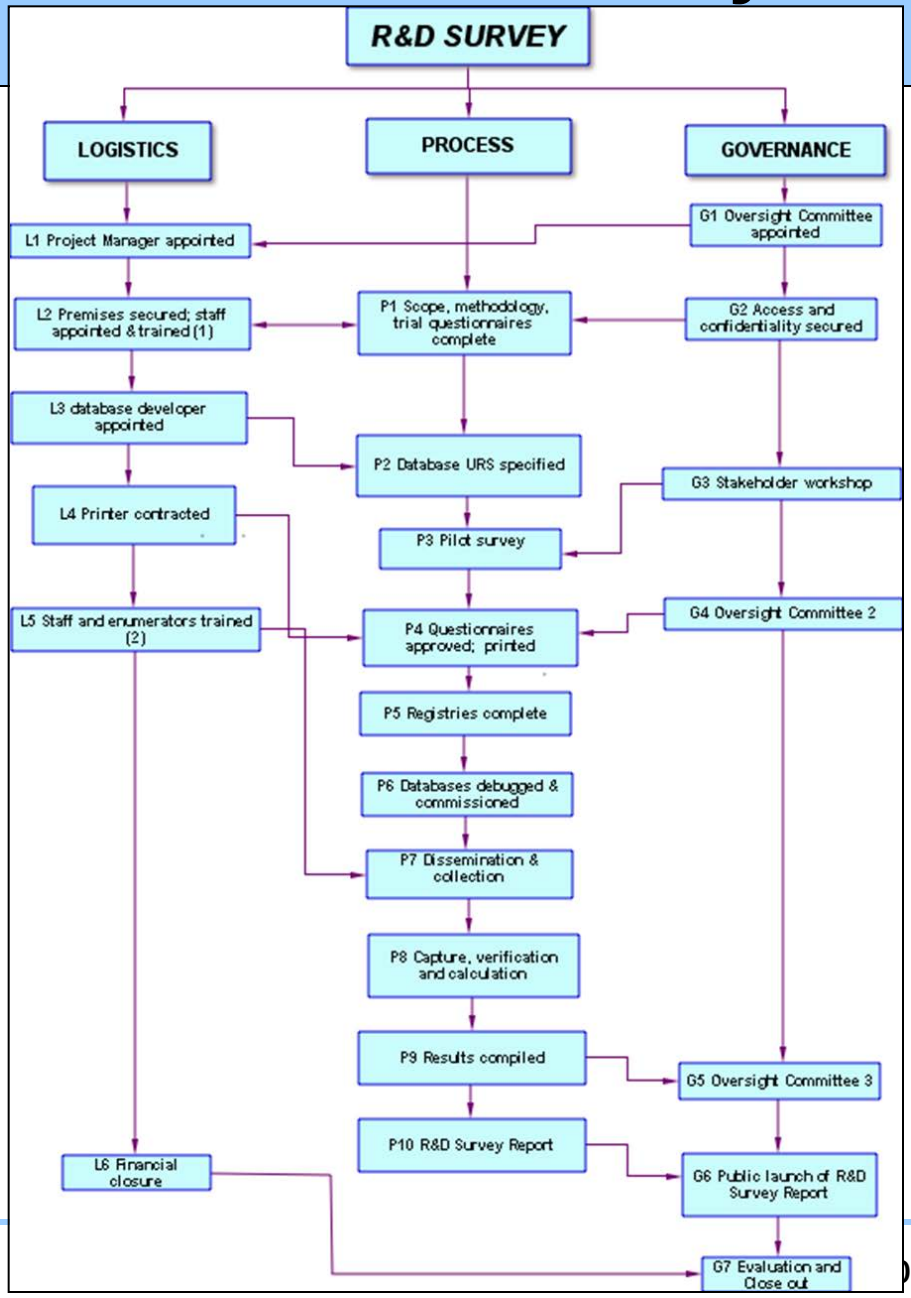
Adopting a project management methodology

- **Goal directed project management (GDPM) methodology (http://www.gdpm.com).**
- Conduct of the project leads to parallel development of a final product, the people and the organization involved.
- Breakdown the overall project into a clear set of milestones that hold the project together.
- Develop a project milestone plan, structured according to ‘Result Paths/Project lines’; each contains series of project milestones.
- **R&D Survey is structured along three result paths: Governance, Logistics and Process.**

Milestone Plan of an R&D Survey

- **Governance:** oversight, advice, and authority.
- **Logistics:** financial, human and material resources.
- **Process:** main work from design through implementation/carry out and close out.



