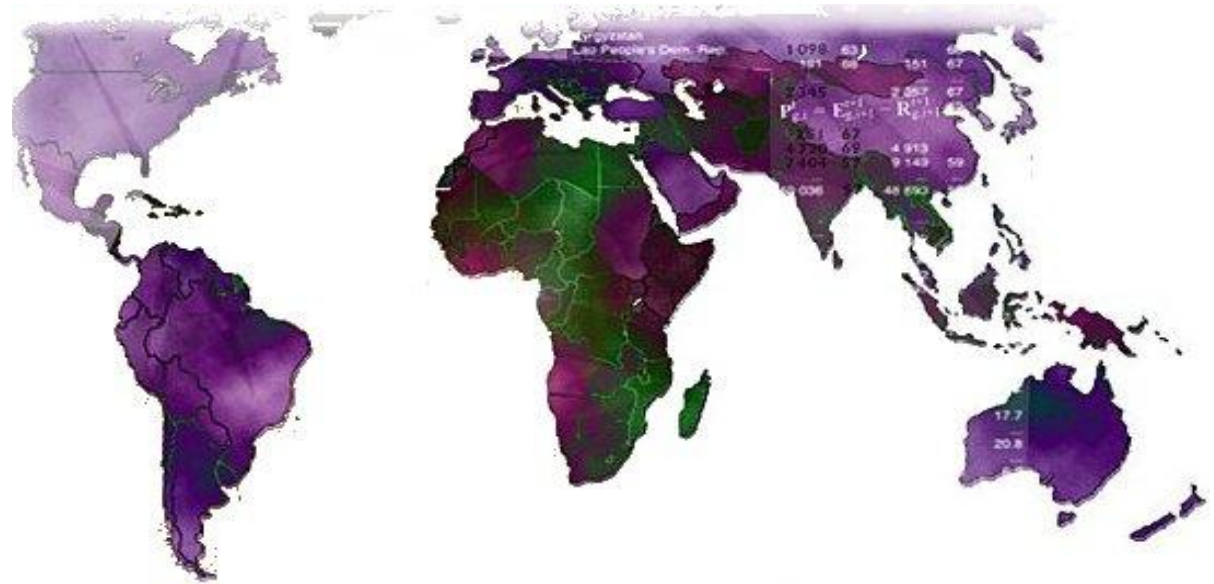




United Nations
Educational, Scientific and
Cultural Organization

UNESCO
INSTITUTE
for
STATISTICS



Reviewing the concept of Scientific and Technological Actives (STA)

Meeting of the RICYT Technical Committee

Lisbon, Portugal

11-12 June 2015

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Outline

- Introduction and brief recap of previous work, current process
- Main elements of current definitions
- Feedback received for the discussion paper
- Initial proposals for revising the concept of STA

Background

- UNESCO Recommendation from 1978 (Standardization of Statistics on Science & Technology) and current definition from 1984 Manual for Statistics on STA
- Includes 3 components: R&D, S&T services (STS) and S&T Education and Training (STET)
- Growing concern that concepts need to be reviewed:
 - Not well implemented → data availability and comparability
 - Significant changes in S&T and innovation systems
 - Related frameworks have continued to evolve (e.g. R&D, innovation)
 - Increasing policy demand to better measure impacts of public support to R&D and other S&T activities

Process -1

- Initial consultation with national S&T indicator experts – LA in 2011 and 2013: inquired the use and implementation of the concept of STA with respect to data collection
- Initial proposal (2013): based on work by Holbrook & Godin
- Broaden definition to STIA (including innovation)
- Concerns: approach is too broad/difficult to implement
- Further work (2014 to now): Vladimir López-Bassols: carried out a review of earlier work, stocktaking exercise to identify current national practices on data collection
- Initial findings, principles guiding the revision: discussed at the 2014 RICYT Technical Committee meeting

Process -2

- Drafted a discussion paper on "Reviewing the concept of STA" for comments, by national/regional STI stat experts, January 2015.
- Initial proposals: incl. priorities for measurement (in some cases restricting the scope), simplifying certain concepts and establishing clearer links to other frameworks and potential data sources
- Feedback received, reaching some consensus on the main direction and priorities for the next phase of the revision: Will be discussed later
- Being drafted a background report with specific proposals for an expert meeting planned for 8-9 July 2015 at UIS in Montreal.

Key elements from current definition

- For statistical purposes, scientific and technological activities (STA) can be defined as all **systematic activities** which are closely concerned with the **generation, advancement, dissemination and application of scientific and technical knowledge** in **all fields of science and technology**, that is the natural sciences, engineering and technology, the medical and the agricultural sciences (NS), as well as the social sciences and humanities (SSH). (UNESCO, 1984)

Sub-components of STA

R&D: Research and Experimental Development: R&D defined as per *Frascati Manual* (currently being revised).

