

**The Information Economy:
The History of a Concept Through its Measurement,
1949-2005**

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Abstract

The information economy is one of the key concepts invented to explain structural changes in the modern economy. It has given rise to theories on society, conceptual frameworks for policy, and statistics for measurement. This paper analyzes the history of the concept of information and its role in public discourses about the economy and society through the lens of statistics. It argues that the preoccupation with the growth and management of scientific publications was the very first step toward the construction of the concept of the information economy. Over history, the concept evolved from an understanding of information as knowledge, to information as commodity, or industrial activity, then information as technology. An international organization, the OECD, is discussed as emblematic of the conceptual and statistical work conducted on information over the period 1949-2005.

If society devotes considerable amounts of its resources to any particular activity, economists will want to look into this allocation and get an idea of the magnitude of the activity, its major breakdown, and its relation to other activities (F. Machlup (1962), *The Production and Distribution of Knowledge in the United States*, p. 7).

Once an organism is born or a phenomenon uncovered, there is an almost irresistible urge to measure its growth (M. U. Porat (1977), *The Information Economy*, p. 63).

**The Information Economy:
The History of a Concept Through its Measurement,
1949-2005**

For over forty years, information and communication technologies have been everywhere in the literature, explaining changes in society, and giving rise to many terms and buzzwords like the information economy (see Appendix 1).¹ Echoing early works, the OECD (Organization for Economic Co-Operation and Development), in an influential study conducted in the 1960s, concluded that “the computer can be considered as the key to the second industrial revolution, just as the steam engine was the center of the first industrial revolution”. To the OECD, “the strategic significance of the computer is partly due to the fact that information is the key to management”.² More recently, the organization has used new concepts to explain changes in the economy: new economy, knowledge-based economy, information society. All of these changes are explained, partly or wholly, by information technology. How did we get there? How did information, and its technologies, acquire such a central role in public discourses?

This paper documents the recent history of the concept of information through the lens of statistics. Many concepts depend on statistics for their definition. Such is the case for productivity.³ We cannot discuss productivity without statistics and ratios, or at least a minimal idea of quantities. Information is different. It is not a concept of a quantitative nature. However, it is amenable to (imperfect) quantification, like many other concepts. In such a case, statistics often proves influential in focusing or crystallizing the attention of people on specific dimensions of the reality or phenomenon, and not on others.

¹ J. R. Beniger (1986), *The Control Revolution: Technological and Economic Origins of the Information Society*, Cambridge (Mass.): Harvard University Press.

² OECD (1969), *Gaps in Technology: Electronic Computers*, Paris, p. 26-27.

³ B. Godin (2006), *The Value of Science: Changing Conceptions of Scientific Productivity, 1869-circa 1970*, Communication presented to the international conference “The Future of Science, Technology and Innovation Policy: Linking Research and Practice”, SPRU, Brighton, Great Britain, September 11-13, 2006.

In this paper, I analyze official statistics and the role they play in public discourses on the information economy. The paper looks at the measurement of information in an international organization – the OECD –, from 1949 to 2005. 1949 is the year W. Schramm edited a much quoted book of papers from C.E. Shannon and W. Weaver on communication theory,⁴ but here it corresponds to the entry of an international organization into the field. This paper uses archival material, as deposited at the European University Institute (Florence) for a project on the history of statistics on science and technology.⁵ As an early promoter of national science policy and as a think tank to its Member countries, the OECD is an ideal test case for understanding the way governments think about information. National delegates bring their ideas to the organization which, in turn, produces working papers and policy recommendations that feed national policy-makers.

The thesis of this paper is that, over the past fifty years, the concept of information developed in three stages. The first was characterized by information as knowledge. In the 1950s and after, scientists and governments became preoccupied with information growth and “explosion”. There was, so they argued, an explosion of literature, as measured by librarians and by historian D. J. D. Price. The computer was seen as the solution, but too-rapid development could complicate its use because of system incompatibility, thus the need for management of information and for appropriate technological systems to process it. Information-as-knowledge carried a restricted definition of information: information was limited to scientific and technological information – although transfer to non-scientists, namely industry, was often the main objective of early policies. The statistics developed reflected this choice: information was measured as documentation.

This conception of information was followed by a second one: information as commodity or economic activity. Such a conception was developed by American economists F.

⁴ C. E. Shannon and W. Weaver (1949), *Mathematical Theory of Communication*, Urbana: University of Illinois Press.

⁵ B. Godin (2005), *Measurement and Statistics on Science and Technology: 1920 to the Present*, London: Routledge.

Machlup and M. U. Porat, and became very popular in the late 1970s and early 1980s. What preoccupied policy-makers was structural change in the economy, namely the transition from a manufacturing economy to a service or information economy, and “information gaps” between countries. Information came to be defined very broadly. It included just about anything that was intangible. The statistics developed for measuring information relied on the national accounts: aggregating expenditures for specific industrial activities into an information field.

OECD Evolving Conceptions of Information

Information as knowledge

Emblematic authors: Bernal and Price

Issue: information explosion

Restricted definition: scientific and technological information

Statistics: documentation

Information as economic activity (or commodity)

Emblematic authors: Machlup and Porat

Issue: structural change

Broad definition: information goods and services (industries)

Statistics: accounting

Information as technology

Emblematic authors: Freeman and Miles

Issue: technological revolution

Restricted definition: (information and communication) technologies

Statistics: applications and uses

More recently, a third conception of information emerged: information as technology. Many analysts came to view information technologies, because of their widespread effects on the economy, as bringing forth a new techno-economic paradigm or technological revolution. The key issue was no longer identifying the sector producing the technologies, but rather mapping the applications of information technologies and their uses. Information was thereafter restricted, at least in official circles, to what came to be called “information and communication technologies”, and the measurement emphasized the diffusion and use of the technologies. C. Freeman and I. Miles, from

SPRU, were influential in this reorientation of the concept of information. From the 1990s onward, the OECD turned entirely to such an approach to information.⁶

This paper argues that this interest in the information economy, contrary to what most authors who have studied the phenomenon discussed, predates the literature that used the concept. Information was the concern of science policy (scientific and technical documentation) before it became a matter of economic policy (industries responsible for information goods and services) and then technology policy (promotion of information and communication technologies). The preoccupation with the growth and management of scientific publications was the very first step toward the construction of the concept of the information economy. This paper also argues that the history of the concept is intimately linked to its measurement. At all three stages, the OECD and its member countries developed and initiated projects on a methodological manual to crystallize the meaning of the concept of information and standardize its measurement. The efforts failed until very recently, namely until information came to be identified with technology. A large part of this paper analyzes the history of these projects, and looks at the factors – conceptual, methodological and political – behind the experiences.

The Economics of Information

The OECD's concern with information goes back to 1949 when the OEEC⁷ – the predecessor of OECD – set up a working party on scientific and technical information (Working Party no. 3). According to A. King, head of the working party (and first head of the Directorate for Scientific Affairs at OECD), studying scientific and technical

⁶ This third framework actually competes with another one: the knowledge-based society or economy. Although this latter framework, which first emerged in the 1960s, contributed to the literature on information, particularly beginning with the idea of information as commodity, it is not discussed here. The knowledge-based society carries a very broad definition of knowledge, which includes science, technology, innovation and education. References to information *per se* are mainly to information and communication technologies, and the framework is concerned with a lot more than information, and in this sense cannot be strictly identified as a framework on information. See B. Godin (2008), *The Knowledge Economy: Fritz Machlup's Construction of a Synthetic Concept*, in R. Viale and H. Etzkovitz (eds.), *The Capitalization of Knowledge: A Triple Helix of University-Industry-Government*, Edward Elgar, Forthcoming; B. Godin (2006), *The Knowledge-Based Economy: Conceptual Framework of Buzzword?*, *Journal of Technology Transfer*, 31 (1), pp. 17-30.

information was the means to get science policy considerations into the organization, an organization not very hot on dealing with science at the time.⁸ Science policies did not yet exist, and there was reluctance to look at a “cultural” good (science) from an economic point of view. The Working Party was concerned mainly with productivity, but also dealt with the exchange of scientific and technical information between countries, particularly from the USSR, and set up a network of national centers for scientific and technical information. After two years, a Committee on Scientific and Technical Matters was finally set up that continued this work, and others. However, it was left to the European Productivity Agency, a body of the OEEC created in 1953, to conduct the first survey on scientific and technical information. In 1955, under the coordination of the British Central Office of Information, the Agency conducted an international inquiry on the use made of scientific and technical information by more than 2,000 small and medium firms in five industries.⁹ Although the literature was the main method identified for keeping abreast of information, the study found that contact with suppliers was the primary source for solutions to industrial problems.

Then, in 1961, the OECD was created with a mandate focused on policies. Whereas its predecessor had operational responsibilities, the new organization was oriented toward helping member countries establish policies in many fields, among them science and technology. A Directorate for Scientific Affairs was set up, supported by committees composed of national delegates (see Appendix 2). It was in this Directorate that information policies came to be discussed, first of all at the Committee for Scientific Research.

⁷ Organization for European Economic Co-Operation.

⁸ A. King (1992), *The Productivity Movement in Post-War Europe*, mimeo, p. 5-6.

⁹ EPA (1958), *Technical Information and the Smaller Firm: Facts and Figures on Practices in European and American Industry*, Paris; EPA (1959), *Technical Information and Small and Medium Sized Firms: Methods Available in Europe and the United States, Numbers and Facts*, Paris. The survey was followed by

The Ad Hoc Group on Scientific and Technical Information (1962)

In 1962, the OECD Committee for Scientific Research produced the first reflections of the organization on scientific and technical information policy.¹⁰ Echoing work conducted elsewhere in the Directorate for Scientific Affairs on research¹¹ and on education,¹² the document looked at information from an economic point of view: information as an economic asset. To the Committee, economic growth depended on scientific research and “the effective and rapid transmission of research results”. The exchange of scientific and technical information concerned scientists themselves, but also transfer to the general public, which “is still not sufficiently science-conscious”, and to industry. Scientists, the public, and industry were thus identified as the three targets of an information policy, particularly industry: “The constant growth of scientific knowledge demands a closer liaison between science and industry than ever before. Information is the pipeline through which discoveries and facts reach the technologist and engineer, as well as managers and skilled workers”.¹³

To the committee, the problem of scientific and technical information was the vast volume and dispersion of scientific and technical output, hence the increasing need for fast and reliable abstracting and indexing services, and networks of communication centers. However, “the task of coping with the increasing volume and complexity of material is too great to be handled efficiently by individual countries. Therefore, the OECD needs to encourage and stimulate coordination among Member countries”.¹⁴ To this end, the Committee recommended the creation of an *ad hoc* group on scientific and technical information.

another one in 1960 concerned with suppliers of information: EPA (1960), *Technical Services to the Smaller Firm by Basic Suppliers: Case Studies of European and American Industry*, Paris.

¹⁰ OECD (1962), *The Function of OECD in the Field of Scientific and Technical Information*, SR(62)25.

¹¹ OECD (1962), *Economics of Research and Development*, SR(62)15.

¹² OEEC (1960), *Investment in Education and Economic Growth*, Paris; OECD (1962), *Policy Conference on Economic Growth and Investment in Education*, Paris.

¹³ *Ibid*, p. 3.

¹⁴ *Ibid*, p. 5.

The main task of the group, over the first years of its existence, was conducting reviews of information centers, facilities and exchanges in industrial sectors like ceramics and glass, shipbuilding, fuel and heat processes, textiles, pharmaceuticals, electronics and electrical engineering.¹⁵ Then, in 1965, a more policy-oriented approach was suggested. “Most of the attention devoted by governments, or by national or international organizations to the problems of scientific and technical information has been detailed and piecemeal”,¹⁶ commented the Committee for Scientific Research. The OECD itself had worked mainly on information for industry with its sectoral reviews of facilities. Until then, “a scientific and technical information policy [was understood as] directed towards bridging the gap between science and industry”.¹⁷ Now, the OECD was suggesting a “breath of approach”: the organization should concentrate on the study of national information systems, and its links to science and economic policies.¹⁸ Information policy was defined as including “any aspect of government intervention in the management of national scientific and technical information matters”.¹⁹

The Ad Hoc Group on Information Policy (1965)

At the suggestion of the American delegate, the Committee for Scientific Research created an *ad hoc* group on scientific and technical information policy. To the OECD, “scientific and technical information plays an integral part not only in the conduct of research and development but also in their application, as a factor in the innovation process. The significance of this is, of course, widely realized and many countries are already paying special attention to improving the flow of information. However, the magnitude of the costs involved raises important problems for government”.²⁰

¹⁵ OECD (1964), Sectoral Reviews of Scientific and Technical Information Facilities: Policy Note, SR(64)38.

¹⁶ OECD (1965), Ad Hoc Group for Scientific and Technical Information Policy, SR (65) 51, p. 2.

¹⁷ OECD (1962), The Function of OECD in the Field of Scientific and Technical Information, op. cit., p. 2.

¹⁸ OECD (1965), Sectoral Review of Scientific and Technical Information, SR(65)15.

¹⁹ OECD (1966), Résumé of the Principal Action Resulting from the London Meeting, Held on 21st and 22nd March, 1966, DAS/CSI/66.74. See also: OECD (1966), Scientific and Technical Information and the Policies of Governments: Revised Synopsis, DAS/CSI/66.298, p. 4.

²⁰ OECD (1965), Ad Hoc Group for Scientific and Technical Information Policy, op. cit., p. 2.

To the OECD, the problem with scientific and technical information was twofold. First, there was what the organization called the information explosion (other terms used were information deluge, information confusion, and information chaos) (see the list below). To the OECD, “the number of scientists and the amount they publish are increasing dramatically. More than 50,000 scientific journals are published regularly, containing more than a million scientific articles (...). The situation is complicated further by the presence of an unknown but increasing (and increasingly important) number of unpublished reports (...). Hence the problem: to tame and organize this growing mass of words and paper into a form that facilitates the transfer of the information”.²¹

OECD Vocabulary

Computer Revolution	Information Deluge	Information Economy
Information Age	Information Explosion	Information Society
Information Gaps	Information Chaos	Network Society
Awareness Gap	Information Confusion	Digital Economy
	Information Pollution	
	Information Overload	
	Overabundance of Information	

The second part of the problem with information was technologies. Although “the computer provides the only possible means of bringing order out of the information chaos”,²² the proliferation of information systems suggests the danger of an uncoordinated development: “A variety of local and national services have sprung up in particular fields to solve particular tactical problems (...).²³ However, “the uneven development of the new systems in different countries is leading to a potential information gap”.²⁴ Therefore, “the development of a coherent system and a strategy is

²¹ OECD (1966), *Scientific and Technical Information and the Policies of Governments: Revised Synopsis*, op. cit., p. 2.

²² OECD (1967), *Scientific and Technical Information Systems and Policies*, DAS/SPR/67.109, p. 7.

²³ OECD (1966), *Scientific and Technical Information and the Policies of Governments: Revised Synopsis*, op. cit., p. 2.

²⁴ OECD (1967), *Scientific and Technical Information Systems and Policies*, op. cit., p. 2.

needed, and only governments have the breadth of responsibility and resources to attempt this”.²⁵ The OECD thus called for the development of national information policies where, “in each Member country, there should be one [and only one] office charged with the overall responsibility” of coordinating information development nationally.²⁶ For its part, the OECD should provide members with an “international mechanism to promote co-ordination and agreement in establishing comprehensive and compatible information systems”.

Briefly stated, the rhetoric on scientific and technical information at OECD was threefold: 1) there is an information explosion; 2) new technologies can help bring order; 3) but there is need for a common approach (system compatibility and standards) and a single body in member countries for national policy. “Failure to take such a co-ordinating action, besides the certainty of wasteful duplication of resources, will mean increased costs, reduced efficiency, delayed application and, above all, information gaps”.²⁷

The first step toward an OECD program of work was collecting information on international organizations active in the field,²⁸ and the different national systems of scientific and technical information, with indications on the flow of funds and sums of money.²⁹ Reviews of national information policies were also initiated.³⁰ The next step was developing statistics for policy-makers.

The Economics of Information Panel (1965)

During its very first meeting in 1965, the *ad hoc* group for information policy decided to set up a panel of experts on the economics of information.³¹ The group argued that data in the field were at present notoriously deficient, among them on inventory of national

²⁵ OECD (1966), *Scientific and Technical Information and the Policies of Governments: Revised Synopsis*, op. cit., p. 2.

²⁶ *Ibid*, p. 5. This recommendation would be reiterated at the third ministerial meeting on science in 1968.

²⁷ OECD (1967), *Scientific and Technical Information Systems and Policies*, op. cit., p. 12.

²⁸ OECD (1965), *Information Activities of Some Major International Organizations*, SR(65)52.

²⁹ OECD (1966), *Organigrammes des systèmes nationaux d'information*, DAS/CSI/66.81.

³⁰ Canada (1970), Ireland (1972), Switzerland (1973), Spain (1973), Germany (1975).

³¹ OECD (1966), *The Economics of Information*, DAS/CSI/66.173.

information facilities, their cost and effectiveness. Already in 1963, the national delegates to the Committee for Scientific Research asked for a study on money devoted to scientific and technical information,³² to be conducted in close liaison with the research and development (R&D) survey, as conventionalized in the OECD methodological manual known as the Frascati manual.³³ Now, such economic studies were judged essential “for the efficient allocation of the national information budget”. “The task given to [the Economics of Information] panel is to provide, for these people (especially in government) who have to take decisions in the field of information, the economic elements which should form an important part of the bases for these decisions”.³⁴ A plan of action was drafted in 1966,³⁵ centered around two main components: 1) identifying the processes by which information is transferred from research to users and measuring cost and effectiveness, 2) developing standards on data to be collected. To the OECD, the unit of information for measurement was defined as “a scientific article, an abstract or a report”, and the studies’ suggested coverage was all sectors of the economy: government, higher education, industry, non profit.

The Secretariat recommended that governments give high priority to the task of measuring scientific and technical information and offered proposals for a specific survey “to supply governments with a solid statistical foundation on which to build their national

32 OECD (1963), Minutes of the 7th Session, SR/M (63) 2. Once finalized, the survey would be transferred to the statistical division of the Directorate for Scientific Affairs, and its results provide a chapter in the biennial report on R&D.

33 OECD (1962), The Measurement of Scientific and Technical Activities: Proposed Standard Practice for Surveys of Research and Experimental Development, DAS/PD/62.47. The Frascati manual is a methodological document aimed at national statisticians for collecting data on R&D. It proposed standardized definitions, classifications and a methodology for conducting R&D surveys. The Frascati manual essentially developed three sets of guidelines. Firstly, norms were proposed for defining science as “systematic” research and demarcating research from other activities so these other activities could be excluded: research/related scientific activities, development/production, research/teaching. Secondly, the manual suggested classification of research activities according to 1) the sector that finances or executes the research: government, university, industry or non-profit organizations and, in relation to this latter dimension, 2) the type or character of the research, which is either basic, applied or concerned with the development of products and processes, 3) the activities classified by discipline in the case of universities (and non-profit organizations), by industrial sector or product in the case of firms, and by functions or socioeconomic objectives in the case of governments. Finally, the manual suggested a basic statistic as an indicator for policy purposes.

