What's So Difficult About International Statistics?
UNESCO and the Measurement of
Scientific and Technological Activities

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3. B. Godin, *Measuring Science: Is There Basic Research Without Statistics?*
4. B. Godin, *Neglected Scientific Activities: The (Non) Measurement of Related Scientific Activities*.
5. H. Stead, *The Development of S&T Statistics in Canada: An Informal Account*.
6. B. Godin, *The Disappearance of Statistics on Basic Research in Canada: A Note*.
7. B. Godin, *Defining R&D: Is Research Always Systematic?*
8. B. Godin, *The Emergence of Science and Technology Indicators: Why Did Governments Supplement Statistics With Indicators?*
9. B. Godin, *The Number Makers: A Short History of Official Science and Technology Statistics*.
10. B. Godin, *Metadata: How Footnotes Make for Doubtful Numbers*.
11. B. Godin, *Tradition and Innovation: The Historical Contingency of R&D Statistical Classifications*.
12. B. Godin, *Taking Demand Seriously: OECD and the Role of Users in Science and Technology Statistics*.

What's So Difficult About International Statistics? UNESCO and the Measurement of Scientific and Technological Activities

International organizations compete between themselves as much as national governments do in war and politics. Each wants its own decisions and interpretations to take precedence over those of their rivals. Some are more successful at it than others, however, like the OECD in the case of science and technology statistics. In 1963, the OECD published the first edition of the Frascati manual, which subsequently became the world standard. [1] Although UNESCO now regularly insists upon greater collaboration with the OECD, [2] there was once a time, however, when it felt it could dominate the field.

This paper is concerned with UNESCO's efforts to standardize science and technology statistics at the international level. As early as 1966, UNESCO assigned itself the task of developing international standards for measuring science and technology. [3] Several other organizations would soon get involved in standardization at the "regional" level: the OECD, the ECE, [4] the CMEA, [5] the OAS, [6] and the Scandinavian group Nordfork. But UNESCO wanted to serve as the "focal point", as it claimed, [7] and it partly succeeded. Having already developed international standards in statistics on education (1958) and culture (1964), [8] it subsequently drafted a standard methodology on science and technology statistics that was approved by Member countries in 1978.

[1] OECD (1962), *The Measurement of Scientific and Technical Activities: Proposed Standard Practice for Surveys of Research and Experimental Development*, Paris.
[2] UNESCO (1994), *Meeting of Experts on the Improvement of the Coverage, Reliability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics*, ST.94/CONF.603/12, p.5; OECD (1999), *Summary Record of the NESTI Meeting*, DSTI/EAS/STP/NESTI/M (99) 1, p. 14.
[3] UNESCO (1966), *Problems Encountered in the Development of a Standard International Methodology of Science Statistics*, UNESCO/CS/0666.SS-80/5.
[4] Economic Community of Europe.
[5] Council for Mutual Economic Assistance.
[6] Organization of American States.
[7] UNESCO (1969), *Report of the Session Held in Geneva 2-6 June 1969*, UNESCO/COM/CONF.22/7, p. 14.

Pragmatic difficulties would soon appear concerning the application of its recommendation, however. This paper will describe the history of these difficulties. The first difficulty that UNESCO encountered concerned its proposal to collaborate with the OECD. The latter recently highlighted the leading role it played in the development of methodologies and indicators. [9] I will show how, in the early seventies, this fact drove the OECD's response to UNESCO proposal for increased collaboration.

A second difficulty had to do with the "varying level of competence" of UNESCO Member countries. [10] UNESCO dealt with a larger and more diversified number of countries than the OECD, including countries that had not yet developed the necessary expertise for properly measuring science and technology. A related problem was the fact that current R&D statistics did not meet the particular needs of developing countries.

A third difficulty concerned financial resources. In 1984, the United States withdrew from UNESCO, accusing the organization of political patronage and ideological biases. This decision affected the whole statistics program, particularly the division of science statistics. Ten years later, the division was still sending strong appeals to the Director-General "to foresee in the future budget the appropriate financial assistance". [11]

The Road Towards International Statistics

The UNESCO Office of Statistics was set up in 196?. As early as 1965, a Division of Science Statistics was created with three main tasks: 1) collection, analysis and publication of data, 2) methodological work for sustaining the collection of statistical data, and 3) technical assistance to Member countries through expert missions and fellowships.

[8] The United Nations produced important international classifications that are still in use: International Standard Industrial Classification (ISIC), Standard International Trade Classification (SITC), International Standard Classification of Occupations (ISCO), International Standard Classification of Education (ISCED).
[9] OECD (1997), *Some Basic Considerations on the Future Co-operation Between the OECD Secretariat and Eurostat with UNESCO in the Field of Science and Technology Statistics*, DSTI/EAS/STP/NESTI (97) 12, p. 2.
[10] UNESCO (1981), *Progress Made in the Development of International Statistics on Science and Technology*, UNESCO/ECE/CONF.81/ST.000/6, p. 3.