STET: Scientific and technological education and training at broadly the third level (STET) can be defined as all activities comprising specialized non-university higher education and training, higher education and training leading to a university degree, post-graduate and further training and organized lifelong training for scientists and engineers.

STS: Scientific and technological services (STS) can be defined as any activities concerned with scientific research and experimental development and contributing to the generation, dissemination and application of scientific and technical knowledge.

STET

- Very broad concept that includes widely different types of activities, combining formal (tertiary) education with training
- Potential boundary issues with R&D even if Frascati Manual delineates what is inside
- Potential boundary issues with education since the scope of S&T may be unclear (all fields of science?)
- Little detail on what types of activities / programmes should be included
- → currently not well-suited for measurement

STS

- For practical reasons, list-based definition was developed identifying 9 “key” services
- Implicit link with R&D
- Includes:
 - Activities of organizations whose main domain is S&T (e.g. museums, zoos)
 - “S&T services” (not clearly defined) provided by organizations involved in information collection and dissemination + translation/editing of S&T books and periodicals
 - Routine S&T support activities which do not qualify as R&D (data collection, surveying, testing/standardization)
 - Activities relating to Intellectual property (IP) protection

Identifying problematic areas – overall concept

■ Strengths

- Broad, so of relevance to larger group of countries compared to R&D, focuses not only on knowledge creation, but also diffusion, adoption
- Currently defined in modular way, so can build on other frameworks for collecting data (notably Frascati Manual)
- Link to concept of HRST which is of high policy interest

■ Weaknesses

- Too broad. Difficult to interpret and implement (particularly STET)
- Boundary issues, mainly with R&D but also innovation and education
- STS uses list-based definition: can be outdated, not exhaustive
- Focus on expenditure → little on outputs/impacts

Feedback received for the discussion paper: Overall message

- Clear support for the revision and for many of the initial suggestions
- Pragmatic approach favored; incremental changes; simplifying the concepts and definitions; maintaining compatibility with other related frameworks; providing practical guidance for data collection
- Not to consider innovation as an additive component, but as a horizontal dimension better captured by other surveys
- Initially to be focused on the revision on STS;
 - Review the current list of STS using broader criteria to define their overall scope
 - No suggestions to exclude any service currently in the list, but to add some
 - ICT/Internet services: identify these activates across various STS instead of as a separate category
- STET to be addressed at a later time
- Further clarify the boundary of STS with R&D and establish more direct links with other related guidance

Proposals for revising the concept of STA: Overall definition

- Maintain an overall framework (R&D, STS and STET), but to better define the boundary of STA and sub-components
- General definition of STA does not require any substantive modification; should continue to cover all fields of science and technology
- Highlight key criteria which define the nature of STA; systematic/formalized; aimed at developing, using, disseminating, applying scientific and/or technical knowledge; do not necessarily create new knowledge (except for R&D)

Subcomponents of STA: R&D

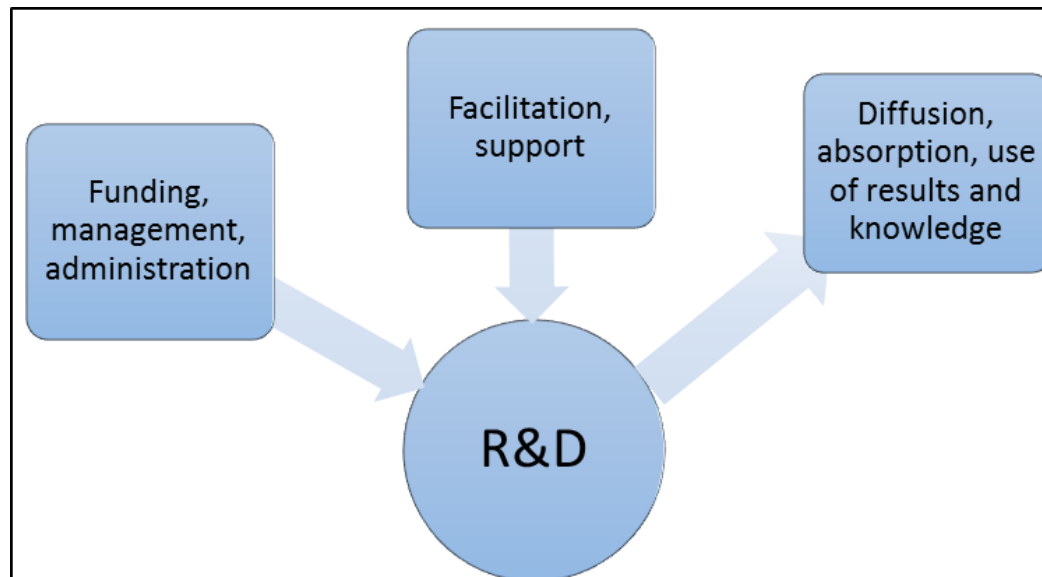
- Research and Experimental Development (R&D)
 - No proposed changes to the definition used within the context of STA, except aligning it with the most recent Frascati Manual (2015) definition of R&D
 - R&D should continue to be prioritized regarding data collection
- Links with other concepts: Innovation
 - Not to include as an additive component within STA, but to highlight the links between these concepts