Milestone Plan of an R&D Survey
cont ..

- Milestones represent unique desired end state with a completion date; sequential and co-dependent; serve to keep a check on time slippage.
- Project Manager and project staff would jointly develop; Parties that have called for the Survey should be consulted.
- Be shared in the survey team and used as a checking device in the regular project meetings.

Governance

G1. Oversight Committee appointed.

G2. Access and confidentiality secured.

G3. Stakeholder workshop.

G4. Oversight Committee approves fieldwork.

G5. Oversight Committee approves results.

G6. Public launch of R&D Survey Report.

G7. Evaluation and close out.

Logistics

L1. Project manager appointed.

L2. Premises secured, staff appointed and initial training.

L3. Database developer appointed.

L4. Printer contracted.

L5. Staff and enumerators trained for fieldwork.

L6. Financial closure.

Process

P1. Scope, methodology, trial questionnaire completed.

P2. Database user requirement specifications (URS) specified.

P3. Pilot survey.

P4. Questionnaires approved and printed.

P5. Registries completed.

P6. Database debugged and commissioned.

P7. Dissemination and data collection.

P8. Capture, verification and calculation.

P9. Results completed.

P10. R&D Survey Report

G1. Oversight/Advisory Committee appointed and Project Champion identified

- Strong advocacy to prepare the way for R&D Survey is important.
- Who is the Project Champion? High-profile senior member in government; ‘to walk with’ the Survey.
- Comprise senior personnel from the institutions in the NIS, NSO, etc.
- Attend to overall governance principles; advise on the technical aspects; review project reports, quality control, sign off results; and commission project evaluation.
- Launch the Project/Survey at a meeting of key stakeholders, with media attendance.

L1. R&D Survey Project manager appointed/identified

- Be able to manage complex projects and have good understanding of NIS.

L2. Premises secured, staff appointed and initial training

- Necessary office equipment, telecoms and internet; allow for call centre style of operation; include area to store hard copies, etc.
- Diploma holders or graduate staff: should be able to negotiate and interact with senior staff of the orgs in NIS.
- Initial training should occur alongside the development and testing of the Survey questionnaires.

G2. Access and confidentiality secured

- Adequate legal framework within which the Project will operate needs to be assured.
- Involvement of National Statistical Office (NSO) to determine the legislation and rules on confidentiality.
- All members of the Project team must be subject to rules on confidentiality.

P1. Scope, methodology, trial questionnaire completed

- Which sectors are to be covered?: public and/or private? Business, Government, Higher education, Private non profit?
- Method?: census, sample or purposive?; sector specific questionnaires?
- Who is the target of the survey? How to develop the survey registers?
- Who will complete the survey questionnaire?
- How contact with organizations is done?
- What is the substantive set of data that will be requested?
- Need to consider the sector and the size and complexity of the organizations.

Government sector

- Units to include in surveys are:
  - R&D institutes: Public research institutes (PRIs); Department-based research institutions (DBRIs)
  - R&D activities of general administrations of central or state government.
  - Public institutions dealing with STS: statistical, meteorological, geological and other public services, museums, hospitals.
  - R&D activities at the municipality level.

Government sector cont ..

- Conduct a census of relevant organizations/units known or assumed to perform R&D.
- Identification generally easy. Sources for survey registers:
  - Registers of government departments, research institutions, statutory bodies.
  - Associations (trade, academic); Learned societies.
  - Registers or databases of scientists and engineers.
  - Database of research grants; Databases of scientific publications.
  - Patents and other IP documents.