34 OECD (1967), Scientific and Technical Information Policy Group: Summary Record of the 7th Meeting Held in Paris on 26th and 37th June, 1967, RC (67) 15, p. 15.

35 OECD (1966), Plan of Action, DAS/CSI/66.209.

policy”.³⁶ Until then, “several countries had expressed reluctance to make available figures of national expenditure on information, because of the lack of accepted definitions”.³⁷ As a consequence, a model survey was sketched with the aim of complementing “the data obtained by means of the R&D survey. The purpose was to show the relationship between research costs and information costs and served as a basis for a study of cost/effectiveness ratios of information facilities”. Data to be collected were:³⁸

- Total resources allocated to scientific and technical information.
- Allocation of resources by economic sectors (business, government, non-profit, higher education).
- Distribution of resources by type of activity: publication and distribution, information and documentation services, symposia and audio-visual media, R&D in information.
- Services: function, resources, equipment, staff.
- Manpower employed by major professional categories.

To conduct this work, two studies were contracted. One to H. Paschen from the Heidelberg Studiengruppe für Systemsforschung for measuring the resources devoted to scientific and technical information (manpower and money), based on the model for R&D (Frascati manual), and another to J. Wolfe from Edinburgh University on cost/effectiveness ratios of information services.

The task proved difficult. After two years of work, the OECD concluded that the compilation of data on manpower and money devoted to scientific and technical information had been harder than originally imagined: there was little experience for guidance, the field was vast, the transfer of information followed diverse routes, services

36 OECD (1968), Survey of Scientific and Technical Information Activities, DAS/SPR/68.35, p. 2.

37 OECD (1967), Scientific and Technical Information Policy Group: Summary Record of the 7th Meeting Held in Paris on 26th and 37th June, 1967, RC (67) 15, p. 5.

38 OECD (1968), Survey on Scientific and Technical Information Activities, op. cit., p.5.

were extremely diversified and therefore difficult to locate and classify, few countries (but the United States) possessed agencies which could provide information. Several national delegates criticized the first draft of a questionnaire (produced by the German Studiengruppe) because it seemed to them too detailed, answers difficult to find, and “not certain how far these would have a direct bearing on government decisions”.³⁹ The Information Policy Group also “expressed its anxiety that progress seemed to be slow in the two studies, and that the Studiengruppe questionnaire seemed complex to the point that it might be difficult to apply in practice”.⁴⁰

The panel on the economics of information thus suggested a limited list of basic data for collection (see Appendix 3).⁴¹ The Information Policy Group decided to continue with the cost/efficiency ratio study of Wolfe,⁴² but gave priority to a methodological manual and recommended that some countries test the methodology.⁴³ The manual was finalized in 1969.⁴⁴ It proposed a definition of scientific and technical information as R&D results and their applications, and defined scientific and technical information activities as “those involved in the transfer of scientific and technical information to the users”. They include “all management, administrative, and operational efforts directed to the planning, support, control, performance, and improvement of the functions or tasks which deal with the processing, handling and communication of scientific and technical information”. Having defined scientific and technical information and its activities, the manual identified four specific classes of scientific and technical information activities: 1) recording, 2) editing, revising, translating, etc. 3) distribution (including conferences), 4) collection, storage, processing, and 5) acquisition. The manual recommended surveying institutions involved in activity 4. Finally, the manual proposed classifications

³⁹ OECD (1968), Scientific and Technical Information Policy Group: Summary Record of the 9th Meeting Held in Paris on 17th and 18th July, 1968, RC(68)15, p. 16.

⁴⁰ OECD (1968), Scientific and Technical Information Policy Group: Summary Record of the 9th Meeting, RC (68) 15, p. 6.

⁴¹ OECD (1969), Information Statistics and Policy: The Next Steps, DAS/STINFO/69.10.

⁴² Finalized in 1971. See: J. Wolfe (1971), The Economics of Technical Information Systems: A Study in Cost-Effectiveness, DAS/STINFO/71.17.

⁴³ OECD (1969), Economics of Information Progress Report and Plan for Future Action, DAS/STINFO/69.25.

⁴⁴ OECD (1969), Proposed Standard Practice for Surveys of Scientific and Technical Information Activities, DAS/STINFO/69.9.

for money and manpower involved in these activities (breakdown by economic sector,⁴⁵ discipline, aim or function, institution size, information system used, and type of user), methodological guidelines and model questionnaires.

**Transfer Institutions Surveyed
According to the OECD Draft Manual
on Scientific and Technical Information**

Library
 General
 Special
 Technical
Document Center
Archives
Documentation Center
Abstract Service
Technical Information Center
Information Evaluation Center
Data Center
Referral Center
Clearinghouse

The manual was tested in several countries, and vehemently criticized at a meeting held in Oslo in 1971.⁴⁶ The manual was qualified as too complicated and too clumsy and not providing governments with basic statistical data to formulate a scientific and technical information policy.⁴⁷ In fact, many countries preferred to go with their own version of a questionnaire. The Scientific and Technical Information Policy Group concluded on the

⁴⁵ With regard to the industrial sector, it was suggested excluding radio and television because “little scientific and technical information is transferred”. Despite the recommendation, this industry would be included in the measurements of the 1970s.

⁴⁶ OECD (1972), Notes on the Meeting of Countries Collecting Statistics on Resources Devoted to STI, DAS/STINFO/72.22.

⁴⁷ OECD (1973), Collection of Statistical Data on STI, DAS/SPR/73.94; OECD (1973), Economics of Information: Summary Record of an ad hoc meeting held in Paris on 5th and 6th November, 1973, DAS/STINFO/73.18.

“lack of realism of the methodology proposed. An overall approach similar to that of the R&D surveys is practically unattainable”, but serves only as a starting point.⁴⁸

By 1973, the panel on the economics of information itself concluded that the draft manual was “only an example: it should be modified for use, in the light of national needs”. It also added that data on manpower and money do not provide all the data needed. Other indicators should be identified and defined.⁴⁹ “Before fixing on a methodology, it is necessary to identify the essential data and to define the indicators that are needed”.⁵⁰ A steering group was thus created in 1974 to “identify the minimum data needed by countries to manage their information policies”⁵¹ and a first meeting was held in October.⁵² A list of elementary statistics, some of them already collected in member countries, was drawn up on financial resources, manpower, information produced and used, computers and communications, and users (see Appendix 4).

In the end, the two instruments – the methodological manual and the list of indicators – were never used to measure scientific and technical information at the OECD.⁵³ Two factors explained the failure of the organization in measuring scientific and technical information. The first, and most important, was the absence of a conceptual framework to guide statisticians. Whereas other measurement exercises conducted in the Directorate were based on a framework that helped orient the collection of statistics, namely the highly popular accounting framework,⁵⁴ statistics on information at the OECD were entirely driven by a rhetoric on the information explosion. The rhetoric relied on findings

⁴⁸ OECD (1972), Notes on the Meeting of Countries Collecting Statistics on Resources Devoted to STI, op. cit., p. 6.

⁴⁹ OECD (1973), Economics of Information: Summary Record of an ad hoc meeting held in Paris on 5th and 6th November, 1973, op. cit.

⁵⁰ Ibid., p. 3.

⁵¹ OECD (1974), Statistics, Time Series and Indicators for Scientific and Technical Information, DAS/STINFO/74.16.

⁵² OECD (1974), Steering Group on Indicators for STI: Summary Record of the first meeting of the Group Held on 24th and 25th October, 1974, DAS/STINFO/74.28.

⁵³ A second manual was also envisaged on costs/effectiveness, but never developed. See: OECD (1975), STINFO: Summary Record of the 24th Meeting, DSTI/STINFO/75.19, p. 6; STINFO: Summary Record of the 25th Meeting, DSTI/STINFO/75.33, p. 7.

like those of D. D. S. Price on the exponential growth of literature,⁵⁵ and the emerging literature on the management of scientific publications,⁵⁶ of which the British left-wing scientist J. D. Bernal was an active advocate.⁵⁷ To Bernal, the system of scientific publications “was an enormous and chaotic structure”,⁵⁸ and a centralized institute was much needed. To Price, science was “near a crisis” because of the proliferation and superabundance of literature,⁵⁹ a monster as he called it.⁶⁰ “Some radically new technique must be evolved if publication is to continue as a useful contribution”.⁶¹ The Information Policy Group listened and flirted with a European clearinghouse as a single point of entry through which documents passed, discussed a network of referral centers, and contracted studies on specialized information systems (physics, chemistry, medicine, social sciences). However, framed as it was, the issue was entirely concerned with science and scientists, not technology and innovation.⁶² It was not enough to construct relevant and meaningful statistics for policies: measuring the stock of information and its

⁵⁴ The framework was already used at OECD in studies on R&D, where the surveys were aligned with the System of National Accounts by way of the Frascati manual, and studies on education, which relied on the then-new theory on human capital.

⁵⁵ D. D. S. Price (1951), *Quantitative Measures of the Development of Science*, *Archives internationales d'histoire des sciences*, 5, pp. 85-93; D. D. S. Price, (1956), *The Exponential Curve of Science*, *Discovery*, 17, pp. 240-243; D. D. S. Price (1961), *Science since Babylon*, New Haven: Yale University Press; D. D. S. Price (1963), *Little Science, Big Science*, New York: Columbia University Press. In 1971, the OECD commissioned a study on forecasting growth in scientific and technical information (see G. Anderla (1973), *Information in 1985: A Forecasting Study of Information Needs and Resources*, Paris: OECD) which served as a basis for a workshop held in 1973, in which Price participated (see OECD (1974), *Information in 1985: Notes on a Workshop Held in Paris, 101-12 December 1973*, DAS/STINFO/74.2).

⁵⁶ The first important conferences on the subject were: Royal Society (1948), *The Royal Society Scientific Information Conference: Reports and Papers Submitted*, London: Royal Society; National Academy of Sciences (1959), *Proceedings of the International Conference on Scientific Information*, Two volumes, Washington: National Academy of Sciences.

⁵⁷ J.D. Bernal (1939) [1973], *The Social Function of Science*, Cambridge (Mass.): MIT Press, pp. 292-308; J.D. Bernal (1948), *Provisional Scheme for Central Distribution of Scientific Publications*, in *Royal Society, The Royal Society Information Conference*, op. cit., pp. 253-258.

⁵⁸ *Ibid.* p. 117. This is the first occurrence in the literature of the term chaos in this context.

⁵⁹ D. D. S. Price (1961), *Science since Babylon*, op. cit., p. 124.

⁶⁰ *Ibid.*, p. 104.

⁶¹ Price, D. D. S. (1956), *The Exponential Curve of Science*, op. cit., p. 524.

⁶² However, it gave rise to a literature on information flows in R&D and, later, technology transfer. Pioneering studies were: Bureau of Applied Social Research (1958), *The Flow of Information Among Scientists: Problems, Opportunities, and Research Questions*, report prepared for the NSF, Columbia University; T. J. Allen (1966), *Performance of Information Channels in the Transfer of Technology*, *Industrial Management Review*, 8, pp. 87-98; D. G. Marquis and T. J. Allen (1966), *Communication Patterns in Applied Technology*, *American Psychologist*, 21, pp. 1052-1060; T. J. Allen (1969), *The Differential Performance of Information Channels in the Transfer of Technology*, in W. H. Gruber and D. G. Marquis (eds.), *Factors in the Transfer of Technology*, Cambridge (Mass.): MIT Press, pp. 137-154.

growth was only peripherally related to the needs of policy-makers...and those of an economic organization (the OECD).

The second factor at the origin of the failure was the fuzziness of the concept of information itself. To mathematicians and physicists,⁶³ biologists,⁶⁴ and economists,⁶⁵ to name just a few disciplines, information means different things, and is often a metaphor. In his pioneering work titled *The Production and Distribution of Knowledge in the United States* (1962), F. Machlup tried to make sense of the concept and distinguished knowledge from information with the verb form: “to *inform* is an activity by which knowledge is conveyed; to *know* may be the result of having been informed”.⁶⁶ One is a process, an activity, while the other is a state, a result. But, added Machlup, “information as that which is being communicated becomes identical with knowledge in the sense of that which is known”. Machlup therefore recommended, whenever possible, the use of

⁶³ N. Wiener (1948), *Cybernetics: Or Control and Communication in the Animal and Machine*, Cambridge (Mass.): MIT Press; C. E. Shannon (1948), *The Mathematical Theory of Communication*, Bell System Technical Journal, 27 (3-4), pp. 379-423; C. E. Shannon and W. Weaver (1949), *The Mathematical Theory of Communication*, op. cit. N. Wiener (1950), *The Human Use of Human Beings: Cybernetics and Society*, Boston: Houghton Mifflin.

⁶⁴ H. Quastler (1953), *Essays on the Use of Information Theory in Biology*, Urbana: University of Illinois Press; J. D. Watson and F. Crick (1953), *Genetical Implications of the Structure of Deoxyribonucleic Acid*, *Nature*, 171, pp. 964-967. For a contemporary debate on the information and biology, see the paper from J. Maynard Smith and comments from K. Sterelny, P. Godfrey-Smith, and S. Sarkar in *Philosophy of Science*, 67 (2) 2000, pp. 177-218.

⁶⁵ On information as knowledge in economics, see: F. Hayek (1937), *Economics and Knowledge*, *Economica*, 4, pp. 33-54; F. Hayek (1945), *The Use of Knowledge in Society*, *American Economic Review*, 35 (4), pp. 519-530; F. Hayek (1978), *Competition as a Discovery Procedure*, in *New Studies in Philosophy, Politics, Economics and the History of Ideas*, London: Routledge, pp. 179-190; G. J. Stigler (1961), *The Economics of Information*, *Journal of Political Economy*, LXIX (3), pp. 213-225; J. E. Stiglitz (1974), *Information and Economic Analysis*, in M. Parkin and A. R. Nobay (eds.), *Current Economic Problems*, Cambridge: Cambridge University Press, pp. 27-52; J. E. Stiglitz (1985), *Information and Economic Analysis: A Perspective*, *Economic Journal*, 95, pp. 21-41; K. J. Arrow (1962), *Economic Welfare and the Allocation of Resources for Invention*, in NBER, *The Rate and Direction of Inventive Activity*, Princeton: Princeton University Press, pp. 609-625; K. J. Arrow (1973), *Information and Economic Behavior*, Lecture Given at the 1972 Nobel Prize Celebration, Stockholm: Federation of Swedish Industries; K. J. Arrow (1974), *Limited Knowledge and Economic Analysis*, *American Economic Review*, 64, pp. 1-10; K. J. Arrow (1979), *The Economics of Information*, in M. L. Dertouzos and J. Moses (eds.), *The Computer Age: A Twenty-Year View*, Cambridge (Mass.): MIT Press, pp. 306-317; K. E. Boulding (1966), *The Economics of Knowledge and the Knowledge of Economics*, *American Economic Review*, 56 (1-2), pp. 1-13; J. Marschak (1968), *Economics of Inquiring, Communicating, Deciding*, *American Economic Review*, 58 (2), pp. 1-18; J. Marschak (1974), *Economic Information, Decision and Prediction*, Dordrecht: Reidel.

⁶⁶ F. Machlup (1962), *The Production and Distribution of Knowledge in the United States*, Princeton: Princeton University Press, p. 15.

the word knowledge.⁶⁷ However, his suggestion did not resolve the issue: in the following decades, every measurement exercise that followed Machlup's footsteps used either the term information or knowledge interchangeably.

At the OECD, early measurements of information had two characteristics. First, information was limited to scientific and technical information, and second, information was measured as documentation. This was a rather restrictive definition compared to Machlup's five classes of information or knowledge: practical, intellectual, entertainment, spiritual, unwanted.⁶⁸ Defined as knowledge, the measurement of information included, to Machlup: education, R&D, media of communication (documentation, including audio-visual media), and information machines and services. Machlup's measurement was based on a policy-oriented framework, namely an accounting framework, using the System of National Accounts' classes and data to estimate money and manpower devoted to information activities. This was a far cry from OECD work on scientific and technical information and its specific surveys. From 1969 on, there had been frequent suggestions from national delegates to redirect the then-current work of the OECD statisticians.⁶⁹ The malaise was only partly understood and only partly explicit, and the critics had little success.

The OECD was not alone in experiencing limited success in measuring scientific and technical information. UNESCO was another organization that left the field after some preliminary work. In its efforts to extend the range of science and technology indicators in order to better cover developing countries' activities, UNESCO drafted a methodological guide for measuring scientific and technical information and documentation (STID). The guide was tested in seven countries, and published in a provisional version in 1984.⁷⁰ It was based on a study written for UNESCO in 1979 by

⁶⁷ Ibid, p. 8.

⁶⁸ Ibid., pp. 21-22.

⁶⁹ OECD (1969), Draft Proposals for a Change in the Orientation of the Programme of the Working Panel on the Economics of Information, DAS/STINFO/69.27; OECD (1969), Proposed Developments in the Programme of the Working Panel on Management/Economics of Information, DAS/STINFO/69.45; OECD (1971), New Activities in Management and Economics of Information, DAS/STINFO/71.27.

⁷⁰ UNESCO (1984), Guide to Statistics on Scientific and Technological Information and Documentation (STID), ST-84/WS/18, Paris.

D. Murphy from the Irish National Science Council.⁷¹ The guide defined scientific and technical information and documentation as “the collection, processing, storage and analysis of quantitative data concerning information activities (...)”. To UNESCO, the principal items to be measured were the institutions and individuals performing these activities, the amount of financial resources and physical facilities available, and the quantity of users. Three types of respondents were identified for surveying: 1) producers, 2) collectors, processors and disseminators, and 3) users. The first stage of measurement was to collect information on the second type of institutions only, namely:

- specialized libraries and centers,
- national libraries and libraries of higher education, referral centers,
- editing, publishing, printing, consulting and advisory services and enterprises.

In the end, UNESCO never collected data on information. In fact, few countries were interested in these activities. Measuring R&D remained the priority. A meeting of experts on the methodology of collecting data on scientific and technical information and documentation activities was held in 1985 to assess the lessons learned from the pilot surveys. It was reported that the activities were not deemed all that important or urgent, that the purpose for measuring them was not obvious, and that there were difficulties in interpreting the definition.⁷²

Both the OECD and UNESCO were preceded in their efforts by another organization: the US National Science Foundation (NSF). The NSF, a pioneering agency in this field that produced work which greatly influenced the OECD,⁷³ abandoned a similar methodology after twenty years of data collection. From its very beginning in the 1950s, the NSF

⁷¹ D. Murphy (1979), *Statistics on Scientific and Technical Information and Documentation*, PGI-79/WS/5, Paris: UNESCO.