As I showed in a previous paper, countries usually based their measurements on repertories – or lists. [12] In the fifties UNESCO similarly set up multiple directories on national councils, bilateral links of cooperation, and scientific institutions – both national and international. [13] It first attempted to systematically measure resources in 1960, [14] collecting data from wherever it could get it. In 1964-65, however, it began circulating a questionnaire to Latin American countries. [15] The questionnaire was limited to two tables because of "lack of paucity of statistical organizations and the disparity between the magnitude of the effort required to gather detailed data". [16] It nonetheless served as the basis for the preparation of a second questionnaire – international in scope – for publication in the 1967 UNESCO *Statistical Yearbook*. This was the beginning of regular statistical series on science and technology at UNESCO. The organization would conduct two surveys until 1975, afterward limited to only one: one based on a concise questionnaire for all countries with a limited number of questions (annual), and a larger and more comprehensive optional questionnaire (biennial). [17]

UNESCO's program of work on science and technology statistics was developed with the support of two groups (see Annex 1). The first group was an Advisory Panel on Science Statistics [18] that held five meetings between 1966 and 1971. The first meeting was attended by four experts: H. Bishop (UK), A.A. Farag (United Arab Republic), J. Nekola (Czechoslovakia), J.-P. Spindler (France). Except for the very first meetings, few archives remain to properly document the period.

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[11] UNESCO (1994), *Meeting of Experts on the Improvement of the Coverage, Reliability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics*, ST.94/CONF.603/12, pp. 5.
[12] B. Godin (2001), *The Number Makers: A Short History of Official Science and Technology Statistics*, Montreal: OST.
[13] UNESCO (1968), *General Surveys Conducted by UNESCO in the Field of Science and Technology*, NS/ROU/132, Paris.
[14] W. Brand (1960), *Requirements and Resources of Scientific and Technical Personnel in Ten Asian Countries*, ST/S/6A, Paris: UNESCO. See also: UNESCO, *Provisional Guide to the Collection of Science Statistics*, COM/MD/3, Paris: 1968, chapter 1.
[15] UNESCO/ST/Q/86.
[16] UNESCO (1966), *Statistical Data on Science and Technology for Publication in the UNESCO Statistical Yearbook: Development of the UNESCO Questionnaire*, UNESCO/CS/0666.SS-80/4, p. 2.
[17] UNESCO (1969), *Report of the Session Held in Geneva 2-6 June 1969*, UNESCO/COM/CONF.22/7, p. 8.
[18] Later called Group of Experts on Methodology of Science Statistics.

The second group of experts was a joint UNESCO/ECE Working Group on Statistics of Science and Technology. It accompanied UNESCO over the period 1969-1981. The group was established jointly by the Conference of European Statisticians and UNESCO with a view to linking national statistical offices and science policy bodies with UNESCO's work.

The real work on standardization began in association with the latter group. In 1968, UNESCO circulated a questionnaire in preparation for a 1970 conference of European (East and West) Ministers responsible for science policy. The conference served as a basis for the implementation of the UNESCO's long term science statistics programme. Although the survey's results were far from satisfactory in terms of coverage, definitions and classifications, [19] it was the first time the same instrument had been used to collect R&D statistics in both Eastern and Western European countries. [20] This survey would thereafter serve as the model for the biennial survey.

The View From Nowhere

To extend OECD's work to all countries, UNESCO faced two challenges, which corresponded to two groups of countries: "The methodology so developed [OECD] must be adapted for use by Member States at widely varying levels of development and with diverse forms of socio-economic organizations", UNESCO explained. [21] The first group (developing countries) had almost no experience in the field of science and technology statistics, whereas the second (Eastern European countries) had an economic system that required important adaptations to fit OECD standards: [22]

> A statistical methodology developed in a country with 40,000 scientists and 200,000 engineers in all fields of science and technology may be of little use in a country with only

[19] UNESCO (1969), *An Evaluation of the Preliminary Results of a UNESCO Survey on R&D Effort in European Member Countries in 1967*, COM/CONF.22/3.
[20] UNESCO (1970), *Statistiques sur les activités de R&D, 1967*, UNESCO/MINESPOL 5 ; UNESCO (1972), *Recent Statistical Data on European R&D*, SC.72/CONF.3/6.
[21] UNESCO (1966), *Science Statistics in UNESCO*, UNESCO/CS/0666.SS-80/3, p. 3.
[22] UNESCO (1966), *Problems Encountered in the Development of a Standard International Methodology of Science Statistics*, UNESCO/CS/0666.SS-80/5, p. 3.

> 50 scientists and 200 engineers; a questionnaire suitable for use in a country with a highly developed statistical organization may be impractical in a country where few professional statisticians are struggling to gather the most basic demographic and economic data essential to planning.