Government sector cont..

- Department-based research institutions (DBRIs)
- Issues: non-availability of information in compiled form
- Contact point: Senior civil servants: Director-General or Permanent Secretary
- Public research institutes (PRIs)
- Contact point: Chief Executive Officer or executive responsible for research management
- In both cases, questionnaire should be completed by research manager(s) incorporation with Accountant/personnel manger

Higher education sector

- Units to cover: all universities and corresponding institutions. Other institutions in the sector known or assumed to perform R&D.
  - Could use smaller units, such as departments or institutes of the university, as statistical units.
  - Conduct a census of relevant organizations/units known or assumed to perform R&D.
  - Identification generally easy. Sources for survey registers:
  - List of higher education institutions and same sources as government.
  - Researcher CV database; Publications databases (Web of Science™ or Scopus™).

Higher education sector cont..

- Higher Education institutes (HEIs) are the main seat of R&D activity
  - Determining the headcount of staff that are active researchers, and estimating their time spent on research and also obtaining a good estimate of the overall research expenditure is key (refer to annex 2 of FM).
  - Different degree of autonomy
  - Staff employed as civil servants – list of employees is available
  - Academics directly employed by HEI – staff details are protected
  - Maturity of HEIs and historic relationships with Government
- Contact point: through Vice Chancellor or Dean of Faculties, Dean of Research or, Head of Departments.
- Questionnaire should be completed by Dean of Faculties or Dean/Head of research/departments in collaboration with Account/personnel departments.

Business enterprise sector

- Units to cover: all enterprises performing R&D, either continuously or occasionally.
- Issues: no comprehensive and up-to-date business register; no directory of companies that perform R&D → census estimate through a random sample is not possible.
- Conduct a purposive survey that deliberately sets out to identify R&D performers (ie. cover all firms known or supposed to perform R&D).
- Contact point: through CEO, or a divisional head.
- Questionnaire might be completed by the CEO, or a technology manager. It is rare for staff in human resources or finance to have such knowledge and information.

Business sector cont…

- How to detect R&D activity in Business? Sources for Business register of firms that perform R&D:
  - Registers of publicly funded research grants / Directories of R&D laboratories
  - Lists of enterprises reporting R&D activities in previous R&D surveys, or in innovation surveys / enterprise surveys.
  - Industrial research associations / Professional associations / Chamber of Commerce / Trade associations
  - National stock exchange
  - Company annual reports / Trade journals
  - Register of approved clinical trials / GMO trials
  - Lists of enterprises claiming tax deductions for R&D

Business sector cont…

- Some typical issues:
- R&D performed in business sector remains low in many developing and emerging economies.
- Necessary to understand the structure of companies to avoid double counting (holding companies or diversified industrial groups).
- Need to identify an appropriate unit of measure (UOM); Can look at the income tax status (whether a registered taxpayer?).
- Developing the business register of firms that perform R&D: start with large firms in sub-sectors that 'usually' involve some R&D: petrochemicals, chemicals, mining and mineral processing, pharmaceuticals, electrical, electronics and software. Ask '*who in your sub-sector is also doing R&D, and how do we contact them?*'
- Exclude holding companies, construction, retail, and utilities as sub-sectors likely to perform little or no R&D.
- Need direct interaction with firms to verify the existence of R&D activities.
- Large firms/MNC - discussion with the Chief Financial Officer or Chief Technology Officer; Missing a large firm might result in significant error.
- Service sector often under-reported: try to engage with leading banks, insurers, mobile telephony and ICT companies.

Private non-profit sector

- Differs significantly country by country; Same challenges as in business.
- Difficulty in identifing PNPs engaged in R&D; Not clear about, status, ownership.
- Engaged in wide range of activities; Perform in-house R&D as well as contract R&D.
- Sources for identifying possible survey respondents: mainly the same as for the government sector.
- Register information may be less comprehensive and could be completed by information from researchers or research administrations.
- Conduct a purposive survey.