⁷² UNESCO (1985), *Meeting of Experts on the Methodology of Data Collection on STID Activities*, 1-3 October 1985, Background Paper, ST-85/CONF.603/COL.1, Paris, pp. 26-29.

⁷³ The ad hoc group on scientific and technical information (1962) was chaired by B. W. Adkinson from the NSF. The ad hoc group on information policy (1965) was created at the suggestion of the US delegate. The NSF approach (definition and list of scientific and technical information activities) was adopted as a model by both the German Studiengruppe and the steering group on indicators.

conducted regular surveys of R&D, among them on government research. The results were published in a document titled *Federal Funds for Science*.⁷⁴ R&D data included “other scientific activities” (later called related scientific activities), as did most surveys conducted at the time in other countries. But these activities were not separated from R&D activities. Then in 1958, the NSF published *Funds for Scientific Activities in the Federal Government*.⁷⁵ The publication was, among other things, a re-analysis of the 1953-54 data. Scientific activities were presented as being broader than R&D alone, and were defined as the “creation of new knowledge, new applications of knowledge to useful purposes, or the furtherance of the creation of new knowledge or new applications” (no page number). The activities were broken down into seven classes, the first three defining R&D and the last four defining “other scientific activities”: R&D, planning and administration, plant, data collection, dissemination of scientific information, training, testing and standardization. It was estimated that “other scientific activities” amounted to \$199 million, or 7.8% of all scientific activities. Of these, data collection was responsible for nearly 70%, and information 6.5%, but the latter was said to be largely underestimated by a factor of at least three.

Subsequent editions of *Federal Funds for Science* (renamed in 1964 as *Federal Funds for R&D and Other Scientific Activities*) thereafter included data on scientific and technical information, and, for a shorter period, general-purpose data collection. Over time, detailed sub-classes were developed for each of these categories, reaching a zenith in 1978 when scientific and technical information alone had four subclasses, which were in turn subdivided into eleven other subclasses:⁷⁶

⁷⁴ National Science Foundation (1953), *Federal Funds for Science*, Government Printing Office: Washington.

⁷⁵ National Science Foundation (1958), *Funds for Scientific Activities in the Federal Government*, Fiscal Years 1953 and 1954, NSF-58-14, Washington.

Scientific and Technical Information
According to NSF (1978)

Publication and distribution

- Primary publication
- Patent examination
- Secondary and tertiary publication
- Support of publication

Documentation, reference and information services

- Library and reference
- Networking for libraries
- Specialized information centers
- Networking for specialized information centers
- Translations

Symposia and audiovisual media

- Symposia
- Audiovisual media

R&D in information sciences

The NSF stopped collecting data on “other scientific activities” with the 1978 edition of *Federal Funds*. Why did NSF abandon the measurement of scientific and technical information activities? The first reason has to do with the magnitude of the activities. Over the period 1958-1978, the surveys reported that information and data collection represented only about 1% to 2% of federal government scientific activities. A survey of such a low volume of activities was not considered worth the effort.⁷⁷

It was not worth the effort considering that, secondly, the NSF began publishing *Science Indicators (SI)* in 1973.⁷⁸ Everyone applauded the publication, including Congress and

⁷⁶ National Science Foundation (1978), *Federal Funds for R&D and Other Scientific Activities: Fiscal Years 1976, 1977, 1978*, NSF-78-300, Washington.

⁷⁷ A survey on scientific and technical information in industry was also planned as early as 1964 but was never, to the best of my knowledge, conducted. In 1961, however, the NSF conducted the first survey on publication practices in industry. See: NSF (1961), *Publication of Basic Research Findings in Industry, 1957-59*, NSF 61-62, Washington.

⁷⁸ National Science Board (1973), *Science Indicators: 1972*, Washington: NSF.

the press. Among the indicators that soon appeared in *SI* for measuring science and technology were what were considered to be good statistics on scientific information – at least as far as the United States was concerned: counting publications, or bibliometric indicators. The NSF's Division of Science Information had commissioned three studies “to develop and initiate a system of statistical indicators of scientific and technical communication”. One dealt with measuring scientific and technical information activities in the traditional sense (expenditures, products and services offered by libraries), plus some indicators on publications (growth of literature, citations).⁷⁹ The other two focused on bibliometrics exclusively.⁸⁰ This last option prevailed at the NSF.

Such was the fate of the early measurements of information in public organizations. In the following decades, the measurement of scientific and technical information activities (manpower and money) was limited to very few countries in their survey of government R&D. Measuring information as documentation became the province of bibliometricians, whereas official statisticians were totally absent as producers of data, but were (reluctant) users. The revival of the measurement of information at the OECD was due to a factor external to the organization: an accounting framework developed by the American M. U. Porat from Stanford University.

The Information Economy

In 1977, Porat, in collaboration with M. R. Rubin, published a nine-volume study titled *The Information Economy* as part of work done for the US Department of Commerce and its Office of Telecommunications.⁸¹ Porat took the information economy for granted, and did not really develop a rationale for studying it. His aim was simply to measure it.

⁷⁹ King Research Inc. (1976), *Statistical Indicators of Scientific and Technical Communication: 1960-1980*, three volumes, Washington: NSF. Some of the statistics from the report were included in NSF (1977), *Science and Engineering Indicators: 1976*, Washington, pp. 59-63.

⁸⁰ F. Narin (1976), *Evaluative Bibliometrics: The Use of Publications and Citation Analysis in the Evaluation of Scientific Activity*, Report prepared for the NSF, New Jersey: Computer Horizons Inc.; National Federation of Abstracting and Indexing Services (1975), *Science Literature Indicators Study*, Report prepared for the NSF, Philadelphia: National Federation of Abstracting and Indexing Services.

⁸¹ M. U. Porat and M. R. Rubin (1977), *The Information Economy*, Office of Telecommunications, US Department of Commerce, Washington.

Porat took for granted the fact that the United States has evolved “from an economy that is based primarily in manufacturing and industry to one that is based primarily in knowledge, communication and information”.⁸² To Porat, the rationale for studying the information economy had already been offered by F. Machlup,⁸³ D. Bell,⁸⁴ and P. Drucker,⁸⁵ and Porat acknowledged his debt to these authors: “Most of the basic insights and concepts motivating this study were established in Fritz Machlup’s groundbreaking book on the knowledge industries. [Machlup] provides an empirical backdrop to subsequent work by Daniel Bell, Peter Drucker and others”.⁸⁶

To Porat, “information is data that have been organized and communicated. The information activity includes all the resources [capital and labor] consumed in producing, processing and distributing information goods and services”.⁸⁷ Defined as such, information covered all kinds of information, not only scientific and technical information: “The end product of all information service markets is knowledge. An information market enables the consumer to know something that was not known beforehand: to exchange a symbolic experience; to learn or relearn something; to change perception of cognition; to reduce uncertainty; to expand one’s range of options; to exercise rational choice; to evaluate decisions; to control a process; to communicate an idea, a fact, or an opinion”.⁸⁸

To Porat, measuring information was a difficult task, because information is not a sector *per se* but an activity: “Information is not a homogeneous good or service such as milk or iron ore. It is a collection or a bundle of many heterogeneous goods and services that

⁸² M. U. Porat (1977), *The Information Economy*, volume 1, Office of Telecommunications, US Department of Commerce, Washington, p. 1.

⁸³ On Fritz Machlup, see: B. Godin (2008), *The Knowledge Economy: Fritz Machlup’s Construction of a Synthetic Concept*, op. cit.

⁸⁴ D. Bell (1973), *The Coming of Post-Industrial Society: A Venture in Social Forecasting*, New York: Basic Books.

⁸⁵ P. Drucker (1968), *The Age of Discontinuity: Guidelines to Our Changing Society*, New York: Harper and Row.

⁸⁶ M. U. Porat (1977), *The Information Economy*, op. cit., p. 44.

⁸⁷ *Ibid*, p. 2.

⁸⁸ *Ibid*, p. 22.

together comprise an activity”.⁸⁹ To measure the information economy, Porat used an accounting framework, as first suggested by Machlup, aggregating different industrial classes into an information field. However, there existed, according to Porat, significant methodological differences between Machlup’s approach and the one set forth in his work. Porat used value-added instead of final demand, and separated information into two sectors: primary (production) and secondary (consumption).⁹⁰

Porat calculated two estimates, one for each sector, and added them to get a total value of information in the economy. The primary information sector was defined as composed of eight broad categories of industries (see Appendix 5) corresponding to many specific industrial classes,⁹¹ and was constructed from the System of National Accounts data and its derived input-output tables. Porat estimated that the information sector grew from around 18% of national income in 1929 to 25.1% in 1967.⁹² He also estimated the information workers involved in this activity. Using a typology consisting of five broad classes of workers (see Appendix 6) and constructed from occupational classes from the US Bureau of Labor Statistics, Porat estimated that the information sector increased from less than 10% of all of the workforce in 1860 to over 40% in 1970 and 53% of all labour income.⁹³ With regard to the secondary information sector (which included information services produced by non-information firms and public organizations and consumed internally), Porat used the Bureau of Labor Statistics classification of occupations, computing that it amounted to 21% of GNP in 1967.⁹⁴ Overall, for the two sectors combined, the information economy amounted to 46% of GNP and 53% of labour income in the United States. These were the numbers that astonished the OECD bureaucrats.

⁸⁹ Ibid, p. 2.

⁹⁰ Ibid, p. 44. This kind of separation of activities in statistics was anticipated by Fritz Machlup. See F. Machlup (1962), *The Production and Distribution of Knowledge in the United States*, op. cit., p. VI.

⁹¹ Ibid, pp. 27-28.

⁹² Ibid, p. 65.

⁹³ Ibid, p. 119.

The Working Party on Information, Computer, and Communications Policy (1976)

The concept of an information economy and its accounting provided the OECD with a solution to the recurrent problem of defining information and imagining a field of action. In fact, from 1969 on, several review groups were set up to formulate recommendations and to reorient the work of the organization toward what was called an integrated approach to information, namely looking at more horizontal issues like management, economics, legal aspects and education.⁹⁵ Progress was slow, and information lacked recognition within the Committee for Scientific Affairs.⁹⁶

Then, in February 1975, the OECD held a conference on Computers and Telecommunications Policy. The idea of a conference was first proposed in 1973 to look at the development of computer and telecommunication technologies and their role (or promise) as a “key industry”. The objectives of the conference were to understand the economic and social implications of new technologies, identify policies, and promote international cooperation.⁹⁷ The conference took notice of a structural transition from an industrial society to a post-industrial society with a strong service economy that is basically information-oriented. Such was the message from E. B. Parker from Stanford University in a communication to the conference, with a contribution from Porat.⁹⁸ To the OECD, such structural change in the economy required new tools for rational management, namely for the allocation of resources. But there was a lack of statistics and indicators to this end.⁹⁹

⁹⁴ Ibid, p. 154.

⁹⁵ OECD (1971), *Information for a Changing Society*, Paris, known as the Piganiol report; OECD (1971), *Report of the Ad Hoc Group on Information, Computer and Communication*, SP(71)19, known as the Whitehead report; OECD (1973), *Report of the Coordination of the Information Policy Group, the Computer Utilization Group, and Related Activities on Information, Computer, and Communication*, SPT(73)6; OECD (1973), *Information Technology: Some Policy Issues for Governments*, SPT(73)7; OECD (1976), *Task Force on Information, Computer and Communication Policy Programme*, SPT(76)7; OECD (1976), *First report of the Ad Hoc Group on Information, Computer, Communication Policy*, SPT(76)25.

⁹⁶ OECD (1972), *STINFO: Summary Record of the 18th Meeting*, DASA/STINFO/72.37; OECD (1975), *A New Approach*, DSTI/CUG/75.25, p. 15.

⁹⁷ OECD (1973), *Conference on Computers/Telecommunications Policies: Alternatives for Policy Makers*, DAS/SPR/73.105.

⁹⁸ E. B. Parker (1975), *Social Implications of Computer/Telecommunications Systems*, DSTI/CUG/75.1.

⁹⁹ OECD (1975), *Conference on Computers and Telecommunications Policy*, SPT(75)3.

In order to participate in the new economy, the Secretariat thus suggested a new approach to work. It recommended a horizontal approach or framework to information.¹⁰⁰ Here, it meant defining more clearly the information sector and its contribution to GDP, trade and employment by way of accounting and input-output matrices, as Parker and Porat suggested. In 1976, the OECD Committee for Science and Technology Policy (CSTP) (formerly Directorate for Scientific Affairs) thus created a Working Party on Information, Computer, and Communications Policy (ICCP).¹⁰¹ The Working Party integrated work conducted in different groups, among them the Information Policy Group.¹⁰² According to the then-director of the Directorate for Science, Technology, and Industry, D. Beckler: “One of the objectives of this new body would be to define new interrelationships between the various components of this field”, i.e.: develop an integrated approach.¹⁰³ The group started as a Working Party, and became a Committee in 1982.¹⁰⁴

The first thing the Working Party did was develop a project on the “information economy” (*sic*) entitled *Macro-Economic Analysis of Information Activities and the Role of Electronic, Telecommunications and Related Technologies*, first sketched in 1973. The aim of the project was to analyze and quantify information activities, assess their growth and innovation potential, and investigate the socio-economic consequences.¹⁰⁵ According to the Working Party, “the rapid development and diffusion of advances in electronics (micro-electronics, micro-processors, the computer-on-a-chip) and

¹⁰⁰ OECD (1975), *Information, Computer, Telecommunications: A New Approach to Future Work*, DSTI/STINFO/75.22.

¹⁰¹ OECD (1976), *Draft Mandate of the ICCP Group*, SPT(76)40; OECD (1977), *Final Mandate of the Working Party on Information, Computer and Communications Policy*, DSTI/ICCP/77.58.

¹⁰² As well as the Computer Utilization Group, created in 1969, and a Panel on Information Technology and Urban Management. A Panel on Data Bank continued on its own for few more years.

¹⁰³ OECD (1977), *Draft Summary Record of the First Session*, DSTI/ICCP/77.17, p. 2.

¹⁰⁴ In 1978, the Secretariat General’s budget proposal suggested elevating the status of the group to a Division in the Directorate for Science, Technology and Industry. See OECD (1978), *Draft Summary Record of the Fourth Session*, DSTI/ICCP/78.30, p. 3. Then, in 1980, the French delegate, supported by several countries, proposed that a committee be set up (on the “informatization of society”). See OECD (1980), *High Level Conference on Information, Computer and Communication Policies for the 1980s*, DSTI/ICCP/80.38, p. 34.). In 1981, the CSTP proposed elevating the Working Party to a Committee. The Working Party became a Committee on its own (no longer attached to the Committee on Science and Technology Policy) in 1982.

¹⁰⁵ OECD (1977), *Macro-Economic Analysis of Information Activities and the Role of Electronic, Telecommunications and Related Technologies*, DSTI/ICCP/77.5.

telecommunications (broadband cable, satellites, laser) and related physical technologies such as optical and video systems, are becoming of critical importance for the industrialized countries. Indeed, it is argued that these technologies are an emerging national resource and thus the basis for further economic and social development”.¹⁰⁶ Above all, “advanced information technologies promise to introduce productivity increases for most information goods and services and contribute to overall productivity of an economy”.¹⁰⁷ It was no longer the information explosion that guided the efforts of the OECD, but rather technologies and the “technological revolution”.

Hierarchy of Bodies at OECD



The project proposed to identify and measure the consequences of the information sector on economic growth (productivity and value-added), changes in employment (transition from an industrial to an information society, automation, division of labour) and determine whether there was “concentration of these technologies and relevant industries within a few countries only”.¹⁰⁸ The general objective was to find empirical evidence for the emerging “information economy”, and to suggest policies. To the OECD,

¹⁰⁶ Ibid, p. 3.

¹⁰⁷ Ibid, p. 4.

¹⁰⁸ Ibid, p. 7.

technological policies would have to be “distinct from the past where the simple desire to promote prestige projects and/or the “technological gap” argument was often justification enough to provide resources”.¹⁰⁹ Four major sub-projects were proposed: estimate the size and growth of the information sector, study the innovation potential of the technologies, develop indicators of economic, industrial and social impacts, and offer policy guidance and strategies.

According to the Working Party, the design and methodology of the studies should rely on a macro-economic analysis of information activities. To this end, the project needed clear definitions and, above all, an empirical approach that started at the micro-level – the company – not a theoretical approach like input-output matrices as these were qualified as too global with a too-high degree of aggregation. “This requires considerably more than the exploitation of existing measurement and analysis techniques”.¹¹⁰ An expert group was thus suggested to support this work.

The group of experts was established by the Committee for Science, Technology and Industry in 1977,¹¹¹ and the first meeting held in March that same year.¹¹² An action plan followed.¹¹³ To the expert group, what one observes is a “transition from industrial economies towards a post-industrial society, where the relative importance of industrial production (in the classical sense) and the size of the labor force employed in this sector is diminishing while the processing of large volumes of information for the management of our increasingly complex society is quantitatively and qualitatively gaining momentum”.¹¹⁴ These transformations suggested a need for a new terminology and a definition of the information sector. This sector, however, cuts across all sectors of the economy and is difficult to measure. Following Porat, “the Group recommends work to extract the information sector from the conventional labor force statistics and national

¹⁰⁹ Ibid, p. 8.

¹¹⁰ Ibid, p. 12.

¹¹¹ OECD (1977), Mandate of the Group of Experts on Economic Analysis of Information Activities and the Role of Electronic, Telecommunications and Related Technologies, DSTI/ICCP/77.37.

¹¹² OECD (1977), Working Party on ICCP: Draft Summary Report, DSTI/ICCP/77.17.

¹¹³ OECD (1977), Preliminary Project Outline, Terms of Reference and Action Plan, DSTI/ICCP/77.33.

¹¹⁴ Ibid, p. 1.

accounts”, plus micro-economic studies of specific industrial sectors.¹¹⁵ The action plan was approved at the second meeting of the group of experts in June 1977.¹¹⁶ At that meeting, Porat was invited to summarize his work and present a practical guide, or cookbook as he called it, for building the information sector’s accounts.¹¹⁷ For its part, the Secretariat proposed guidelines for measuring the sector, based on Porat’s work.¹¹⁸ A questionnaire was then sent to countries on the availability of the statistics required to construct a “Porat type” analysis.

The next meeting (December 1977) studied the guidelines proposed,¹¹⁹ particularly in light of the report by a consultant, S. Wall (University of Cambridge, UK), who looked at national data available for conducting a “Porat type” analysis.¹²⁰ Wall’s conclusions were that “few countries have a convenient and detailed single source of data as yielded by the United States input-output worktape. Even Porat had to carry out a considerable amount of search. (...) In the case of studies seeking to replicate Porat’s work, the conclusion must be drawn that national researchers need to engage in a considerable amount of search activity”.¹²¹ Still, some immediate work was possible using existing nomenclature: information occupations might reasonably be extracted, and measurement from the national accounts of the sector’s value-added was feasible, for the marketed goods and services at least. Wall then presented a program of work separating responsibilities among different countries for a final report to be finished in less than a year (October 1978). Members of the group agreed.