The task was enormous: "The Secretariat does not underestimate the formidable problems which are involved in such an undertaking, but is confident that, with the help of Member States having experience in this field of statistics, much progress can be made toward this goal". [23] There had certainly been previous attempts at standardization, but they were local in scope, according to UNESCO: [24]

> Partial solutions already attempted on a regional basis [OECD, CMEA, EEC, OAS], while being welcomed by all those concerned, represent in fact intermediate steps in the search for agreement between all countries of the international community, irrespective of their geographical location or their socio-economic organization. (…) The most pressing methodological problems that exist in this field of statistics relate to the comparability of data among all nations, comparisons of the scientific efforts of the countries of Eastern Europe with those of Western Europe and North America, and the formulation of a methodology for science statistics adapted to serve Member States at varying levels of socio-economic development.

For UNESCO, the seventies were ripe for standardization: "At first sight it would seem that the task of standardizing science statistics is premature because the field they cover is still far from being well delimited. However, the presence of three factors which characterize our scientific world leads one to conclude that the time has now come to make a first attempt at international standardization": [25]

1. The considerable (sic) experience that has already been gained by countries and organizations in a rather short period of time;
2. The recent institutionalization and professionalization of scientific and technological activities, particularly R&D;
3. The need for information by policy-makers planning the development or application of science and technology.

[23] *Ibid*, p. 4.
[24] UNESCO (1972), *Considerations on the International Standardization of Science Statistics*, COM-72/CONF.15/4, p. 6.
[25] *Ibid*. pp. 10-11.

Standards were consequently suggested as early as 1969, [26] and a provisional manual was published in 1980. [27]Along with a guide published in 1968 to assist countries in data collection, [28] these were the first methodological document that UNESCO produced. The manual was written by Chris Freeman, author of the Frascati manual, and it was concerned with the standardization of data between Western and Eastern Europe and with the necessity of measuring related scientific activities (RSA). [29] It dealt at length with the concept of "scientific and technological activities" (STA), rather than solely with R&D, because:

> Broadening of the scope of science statistics is particularly appropriated to the conditions of most of the developing countries which are normally engaged in more general scientific and technological activities, rather than R&D solely. [30] In developing countries proportionally more resources are devoted to scientific activities related to the transfer of technology and the utilization of known techniques than to R&D per se. [31]

The concept of STA would become the basis of UNESCO's philosophy of science and technology measurement. [32] In retrospect, one could say that UNESCO had decided to go beyond three "limitations" of current statistics by extending: [33]

- Measurement to activities other than R&D, like information and documentation, and education;
- Statistical surveys to the social sciences and humanities;
- Statistics to outputs.

[26] C. Freeman (1969), *The Measurement of Scientific and Technical Activities*, ST/S/15, Paris: UNESCO.
[27] UNESCO (1980), *Manual for Statistics on Scientific and Technological Activities* (provisional), ST-80/WS/38, Paris.
[28] UNESCO, *Provisional Guide to the Collection of Science Statistics*, COM/MD/3, Paris: 1968.
[29] B. Godin (2000), *Neglected Scientific Activities: The (Non) Measurement of Related Scientific Activities*, Montreal: OST.
[30] UNESCO (1969), *Science Statistics in Relation to General Economic Statistics: Current Status and Future Directions*, UNESCO/COM/CONF.22/2, p. 9.
[31] UNESCO (1972), *Considerations on the International Standardization of Science Statistics*, COM-72/CONF.15/4, p. 14.
[32] J.-C. Bochet, *The Quantitative Measurement of Scientific and Technological Activities Related to R&D Development*, CSR-S-2, Paris: UNESCO, 1974; J.-C. Bochet, *The Quantitative Measurement of Scientific and Technological Activities Related to R&D Development: Feasibility Study*, CSR-S-4, Paris: UNESCO, 1977.

Over the next two decades, UNESCO worked to varying degrees on each of these three tasks (Annex 2). Firstly, it produced a study on output, written by C. Freeman, [34] but it did not really go further than this, in view of the difficulties mentioned above. [35] Secondly, it produced a methodological document on the social sciences, [36] and included questions pertinent to the social sciences in its questionnaire as early as 1971. Thirdly, it undertook a study of Scientific and Technical Information and Documentation (STID), [37] tested its methodology in four countries, and published a provisional manual. [38]

These advances were made despite strong skepticism throughout the whole period: [39]

> It was felt by a number of participants that the broadening of the content of statistics of science and technology in the way being considered would throw a heavy and in some cases an impossible load upon those government departments or agencies which are more directly concerned with the collection of these data. (…) [But] UNESCO should provide guidelines for the development of a comprehensive system of statistics of science and technology.