P1. Scope, methodology, questionnaire…. cont …

- Questionnaire designing
- Unique questionnaire for each sector; simple and short, logical and with clear definitions and instructions; explanatory notes, hypothetical examples, etc.

- Contact with organizations
- Each sector has different management styles, approaches and institutional culture; Consider the existing norms in relation to data exchange.
- Building interest, trust, and commitment with the respondents to assure their cooperation through out.
- Once the possible respondent has been identified and their contact details captured, an official letter of request should be sent to the organizations.
- First R&D Survey: through interviews rather than other methods (telephonic interview followed up with an on-site interview).

- The first enumeration contact between the Survey and respondent is crucial: "*One can only make a first impression once*".
- Common elements: purpose of the interaction, the authority under which the interaction takes place, statement on confidentiality of info.
- Sample telephone script:

  Salutation …….

  This is the Office of ……. my name is ……. We are carrying out the official Survey of Research and Development …

  Could you please let me speak to ……. to discuss completion of the Survey …

- Typical conversation involving an enumerator and the R&D manager:

  Salutation …….

  Thank you for your time. We are trying to estimate the amount of R&D activity in your organization.

  Does your firm carry out R&D?

  Could you give me some idea of what R&D you are working on?

  I see ….. and this work is done in-house?

  How many staff are involved in this work? Professionals; technicians? Full time/part time?

  How much do you think this costs at present?

  Excellent. We would like you to complete a survey questionnaire ….

L3. Database developer appointed / Database developed

- Need a suitable database: for Survey fieldwork, collection, compilation, analysis and maintenance of the data.
- Possible to use spreadsheet functionality; desirable to develop customized database tools:
  - » Registry database: register of possible respondents by sector; tool to manage the fieldwork and track the status of responses.
  - » Records database: with analytical interface (password protected with suitable access rights).
- In-house database developer/manager

P2. Database user requirement specification (URS)

- Pay attention to URS before the construction of the databases.
- Records database: design should support the compilation of standard set of indicators as well as other possible info requests; Develop in collaboration with the intended users.
- Registry database: comprises respondents contact information, corporate identity, the person responsible for completing the survey, etc.
- Could also serve as a fieldwork management tool to track the status of individual respondents and progress in the return of the questionnaire.

G3. Stakeholder workshop

- To make aware of importance, intention of the survey and to seek buy-in and cooperation.
- Bring all the major R&D performers; or convene separate workshops for the different sectors or regional workshops.
- Issues for discussion:
  - » Origins and purpose of R&D Surveys; What counts as R&D; Headcounts and full time equivalents; Type of R&D, and attribution by Field of Science; Unit of measure: individual, group, department, faculty?; Availability of secondary data sources (funding databases); Confidentiality; Timing of the fieldwork, etc.

P3. Pilot Survey completed

- To verify validity of the items, eliminate any confusions.
- Restricted in coverage.

L4. Printer contracted

- Layout and printing of the questionnaire→ in-house / commercial print shop.

P4. Questionnaires approved and printed

- Changes to the questionnaire is discussed; Final questionnaire(s) is approved by the Project Committee for printing.

P5. Registries complete

- A decision must be made to declare the registries as ‘closed’ for the addition of new records.

P6. Databases debugged and commissioned

- Make changes to the records database using the inputs from the pilot survey; Databases are tested and finalized.

L5. Staff and enumerators trained on final questionnaires and fieldwork.

G4. Oversight Committee approval of fieldwork

- Gives the authority to proceed with the full fieldwork.

P7. Dissemination and collection

- Accounts for the main work of the Survey.
- Tracking incidents:
  - » Close connection between the enumerator responsible for a particular respondent, the completed questionnaire, and the database record.
  - » Each questionnaire should be assigned to an individual member of the survey team.
  - » Better documentation is essential; log all interactions between the Survey and respondents, with relevant details:
    - – name of the project staff, organization contacted; date/time of call; brief reason - reminder, checking data, clarifying guidelines, etc;
    - – info related to date of despatch of a questionnaire, its receipt by the respondent, follow-up steps, etc.
  - » Makes the handover of work from one fieldworker to another that much easier.