¹¹⁵ Ibid, p.2 .

¹¹⁶ OECD (1977), Draft Summary Record of the Second Session, DSTI/ICCP/77.39.

¹¹⁷ M. U. Porat (1977), Building a Primary and Secondary Information Sector: A National Income Accounts Manual, DSTI/ICCP/77.26. See also: M. U. Porat (1978), Policy Uses of a Macroeconomic Model of the Information Sector and of Microeconomic Production Functions, DSTI/ICCP/78.18.

¹¹⁸ OECD (1977), Definitions and Data to Build Information Sector Accounts, DSTI/ICCP/77.40. The final guidelines can be found in OECD (1978), Work Programme for Deriving Comparative Information Sector Statistics, DSTI/ICCP78.4.

¹¹⁹ OECD (1978), Draft Summary Record of the Third Session, DSTI/ICCP/78.3

¹²⁰ S. Wall (1977), A Preliminary Analysis of Country Replies to Questionnaire, DSTI/ICCP/77.52.

¹²¹ OECD (1978), Draft Summary Record of the Third Session, DSTI/ICCP/78.3, p. 5.

The results were presented at the *High Level Conference on ICCP for the 1980s*, and published in two volumes in what was known as the Red ICCP reports series in 1981.¹²² A major question, reported the document, “was to know whether these changes [information economy] occurred only in the United States or whether they constituted a more general trend”.¹²³ According to the OECD, “there [was] increasing concern in Europe about the so-called “information gap” between Europe and the United States”.¹²⁴ Nine countries for which data were available were studied.¹²⁵ Using Porat’s typologies, method and classifications, the OECD estimated that the primary sector of information amounted to 20.3% of total value-added, and that over a third of professions were concerned with information. Furthermore, 30% of trade in manufacturing goods was concerned with information commodities. To the OECD, the data confirmed that a structural change was happening in OECD economies: a progressive shift toward an information economy, at least on the supply side (production of goods and services). On the demand side, however, “consumption of information goods and services is still playing a fairly minor role in the budget of the average household”.¹²⁶

The Group of Experts on ICC Statistics (1982)

The exercise on the information economy proved difficult.¹²⁷ According to the OECD, “the methodological problem stems from the fact that ICC activities have to be considered as an object of study *per se* whereas general statistics pay them no special attention”.¹²⁸ “The current system of national accounts emphasizes older, mature or even declining economic activities and provides only little information on emerging new industries and new employment. The decision on what constitutes a major “industry” was made in the 1930s. This explains why agriculture and extracting industries are major

¹²² OECD (1981), *Information Activities, Electronic and Telecommunications Technologies: Impact on Employment, Growth and Trade*, Paris.

¹²³ *Ibid.*, p. 3.

¹²⁴ OECD (1978), *Draft Summary Record of the Fourth Session, DSTI/ICCP/78.30*, p. 3.

¹²⁵ Germany, Austria, Canada, United States, Finland, France, Japan, United Kingdom and Sweden.

¹²⁶ OECD (1981), *Information Activities, Electronic and Telecommunications Technologies*, op. cit., p. 12.

¹²⁷ See chapter 2 of OECD (1981), *Information Activities, Electronics and Telecommunications*, Volume 2, Paris.

¹²⁸ OECD (1982), *Proposal for the development of a statistical system in the field of information, computer and communications, DSTI/ICCP/82.25*, p. 1.

industries. By contrast, digital computers which did not exist when the classification schemes were set up, appear as part of the non-electrical machinery group. Microprocessors do not have a code at all (...), software is not mentioned either”.¹²⁹ For these reasons, “it proved almost impossible to collect data on the growth of what was called the “information sector. It was only possible to extract from official sources a limited number of data on employment, output growth and trade in IT goods and services to plot rough trends (...). These trends were much questioned and indeed were too weak for policy analyses and policy formulations”.¹³⁰

The difficulties were discussed at length on several occasions at the OECD.¹³¹ In 1982, the OECD Secretariat thus proposed to the Working Party on ICCP a statistical program and the creation of an *ad hoc* group of experts on statistics.¹³² To the Secretariat, “the post-World War II period was characterized by sustained innovation, particularly in the fields of electronics. In order to better encompass and monitor the structural changes, improved statistical concepts and data bases are needed, as well as a quantitative framework to better analyze and evaluate the importance of emerging changes related to the use of the new technology”. The Secretariat proposed the development of a conceptual framework for collecting statistical data and a methodology for assessing the impact of information, computer, and communications (ICC) technologies on the economy. The framework was built around three levels by which information technology enters the economy: production of components, systems, and use. The methodology consisted of developing a series of indicators based on internationally-agreed classifications,¹³³ and used an input/output model to measure the diffusion of technologies.

¹²⁹ OECD (1984), Proposed Scope of Project on ICC-Statistics, ICCP (84) 6, p. 3.

¹³⁰ Ibid., p. 4. An expert group on transborder data flows experienced similar problems. See: OECD (1979), Note on Approaches to the Quantification of Transborder Flows of Non-Personal Data, DSTI/ICCP/79.10; OECD (1979), Transborder Flows of Non-Personal Data: Questionnaire, DSTI/ICCP/79.18; OECD (1979), Replies to Questionnaire on Flows of Non-Personal Data, DSTI/ICCP/79.49.

¹³¹ At the 1980 conference where the report on the information economy was first presented, and again in October 1981 at a special session of the Working Party on Information Technology, Productivity and Employment which produced OECD (1982), Information Technology, Productivity and Employment, DSTI/ICCP/82.11. Published in 1981, in the Red ICCP series, as report no. 5.

¹³² OECD (1982), Information Technology Statistics: Draft Study Design, DSTI/ICCP/82.13.

¹³³ R&D, supply of skilled labour, trade flow, ICC intensity (products, services, employment) by industrial sector, investment, household expenditures, stocks of products, new companies.

At its 11th Session (April 1982), the national delegates endorsed an exploratory activity on ICC statistics based on the Secretariat's proposal. The Working Party called for a meeting of experts and users of statistics to study the required methodology. The first meeting, convened to develop "a coherent and reliable statistical database in the ICC field", was held in September 1982. The suggested data collection would cover information goods, services and impacts (diffusion). Two tasks were identified.¹³⁴ The first was developing a framework for statistics; the second, collecting data for immediate use for policy-makers and other Working Parties, in line with the 1981 study on measuring the information economy.

The Secretariat thus prepared a detailed proposal and submitted it to the *ad hoc* group.¹³⁵ The document reiterated that measurement should enable the measuring of trends in the field of information and impacts on economic variables such as growth, employment, consumption, investment and trade. It proposed 1) a statistical information system that would allow tracking of the ICC field based on a few simple indicators constructed from existing statistics for immediate use; 2) setting up a think tank within the OECD to develop "a methodological guide playing a similar role for this field to that of the Frascati Manual for research and development". Then the document proposed a definition of the ICC field as consisting of five parts (electronic components, electronic equipment, communication systems, network and computer system management services, and information services) and suggested a preliminary series of indicators.¹³⁶ The aim of the statistics and indicators would be to analyze production and utilization by way of input-output tables to "show how the ICC field products (goods and services) are used by other industries to make final products".

¹³⁴ OECD (1982), *Ad Hoc Meeting of Experts on Statistics on ICC: Draft Summary Record*, DSTI/ICCP/82.41.

¹³⁵ OECD (1982), *Proposal for the Development of a Statistical System in the Field of Information, Computer and Communications*, DSTI/ICCP/82.25.

¹³⁶ Production (market volume/GDP, import rate, export rate, degree of foreign penetration, degree of concentration), utilization (users' expenditures in relation to industry and field), environment.

The next meeting of the group (June 1983) started defining the program of work, based on an updated plan submitted by the Secretariat.¹³⁷ The document suggested a new definition of ICC as composed of two sectors, plus context, or environment: information (ICC-1), in the sense of documentation, and its production and distribution (ICC-2): hardware, software, networks and systems. Indicators were suggested as follows

ICC-1

- Volume and value
- Trade (imports and exports)
- Costs of production
- Stocks

ICC-2

- Production and market
 - Value
 - Market
 - Labour
 - Investments
 - Stocks
- Use
 - Expenditures by type of user
 - National expenditures
 - Labour

ICC-3

- Environment
 - R&D
 - Patents
 - Technological Balance of payment
 - Public Expenditures on R&D

This division of the information field into sectors was adopted by the experts. The Secretariat's programme of work was also adopted, centered around three points: 1) updating previously-collected statistics like those of the report on measuring the information economy, 2) working on a selected series of indicators for immediate use (6 months), and 3) initiating long-term work on ICC-1 and a manual (18-24 months).

A few months later, after the October 1983 meeting, the scope of the program was redefined. "A choice must be made", stated the Secretariat, "between a total revision of

¹³⁷ OECD (1983), Plan de travail pour l'élaboration de statistiques relatives à l'information, à

the existing system and the more limited approach of collecting indicators relevant to the ICC field (...). While the total approach remains a long-term objective, it has been decided to concentrate on a modular approach".¹³⁸ Clearly stated, the OECD was abandoning the idea of a manual, and suggested preparing guidelines for a classification of the ICC field and developing indicators on the basis of existing statistics or ad-hoc surveys.

In 1984, the Committee on ICCP (formerly the Working Party) initiated the implementation of the program of development on ICC indicators. A few months later, the Secretariat insisted again on collecting immediate statistics: "In the recent past, the ICCP Secretariat has made a number of proposals (...). At the three meetings held, it was argued that the scope and dimensions presented in these proposals were too ambitious, in particular given the amount of human and financial resources available in the ICCP Secretariat".¹³⁹ To the Secretariat, "preparing a Frascati-type manual might prove too time and resource consuming and might result in too rigid a system".¹⁴⁰ Therefore, a "pragmatic" approach was proposed that "does not require the creation of entirely new classifications, but rather suggests building on the foundations of existing statistics".¹⁴¹ The programme of work suggested making little effort on ICC-1 but rather concentrating on ICC-2.¹⁴²

To a certain extent, the program produced results. As preliminary work, an inventory of available and planned national statistics on ICC was conducted,¹⁴³ and an analysis of

l'informatique et aux communications, DSTI/ICCP/83.13.

¹³⁸ OECD (1984), Proposed Scope of Project on ICC-Statistics, ICCP (84) 6, p. 4.

¹³⁹ OECD (1985), Draft Scope and Structure for ICC Statistics, DSTI/ICCP/85.57, p.3.

¹⁴⁰ Ibid, p. 4.

¹⁴¹ Ibid, p. 5.

¹⁴² Recommendations were made for concentrating on only five classes of goods (electronic components, data processing equipment, office equipment, industrial electronics, telecommunications) and the corresponding services (including software), on limiting the measurement of environment to its technological component, and prioritizing statistics on trade (because they allow tracking of products, and because trade was identified as the main issue in debates on information technology as well as for the Committee).

¹⁴³ Available in OECD (1985), Australian Proposal for a Work Programme for the Development of a Manual of ICC Statistics, DSTI/ICCP/85.49, pp. 33s.

current classifications and databases was performed.¹⁴⁴ Statistics on the information economy were updated,¹⁴⁵ and a pilot survey on the production and trade of goods and services was conducted,¹⁴⁶ evaluated,¹⁴⁷ and followed by two more data collections.¹⁴⁸ Data on trade were also extracted from the OECD Foreign Trade database.¹⁴⁹

However, it was the manual that interested the expert group most. Impatient, some members of the group pointed out in 1988 that “it was necessary to give it priority over data collection” which is usually out-of-date and deficient.¹⁵⁰ The idea of a manual was originally suggested by the Australian delegate to the ICCP High Level Ministerial Meeting in 1980,¹⁵¹ and integrated into the early programme on ICC statistics in 1982, then abandoned. In 1985, at the same meeting where the programme of work based on the Secretariat’s paper was adopted, Australia submitted a discussion paper summarizing the current position reached within the group of experts on ICC statistics and outlined a list of tasks to be undertaken, culminating in a workshop in September 1987 to review and finalize a draft version of the manual.¹⁵² The Australian document started as follows: “Lack of ICC data is something of a paradox, given the rapidly increasing importance of the storage and retrieval of information to support so many aspects of the workings of sophisticated industrialized countries”. Therefore, “the development of a manual for ICC

¹⁴⁴ OECD (1985), An Inventory of ICC-Related Data Available at OECD, DSTI/ICCP/85.50. The analysis revealed that current classifications (on industries – STIC – and on trade – STIC) were not sufficiently detailed and did not cover the whole field of ICC activities: ISIC was last revised in 1968; STIC was better because it was product-oriented, but did not cover software.

¹⁴⁵ OECD (1984), Update of Information Sector Statistics, ICCP (84) 19. Published as OECD (1986), Trends in the Information Economy, Paris. Four new countries participated: Australia, Denmark, Norway and New Zealand.

¹⁴⁶ OECD (1986), Draft Questionnaire on ICC-Based Goods and Services, DSTI/ICCP/86.4.

¹⁴⁷ OECD (1988), Questionnaire on ICC-Based Goods and Services: An Evaluation of the Results, DSTI/IP/88.7.

¹⁴⁸ OECD (1989), Results of the Mini-Survey on ICC Goods, DSTI/IP/89.5; OECD (1989), Revised Questionnaire, DSTI/IP/89.6. All in all, three data collection exercises were conducted (the database covered 1982-1989; data for the years 1986 and 1989 include services).

¹⁴⁹ OECD (1985), Trade in ICC-Related Products and Systems as Reported in the OECD Trade File, DSTI/ICCP85.52. See also: OECD (1989), Report of the ICC Trade Database, DSTI/IP/89.7; OECD (1990), The Treatment of International Trade in Services in National Statistical Surveys, DSTI/IP/90.7.

¹⁵⁰ OECD (1988), Group of National Experts on Statistics for ICC: Summary Record, ICCP (88) 19, p. 4.

¹⁵¹ OECD (1980), Statistics for ICCP: An Australian Action Paper, DSTI/ICCP/80.26; and Intervention of J. D. Bell in OECD (1980), High Level Conference on Information, Computer and Communications Policies for the 1980s, Annex, DSTI/ICCP/80.38, pp. 61-62.

¹⁵² OECD (1985), Australian Proposal for a Work Programme for the Development of a Manual of ICC Statistics, DSTI/ICCP/85.49.

statistics is seen as the most critical component of further work within the OECD in this field of statistics”.¹⁵³ The aim of the manual was to provide a conceptual framework, practical guidelines, and a basis for international statistical comparisons, “as with the Frascati manual for research and development”.¹⁵⁴

To this end, the Australian document discussed options for framing the measurement: a set of policy issues, as identified previously by the Secretariat (see Appendix 7)¹⁵⁵ and organized around three broad categories (supply, application, and winners and losers), or an economic-oriented framework on trade, production and investment.¹⁵⁶ The proposal then analyzed the options available for defining the field of ICC and its boundaries: using Porat’s primary and secondary sectors, or the OECD definition of ICC-1 and ICC-2. Finally, the document recommended organizing the statistics to be collected¹⁵⁷ into categories (supply, demand, population, labour, infrastructure, others). The document emphasized that “it is clear that modifications of a number of major international classifications will be a critical determinant of ICC data availability”.¹⁵⁸ It would have to relate the statistics to the System of National Accounts and other structural data in order “to understand the impact of ICC activities on the structure and performance of the economy as a whole”.¹⁵⁹ The manual would also make recommendations on methodologies: guidelines for special surveys designed specifically to collect ICC data, and procedures for deriving indicators from available statistics.

As discussed above, the Secretariat rejected the idea of a manual in 1985. Then, in 1988, the Secretariat re-examined the Australian proposal and suggested creating a small group of national experts to produce what it called an “interim” manual. “While the aim [of a manual] remains valid, it has become clear that the proposal needs to be reinterpreted in

¹⁵³ Ibid, p. 6.

¹⁵⁴ Ibid, p. 6.

¹⁵⁵ OECD (1983), Policy Issues to Define the Scope of the Project, ICCP (83) 9; OECD (1984), ICC Statistics Project, ICCP (84) 20.

¹⁵⁶ As in OECD (1985), 1986 Work Program Proposal, ICCP (85) 4.

¹⁵⁷ Those suggested in OECD (1984), Update of Information Sector Statistics, op. cit.

¹⁵⁸ OECD (1985), Australian Proposal for a Work Programme for the Development of a Manual of ICC Statistics, op. cit., p. 15.

¹⁵⁹ Ibid., p. 18.

the light of a number of factors”.¹⁶⁰ These factors were, firstly, the continued resource constraints that favour more modest alternatives like using existing sources of data, adding questions to existing surveys, and a minimal set of guidelines. The second factor was progress made in the last few years in the revision of international classifications. The Secretariat suggested “the development of a basic manual of concepts and practical guidelines for the collection of ICC data primarily through the addition of new questions to existing surveys, but also the reworking of existing data sources”.¹⁶¹ To the Secretariat, the manual should carry “a strong economic performance and structural adjustment perspective, reflecting the primary concern of policy makers”.¹⁶² This meant that the framework should evolve around the pattern of ICC innovation and diffusion (growth and structural change) and its economic impacts.¹⁶³ From an indicators point of view, three broad policy goals were suggested: innovation and production (what goods and services are produced, their importance – output, employment, trade – industries, market structure, investments), diffusion (demand, patterns of use within industries, investments), and environment (climate, infrastructure, impact on productivity, employment, competitiveness and trade).

These were only the first recommendations of the Secretariat. The paper continued as follows: “it is probable that the problem [of defining the boundaries of what constitutes ICC goods and services] has been overemphasized. In general, policy issues tend to be fairly narrowly focused on a limited range of ICC goods and services in relation to the economics of just one or a few sectors: the growing use of computers in financial business services, for example, or the nexus between new telecommunications technologies and regulation in the industry. For such analyses, a precise global definition of the ICC sector as a whole is unnecessary. There are few policy issues that need to address the entire sector. It is only in calculating the contribution of ICC as a whole to global GDP or employment that the question of a global boundary becomes important”.

¹⁶⁰ OECD (1988), Revised Proposal for the Development of a Manual for ICC Statistics, DSTI/IP/88.9, p. 2.

¹⁶¹ Ibid, p. 2.

¹⁶² Ibid, p. 5.

¹⁶³ Ibid, p. 3.

¹⁶⁴ Because “the focus of policy is almost exclusively on those ICC goods and services based on new computer or telecommunications technologies”, the interim manual should focus on 1) defining the ICC-2 sector alone, not ICC-1, and deal with the goods and services of major interest, 2) link these definitions to corresponding international classifications, 3) provide guidelines for existing surveys or for conducting ad-hoc surveys.