Subcomponents of STA: STS- 1

- Currently covers a group of services which have direct or indirect links to R&D: need to further clarify nature
- If a more direct link to R&D is considered as a key criteria: **Option 1** → rename these as "Related Scientific (and Technological) Activities - RS(T)A"
 - Help establish more clearly the rationale underlying the choice of these activities; acknowledge the central role played by R&D
 - All the activities with a clear link with R&D: restrictive than what is currently considered under STS
- If a direct/indirect link to R&D is needed: **Option 2** → maintain the current terminology, but clarify the distinction with (and relation to) R&D
 - Should identify the subset of activities/services which have a closer link to R&D
 - Generic definition should complement with more detail on the scope through a list-based definition

Subcomponents of STA: STS - 2

- Group STS/RSTA into 3 broad categories, when it comes to possible link to R&D:



- Help identify/define boundaries and their relationship to R&D
- Highlight different roles that these activities have with respect to R&D
- Could further classify individual STS/RSTA along these dimensions + map them to institutional sectors → help define the scope of STS

	Funding, management, administration	Supporting / facilitating infrastructure	Diffusion and use
Mainly by Governm ent institutio ns	Management and funding of national S&T	Standardization, metrology	S&T services of libraries, archives, documentation centres
		Studies supporting policy and decision-making	S&T services of museums of S&T, botanical gardens, zoos, planetarium, etc.
			Activities relating to patents and licenses
Across all sectors		Testing, quality control	Translation and editing of S&T books and periodicals
		Topographical, geological surveys, routine measurement and testing	Routine consulting work to assist in use of S&T information
		Data collection for routine statistics	Other activities aimed at promoting S&T and diffusing the resulting knowledge
		Prospecting and related activities to identify oil and mineral resources	

List of STS/RSTA -1

1. S&T services provided: libraries, archives, information/doc centres, reference departments, scientific congress centres, data banks/ information-processing departments
 - Maintain, but focus on organizations specializing in S&T; update the language (role of ICTs); possibly combine with the next category
2. S&T services provided: museums of S/T, botanical, Zoological gardens and other S&T collections (anthropological, archaeological, geological, etc.)
 - Group with previous category; distinguish those org which by definition have S&T as the subject (zoos, planetariums, botanical gardens, aquariums, nature reserves) and those specialized in STE (libraries, museums).
 - Includes orgs whose domains are social sciences/humanities (anthropology, archeology, ethnology, art/history museums?)

List of STS/RSTA -2

3. Systematic work on the translation, editing of S&T books periodicals
 - Maintain, update to reflect role of electronic means for information dissemination. Clarify if both national/foreign ones should be included
4. Topographical, geological, hydrological surveying; meteorological, seismological observations; surveying: soils/plants; fish/wildlife resources; routine soil, atmosphere, water testing; checking/monitoring of radioactivity levels
 - Maintain, clarify the boundary with R&D; consider under one group (incl. data collection related to natural sciences and social sciences)
5. Prospecting and related activities designed to locate and identify oil and mineral resources
 - Maintain, but group with the previous one

List of STS/RSTA -3

6. Gathering of information on human, social, economic and cultural phenomena (routine statistics: population censuses; production, distribution, consumption statistics; market studies; social and cultural statistics, etc.)
 - Maintain data collection/analysis as a general category (for all fields of science). Should be considered as R&D (if conducted as part of an R&D project, new methods to collect/analyze data)
7. Testing, standardization, metrology, quality control; regular routine work: analysis, checking and testing, by recognized methods, of materials, products, devices and processes, together, setting up and maintenance of standards, etc
 - Maintain, as closely linked to supporting R&D activities; Clarify boundaries (STS or R&D or other: industrial production activities/commercialization)