And it did: based on a study by K. Messman from the Austrian Central Statistical Office, [40] it drafted a recommendation on international standardization that was adopted by Member countries in November 1978. [41] According to the recommendation, STA were composed of three broad types of activities: R&D, scientific and technical education and training

[33] UNESCO (1969), *Provisional Agenda*, UNESCO/COM/WS/108; UNESCO (1972), *Purposes of Statistics on Science and Technology*, COM-72/CONF.15/2.
[34] C. Freeman (1970), *Measurement of Output of R&D*, Paris: UNESCO, ST-S-16.
[35] Although an international comparative study was launched in the mid-seventies that collected information on the effectiveness of more than 1 000 research units in six European countries.
[36] UNESCO, *The Measurement of Scientific Activities in the Social Sciences and the Humanities*, CSR-S-1, Paris, 1971; UNESCO (1972), *Further Considerations ion the Measurement of Scientific Activities in the Social Sciences and Humanities*, CON-72/CONF.15/6; UNESCO (1974), *Guidelines for the Pilot Survey on Scientific Activities in the Social Sciences and the Humanities*, COM.74/WS/S.
[37] D. Murphy, *Statistics on Scientific and Technical Information and Documentation*, PGI-79/WS/5, Paris: UNESCO, 1979.
[38] UNESCO, *Guide to Statistics on Scientific and Technological Information and Documentation (STID)*, ST-84/WS/18, Paris, 1984.
[39] UNESCO (1969), *Report of the Session Held in Geneva 2-6 June 1969*, UNESCO/COM/CONF.22/7, p. 12.
[40] K. Messman (1975), *A Study of Key Concepts and Norms for the International Collection and Presentation of Science Statistics*, COM-75/WS/26, UNESCO.
[41] UNESCO, *Recommendation Concerning the International Standardization of Statistics on Science and Technology*, Paris, 1978.

(STET), and scientific and technological services (STS) (Annex3). The recommendation suggested three progressive stages of measurement: [42]

> First stage : during this stage, i.e. during the years immediately following the adoption of this recommendation, international statistics should cover only R&D activities in all sectors of performance, together with the stock of SET and/or the economically active SET (…). Second stage: during that stage, the international statistics should be extended to cover STS and STET. Subsequently, the international statistics relating to STS and STET should be progressively extended to the integrated units in the productive sector.

Besides the internationalization of statistics, there was a second leitmotiv driving UNESCO's activities, namely the need to link statistics to policies: [43]

> Except for the socialist countries, few efforts were made to link science policy effectively with national economic policies and to assess the implications for the social and natural environment of an ever-accelerating application of science and technology. (…) Statistics are mainly used (…) to claim additional funds if the position is unfavourable or to justify and maintain the present level of effort if this position is favourable.

UNESCO's activities in this area took several forms. Firstly, it showed an early interest in the quantification of science and technology related to development (classification of R&D by socio-economic objectives) [44] and in regular surveys on national scientific and technological potential (STP). [45] For UNESCO, the essential elements of scientific and technological potential comprised data not only on human and financial resources, but also on physical, informational and organizational resources. It included quantitative as well as descriptive information designed for constituting national data systems on science and technology.

Secondly, it measured problems specific to developing countries. These followed requests in the seventies by the Economic and Social Council of the United Nations (ECOSOC) and the United Nations Advisory Committee on the Application of Science and Technology

[42] *Ibid*, pp. 10-13.
[43] UNESCO (1972), *Purposes of Statistics on Science and Technology*, COM-72/CONF.15/2, p. 3.
[44] UNESCO (1972), *Classification of R&D Expenditures by Major Aims or Objectives*, COM-72/CONF.15/8; UNESCO (1976), *Draft Detailing of the Classification of The Purposes of Government*, UNESCO/ECE/COM.76/CONF.711/5; UNESCO (1977), *Draft Classification of R&D Activities by Objectives*, ST-77/WS/15.
[45] UNESCO, *Manual for Surveying National Scientific and Technological Potential*, NS/SPS/15, Paris, 1970.

(UNACAST). It consequently designed an R&D questionnaire for developed countries concerning the problems of developing countries. [46] It also produced the first ever study of R&D in international organizations, applying a new methodology in a survey of eight organizations. [47] It conducted reflections on technology transfer, [48] along with two workshops – but no measurements. And finally, it added some questions on non-national personnel in its R&D questionnaire in order to measure the "brain drain" problem. [49]

Facing the OECD Monopoly

As I noted above, UNESCO's advances were made in a context of scepticism: "UNESCO is aware of the difficulties involved in such work but, in view of the benefits to be derived from international standardization, will endeavour to overcome the obstacles and find solutions to the problems in science statistics as it has in other fields such as education and cultural statistics". [50] This statement minimized two difficulties, the first of which was the OECD.

The first OECD *ad hoc* review group was "not satisfied that hitherto there has been adequate consultation" between the two organizations. [51] A few years later, the second group similarly concluded that there remained substantial problems: "Many of these problems relate to fundamental structural difficulties posed by the different membership