In sum, the manual was to be developed in three stages: define the scope and structure of the field, establish detailed definitions and concepts, and develop methodologies. The meeting of experts on ICC statistics in June 1988 decided to go ahead with drafting “an interim manual on the model of the Frascati manual”, ¹⁶⁵ “aimed to be a comprehensive framework which would help the compilation of internationally comparable statistics”. ¹⁶⁶ The committee recommended that a consultant be engaged to draft the outline of the manual in line with the revised proposal from the Secretariat for an interim manual. This was qualified as an “acceptable balance between the desirability of a clear conceptual framework accompanied by the appropriate definitions and recommendations for standard practices and the need to make rapid progress on a balanced programme of data-collection and methodological work”. ¹⁶⁷

The plan and timetable for the manual were discussed and approved. As a first step, a discussion paper was prepared by R. Staglin and R. Filip-Kohn from the German Institute for Economic Research (DIW) and presented to experts in May 1989. ¹⁶⁸ The paper had the structure of a manual, with sections dealing with aim and scope, basic definitions and conventions, statistics, collection and interpretation, and survey procedure, and it identified major issues for discussion and choices to be made. The Secretariat also produced a paper of the same type based on both his previous note for an interim manual and the German paper. ¹⁶⁹ In it, we find expressed clearly the understanding of the

¹⁶⁴ Ibid, p. 5.

¹⁶⁵ OECD (1988), Group of National Experts on Statistics for ICC: Summary Record, ICCP (88) 19, p. 1.

¹⁶⁶ OECD (1990), Draft Summary Record of the Fourth Session, DSTI/ICCP/M (90) 2, p. 11.

¹⁶⁷ OECD (1988), Group of National Experts on Statistics for ICC: Summary Record, op. cit., p. 5.

¹⁶⁸ OECD (1989), Detailed Discussion Paper on a Proposed Interim ICC2 Manual, DSTI/IP/89.11.

¹⁶⁹ OECD (1989), A Framework for an Interim ICC Manual, DSTI/IP/89.10.

Secretariat with regard to the manual. The interim nature of the manual meant that it was an *initial* standard practice methodology for reworking *existing* data for *immediate* use. The manual was defined as “an intermediate stage toward the longer term goal of a full manual”.¹⁷⁰ To the Secretariat, a full manual would have to go beyond the scope of the System of National Accounts, deal with socio-economic indicators, and cover other indicators like economic climate or environment (regulatory and tax environment, investment climate standards, skill level of the workforce, foreign ownership, degree of competition, etc.) and social aspects.¹⁷¹ It would have to deal with both private sources and specific surveys. Briefly stated, it would have a broader coverage of variables, measurement units and sources. Actually, the interim manual was to 1) use a list-based approach to defining the field (list of products from the Central Product Classification or CPC used for trade statistics) with correspondence to other classifications of industrial activities and occupations, 2) restricted to marketed production (ICC-2), 3) adding questions to existing surveys, 4) framed within the System of National Accounts.

Both drafts were discussed by the group of experts in detail in May 1989. The meeting gave tasks to five volunteering countries for drafting different parts of the manual.¹⁷² The countries reported back for the next meeting of experts (April 1990).¹⁷³ This was the last meeting of the group. Although a revised schedule for the production of the manual was adopted – Spring 1991 at the latest – the manual would never be completed. The Secretariat informed the group that “the ICC statistical programme was not universally supported in the Directorate for Science, Technology and Industry nor, apparently, among Member governments and that the continuation of the programme would be re-examined in the context of a) its perceived relevance and potential usefulness to the programme of work of the ICCP committee and b) the review of the whole statistical programme of the Directorate for Science, Technology and Industry to be carried out in

¹⁷⁰ Ibid, p. 4.

¹⁷¹ “Though social questions are of undoubted importance, given the limited aims of the present proposal the focus will be on economic issues alone”. OECD (1988), Revised Proposal for the Development of a Manual for ICC Statistics, op. cit., p. 3.

¹⁷² OECD (1989), Meeting of Volunteer Experts on an Interim ICC Statistics Manual, DSTI/IP/89.8.

¹⁷³ OECD (1990), Ad Hoc Group of Experts on Statistics for ICC: Summary Record, ICCP (90) 15.

the context of the Technology-Economy Programme (TEP)".¹⁷⁴ To the then-head of the ICCP Division, "the speed of the innovation push of the sector meant that it was difficult for official statistics to keep up [and] that the group was in a difficult competitive situation with respect to trade associations and private consultants (...). Maybe 10 years hence the field might have stabilized but for the moment it was extremely difficult to create and maintain up-to-date official statistics in the ICC area (...). The sector is a lot different from that of R&D statistics, which is more aggregated (Frascati manual)".¹⁷⁵ The director concluded that "it was arguable whether the ICC statistics manual was really useful" due to rapid change in the field.¹⁷⁶ Later during the meeting, he mentioned that data required for analytical purposes were indicators like value-added networks, information technology-usage indicators, telecommunication costs to users, and trade in ICC services and telecommunications equipment, but several of the indicators were criticized by the group.

The statistical database on ICC trade in goods was frozen in 1990,¹⁷⁷ statistical work was incorporated into other programmes of work within the Directorate, namely the Group of Experts on Science and Technology Indicators (NESTI) and the Industry Committee,¹⁷⁸ and the interim manual was shifted to low-priority. The ICC statistics programme was "no longer considered relevant from the point of view of its timeliness and focus".¹⁷⁹

In the history of the OECD, this was the second failure of a statistical program on information, and of a manual – the first was on information as knowledge. The failure is surprising since, according to the OECD itself, "many countries [were] looking to the OECD for further work in this field",¹⁸⁰ since the work of the Working Party on ICCP and ICC statistics in general had received increased attention from other OECD

¹⁷⁴ Ibid., p. 2.

¹⁷⁵ Ibid, p. 2.

¹⁷⁶ Ibid.

¹⁷⁷ The database was criticized for the sparseness of the data and the classifications used (not adapted to the developments in the field). OECD (1992), Activities of the OECD Sectoral Groups and Working Parties Relating to Services Statistics, DSTI/STII/IND/WP9 (92) 10.

¹⁷⁸ OECD (1990), A Draft Medium Term Plan for the Work of the STIID, DSTI/IP (90) 22.

¹⁷⁹ OECD (1991), Summary Record of the Meeting of Experts on the Consequence of the TEP Indicators Conference, DSTI/STII/IND/STP (91) 2.

¹⁸⁰ OECD (1981), Draft Summary Record of the 9th Session, DSTI/ICCP/81.6, p. 3.

Committees (Trade, Industry, Multinational Enterprises),¹⁸¹ and since the Secretariat worked to strengthen the ICCP Division and broaden the scope of the Statistics groups to serve other divisions of the DSTI, namely Industry as well as Science and Technology Policy.¹⁸² The causes of this failure were threefold. The first is methodological. The task of constructing an information sector account was too complex for the time: the field was evolving rapidly and no standardized classification was available. The scope of the project was too large and countries had no adequate statistics. The second factor responsible for the failure relates to the method of work, or to the expert group itself. The OECD explicitly refused to set up a standing working party,¹⁸³ preferring an informal expert group. Progress was slow and dynamism lacking, and the ICCP Committee never hesitated to comment on this.¹⁸⁴ There was also reluctance in the group to work with other units of Directorate. While a single division for statistical work was created in 1987 within the Directorate, the Committee itself did “not favor the creation of [a] joint Working Party” (ICCP, Science and Technology, Industry).¹⁸⁵ Third, as discussed in the next section, other perspectives on measurement became available that proved more attractive.

The Information Society

After Porat, the work on information at the OECD was conducted according to a concept of information as a commodity, or industrial activity: information is a good or service, produced by many industries, consumed by other industries, and measured with accounting statistics (economic activities of sectors). Information was no longer restricted to science and technology, but concerned all sectors of the economy. At the OECD, such an orientation was in the air as early as 1970. The third ministerial meeting on science in 1968 invited the OECD to reinforce its action on information policies, and proposed setting up an *ad hoc* policy group to advise on future actions. The group, headed by P.

¹⁸¹ OECD (1980), Draft Summary Record of the 7th Session, DSTI/ICCP/80.12, p. 3.

¹⁸² OECD (1984), Draft Summary Record of the Fifth Session, ICCP/M (84) 2, p. 17.

¹⁸³ OECD (1983), Summary Record of the Second Session, ICCP/M(83)1, p. 10.

¹⁸⁴ OECD (1986), Meeting of Experts on Statistics for ICC: Summary Record, DSTI/ICCP/86.15, p. 3.

¹⁸⁵ OECD (1986), Draft Summary Record of the Eighth Session, ICCP/M (86) 1, p. 10.

Piganiol, produced its report in 1970.¹⁸⁶ Echoing the Brooks report on science and technology,¹⁸⁷ the group suggested integrating information policy into R&D policy, and extending the focus from information for scientists to transfers to government and non-specialists.¹⁸⁸ As a consequence, the Information Policy Group passed from the Committee for Scientific Research to the Committee for Science Policy in 1970. In the following years, several reviews of OECD activities in the field were conducted which urged closer co-ordination between the different expert groups, and a new mandate was proposed to the Information Policy Group in 1974.¹⁸⁹

A second shift in the use of the concept of information occurred in the 1990s. As we have seen, the first shift was from information as knowledge to information as commodity or industrial activity. Now, it was information technology *per se* that came to interest policy-makers and statisticians and to define what information is.¹⁹⁰ With regard to technology specifically, the reorientation goes back to Porat once again. In concluding his report, Porat focused on technology: “we are just on the edge of becoming an information economy. The information technologies – computers and telecommunications – are the main engines of this transformation”.¹⁹¹ “No portion of the US economy is untouched by information technology”.¹⁹² To Porat, “information policy attends to the issues raised by the combined effects of information technologies (computers and telecommunications) on market and non-market events”.¹⁹³ Porat then suggested a policy framework and

¹⁸⁶ OECD (1971), *Information for a Changing Society*, *op. cit.*

¹⁸⁷ OECD (1970), *Information for a Changing Society: Some Policy Considerations*, DAS/STINFO/70.30. Published as OECD (1971), *Science, Growth, and Society: A New Perspective*, Paris.

¹⁸⁸ This argument was first offered in 1967 by the US delegate and submitted to the third ministerial meeting: “Information for scientific research may be far too narrow (...). The Information Policy Group might do well to broaden its scope to examine all those resources that serve the economic development and welfare of the countries. See OECD (1967), *Scientific and Technical Information Group: Summary Record of the 7th Meeting Held in Paris on 26th and 27th June, 1967*, RC (67) 15, p. 10.

¹⁸⁹ OECD (1974), *The Information Policy Group: History, Programme and Mandate*, DAS/STINFO/74.7.

¹⁹⁰ Indeed, the Committee for Scientific Affairs had changed its name in 1972 to the Committee for *Scientific and Technological Policy*.

¹⁹¹ M. U. Porat (1977), *The Information Economy*, *op. cit.*, p. 204.

¹⁹² *Ibid.*, p. 207.

¹⁹³ *Ibid.*

identified policy issues based on flows of information technology into society: production, application, impact.¹⁹⁴

Information technology was also the main focus of the OECD's rhetoric on the information economy, as expressed in the work on ICC statistics. Yet the measurement did not revolve around technologies and specific surveys but, as with Porat, on information sectors and accounting. In the 1990s, however, information as technology came to define the core of the ICCP program of work. The new conception did not replace entirely the previous ones. All three conceptions of information overlapped. As we have seen, information as knowledge continued to be discussed within the conception of information as commodity (ICC-1). Equally, information as commodity continued to be measured in the new conception discussed in this section (information as technology). However, information as technology mainly added a new dimension to the measurements, with dedicated instruments.

At the OECD, the interest in information technology and the economy goes back to the late 1960s. In 1966, the OECD initiated a study on what was then called "technological gaps". The organization looked at the disparities in economic performances between the United States and Europe, and the role of technologies in these disparities. The results were published in 1968 and 1970.¹⁹⁵ Among the technologies studied were electronic components and electronic computers.¹⁹⁶ To the OECD, the computer constituted a "key" industry: "because of its widespread use in commerce, industry and government (...), the computer is coming to play the role of a nervous system, and can be considered a key factor in the economic and social structure of a country; it is also of obvious strategic significance to countries with major defense capabilities".¹⁹⁷ The OECD measured a "clear-cut lead of the United States" on every indicator studied: source of

¹⁹⁴ See also: M. U. Porat (1978), *Communication Policy in an Information Society*, in G. O. Robinsen (ed.), *Communications for Tomorrow*, New York: Praeger, pp. 3-60.

¹⁹⁵ OECD (1970), *Gaps in Technology: Comparisons Between Member Countries in Education, Research & Development, Technological Innovation, International Economic Exchanges*, Paris.

¹⁹⁶ OECD (1968), *Gaps in Technology: Electronic Components*, Paris; OECD (1969), *Gaps in Technology: Electronic Computers*, Paris.

¹⁹⁷ OECD (1969), *Gaps in Technology: Electronic Computers*, op. cit., p. 8.

major inventions, technological balance of payments (or licensing agreements), market share, and international trade.

One conclusion of the study on gaps, with regard to statistics, was the poor quality of the data, or their absence: “Perhaps the main finding of the present survey of the computer industry is the existence of a major statistical gap”.¹⁹⁸ Following *Gaps in Technology* and a request from the third ministerial meeting on science in 1968, a Group on Computer Utilization was set up in 1969 and a survey on computer use was conducted.¹⁹⁹ To the Group, “member countries have a vital interest in accelerating the use of computers in all segments of society and the economy”.²⁰⁰ In the following years, the Group on Computer Utilization studied many aspects of information technology (see Appendix 8). It was this group that first suggested the idea of a conference on Computers and Telecommunications Policy (1975), which launched the project on the information economy. The new understanding of information as technology also came from this group. This shift was not without its opponents at the OECD, first among them the Information Policy Group. To that group, which was more concerned with documentation and its computerized systems, a concentration on the technological aspects of the information economy meant “unbalance and incompleteness” and “failure to give due attention to the intellectual aspects of information and the needs of its users”.²⁰¹ Eventually, the Computer Utilization Group won out over the Information Policy Group, and when the two groups merged into a working party on ICCP in 1976, the agenda of the Computer Utilization Group supplanted that of the Information Policy Group.

The contribution of technology, particularly information technology, to economic growth and productivity became a major concern in Member countries and at the OECD in the 1980s: technical change and economic policy, technology and structural change, technology and competitiveness, technical change and economic growth, and technology and the economy are the subjects of only some of the many projects carried out by the

¹⁹⁸ Ibid, p. 157.

¹⁹⁹ OECD (1969), Questionnaire on Computer Utilisation, DAS/SPR/69.5.

²⁰⁰ OECD (1969), Outline of the Study, DAS/SPR/69.1, p. 3.

²⁰¹ OECD (1975), IPG/CUG: Summary Record of the Joint Meeting, DSTI/STINFO/75.25.

OECD during this period.²⁰² This work was influenced and supported by C. Freeman, a consultant from the Science Policy Research Unit (SPRU), whose works developed the idea that “generic” technologies, because of their pervasive effects on the economy, ought to be the focus of policies. To Freeman, there have been five waves of innovations since the industrial revolution. Only the last one qualified as a change of “techno-economic paradigm” or a technologic revolution: information technologies.²⁰³

From its very beginning in 1982, the ICCP Committee has studied several information technologies and their effects on the economy, and published its analyses in the Red ICCP series (see Appendix 9). The data used were rarely standardized ones, relying on different sources (official, academic, private). In 1988, the Committee then launched a project on the economic implications of information technologies.²⁰⁴ The project aimed to look at the socioeconomic impacts of information technology, construct a policy framework, and develop appropriate data and indicators. The declared focus of the project was not the production of technologies that “in itself contributes little to economic growth”, but the broader contribution to economic development through the use of technologies.²⁰⁵ This was the origin of a preoccupation for the so-called information society, rather than the information economy, at the OECD – although widespread use of the term information society came later, and the term information economy continued to be used.²⁰⁶ To study the phenomenon, an expert group was created on Economic Implications of Information Technologies (EIIT).

²⁰² For published reports, see: OECD (1980), *Technical Change and Economic Policy: Science and Technology in a New Socio-economic Context*, Paris; OECD (1988), *New Technologies in the 1990s: A Socio-Economic Strategy*, Paris; OECD (1992), *Technology and the Economy: the Key Relationships*, Paris.

²⁰³ C. Freeman, J. Clark and L. Soete (1982), *Unemployment and Technical Innovation*, Connecticut: Greenwood Press; C. Freeman (1987), *Information Technology and Change in Techno-Economic Paradigm*, in C. Freeman and L. Soete (eds.), *Technical Change and Full Employment*, Oxford: Blackwell, pp. 49-69; C. Freeman (1987), *The Challenge of New Technologies*, in OECD, *Interdependence and Co-operation in Tomorrow's World*, Paris, pp. 123-156; C. Freeman and C. Perez (1988), *Structural Crises of Adjustment, Business Cycles and Investment Behavior*, in G. Dosi et al. (eds.), *Technical Change and Economic Theory*, London: Pinter, pp. 38-66.

²⁰⁴ OECD (1988), *Socio-economic Implications of Information and Communication Technology and Applications: Opportunities for Change*, ICCP (88) 4.

²⁰⁵ OECD (1988), *Economic Implications of Information Technologies: Draft Summary Record of the First Session*, DSTI/ICCP/EIIT/88.4.

²⁰⁶ To the OECD, the term information economy refers to the implications of information technologies on the economy, on firms' performance, (productivity, profitability, employment), while the information

The Working Party on Economic Implications of Information Technologies (1988)

In approving the project on the Economic Implications of Information Technologies, the ICCP Committee agreed on the importance of determining indicators, mainly on the use of information technology.²⁰⁷ The first task of the group on Economic Implications of Information Technologies was therefore to develop indicators on information technology usage “as the foundation for the investigations on impacts”.²⁰⁸ I. Miles from SPRU was invited as a consultant to present his Information Technology Accounting Framework (ITAF).²⁰⁹ Miles urged a change in both object and methodology: from measuring technology sectors to measuring the use of information technologies. “Most approaches to the information economy have been content to develop highly aggregated estimates of the size of an information sector”, with little attention to the use of information technologies themselves, claimed Miles.²¹⁰ To Miles, the information economy does not simply refer to information sectors, nor to information-technology producing sectors, but to the diffusion of information technology. Information technology, particularly microelectronics, is a pervasive technology across the whole economy and across a wide range of applications. To account for the diffusion of information technology, Miles suggested using existing but unexploited data and, above all, input-output tables to track the interrelationships between production and applications or uses.