List of STS/RSTA -4

8. Regular routine work: counselling of clients, other sections of an organization or independent users, designed to help them make use of scientific, technological and management info
 - Maintain, but narrow (consulting focusing on S&T); Consolidate into broader category which includes policy studies, S&T foresight, etc
9. Activities relating to patents and licenses
 - Expand to include public and private organizations; Expand to include other IP protection methods (need to discuss which ones)

List of STS/RSTA: Proposal

- Define 4 broad categories which encompass the broad range of activities to be captured under STS/RSTA
 1. Services directly support R&D (S&T support services): engineering services, environmental consulting, metrology, testing, industrial design
 2. Funding, administration, legal services relating to S&T activities (incl. R&D)
 3. Activities relating to the diffusion and dissemination of scientific information/knowledge: specialized organizations
 4. Activities relating to the application of scientific methods: data collection/analysis, surveying/mapping, weather monitoring and forecasting, astronomical and seismological monitoring, collection of routine socio-economic statistics
 - ICT/Internet services: not to identify as separate category; consider them primarily as tools or instruments which can contribute to various other activities
- Help set the overall boundary; allow for more detailed lists to be developed at the national level

Methodologies and data sources -1

- The revised guidance should highlight:
 - In theory: a functional approach based on the nature of the activities should be prioritized
 - Need to identify STS/RSTA activities in all types of org: org carrying out surveys, scientific data collection, information processing and dissemination, feasibility and other studies, testing, metrology and standards
 - In practice: focus first on an institutional approach based on the type of organization considered
 - Reason: for some STS/RSTA, they are mainly carried out by a limited number of organizations in public sector: collection of data -> NSO, dissemination of S&T knowledge -> museums, zoos, planetarium, setting standards -> Standards Bureaux, Patent offices

Methodologies and data sources -2

- ▣ Identifying appropriate data sources: linked to the intended scope in terms of institutional sectors
- ▣ Coverage of the Government sector should be prioritized
- ▣ Data sources for R&D and STS/RSTA by institutional sector:

	Government sector	Higher Education sector	Business enterprise sector	Private Non Profit sector
R&D	R&D surveys, budgetary data	R&D surveys, administrative data	R&D surveys	R&D surveys
STS/RSTA	Dedicated surveys, budgetary data	Administrative data	Dedicated surveys, innovation surveys	Dedicated surveys, administrative data

Methodologies and data sources -3

- Method of data collection: both performer and funder-based approaches should be considered
 - Performer-based approach -> yield more reliable results (better placed to identify the components, limit the risk of double-counting)
 - Funder-based approach (with budgetary data) -> more practical as majority of STS/RSTA take place in GOV/HE
- To identify target org: Gov sector-> national registers of government/public sector bodies; BES -> R&D/innovation surveys
- For org involved in STS/RSTA, R&D -> use some form of “STS coefficient”

Collecting data on STA personnel

- Overall framework could in principle be applied to collecting personnel data (as in the case of Exp data), but problematic with funder-based data
- Need to determine the scope: what should be measured: all personnel employed in R&D and STS/RSTA?
- R&D Personnel -> R&D Surveys; STS/RSTA personnel -> Challenge is identifying personnel who are involved in STS/RSTA, in both R&D-performing and other organizations
- Which breakdown(s) should be used to collect data on STS/RSTA personnel -> whether to identify the main occupational categories corresponding to personnel employed in STS/RSTA tasks?
- Treatment for personnel involved in both R&D and STS/RSTA -> may be useful to consider the concept of R&D/STS coefficients
- Need to assess the policy demand for personnel data on STA beyond R&D and to collect more detailed methodological information on current approaches and available sources

Type of organization			
Activity	Unit carries out R&D as a primary or secondary activity	Unit does not perform R&D but carries out RSTA	Other units
R&D	Researchers	n.a.	n.a.
Activities which require technical knowledge and directly support R&D projects / RSTA	R&D personnel (technicians and equivalent staff)	RSTA personnel	n.a.
	RSTA personnel		
Non-technical activities which support R&D projects /RSTA	Other R&D support staff	RSTA personnel	n.a.
	RSTA personnel		
Other activities	n.a.		

Way forward

- Finalize the proposal for July meeting; circulate to the experts; holding technical advisory meeting (8-9 July 2015 at UIS in Montreal) for further suggestions
- Assess whether there is a clear demand for guidance regarding personnel data as well as follow-up work on STET
- Incorporate the inputs and finalize the proposal and have broader consultation
- Incorporate further feedback; draft more precise text for revised guidelines -> UIS Technical Paper
- Summary of revised guidelines -> go through a formal process for adoption by UNESCO

Thank you!

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