[46] UNESCO (1973), *The Quantification of R&D Expenditures Relevant to Specific Problems of Developing Countries*, ESA/S&T/AC.2/4. The OECD also developed a questionnaire and collected data in the early seventies. See: *Inventaire international des programmes et des ressources consacrées à la R&D en faveur des pays en voie de développement par les pays membres de l'OCDE en 1969 et 1971*, DAS/SPR/72.17.
[47] UNESCO (1976), *R&D Activities in International Organizations*, UNESCO-ECE/COM-76/CONF.711/3. The results of a world-wide survey of bilateral institutional links in science and technology had already been published in 1969 but was never revised due to lack of resources: UNESCO (1969), *Bilateral Institutional Links in Science and Technology*, Science Policy Studies and Documents no. 13, Paris: UNESCO.
[48] UNESCO (1972), *Statistics on the International Transfer of Technology*, UNESCO/COM/72/CONF.15/7; UNESCO (1975), *The Statistical Needs of Technology Transfer Policy-Makers*, SC.TECH/R.27/Rev.1; UNESCO (1981), *Development of Science and Technology Statistics to Measure the International Flow of Technology*, UNESCO/ECE/CONF.81/ST.001/2.
[49] UNESCO (1976), *Progress Made on the Development of Statistics on Science and Technology, January 1973-June 1975*, UNESCO/ECE/COM-76/CONF.711/2, p. 5.
[50] UNESCO (1972), *Considerations on the International Standardization of Science Statistics*, COM-72/CONF.15/4, p. 9.
[51] OECD (1973), *Report of the Ad Hoc Review Group on R&D Statistics*, SPT (73), p. 15.

patterns of the two organizations". [52] And it continued: "Our expectations of achieving comparability must remain realistic and, hence, modest". [53]

UNESCO held four meetings with the OECD in 1973 and 1974 to harmonize questionnaires. The objectives were to facilitate the respondents' task, avoid possible duplication and obtain better comparability. The main difference between UNESCO and the OECD had to do with sectors of performance. [54] UNESCO did not consider private non-profit institutions as a sector in their own right. These institutions were instead classified according to the following three sectors: business, government, and university. The OECD, on the other hand, classified institutions according to their ownership (or control), which meant assigning private non-profit units to a separate sector. This was in line with the System of National Accounts (SNA) and was supposed to allow the comparison of science and technology activities with other economic activities. [55] For UNESCO, however, the formulation of policies did not require a close relationship between science statistics and the SNA: [56]

> The definitions and contents of the SNA sectors were made for purposes other than those of science statistics. (…). A system of science statistics should provide an independent framework (…) and whenever possible, it should be linked with the SNA but not forced into SNA categories.

UNESCO maintained that "financing and control cannot be considered as predominant criteria for a classification of R&D bodies into sectors of performance". [57] It was rather the "service rendered" that was considered important – as the OECD had indeed already admitted in the case of the Higher Education sector. Units should be classified according to

[52] OECD (1978), *Report of the Second Ad Hoc Review Group on R&D Statistics*, SPT (78) 6, p. 34.
[53] *Ibid*, p. 35.
[54] UNESCO (1973), *The Development of Coordinated UNESCO and OECD Questionnaires for Statistics on Science and Technology: UNESCO Proposals*, COM/WS/343; OECD (1973), *The Development of Coordinated UNESCO and OECD Questionnaires on Science and Technology*, DAS/SPR/73.84.
[55] B. Godin (2001), *Tradition and Innovation: The Historical Contingency of R&D Statistical Classifications*, Montreal: OST.
[56] UNESCO (1969), *Report of the Session Held in Geneva 2-6 June 1969*, UNESCO/COM/CONF.22/7, p. 7.
[57] OECD (1973), The Development of Coordinated UNESCO and OECD Questionnaires on Science and Technology, *op. cit*. p. 13.

one of three functions – production of goods and services (business), collective needs (government), or knowledge (universities) – irrespective of their juridical property.

UNESCO's proposition regarding sectors of performance was rejected. Yet, the OECD Secretariat had offered to devise a methodology converting data into a form suitable for UNESCO's uses. It would have redefined the private non-profit sector and asked Member countries for more disaggregated data that could have served organizations. But Member countries, via NESTI, rejected the idea. The two organizations instead agreed to include explanations and examples of concordance or conversion tables in their respective questionnaires.

Why did OECD Member countries refused to depart from their practices? As reported by the OECD Secretariat in its responses to the second *ad hoc* review group, "les pays de l'OCDE perdraient le contrôle complet qu'ils détiennent actuellement sur leurs normes et méthodes". [58] Moreover :

> The time is not ripe for « world-wide » science standards and that the official adoption of the current draft of the UNESCO Manual in a fit of empty internationalism would be unlikely to bring any practical benefits. (…) The current draft is, in our view, rather too ambitious and insufficiently based on practical experience to play this role. [59]

The End of a Dream

This was only the beginning of UNESCO's difficulties. A few years later, UNESCO took stock of problems it was having with another partner, the ECE: "When various recommendations of earlier meetings in this field – starting from the 1976 Prague seminar – are reviewed, it is impossible not to conclude that there has been inadequate follow-up within ECE". [60] Too many projects were recommended for the available resources or UNESCO and the ECE directed too few resources towards the recommended projects.

[58] The page where the citation appears is missing in the English version. OECD (1977), *Response by the Secretariat to the Questions of the Ad Hoc Group*, DSTI/SPR/77.52, p. 16.
[59] *Ibid*, p. 18.
[60] UNESCO (1981), *Report of the Fourth Joint Meeting on the Development of Science and Technology Statistics Held in Geneva, 4-7 May 1981*, UNESCO/ECE/CONF.81/ST.001/9, p. 7.