This “philosophy” was what the group on Economic Implications of Information Technologies adopted, but it did not adopt the methodological approach. Until full input-

society refers to the social consequences of technologies (modes of behavior, relationships in and between communities) (OECD (2003), A Framework Document for Information Society Measurements and Analysis, DSTI/ICCP/IIS (2003) 9, p. 7). “Tomorrow’s economy will be, to a great extent an information economy and society will be increasingly an information society. That is information will contribute in great part to the value added of most goods and services and information intensive activities will increasingly be carried out by households and citizens” (OECD (1998), The ICCP Ad Hoc Statistical Panel: A Proposal for a Programme of Work, DSTI/ICCP/AH/RD (98) 5, p. 2).

²⁰⁷ OECD (1989), Draft Summary Record of the Thirteenth Session, ICCP/M (88) 1, p. 8.

²⁰⁸ OECD (1989), Economic Implications of Information Technologies: Draft Summary Record of the Second Session, DSTI/ICCP/EIIT/89.1.

²⁰⁹ I. Miles (1989), The Statistical Analysis of the Information Economy: Why an Accounting Framework is Needed, OECD, DSTI/ICCP/89.2; I. Miles (1990), Mapping and Measuring the Information Economy, London: British Library; I. Miles (1991), Statistics and the Information Age, Futures, 23 (9), pp. 915-934.

²¹⁰ I. Miles (1989), The Statistical Analysis of the Information Economy, p. 2.

output information becomes possible, the Secretariat recommended, for example, that specific surveys on advanced manufacturing technologies be used to track the diffusion of information-technology-related goods.²¹¹ At a meeting held in September 1988 in Stockholm, a questionnaire was prepared on the use of information technology and sent to member countries. Despite the absence of some data in member countries, a statistical analysis was conducted by I. Miles and D. Kimpel and published in the Red ICCP series.²¹² This kind of work, with its “pragmatic” approach, was a model often brought to the attention of the expert group on ICC statistics for emulation, but in vain.

Then, in 1992, the expert group discussed a new project on developing new indicators and launching an “Information Economy Revisited” study. A special session on national information technology policies and structures was therefore held in October,²¹³ while a project was identified to “map” the relationships between information technology and the economy, that is, to assess the impacts of information technology on the economy, and particularly on productivity.²¹⁴ To the group, such analysis “requires an enormous body of cross national information and databases. Unfortunately, the currently developed body of knowledge or data collection system is not sufficient to allow empirically convincing and scientifically valid conclusions about various aspects of information technology impacts on productivity”.²¹⁵ The group added, “the existing literature has had an

²¹¹ OECD (1988), Group of National Experts on Statistics for ICC: Summary Record, ICCP (88) 19, p. 5. As conducted in the United States, Canada and Australia. For the United States, see NSF (1991), Science and Engineering Indicators 1991, Washington, pp. 154-157; NSF (1996), Science and Engineering Indicators 1996, Washington, pp. 6-24 to 6-27; NSF (1998), Science and Engineering Indicators 1998, Washington, Chapter 8; NSF (2000), Science and Engineering Indicators 2000, Washington, Chapter 9. For Canada: Statistics Canada (1989), Survey of Manufacturing Technology: The Leading Technologies, Science Statistics, 88-001, 13 (9), October; Y. Fortier and L. M. Ducharme (1993), Comparaison de l'utilisation des technologies de fabrication avancées au Canada et aux États-Unis, STI Review, 12, pp. 87-107. For Australia: B. Pattinson (1992), Survey of Manufacturing Technology – Australia, DSTI/STII/STP/NESTI (92) 8, OECD.

²¹² OECD (1990), Indications and Analysis of Current and Emerging IT Usage, DSTI/ICCP/EIIT/90.10. Published as report no. 31 in the ICCP Red series; OECD (1993), Usage Indicators: A New Foundation for Information Technology Policy, Paris.

²¹³ OECD (1992), Proposal for a First Special Session on Information Technology Policy, DSTI/ICCP (92)11; OECD (1993), Report on the Special Session on Information Technology Policies: New Challenges for Competition and Co-Operation, DSTI/ICCP (92) 13.

²¹⁴ OECD (1992), Micro- and Macroeconomic Impacts of National IT Policies, DSTI/ICCP/EIIT (92) 11; OECD (1993), Micro- and Macroeconomic Impacts of IT and National Information Technology Policies and Programmes, DSTI/ICCP/EIIT (93) 1.

²¹⁵ Ibid, p. 5.

opportunistic focus on case studies of small populations where data happens to be available or is easily gathered”.²¹⁶ To establish the foundations for the task, a workshop was hosted by the NSF in autumn 1993 to review the state of the art in productivity measurement methods, investigate cross-national studies, analyze available data sets and examine the feasibility of new international statistical series.²¹⁷ The project became part of the Technology, Productivity and Job Creation Project, the first joint project of the Directorate for Science, Technology and Industry (combining ICCP, the Science and Technology Policy, and the Industry divisions)²¹⁸ and a precursor to the Growth project of the late 1990s, where information technology appeared as central in explaining the performance of the New Economy.²¹⁹

As a follow-up to the session on information technology policies, a review group was set up to identify future directions of work on information, computer and communications policies – to identify issues and challenges of the group on Economic Implications of Information Technologies, elicit views on a future agenda, and renew and refocus the mandate of the group. The review reaffirmed the importance and relevance of the expert group on Economic Implications of Information Technologies, but expressed “concern about the lack of reliable statistical data in the area of usage statistics” and the “absence of appropriate methodologies and concepts quantifying intangible benefits”.²²⁰ The report also recommended elevating the status of the group to that of a Working Party. The Group on Economic Implications of Information Technologies then became the Working Party on Information Technology Policy in 1993.²²¹ By mid-1995, the group had not yet met. According to some, there were increasing difficulties in interesting Member

²¹⁶ Ibid, p. 6.

²¹⁷ OECD (1994), *The Productivity Impacts of Information Technology Investment*, DSTI/ICCP (94)1. Some of the papers from the conference were published in *Economics of Innovation and New Technology*, 3 (3-4), 1995.

²¹⁸ OECD (1994), *STI Work on Technology, Productivity, and Employment*, DSTI/IND/STP/ICCP (94) 2. Report published as OECD (1996), *Technology, Productivity and Job Creation*, Paris.

²¹⁹ B. Godin (2004), *The New Economy: What the Concept Owes to the OECD*, *Research Policy*, 33 (5), pp. 679-690.

²²⁰ OECD (1993), *EIIT Review Report*, DSTI/ICCP/EIIT (93) 2.

²²¹ OECD (1993), *Working Party on Information Technology Policy: Draft Mandate*, DSTI/ICCP (93) 6.

countries in the concept of the information economy or society.²²² The OECD Council asked for cuts in the ICCP Committee budget: the 1993 program of work weakened ICCP by eliminating one post and reduced consultancy resources and the hosting of meetings by 30%. There was also a suggestion that the committee be terminated²²³ and a proposed restructuring of the Directorate for Science, Technology and Industry: from 1994 onward, the ICCP committee would be served by a Science, Technology and Communications Policy Division.

In an ultimate bid for survival, the ICCP Committee drafted a proposal on the Information Society to be included in the final communiqué of the May 1995 ministerial meeting (G-7).²²⁴ The proposal dealt with the importance of information technology and the need for a policy framework. As a result, the ministers asked the OECD for a policy framework on the Information Society (Global Information Infrastructure/Global Information Society, or GII/GIS). “The world community need to adapt [to the Global Information Infrastructure] in all the political, economic, social and cultural dimensions, thus establishing the basis for a new Global Information Society”.²²⁵ But a common vision was lacking with regard to the Information Society concept.²²⁶ Using available and recently completed work, the ICCP Secretariat produced, in a very short time, a policy framework in which the principle of market competition held preeminence, and where government’s role was that of a catalyst and facilitator for developing efficient markets, overcoming barriers and obstacles, promoting equal access to information, and protecting cultural and linguistic diversity in content products and services (software, multimedia, publishers, broadcasters, audio-visual and sound recording producers).²²⁷

²²² There were already plenty of discourses and initiatives at other levels of governments. For influential documents, see the EU Commission’s Bangemann report (European Commission (2004), *Europe and the Global Information Society: Recommendations to the European Council*, Brussels) and the US initiative for the Information Super Highway (Task Force on Information Infrastructure (1995), *Global Information Infrastructure: Agenda for Co-Operation*).

²²³ OECD (1994), Draft Summary Record of the 26th Session, ICCP/M (94) 2, p. 3.

²²⁴ OECD (1995), Draft Summary Record of the 27th Session, ICCP/M (95) 1, p. 5-6

²²⁵ OECD (1996), GII-GIS: Statement of Policy Recommendations Made by the ICCP Committee, DSTI/ICCP (96) 10, p. 2.

²²⁶ *Ibid.*, p. 3.

²²⁷ OECD (1996), GII-GIS: Policy Requirements, DSTI/ICCP (96) 24; OECD (1996), GII-GIS: Policy Recommendations for Action, DSTI/ICCP (96) 25.

The report was submitted to a meeting of ICCP at the ministerial level in May 1996, and endorsed by the G-7 in May 1997.

These efforts from the ICCP Committee have had two consequences. The first was reactivating the newly-created Working Party on Information Technology Policy (formerly the Working Party on Economic Implications of Information Technologies). The renewed mandate of the Working Party focused on developing a policy framework for the information economy centered around the demand or user side of technologies (diffusion, impacts) rather than the supply side, and with a specific mention of developing “methods and tools for measurement”. The Working Party was, for a second time in as many years, renamed the Working Party on Information Economy in 1995.²²⁸ The first task of the Working Party was organizing a series of six workshops (1995-1999) on the economics of the information society, a regular feature of which were sessions on data and indicators.²²⁹

A relatively new series titled *Information Technology Outlook* became a top priority of the Working Party. The series was first proposed in 1990.²³⁰ It was created to cover both information technology and communication technology, and to collect data from any source (international organizations, directorates of the OECD, ICCP research projects, member countries, private consultants). The publication would not necessitate new data collection. The focus was rather on the analysis of existing data, and updated data on an *ad hoc* basis. The added value was to bring together data from diverse sources and present them in a common framework. The second objective was to “give a higher profile to the regular work of the ICCP” and “an enhanced sense of identity” to the Committee and the to work of its working parties. A *Communication Outlook* came first (from a Working Party on Telecommunications and Information Services Policies), as the consequence of a special session on telecommunications policy held in 1990. The first

²²⁸ OECD (1995), Mandate and Activities of the Working Party on Information Technology Policy, DSTI/ICCP (95) 28; OECD (1996), Mandate, Terms of Reference and Name of the Working Party, DSTI/ICCP/IE (96) 2; OECD (1996), Proposed New Mandate of the Working Party, DSTI/ICCP/IE (96) 3.

²²⁹ OECD (1999), OECD Workshops on the Economics of the Information Society: A Synthesis of Policy Implications, DSTI/ICCP/IE (99) 1.

edition of *Information Technology Outlook* followed in 1992 (from the Working Party on Economic Implications of Information Technologies).²³¹ The biennial series continues to this day – with three sections since 1997 (scoreboard of indicators, policies, issues) and more use of official statistics (than private sources).²³²

The series became the “showcase” for statistical work on the theme of the information economy. Editions carried results from work conducted on electronic commerce, software, skills and employment, and digital divide. There had been suggestions to change the name of the series to *Outlook for the Information Economy*,²³³ but without success.

The Working Party on Indicators for the Information Society (1999)

The second consequence of the ministerial meeting was the creation of another Working Party. At the suggestion of the ICCP Committee, in May 1996 the ICCP at the ministerial level suggested that the Secretariat develop “a common framework for indicators and standard definitions” for the information society and set up a statistical panel to develop “new indicators which identify, assess and monitor the emergence” of the information society.²³⁴ A statistical panel was set up in 1997,²³⁵ and the ICCP Committee asked the panel to start its work by surveying existing data on both the supply and demand for Information and Communication Technology (ICT). The work would have to be conducted in close cooperation with Eurostat and its Working Group on Statistics for the Information Society.

²³⁰ OECD (1990), *Information Technology and Communications (ITC) Outlook: Proposal for a New ICCP Publication Project*, DSTI (90) 9.

²³¹ OECD (1991), *Information Technology Outlook*, DSTI/ICCP (91) 1.

²³² OECD (1997), *Recent Changes in the Information Technology Outlook and Implications for Future Editions*, DSTI/ICCP/IE (97) 2.

²³³ OECD (1996), *Summary Record of the First Meeting of the Working Party*, DSTI/ICCP/IE (96) 1, p. 4.

²³⁴ OECD (1996), *Global Information Infrastructure-Global Information Society: Statement of Policy Recommendations Made by the ICCP Committee*, DSTI/ICCP (96) 10, p. 9; OECD (1996), *GII-GIS: Policy Requirements*, op. cit., p. 23.

²³⁵ OECD (1997), *The ICCP Statistical Panel: Mandate, Mission, Goals and Work*, DSTI/ICCP/AH (97) 1.

The statistical panel was chaired by F. Gault from Statistics Canada, and met for the first time in June 1997. From the start, and as a lesson from past experiences, a “pragmatic and concrete approach was emphasized which would produce tangible results in the near-term”.²³⁶ The group agreed to produce a survey of available data in member countries, as well as a preliminary ICT definition (industries) by June 1998. Work was also suggested on an ICT product-based or commodity-based definition and, once that was achieved, one on content (industries that create information). Eurostat suggested it would take the lead on the commodity-based definition, and France proposed to undertake the work on content. Finally, work was envisaged to measure the use of ICT (in households, government and business).

The statistical panel, renamed the Working Party on Indicators for the Information Society in 1998, “has been able to provide a high quality response in a relatively short time span”.²³⁷ It produced a definition of the ICT sector in less than a year (see Appendix 10),²³⁸ from which a series of statistics were published,²³⁹ and developed a list of ICT products.²⁴⁰ It also developed model questionnaires on the use of ICT technologies in business²⁴¹ and households,²⁴² including electronic commerce.²⁴³

One area where results did not pan out was in measuring what was called “content”. From 1998 on, the working party succeeded in settling debates on definitions (conventions on boundaries), particularly for ICT products and e-commerce. Content was not that easy. As we have seen, from the very beginning of information statistics, there was hope of measuring information *per se* (knowledge or documentation). The idea came

²³⁶ OECD (1997), Summary Record of the Ad Hoc Meeting on Indicators for the Information Society, DSTI/ICCP/AH/M (97) 1, p. 3.

²³⁷ OECD (2004), Policy Relevant Indicators and Empirical Analysis for the Information Society: A Discussion of WPIIS Outputs and Ideas for Future Work, DSTI/ICCP/IIS (2004) 1, p. 9.

²³⁸ OECD (1998), Summary Record of the Second Ad Hoc Meeting on Indicators for the Information Society, DSTI/ICCP/AH/M (98)/REV1, p. 9. Revised in 2002: DSTI/ICCP/IIS (2002) 2.

²³⁹ OECD (2000), Measuring the Information Sector, Paris.

²⁴⁰ OECD (2003), A Proposed Classification of ICT Goods, DSTI/ICCP/IIS (2003) 1/REV2.

²⁴¹ OECD (2001), Measuring ICT Usage and Electronic Commerce in Enterprises: Proposal for a Model Questionnaire, DSTI/ICCP/IIS (2001) 1/REV1.

²⁴² OECD (2001), Measurement of ICT Usage in Households/By Individuals: Proposal for a Model Questionnaire, DSTI/ICCP/IIS (2001) 2 and DSTI/ICCP/IIS (2002) 1/REV1.

²⁴³ Work on electronic commerce was conducted jointly with the Working Party on Information Economy.

back on the agenda in the mid 1990s under the name “content”, those industries which produce and disseminate informational products. Defined as such, content was a sensitive political issue. While previous work of statisticians had concentrated on the knowledge and/or commodity side of information, content involved looking at, among others, culture and cultural industries.

The Ministerial meeting of 1996 on the information society had called for economic efficiency and more equitable access to media and content resources. The Working Party on Indicators for the Information Society started work on content in 1999. France and Canada proposed a new definition of ICT that would include images, sound and text that are displayed, processed, stored and transmitted by ICT.²⁴⁴ This category of goods and services was called “communication product”. It was not concerned, in the end, with the industries that create such products, but with the medium of diffusion, or technology. The suggested list of industrial classes included publishing, printing and media, but also radio and television, motion pictures, libraries, museums and services like marketing and advertising, education and health. Many believed that the concept was too broad, and requested a review of the principles outlined in the paper,²⁴⁵ in line with the Canadian experience that limited content to industries engaged in disseminating and/or reproducing products by new electronic technologies.²⁴⁶ Indeed, the meeting of the Working Party in November 1999 specified that the requirement was for electronic content, and the Secretariat produced a paper on defining and measuring (that small part of) the electronic content sector.²⁴⁷ The French and Canadian delegates therefore produced a discussion paper that amended their first suggestion, proposing a narrower definition that excluded marketing and advertising, libraries and museums, and education and health, the latter because it targeted specific individuals or groups.²⁴⁸ On the other hand, the United States delegate proposed keeping the set of industries larger, i.e.: education, health services and

²⁴⁴ OECD (1999), *Defining the Content Sector: A Discussion Paper*, DSTI/ICCP/IIS (99) 1.

²⁴⁵ OECD (1999), *Summary Record of the 3rd Ad Hoc Meeting of the Working Party on Indicators for the Information Society*, DSTI/ICCP/IIS/M (99) 1, p. 3-4.

²⁴⁶ OECD (1999), *NAICS, the ICT Sector and the Content Sector: the Canadian Experience and Proposed Approach*, DSTI/ICCP/IIS/RD (99) 4.

²⁴⁷ OECD (2000), *The Electronic Content Sector and Electronic Communication Products*, DSTI/ICCP/IIS (2000) 1.

²⁴⁸ OECD (2001), *The Content Sector: Outline and Features*, DSTI/ICCP/IIS (2001) 5.

other industries where ICTs are having an impact on the way the product or service is delivered. In the end, delegates preferred to continue with the French-Canadian discussion paper as a framework. No agreement was reached, and the meeting ended with the suggestion to create an expert group and take a different approach that would include both traditional and electronic content.²⁴⁹ Nothing has happened since.

What is not mentioned in the minutes of the Working Party (nor in the Guide discussed below) is the opposition of the United States to measuring informational (or cultural) content. As measured in a study by the Working Party on Information Economy on the content industry, the United States was the largest market for music and audio-visual sales and, above all, it dominated the European market.²⁵⁰ From the very beginning of the Working Party's work on the ICT sector, the United States delegate refused to discuss and include content industries in the definition. These instructions were given to him by the Department of Commerce, the Department of Trade and the State Department.²⁵¹ As a consequence, two industries were eliminated from the 1998 ICT sector definition (reproduction of recorded media, radio and television services).