P8: Capture, verification and calculation

- Questionnaires are completed and signed off by respondents. Data processing starts.
- Checking accuracy, consistency, completeness and data verifications, etc; Following-up with respondents.
- Consistency checks:
  - » Full-time equivalent < headcount;
  - » R&D expenditure < = organization total revenue
- Once discrepancies are resolved questionnaires will be finalized and signed off and data will be captured in the records database.

- Decide how to treat incomplete or missing items: imputations for item non responses, unit non-responses.
- Different ways to handle missing data:
  - » Find alternative public source: E.g. company annual report and search for the relevant item.
  - » Use historic data for the entity from a previous survey.
  - » Use information from the same survey from a different item.
  - » Other imputation techniques (refer to Chapter 7 of FM).
  - » All imputations must be logged as incidents.
  - » Contributes to metadata; help interpret the full meaning of the Survey.

P9. Results compiled / analyzed

- Compile the standard set of indicators.
  - » Main indicators: GERD:GDP; share of GERD across BERD, HERD and GOVERD; Researcher FTE in relation to the total population/employed workforce/labour force.
  - » Macro indicators: gender, sector of employment, main fields of science, level of qualification, sources of funds, regional distribution, nationality of the R&D staff, etc.

G5. Oversight Committee approval of results

- Gives approval for public launch and dissemination of key results.

P10. R&D Survey Report

•Production of final report including a much richer account of the conduct of the Survey, as well as more detailed data tables.

•Report could be hosted on the Survey Agency/NSO website.

G6. Launch of R&D Survey Results

•Official launch of the R&D Survey, and provides an opportunity for the responsible agency to interact with the major stakeholders.

•The Project Champion should be closely involved in the public launch.

L6. Financial close out

•Include any disposal of assets as well as ensuring the safe storage of confidential information.

G7. Evaluation and close out

•Include an external evaluation.

•Communicate the results back to the respondents to maintain their trust and buy-in.

•Send out of a letter of appreciation to all respondents with the final report as well as information concerning data access and future surveys.

- The R&D Survey is done ☺

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Model questionnaires and Instruction manuals

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NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D) INPUTS
HIGHER EDUCATION
ACADEMIC YEAR: …..(YYYY/YYYY)….

Organisation	Please modify address label (only if there is one)

AUTHORITY
(NAME OF THE CENTRE/AGENCY/DIRECTORATE) is mandated to conduct a Survey of Inputs into Research and Experimental Development (R&D) for the …… (Ministry).

All data gathered for this survey is confidential. Only the survey team sees individual organisation data. Raw data gathered for this survey is confidential except when an organisation gives written permission for its data to be disclosed to other parties.

PURPOSE AND SCOPE OF SURVEY
The R&D survey collects data on the inputs into R&D activities performed IN-HOUSE by all organisations (including Higher Education Government, Business and Not-for Profit). The data are used for planning and monitoring purposes and for measuring international competitiveness.

This survey covers the Financial Year: DD/MM/YYY to DD/MM/YYYY (or your nearest complete financial year).

DUE DATE
Kindly complete and return this questionnaire by …… to: R&D Survey, [full address]

ASSISTANCE
To assist you with queries kindly contact one of the survey managers:

Name	Contact Number	E-mail

PERSON COMPLETING THE QUESTIONNAIRE: Name of Director/Coordinator:
Signature:
(Name of the Institution):

Organization		Tel	( )
Name (with title)		Fax	( )
Designation		Cell	( )
Date		E-mail	
Signature		Website	

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Way forward

- Further adjustments / improvements to the Guide.
- Go through a peer review process.
- Further improvements / revisions.
- Worldwide consultation??
- Present the draft Guide in various workshops, forums, etc., for inputs, comments, …
- Publishing as a UIS Technical Paper in late 2013.
- Implementation in developing countries which are planning to establish their first R&D Survey.

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Thank you!

http://www.uis.unesco.org

Rohan Pathirage

r.pathirage@unesco.org