But the main difficulty lay in the Member countries themselves. In 1981, UNESCO concluded that although there had been an increase in the number of countries responding to the UNESCO questionnaire (80 countries), this progress was undermined by the "scarcity and inconsistency of the data received (…) in spite of the closer cooperation with the national statistical services in the developing countries through staff missions in the field or consultancy services". [61] Yet, only a few years earlier, UNESCO had enthusiastically reported that: "the results obtained so far are encouraging in that a definite improvement has been noted in replies to questionnaires not only with regard to the response rate but also with regard to the application of the proposed standards". [62] Now, however, almost every project is recognized as having failed.

The first instance of failure was the attempt to measure the social sciences and humanities. A pilot survey in 30 countries was carried out in 1974 and 1975 to test feasibility, followed by field-testing in two countries. This led to a special inquiry that was annexed to the annual survey in 1977-78. But very few countries responded, and those that did returned incomplete questionnaires. The main conclusion reached "was that at this stage such a survey is neither practicable nor realistic". [63] The survey was discontinued.

A similar fate awaited the STID project. The methodology was developed within General Information Program Division of UNESCO, and tested in four countries using a provisional manual. The latter was used in regional training seminars that led to the revision of the proposed questionnaire. But the results of the first surveys (1987 and 1990) were qualified as unsatisfactory: "the responses were discouraging, they were incomplete and the

[61] UNESCO (1981), *Progress Made in the Development of International Statistics on Science and Technology*, UNESCO/ECE/CONF.81/ST.000/6, p. 3.
[62] UNESCO (1976), *Report Prepared by UNESCO in Response to ESOCOC Resolution 1901 on the Quantification of Science and Technological Activities Related to Development*, UNESCO/NS/ROU/379, p. 14.
[63] UNESCO (1981), *Progress Made in the Development of International Statistics on Science and Technology*, UNESCO/ECE/CONF.81/ST.000/6, p. 1.

institutional coverage was partial. This prompted us, therefore, to temporarily discontinue our activities in this area". [64]

Statistics on third level education did not fare any better. Two meetings of experts in 1982 and 1989 led to two methodologies, one on the measurement of S&T personnel, [65] the other on lifelong training. [66] However, "due to the drastic reduction of personnel in the Division of Statistics, priorities had to be established and unfortunately, this area was not considered a high priority. No follow-up activities have, therefore, been undertaken since that meeting". [67]

Finally, the responses to the R&D survey in developed countries concerning the problems of developing countries were also deemed unsatisfactory: only 18 of the 41 countries that received the questionnaire replied to it, and half of these replies contained only very scattered and incomplete data. [68]

All in all, the director of the science division concluded that "the establishment of a system of data collection covering at once the full scope of STS and STET in a country has been considered not practicable. Some priorities have, thus, to be adopted for a selective and piecemeal extension of coverage of certain types of STS and STET". [69] Thus, in 1994, UNESCO called a meeting of experts to reassess the needs of Member countries regarding concepts, definitions and classifications of science and technology statistics. [70] Thirteen countries attended the meeting. The experts took note of the fact that, since 1978, "there appears to be no improvement in the quantity and quality of the science and technology

[64] UNESCO (1994), *General Background to the Meeting and Points for Discussion*, ST.94/CONF.603/5, p. 4.
[65] UNESCO (1982), *Proposals for a Methodology of Data Collection on Scientific and Technological Education and Training at the Third Level*, CSR-S-15.
[66] UNESCO (1989), *Secretariat Background Paper to the Meeting of Experts on the Methodology of Data Collection on Lifelong Training of Scientists, Engineers and Technicians*, ST.89/CONF.602/3.
[67] UNESCO (1994), General Background to the Meeting and Points for Discussion, *op. cit*. p. 3.
[68] UNESCO (1976), *Progress Made on the Development of Statistics on Science and Technology, January 1973-June 1975*, UNESCO/ECE/COM-76/CONF.711/2, p. 2.
[69] Z. Gostkowski (1986), *Integrated Approach to Indicators for Science and Technology*, Paris: UNESCO, p. i.

data collected, particularly in the developing countries". [71] Experts "were of the opinion that the dramatic drop in the quantity of internationally comparable data on R&D transmitted to UNESCO from the developing countries reflects the lack of R&D activities and/or the acute shortage of financial resources necessary for the proper functioning of S&T statistical services at the national level". [72]

The meeting nevertheless concluded that UNESCO should continue to collect internationally comparable data on R&D and to strengthen its assistance to Member countries, but that it should limit its program to the most basic statistics and indicators. [73] It also recommended paying proper attention to statistics on human resources in every activity. [74] The recommendations were never implemented, however. The actual measurement of science and technology at UNESCO remains minimal: an occasional R&D survey at irregular intervals.