Despite the failure on content, the Working Party's methodological outputs contributed to several statistical analyses by the Directorate for Science, Technology, and Industry, firstly in terms of regular and updated indicators on the information economy²⁵² and the knowledge-based economy,²⁵³ and secondly as contributions to projects like the Growth project (New Economy) which, according to the OECD, "with its fresh analysis and bold new conclusions [, made] quite a splash within the Organization":²⁵⁴

²⁴⁹ OECD (2000), Summary Record of the 4th Meeting of the Working Party on Indicators for the Information Society, DSTI/ICCP/IIS/M (2000) 1, p. 5-6.

²⁵⁰ OECD (1996), Content as a New Growth Industry, DSTI/ICCP/IE (96) 6.

²⁵¹ Confidential interview, 12 July 2004.

²⁵² OECD (2002), Measuring the Information Economy, Paris. From 1995, a series of key Indicators plus metadata are published on http://www.oecd.org/document/23/0,2340,en_2649_34449_33987543_1_1_1_1,00.html.

²⁵³ See the OECD Science, Technology and Industry Scoreboard series for 2001 and after.

²⁵⁴ OECD (2000), Draft Summary Record of the 37th Session, DSTI/ICCP/M (2000) 1, p. 7.

- *A New Economy? The Changing Role of Innovation and Information Technology in Growth*, 2000.
- *Drivers of Growth: Information Technology, Innovation and Entrepreneurship*, 2001.
- *Seizing the Benefits of ICT in a Digital Economy*, 2003.
- *ICT and Economic Growth: Evidence from OECD Countries, Industries and Firms*, 2003.
- *The Economic Impact of ICT: Measurement, Evidence and Implications*, 2004.

How can we explain the success of the Working Party on Indicators for the Information Society, whereas previous efforts had failed? Three factors can be identified. The first is history. The Working Party on Indicators for the Information Society worked at a time when industrial classifications, although still imperfect, had improved over the 1980s, and countries were able to deliver data more rapidly. The second reason is pragmatism, a lesson learned from the experiences of the 1980s. The Working Party developed a definition that could be implemented quickly and thus be of immediate use to data users, and to this end it followed up an industry definition.²⁵⁵ The most difficult tasks (content) were dealt with only when other work was finalized. The third factor has to do with the method of work. Unlike other Working Parties, such as the one on the Information Economy, here it was the Working Party on Indicators for the Information Society that conducted the work. Nearly all of the substantive work was done by the delegates, and not by the OECD.

The most recent output of the Working Party is a methodological guide published in 2005. Until 2001, the Working Party “agreed that standards and definitions will need to be revisited frequently in such a fast moving area. Rather than developing a manual on statistics for the information society, the group decided to continue with its approach of building blocks” (individual outputs accompanied by explanatory and methodological guidelines).²⁵⁶ Then, at the meeting in April 2001, the idea of a “manual collecting the

²⁵⁵ OECD (1998), Summary Record of the Second Ad Hoc Meeting on Indicators for the Information Society, DSTI/ICCP/AH/M (98)/REV1, p. 2.

²⁵⁶ OECD (2001), Summary Record of the Meeting of the Working Party on Indicators for the Information Society, DSTI/ICCP/IIS/M (2001) 1, p. 7.

definitional and methodological work carried out by the Working Party on Indicators for the Information Society” emerged: “the Working Party might want to consider whether to produce some synthesis of its definitional and methodological work, e.g. in the form of methodological guidelines for the measurement of statistics for the Information Society”.²⁵⁷ By 2003, the Secretariat had produced an early draft of the guide that drew together the methodological decisions reached within the Working Party.²⁵⁸ The guide was finalized for the 2005 World Summit on the Information Society held in Tunis.²⁵⁹

The guide is a strange document. It is not really a methodological manual, but part of a new lot of documents not mature enough for international standards (see Appendix 11). The guide does not provide instructions and conventions for measuring the information economy or society. Essentially, it documents the statistical work of the Working Party on Indicators for the Information Society and related work done within the OECD on ICT:

- Products (goods and services),
- Infrastructure (telecommunications networks, Internet),
- Supply (industries)
- Demand (ICT and e-commerce)
 - o Business
 - o Households and Individuals
- Content

“The Guide describes areas of work sufficiently advanced in their conceptual and definitional underpinnings, and for which sufficient experiences have been accumulated”,²⁶⁰ but it also discusses works in their early stages or works-in-progress. It includes discussions of debates that occurred during the development of that work and refers to OECD internal documents (not available for general distribution). The Guide is a

²⁵⁷ OECD (2001), WPIIS Work Programme and Terms of Reference, DSTI/ICCP/IIS (2001) 6, p. 2.

²⁵⁸ OECD (2003), A Framework Document for Information Society Measurements and Analysis, DSTI/ICCP/IIS (2003) 9.

²⁵⁹ OECD (2005), Guide to Measuring the Information Society, DSTI/ICCP/IIS (2005) 6/FINAL.

“compilation (*sic*) of concepts, definitions, classifications and methods for the measurement of the information society”.²⁶¹ It is presented as a “living manual”, “open to receiving new components, as well as being subject to revision”.²⁶²

Why has the Directorate for Science, Technology and Industry produced such a Guide – the third methodological document in the same year that did not deserve the name manual? At the OECD, it was hoped that the Working Party work “will become a standard reference”,²⁶³ and help newcomers to the field to “progress more quickly”.²⁶⁴ “It is hoped that the Guide will facilitate improved harmonization of practices (...). This, in turn, will enable better international comparability of data, a key requirement for benchmarking, identification of relative strengths and weakness, and tracking progress”.²⁶⁵ Fine. However, there is a more political explanation, considering the past history of information statistics and the difficulties of the ICCP Committee in interesting people in its statistical output. On several occasions, the Working Party on Indicators for the Information Society congratulated itself that its work, as used in OECD studies, raised “the visibility of official ICT statistics”²⁶⁶ – as well as of the *Information Technology Outlook* series. This was also an important reason for the publication of an early Guide: increase the visibility of the Working Party on Indicators for the Information Society’s work and of the ICCP Committee.²⁶⁷ Incidentally, the head of the Working Party himself (F. Gault) became head of a more visible group in 2002, namely the Group of Experts on Science and Technology Indicators (NESTI). A related factor in publishing an early Guide was “controlling” the field, namely extending the OECD standards to non-OECD countries.²⁶⁸ This factor or task was one to which the OECD devoted itself explicitly after the fall of the Berlin Wall. However, this was precisely what the OECD qualified as

²⁶⁰ OECD (2005), *Guide to Measuring the Information Society*, op. cit., p. 10.

²⁶¹ *Ibid.*

²⁶² *Ibid.*, p. 6.

²⁶³ *Ibid.*

²⁶⁴ *Ibid.*, p. 12.

²⁶⁵ *Ibid.*

²⁶⁶ OECD (2001), *Summary Record of the Meeting of the Working Party on Indicators for the Information Society*, DSTI/ICCP/IIS/M (2001) 1, p. 8.

²⁶⁷ OECD (2001), *WPIIS Work Programme and Terms of Reference*, DSTI/ICCP/IIS (2001) 6, p. 2.

²⁶⁸ OECD (2004), *Policy Relevant Indicators and Empirical Analysis for the Information Society: A Discussion of WPIIS Outputs and Ideas for Future Work*, DSTI/ICCP/IIS (2004) 1, p. 9.

“empty internationalism” in the 1970s, when UNESCO tried to extend the measurement of science and technology to Eastern countries, using new definitions developed specifically for this purpose.²⁶⁹

Conclusion

Information has occupied a large part of the OECD’s work on science and technology. Since 1949, the organization has created as many as fifteen bodies, including a Division and a Committee, specifically concerned with information policy, information technology, and its measurement (see Appendix 12). These bodies have produced hundreds of working papers and notes. Over this period, the concept of information has shifted from an understanding concerned with knowledge, mainly scientific and technical knowledge, to technology. Two *leitmotifs* guided the efforts of the organization. The first was accounting. To the OECD, “it seems normal today, in statistical matters, to use an accounting framework based on the national accounts” (free translation).²⁷⁰ This was the model suggested in the United States by Machlup and Porat, and imitated in many other countries like France,²⁷¹ Great Britain (I. Miles), Germany and Australia. The second *leitmotif* was structural change. To the ICCP Committee, “the object of structural change has been on the policy agenda of OECD programmes for many years. In this context the transition of advanced economies from industrial societies to service and even information societies has gained particular momentum and attention. The Committee of ICCP has been attracted by such visions and [has] assessed the role of information technologies in this process of change”.²⁷²

Over the whole period, a major objective, if not an ideal, of the OECD was measuring information and, to that end, developing a methodological manual. The cherished model

²⁶⁹ OECD (1977), Response by the Secretariat to the Questions of the Ad Hoc Group, DSTI/SPR/77.52, p. 16.

²⁷⁰ « Il paraît aujourd’hui normal, en matière de systèmes statistiques, de se placer d’emblée dans un cadre de cohérence comptable inspiré de la comptabilité nationale. OECD (1983), Plan de travail pour l’élaboration de statistiques relatives à l’information, à l’informatique et aux communications, DSTI/ICCP/83.13.

²⁷¹ OECD (1982), The Statistical Information System on the Computer Sector: a French Proposal, DSTI/ICCP/82.22.

²⁷² OECD (1984), Update of Information Sector Statistics, op. cit., p. 3.

of a manual was the Frascati manual, adopted in 1962 by member countries for surveying their R&D activities. For both the Group on Information Policy and its project on a manual for Scientific and Technical Information Activities, and the ICCP Committee and the manual for Information and Communication statistics, the proclaimed model to emulate was the Frascati manual. In the end, there has never been a Frascati-type manual produced for measuring information. The above two projects failed, as did a third on bibliometrics: a manual was planned in the early 1990s,²⁷³ and drafted,²⁷⁴ but then transformed into a working paper because its structure and coverage did not bear any relationship to a manual.²⁷⁵ The only methodological guidelines on information available at the OECD appeared in 2005 in the form of a guide, not a manual.

How can we explain the failures? Apart from the conceptual, methodological and political factors as discussed in this paper, the failure also has to do with the innovation capacities of the international organization. Although the OECD is a think tank for its member countries and produces papers by the thousand, the organization is rarely an innovator in the matter of theories and concepts. Generally, the organization needs exemplars or models. This explains the success of the OECD Frascati manual. The manual rested entirely on the experience of the US National Science Foundation, itself the result of previous experiences since the 1920s.²⁷⁶ This was also the case for the Oslo manual, a methodological manual for measuring innovation,²⁷⁷ which benefited from a definition launched in the 1960s in a survey conducted by the US Department of Commerce,²⁷⁸ and a common understanding of what innovation was, at least among economists. The history of the failed manuals on information shows that in the absence of long experience and models, the OECD can proceed only slowly.

²⁷³ OECD (1991), Record of the NESTI Meeting, DSTI/STII/STP/NESTI/M (91) 1; OECD (1997), Record of the NESTI Meeting, DSTI/EAS/STP/NESTI (97) 1.

²⁷⁴ OECD (1995), Understanding Bibliometrics: Draft Manual on the Use of Bibliometrics as Science and Technology Indicators, DSTI/STP/NESTI/SUR (95) 4.

²⁷⁵ Y. Okubo (1997), Bibliometric Indicators and Analysis of Research Systems: Methods and Examples, OECD/GD (97) 41.

²⁷⁶ B. Godin (2005), Measurement and Statistics in Science and Technology, op. cit.

²⁷⁷ OECD (1991), OECD Proposed Guidelines for Collecting and Interpreting Innovation Data (Oslo Manual), DSTI/STII/IND/STP (91) 3. General distribution under catalog number OECD/GD (92) 26.

²⁷⁸ US Department of Commerce (1967), Technological Innovation: Its Environment and Management, USGPO, Washington.

The role of the OECD lies elsewhere. History shows that the OECD's contribution to statistics is threefold. First, the organization selects a conceptual framework, generally a fashionable and recent one. This was the case for the information economy. Second, it adapts (often improves) an (existing) methodology, and standardizes and conventionalizes it. This was the work of the Working Party on Indicators for the Information Society. Finally, the organization internationalizes early and innovative analyses (official and academic) conducted at the national level, as it did in studies on the role of information technology in productivity and on the emergence of a new economy.

Despite the decades of work on the concept of information and its measurement, almost any kind of discourse can be, and is, conducted in an attempt to pin down the concept.²⁷⁹ Even statistics, reputed for its power to crystallize and “objectivize” concepts, has failed to stabilize what information is or to produce a consensus operational definition. Information remains a fuzzy concept, although many have jumped on the “bandwagon” of technology as a proxy for information in practice.

²⁷⁹ F. Webster (2002), *Theories of the Information Society*, London: Routledge.

Appendix 1.
Modern Societal Transformations
Identified Between 1950-1984

(From Beniger, 1986)

Year	Transformation	Source
1950	Lonely crowd	Riesman 1950
	Posthistoric man	Seidenberg 1950
1953	Organizational revolution	Boulding 1953
1956	Organization man	Whyte 1956
1957	New social class	Djilas 1957; Gouldner 1979
1958	Meritocracy	Young 1958
1959	Educational revolution	Drucker 1959
	Postcapitalist society	Dahrendorf 1959
1960	End of ideology	Bell 1960
	Postmaturity economy	Rostow 1960
1961	Industrial society	Aron 1961; 1966
1962	Computer revolution	Berkeley 1962; Tomeski 1970; Hawkes 1971
	Knowledge economy	Machlup 1962; 1980; Drucker 1969
1963	New working class	Mallet 1963; Gintis 1970; Gallie 1978
	Postbourgeois society	Lichtheim 1963
1964	Global village	McLuhan 1964
	Managerial capitalism	Marris 1964
	One-dimensional man	Marcuse 1964
	Postcivilized era	Boulding 1964
	Service class society	Dahrendorf 1964
	Technological society	Ellul 1964
1967	New industrial state	Galbraith 1967
	Scientific-technological revolution	Richta, 1967; Daglish 1972; Prague Academy 1973
1968	Dual economy	Averitt 1968
	Neocapitalism	Gorz 1968
	Postmodern society	Etzioni 1968; Breed 1971
	Technocracy	Meynaud 1968
1969	Unprepared society	Michael 1968
	Age of discontinuity	Drucker 1969
	Postcollectivist society	Beer 1969
1970	Postideological society	Feuer 1969
	Computerized society	Martin and Norman 1970
1970	Personal society	Halmos 1970
	Posteconomic society	Kahn 1970
	Postliberal age	Vickers 1970
	Prefigurative culture	Mead 1970
	Technetronic era	Brzezinski 1970
1971	Age of information	Helvey 1971
	Communications	Oettinger 1971
	Postindustrial society	Touraine 1971; Bell 1973
	Self-guiding society	Breed 1971
	Superindustrial society	Toffler 1971

1972	Limits to growth Posttraditional society World without borders	Meadows 1972; Cole 1973 Eisenstadt 1972 Brown 1972
1973	New service society Stalled society	Lewis 1973 Crozier 1973
1974	Consumer vanguard Information revolution	Gartner and Riessman 1974 Lamberton 1974
1975	Communications age Mediacracy Third industrial revolution	Phillips 1975 Phillips 1975 Stine 1975; Stonier 1979
1976	Industrial-technological society Megacorp	Ionescu 1976 Eichner 1976
1977	Electronics revolution Information economy	Evans 1977 Porat 1977
1978	Anticipatory democracy Network nation Republic of technology Telematic society Wired society	Bezold 1978 Hiltz and Turoff 1978 Boorstin 1978 Nora and Minc 1978; Martin 1981 Martin 1978
1979	Collapse of work Computer age Credential society Micro millennium	Jenkins and Sherman 1979 Dertouzos and Moses 1979 Collins 1979 Evans 1979
1980	Micro revolution Microelectronics revolution Third wave	Large 1980, 1984; Laurie 1981 Forester 1980 Toffler 1980
1981	Information society Network marketplace	Martin and Butler 1981 Dordick 1981
1982	Communications revolution Information age	Williams 1982 Dizard 1982
1983	Computer state Gene age	Burnham 1983 Sylvester and Klotz 1983
1984	Second industrial divide	Piore and Sabel 1984

Appendix 2.
Committees and Working Parties
of OEEC/OECD
(1948-1970)

OEEC

OECD

(Directorate
for Scientific Affairs)

Manpower Committee (1948)

Working Party no. 25 on Shortage of

Scientific and Technical Personnel (1957)

Office of Scientific and Technical Personnel (1958)

Scientific and Technical Personnel
Committee (1961)

Working Party no. 3 on Scientific

and Technical Information (1949)

Committee on Scientific Matters (1951)

Committee on Productivity and Applied Research (1952)

Committee on Applied Research (**195?**)

Committee on Scientific Research (1961)

Committee on Science Policy (1966)

Committee on Scientific and Technical Cooperation (1950)

Committee on International Cooperation
(1966)

Appendix 3.

Basic Data for Information Policy

(From DAS/STINFO/69.10)

Characteristics of existing information sources and services:

- (a) Type and number of primary services, volume of information, field, mode of financing services, etc.
- (b) Type and number of secondary services, fields covered, services offered, number and qualifications of staff, equipment, performance, method of financing, etc.

Market for information:

- (a) The various types of users, their present and potential specific needs;
- (b) The foreseeable development of these needs;
- (c) The relative efficiency of the various information services in the light of these needs;
- (d) The identification of present and future needs to be met;
- (e) The influence of promotion operations on the development of needs.

Role of information and its links with other activities:

- (a) The educational role of information and the training facilities which the new information services need for their operators and users;
- (b) The reciprocal relations and interaction of information and research;
- (c) The contribution of information to the scientific, economic and social activities of the nation and how far would the development of certain information activities help the nation to achieve the goals it has set itself in these fields?

General economy of information activities:

- (a) Cost of the main information services and their cost/efficiency ratios;
- (b) The development prospects of certain services, enabling them to become self supporting;
- (c) The general cost of information and its distribution among the different sectors of the economy;
- (d) The State finances assigned to these activities and the financial constraints applied;
- (e) The foreseeable growth in costs and its distribution among the different sectors of the economy.

Characteristics of new systems:

- (a) What are their technical characteristics and performances;
- (b) How will they be integrated with existing services;
- (c) What work of research, promotion and training will they need;
- (d) What will they cost to install and operate and what commercial possibilities do they offer?

Appendix 4. Basic Statistics for STI Indicators

(From DAS/STINFO/74.28)

Volume of information produced and used

Primary publications

- a. number of publications (books, periodicals, etc.) produced by language
- b. number of pages printed (number of pages x number of copies) by scientific disciplines and/or by mission

Secondary services

- a. number of services by information activity
- b. number of services by scientific discipline and/or mission
- c. number of citations published
- d. number of abstracts produced
- e. number of existing data bases by scientific discipline and/or mission
- f. number of SDI profiles
- g. number of retrospective searches

Libraries

- a. number of libraries with number of books and number of periodicals held
- b. number of books and periodicals lent
- c. number of visitors or enquiries
- d. number of photocopies and of microfiches produced
- e. number of translations

Congress

- a. number of national and international congress, symposia, etc. by scientific discipline and/or mission
- b. number of participants

Computer and communication

Computers used for STI activities

- a. number of computers used full-time
- b. number of computers used part-time
- c. number of terminals

Volume of communication traffic

Potential users of STI

- a. scientists and engineers by scientific disciplines
- b. scientists and engineers by sector of employment
- c. R&D scientists and engineers by scientific activities
- d. technicians by sector of employment

**Appendix 5.
Porat's Typology
of Primary Information Sector Industries**

KNOWLEDGE PRODUCTION AND INVENTIVE INDUSTRIES

R&D and Inventive Industries (private)
Private Information Services

INFORMATION DISTRIBUTION AND COMMUNICATION INDUSTRIES

Education
Public Information Services
Regulated Communication Media
Unregulated Communication Media

RISK MANAGEMENT

Insurance Industries (components)
Finance Industries (components)
Speculative Brokers

SEARCH AND COORDINATION INDUSTRIES

Search and Non-speculative Brokerage Industries
Advertising Industries
Non-Market Coordinating Institutions

INFORMATION PROCESSING AND TRANSMISSION SERVICES

Non-Electronic Based Processing
Electronic Based Processing
Telecommunication Infrastructure

INFORMATION GOODS INDUSTRIES

Non-Electronic Consumption or Intermediate Goods
Non-Electronic Investment Goods
Electronic Consumption or Intermediate Goods
Electronic Investment Goods

SELECTED GOVERNMENT ACTIVITIES

Primary Information Services in the Federal Government
Postal Service
State and Local Education

SUPPORT FACILITIES

Information Structure Construction and Rental
Office Furnishings

**Appendix 6.
Porat's Typology
of Information Workers**

MARKET FOR INFORMATION

KNOWLEDGE PRODUCERS

Scientific & Technical Workers
Private Information Services

KNOWLEDGE DISTRIBUTORS

Educators
Public Information Disseminators
Communication Workers

INFORMATION IN MARKET

MARKET SEARCH & COORDINATION SPECIALISTS

Information Gatherers
Search & Coordination Specialists
Planning and Control Workers

INFORMATION PROCESSORS

Non-Electronic Based
Electronic Based

INFORMATION INFRASTRUCTURE

INFORMATION MACHINE WORKERS

Non-Electronic Machine Operators
Electronic Machine Operators
Telecommunication Workers

Appendix 7. Policy Issues for ICC Statistics

(From ICCP (83) 9)

1. How fast are the information technology based activities being diffused in Member countries? Is economic welfare related to the speed of diffusion?
2. What are the factors influencing the rate of diffusion? Are there any implications for policy formulation?
3. What have been and will be the likely effects of information technology on levels of employment (both direct and indirect)?
4. What have been and will be the likely effects of information technology on structures of employment? Which occupational groups are being made redundant; which new groups are being created; and which groups are being only marginally affected by the new technologies (to be broken down by industrial sector, sex, age, geographical location, etc.)?
5. Is information technology “neutral” or “biased” towards the relative saving of labor or capital?
6. What are the impacts of information technology on work and the home environment?
7. Will information technology affect income distribution between wages and profits, and if so, what remedial measures could be adopted?
8. Is information technology likely to initiate a new long term cycle of investment and growth?
9. What are the factors fostering long-term business confidence and will information technology systems affect these factors?
10. Are existing financial mechanisms adequate to support the use of the new technologies and industries?
11. What are the effects of information technology on domestic and international market structures (e.g.: via scale economies, barriers to entry, etc.)?
12. What are the likely impacts of information technology goods and services on patterns of international specialisation and trade flow?
13. Is information technology a useful medium for promoting “conservation” (e.g.: energy, materials, avoidance of pollution, etc.)?
14. Will information technology systems promote or retard the development of personal autonomy (privacy, etc.)?

Appendix 8.

Some Projects of the Computer Utilization Group and the Information Policy Group

Computer Utilization Group

Inventory of databanks
Privacy issues
Communication networks
Specialized personnel
Interactions computer/telecommunications
Information technology in urban management
Information technology in public health
Information technology for government
Information technology and society
Telecommunication services
Data communication
Trans-border dataflow
Computer performances
Applications of computers/telecommunication systems
Computer utilization

Information Policy Group

Information policy
Information for industry
Information and innovation
Information for R&D
Information for decision-making
Government financing
Management of environment
Networking
Costs of information systems
Economics of information
Forecasting
Information systems in S&T
System interconnections
Inventory of documentation services
Information analysis centers
Compatibility
Education and training
Interactive systems
Specialized information systems
(medicine, biology, physics,
chemistry, social sciences)
Statistics and indicators

Appendix 9. ICCP Red Series

1. Transborder Data Flows of the Protection of Privacy, 1979
2. The Usage of International Data Networks in Europe, 1979
3. Policy Implications of Data Network Developments in the OECD Area, 1980
4. Handbook of Information, Computer and Communications Activities of Major International Organisations, 1980
5. Microelectronics Productivity and Employment, 1981
6. Information Activities, Electronics and Telecommunications Technologies, Volume 1: Impact on Employment, Growth and Trade, 1981: Volume 2: Expert's Report ("Background Papers" Series)
7. Microelectronics, Robotics and Jobs, 1982
8. An Exploration of Legal Issues in Information and Communication Technologies, 1983
9. Software: An Emerging Industry, 1985
10. Computer-Related Crime, Analysis of Legal Policy, 1986
11. Trends in Information Economy, 1986
12. Information Technology and Economic Prospects, 1987
13. Trends in Change in Telecommunications Policy, 1987
14. The Telecommunications Industry: The Challenges of Structural Change, 1988
15. Satellites and Fibre Optics - Competition Complementarity, 1988
16. New Telecommunications Services - Videotex Development Strategies, 1989
17. The Internationalization of Software and Computer Services, 1989
18. Telecommunication Network-Based Services: Policy Implications, 1989
19. Information Technology and New Growth Opportunities, 1989
20. Major R&D Programmes for Information Technology, 1989
21. Trade in Information, Computers and Communications Services, 1990
22. Performance Indicators for Public Telecommunications Operators, 1990
23. Universal Service and Rate Restructuring in Telecommunications, 1991
24. Telecommunications Equipment: Changing Materials and Trade Structures, 1991
25. Information Technology Standards: The Economic Dimension, 1991
26. Software Engineering: The Policy Challenge, 1991
27. Telecommunications Type Approval: Policies and Procedures for Material Access, 1992
28. Convergence Between Communications Technologies: Case Studies for North America and Western Europe, 1992
29. Telecommunications and Broadcasting: Convergence or Collision?, 1992
30. Information Networks and New Technologies: Opportunities and Policy Implications for the 1990s, 1992
31. Usage Indicators: A New Foundation for Information Technology Policies, 1993
32. Economy and Trade Issues in the Computerized Database Market, 1993
33. The Economics of Radio Frequency Allocation, 1993
34. International Telecommunications Tariffs: Charging Practices and Procedures, 1994
35. Telecommunications Infrastructure: The Benefits of Competition, 1995
36. International Telecommunications Pricing Practices and Principles: A Progress Review, 1995
37. Price Caps for Telecommunications: Policies and Experiences, 1995
38. Universal Service Obligations in a Competitive Telecommunications Environment, 1995
39. Mobile Cellular Communication: Pricing Strategies and Competition, 1996

Appendix 10. ICT Sector (1998)

Manufacturing

- 3000 Office, accounting and computer machinery
- 3130 Insulated wire and cable
- 3210 Electronic valves and tubes and other electronic components
- 3220 Television and radio transmitters and apparatus for line telephony and line telegraphy
- 3230 Television and radio receivers, sound or video recording or reproducing apparatus, and associated goods
- 3312 Instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process equipment
- 3313 Industrial process control equipment

Services

- 5150 Wholesaling of machinery, equipment and supplies
- 7123 Renting of office machinery and equipment (including computers)
- 6420 Telecommunications
 - 72 Computer and related activities

Appendix 11.
Types of Methodological Documents
from the Directorate for Science, Technology and Industry
(First edition)

Manual

The Measurement of Scientific and Technical Activities: Proposed Standard Practice for Surveys of Research and Development (Frascati manual) (1962).

Proposed Standard Practice for the Collection and Interpretation of Data on the Technological Balance of Payments (1990).

Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (Oslo manual) (1992)

Data on Patents and Their Utilization as Science and Technology Indicators (1994).

Manual on the Measurement of Human Resources in Science and Technology (Canberra manual) (1995).

Measuring Productivity (2001).

Handbook

OECD Handbook on Economic Globalisation Indicators (2005).

Framework

A Framework for Biotechnology Statistics (2005).

Guide

Guide to Measuring the Information Society (2005).

Others

Bibliometric Indicators and Analysis of Research Systems: Methods and Examples (1997).

Appendix 12.
Bodies of the OEEC/OECD
Responsible for Information

OEEC	
Working Party on Scientific and Technical Information	1949
OECD (Directorate for Scientific Affairs, then Directorate for Science, Technology and Industry)	
Committee for Scientific Research	
Ad Hoc Group on Scientific and Technical Information	1962
Ad Hoc Group on Information Policy	1965
Panel on the Economics of Information	1965
Committee on Science Policy (then Committee for Science and Technology Policy)	
Group on Computer Utilization	1969
Working Party on Information, Computer, and Communications Policy	1977
Group of Experts on the Economic Analysis of Information Activities	1977
Division on Information, Computer, and Communications Policy	1978
Committee on Information, Computer, and Communications Policy	1982
Ad Hoc Group on Information and Communication Statistics	1982
Group of Experts on the Economic Implications of Information Technology	1988
Working Party on Information Technology Policy	1993
Working Party on the Information Economy	1995
Statistical Panel on GII/GIS	1996
Working Party on Indicators for the Information Society	1998

Appendix 13.

**MANDATES
OF COMMITTEES, WORKING PARTIES, AND *AD HOC* GROUPS**

Mandate of the Ad Hoc Group on Scientific and Technical Information Policy

(From DAS/SR/65.14, SP (71) 30 and DAS/STINFO/74.7)

It was agreed that the Group should bring together government officials in Member countries with responsibilities at policy level for national programmes in scientific and technical information. The terms of reference were established within the general framework of the formulation of national policies and the guidance of the development of the necessary technology, to:

- draw increased national attention to scientific and technical information and the need to allocate sufficient resources for its support;
- identify mechanisms and guidelines for establishing national policies regarding information systems for science and technology;
- study ways to strengthen national organization for dealing with mounting and complex problems of scientific and technological information, including the strengthening of non-governmental communications systems;
- exchange national experiences with different techniques and mechanisms for more effective handling of scientific and technical information. This could lead to studies of the cost/benefit relationships of information systems, and to selected country reviews and confrontations on national scientific and technical information systems;
- identify specific problems for co-operative action, including development of international arrangements for co-operative activities among OECD countries;
- guide formulation of national policies with regard to the various international organizations concerned with information systems for science and technology.

Mandate of the Working Party on Information, Computer and Communications Policy

(From DSTI/ICCP/77.58)

1. A Working Party on Information, Computer and Communication Policy is hereby established, which shall be responsible for encouraging co-operation among Member countries in the field of information, computer and communications policy.
2. The Field of activity covers methods and means for, and any policy issues arising from, the production, collection, storage, processing, retrieval, transmission, dissemination of impacts of advanced information, computer and communications systems, services and technologies on the economy and society in general.
3. The activities of the Working Party shall include:
 - a. to follow the national and international developments, with special regard to the growing interaction among the various elements in the field of information, computers and communications;
 - b. to analyze developments in this field and call the attention of Member governments to their policy implications from economic, social, cultural and legal standpoints;
 - c. to promote an exchange of experience among Member states regarding policy formulation and implementation in the field;
 - d. to assist Member governments in the development of policies at national and international level, and make recommendations as appropriate regarding guidelines for national policy formulation with due regard to an adequate international co-ordination.
4. In carrying out its programme the Working Party shall Work in close co-operation with other bodies of the Organization and in liaison with international organizations having an interest in this field.
5. The Working Party shall present an annual updating of the information, computer and communications policy medium-term programme for inclusion in the work programme of the CSTP, as well as an annual report on its activities. It shall concurrently make proposals to the CSTP regarding the setting-up of appropriate expert groups and submit their mandates for approval.
6. The Working Party's mandate shall cover an initial period of three years, subject to Rule 21 of the Rules of Procedure of the Organization.

**Mandate of the Group of Experts
on Economic Analysis of Information Activities
and the Role of Electronic, Telecommunications and Related Technologies**

(From DSTI/ICCP/77.37)

A Group of Experts is established to define the socio-economic dimensions of the growth of information goods and services and the role of electronics, telecommunications and related technologies for advanced economies.

More specifically, the Group shall endeavor to:

- (1) - identify the types and order of magnitude of information activities, and of changes in information technologies;

- promote agreement on concepts, definitions and methods for measurement of the developments described;

- harmonize related research methodologies carried out or envisaged in Member countries in this field, in order to facilitate international comparability;
- (2) Analyze selected economic and social policy implications induced by these developments such as productivity changes, economic growth, and employment consequences;
- (3) Prepare by Autumn 1978 a Synthesis Report to the Working Party on Information, Computer and Communication Policy presenting the major results of country research, their international comparison and a range of major policy issues for government action resulting from these developments.

**Terms of Reference of the
Committee for Information, Computer and Communications Policy**

(From C(81)59)

1. A committee for Information, Computer and Communications Policy is hereby established, which shall have the objective of examining policy issues arising from the development and application of technologies in the field of information, computer and communications systems and services, including the impact of such issues on the economy and on society in general, and of strengthening co-operation between the Member countries in this field.
2. The Committee shall, in particular, be responsible in this field for:
 - a. Promoting exchanges of experiences among Member countries on the development and application of technologies in the field of information, computer and communications systems and services as well as on national and international policies;
 - b. Analyzing the developments and calling the attention of Member governments to the major implications of such developments;
 - c. Facilitating the development of information, computer and communications policy at national and international level;
 - d. Fostering co-operation among Member countries and as appropriate, co-ordination of their policies.
3. The Committee shall maintain close working relationships with other relevant bodies of the Organization, and shall also take into account the work of other international organizations active in the field of information, computer and communications policy.
4. The terms of Reference of the Committee for Information, Computer and Communications Policy shall remain in force until 1st March 1987, unless the Council decides otherwise as a result of a review prior to that date.

Mandate of the Group of Experts on Economic Implications of Information Technologies

(From ICCP/M (88) 1)

A Group of experts is established with the following terms of reference:

- 1) To exchange country experiences on the development and diffusion of information technology;
- 2) To carry out analysis of the economic and social implications of information technology applications, and develop a better system for measuring such economic effects;
- 3) To develop, for review by the Committee, policy issues as appropriate, to reduce obstacles and barriers to the diffusion of IT at national and international level and to promote international co-operation in this field;
- 4) The Group will undertake its work in close co-operation with relevant activities of other OECD bodies;
- 5) The Group will undertake work as requested by the ICCP Committee and submit the results of its work on a regular basis for review by this Committee.

Mandate of the Working Party on Information Technology Policy

(From DSTI/ICCP/M (93) 3)

A Working Party on Information Technology Policy is established with the following terms of reference:

- 1) To evaluate the impact of policies and programmes that support the development and diffusion of information systems and technology (IT), to exchange country experiences and to promote international co-operation in this field;
- 2) To submit, for review by the ICCP Committee, analysis to encourage the diffusion of IT in the countries; to call the attention of governments to existing impediments to its adoption; and to support studies/seminars for specific major sectors;
- 3) To analyze the economic and social impacts of IT development (in particular, impacts on employment) and diffusion across major economic sectors, and to evaluate the contribution of IT in strengthening economic growth, productivity and industrial competitiveness; this includes establishing appropriate methods and tools for measurement and international comparison;
- 4) To build co-operative and productive relationships with other bodies within and outside the OECD;
- 5) Where appropriate, to make its work available to a wide audience by the release of documents and publications;
- 6) To undertake work as requested by the ICCP Committee and submit the results of its work on a regular basis for review by this Committee.

Mandate of the Working Party on the Information Economy

(From DSTI/ICCP/IE (96) 3)

The Working Party on the Information Economy shall be responsible for:

- 1) Identifying the policy frameworks for the information economy required to strengthen economic growth, productivity, employment and industrial competitiveness in conjunction with the deployment of the new Global Information Infrastructure and the emergence of a Global Information Society;
- 2) Reviewing and evaluating the economic and social implications of the development, diffusion and use of information and communications technologies, products and services, including content, and their applications, in light of their policy implications;
- 3) Submitting, for review by the ICCP Committee, analysis of factors which encourage the usage of information and communications technologies, products and services, including content, and their applications, in the various sectors of the economy and society; and to develop appropriate methods and tools for measurement and international comparison;
- 4) Undertaking work as requested by the ICCP Committee and submitting the results of its work on a regular basis for review by the Committee;
- 5) Establishing co-operative and productive relationships with other relevant bodies within and outside the OECD, including non-Member countries.

Mandate of the Working Party on Indicators for the Information Society

(From DSTI/ICCP/M (99) 1)

- a) The Working Party will Monitor, supervise, direct and co-ordinate the statistical work and contribute to the development of indicators and quantitative analyses needed to meet the requirement of the Information, Computer and Communications Policy Committee and its subsidiary bodies. More specifically, the Working Party will:
 - i) Ensure the continued improvement of the methodology for the collection of internationally comparable data for measuring the supply and demand for, and impacts of information and communication infrastructures, related services, content and applications like electronic commerce. This may entail the development of manuals produced by the Group.
 - ii) Assist in developing and interpreting new and existing indicators which aid formulating policies, monitoring progress, assessing the effectiveness of regulatory reform, appraising applications and impacts and identifying various obstacles to diffusion and use of information and communication infrastructures, related services and content. These should be undertaken in the light of policy changes or other special characteristics of their countries and advise the Committee on the technical validity of reports based on such indicators.
- b) The Working Party will, when required, assist the other subsidiary bodies of the ICCP Committee in the development of analytical and quantitative analyses on related issues such as information security and privacy, assessing the effectiveness of regulatory reform, appraising applications and impacts and identifying various obstacles to diffusion and use of information and communication infrastructures, related services and content.
- c) The Working Party will seek the maximum practicable conformity of its own work with the statistical work undertaken by other parts of the OECD; and also with the work on indicators for the information society undertaken by other competent international bodies.
- d) The Working Party will co-operate, in particular, with other OECD statistical subgroups and working parties in dealing with broader statistical issues connecting industrial, science and technology activities.
- e) The Working Party will act as a clearing house through which Member countries can exchange information and experience on methods of collection, compilation, analysis and presentation of data which they use as indicators for the information society.