Conclusion

UNESCO took on an enormous task. For the organization, standardizing science and technology statistics meant two things. Firstly, extending OECD standards to all countries; secondly, extending standards to activities beyond just R&D, that is to all scientific and technological activities (STA). In this venture, UNESCO received some help from European countries, at least during the decade it held regular meetings of experts, but it received far less support from the OECD. The latter was indeed the major player in the field and had neither time for nor interest in assisting a competitor.

[70] An additional evaluation exercise, although mainly concerned with indicators specific to Western countries, was realized in 1996 by R. Barré from the French OST: *UNESCO's Activities in the Field of Scientific and Technological Statistics*, BPE-97/WS/2.
[71] UNESCO (1994), *Summary of the Case-Studies on the Needs, Availability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics*, ST.94/CONF 603/4, p. 1.
[72] UNESCO (1994), *Meeting of Experts on the Improvement of the Coverage, Reliability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics*, ST.94/CONF.603/12, pp. 4.
[73] It also recommended, contradictorily, that UNESCO envisage extending data collection to outputs.
[74] UNESCO (1994), Meeting of Experts on the Improvement of the Coverage, Reliability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics, *op. cit*. pp. 2-3.

But the real difficulty limiting UNESCO's ambitions was the absence of a community of views between Member countries. Contrary to the OECD where Member countries were all industrialized countries, [75] UNESCO membership was composed of countries at varying levels of development or with differing economic structures. The situation has changed somewhat since then. UNESCO has in fact abandoned its claim for an original classification of R&D by sectors of performance. The reasons are many – non-responses, implementation difficulties –, [76] but there was one major determining factor was: the shift of centrally planned economies towards free market economies. This move came too late to bring UNESCO Member countries closer together, however. Eastern Europe countries have since chosen the OECD methodology for measuring their scientific and technological activities, and the OECD held four meetings to that end in the nineties. [77]

Nevertheless, and despite its relative failure, UNESCO clearly contributed to advancing the field of science and technology statistics. It doubtless drew upon previous work, including work by the OECD, but it also preceded or paralleled the OECD on several topics: the measurement of the social sciences and humanities; the measurement of related scientific activities, education and training; [78] and the construction of classifications (fields of science; socio-economic objectives). [79] UNESCO also suggested new solutions to several methodological problems regarding R&D surveys. I have already dealt above with the classification of institutions by sectors of performance. A second survey problem had to do with selecting the most appropriate unit for obtaining precise information on research activities: "most of the countries agree that only a survey at the project level would allow

[75] B. Godin (2001), *Taking Demand Seriously: OECD and the Role of Users in S&T Statistics*, Montreal: OST.
[76] UNESCO (1994), Meeting of Experts on the Improvement of the Coverage, Reliability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics, *op. cit*. pp. 3-4.
[77] Training Seminar on Science and Technology Indicators for Non-Member Countries (1991), Conference on S&T Indicators in Central and Eastern Europe (1993), Workshop on the Implementation of OECD Methodologies in Countries in Transition (1995), followed by a Conference (1997).
[78] More than ten years before the publication of the OECD/Eurostat Canberra manual.
[79] For fields of science, see: UNESCO (1969), *List of Scientific Fields and Disciplines Which Will Facilitate the Identification of Scientific and Technical Activities*, UNESCO/COM/CONF.22/10; The classification was developed in collaboration with Germany. First version in 1972, revised in 1973: UNESCO (1973), *Proposed International Standard Nomenclature for Fields of Science and Technology*, UNESCO/NS/ROU/257.

an exact classification" of higher education R&D. [80] Yet another problem concerned the classifications of R&D expenditures: "as the situation now stands, expenditures in the government sector are usually broken down by ministry or department, in the productive sector by branch of industry or product group, and in the higher education sector by field of science or technology". [81] UNESCO held that a common classification by socio-economic objectives would correct the situation.

But theoretical intentions were not enough: the proposed methodologies had to measure up to the pragmatic constraints of the real world. Building on the momentum created by the recent international Conference on Science, [82] the UNESCO Institute of Statistics (1999) is about to launch a new program in the field of science and technology. But if there is a lesson to be drawn from the preceding pages, it is that unless new resources are devoted to the task and new training programs for Member countries are put into place, these new measurement efforts will most likely fail.

[80] UNESCO (1975), *Problems of Data Collection and Analysis at the National Level in the Field of Statistics on Science and Technology*, UNESCO-ECE/COM-76/CONF.711/4, p. 6.
[81] UNESCO (1972), *Classification of R&D Expenditures by Major Aims or Objectives*, COM-72/CONF.15/8, p. 3.
[82] UNESCO (1999), *Science for the Twenty-First Century: A New Commitment*, Budapest.

Annex 1.

UNESCO Conferences and Meetings on S&T Statistics

Meeting of Experts

1. 15-17 June 1966
2. 6-8 May 1968
3. November 1969
4. September 1970
5. 17-20 November 1971

Joint UNESCO/EEC Meeting on the Development of S&T Statistics

1. 2-6 June 1969
2. 27 November-1 December 1972
3. 19-23 January 1976
4. 4-7 May 1981

Other Meetings and Workshops

1. Quantification of S&T Related to Development, 1973
2. Indicators of S&T Development, 1974
3. Higher Education Sector, 1974
4. Problems at the National Level in Science Statistics, 1975
5. Statistics of Science and Technology, 1976
6. International Technology Flows, 1976
7. Standardization, 1977
8. International Technology Flows, 1977
9. Draft Recommendation, June 1978
10. Development of S&T Statistics, [83] 1980
11. Education and Training, 1982
12. STID, 1-3 October 1985
13. Lifelong Training, 1989
14. Improvements of Coverage, Reliability, Concepts, Definitions and Classifications in the Field of Science and Technology Statistics, 1994

[83] Mainly devoted to technology transfer.

Annex 2.
UNESCO Documents on S&T Statistics

1960 Requirements and Resources of Scientific and Technical Personnel in Ten Asian Countries, ST/S/6 A
1968 Provisional Guide to the Collection of Science Statistics, COM/MD/3
1969 The Measurement of Scientific and Technical Activities, ST/S/15
1970 World Summary of Statistics on Science and Technology, ST/S/17
1970 Measurement of Output of Research and Experimental Development, ST/S/16
1970 Manual for Surveying National Scientific and Technological Potential, NS/SPS/15
1971 The Measurement of Scientific Activities in the Social Sciences and the Humanities, CSR-S-1
1974 The Quantitative Measurement of Scientific and Technological Activities Related to Research and Experimental Development, CSR-S-2
1976 R&D Activities in International Organizations, CSR-S-3
1976 Statistics on Science and Technology in Latin America: Experience with UNESCO Pilot Projects 1972-1974
1977 The Statistical Measurement of Scientific and Technological Activities Related to Research and Experimental Development: Feasibility Study, CSR-S-4
1977 Guide to the Collection of Statistics on Science and Technology (second edition), ST.77/WS/4
1978 Development in Human and Financial Resources for Science and Technology, CSR-S-5
1978 Recommendation Concerning the International Standardization of Statistics on Science and Technology
1979 Statistics on Research and Experimental Development in the European and North American Region, CSR-S-6
1979 Estimation of Human and Financial Resources Devoted to R&D at the World and Regional Level, CSR-S-7
1980 National Statistics Systems for Collection of Data on Scientific and Technological Activities in the Countries of Latin America, Part I: Venezuela, Colombia, Mexico and Cuba, ST-80/WS/18
1980 National Statistics Systems for Collection of Data on Scientific and Technological Activities in the Countries of Latin America, Part II: Brazil and Peru, ST-80/WS/29
1980 Statistics on Science and Technology, CSR-S-8
1980 Participation of Women in R&D: A Statistical Study, CSR-S-9
1980 Statistics on Science and Technology, CSR-S-10
1980 Manual for Statistics on Scientific and Technological Activities (provisional), ST-80/WS/38
1981 National Statistics Systems for Collection of Data on Scientific and Technological Activities in the Countries of Latin America, Part III: Uruguay, Argentina and Chile, ST-81/WS/14
1981 Statistics on Science and Technology, CSR-S-11
1982 Human and Financial Resources for Research and Experimental Development in the Productive Sector, CSR-S-12

1982 Trends in Human and Financial Resources for Research and Experimental Development, CSR-S-13
1982 Statistics on Science and Technology, CSR-S-14
1982 Proposal for a Methodology of Data Collection on Scientific and Technological Education and Training at the Third Level, CSR-S-15
1983 Human and Financial Resources for Research and Experimental Development in Agriculture, CSR-S-16
1984 Estimated World Resources for Research and Experimental Development: 1970-1980, CSR-S-17
1984 Manual for Statistics on Scientific and Technological Activities, ST-84/WS/12
1984 Guide to Statistics on Science and Technology (third edition), ST.84/WS/19
1984 Guide to Statistics on Scientific and Technological Information and Documentation (STID), ST-84/WS/18
1984 Manual on the National Budgeting of Scientific and Technological Activities, Science and Policy Studies and Documents no. 48
1985 Estimate of Potential Qualified Graduates from Higher Education, CSR-S-19 (ST-85/WS/16)
1986 Science and Technology for Development: Scandinavian Efforts to Foster Development Research and Transfer Resources for Research and Experimental Development to Developing Countries, CSR-S-20 (ST-86/WS/7)
1986 Integrated Approach to Indicators for Science and Technology, CSR-S-21 (ST-86/WS/8)
1986 Human and Financial Resources for Research and Experimental Development in the Medical Sciences, CSR-S-22
1988 Financial Resources for Fundamental Research, CSR-S-23 (ST-88/WS/4)
1988 Human and Financial Resources for Research and Experimental Development in the Higher Education Sector, CSR-S-24 (ST-89/WS/1)
1990 Manual For Surveying National Scientific and Technological Potential (Revised Edition)
1991 Estimation of World Resources Devoted to Research and Experimental Development: 1980 and 1985, CSR-S-25 (ST-90/WS/9)

Annex 3.

S&T Activities (UNESCO)