A Science Policy for Scientific Information*

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WORKING since 1983 with the Department of Higher Education, first, in the science and technology library sector (from 83 to 89) and now in the science and technology museum sector, I have been associated with the development and planning of fundamental academic research activities, centered around *information:* professional scientific and technical information in the first case, public scientific and technical information in the second case. So, I was and I am now again, faced down with research policy problems, with science policy problems, the science being here what is called information science.

In this paper, I will try to present some of the results and some of the difficulties of these policy activities.

Scientific information for the professional and for the public

Let me first remind you of four facts about scientific information.

1) Some years ago, an analogy was proposed between scientific information and blood: scientific information was said to be the blood of science. That means that the vital principle for science and for the scientist to, through, for example, his (or her) publishing activities.

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2) Among other things, communication activities play an important role in scientists' activities: more than 40% of our time is devoted to communication.

So information and its communication have great importance in science. Then, why, apparently, is scientific information for the scientist or for the public, not included in the different policies defined for science? The scientific study of information which has suffered from this situation is, I think, a determining factor of scientific progress and of scientific literacy.

3) Information technology which affects society in general is also affecting the research process and specially scientific creativity. The use of expert systems in archaeology, judgements or inferences from archaelogical facts.
4) A good representation of science and technology in museums, that is transfer of information through objects, posters, photographs, videos, conferences, books, labels is one of the key problems in the successful public understanding of science.

So information and its communication have great importance in science. Then, why, apparently, is scientific information for the scientist or for the public, not included in the different policies defined for science? The scientific study of information which has suffered from this situation is, I think, a determining factor of scientific progress and of scientific literacy.

A science policy for scientific information

Is there anywhere a science policy for which the props are information science, a policy whose purpose is scientific and technical information research?

Are there national information science research programmes? Not, really, as is shown by steps taken by leading industrial countries over some 20 years. In all these countries however there exists a policy in which the prop is information technology.

Information science

Before analysing this situation, we must realise that speaking of a science policy for information is actually already assuming the existence of an information science.

Effectively, I believe that developing the production of information (general information, scientific and technical information, etc.) requires a science whose purpose is the study of information: nature, origin, properties and production, communication and use, processes and systems. As early as 150 years ago, the rise of the industrial society required — I quote Friedrich Engels — «a science that might study physical properties of natural objects and means of action of the forces of nature». Natural science, physics, was born.

> **Hence, always the primacy of technology over science and the primacy of technology policy over science policy: in all the leading industrial countries, we find policies for which information technology (but not information science) is the prop.**

Presently, this new discipline is not well structured and remains what Toulmin[1] called a would-be discipline. One of the reasons is that in the information field (from mass-media to telecommunications, from libraries to museums), theoretical approaches have always been preceded by practical, technical developments. For example, in the last 60 years, three theoretical approaches emerged a long time after technological revolutions occurred, in the field. They are: the information theory, the mass-media theory and the theory of interactivity:

- In the first case, information is a physical concept which emerges in a technological field: the central question is that of the yield of the transmission channel.
- In the second case, new techniques appear: radio, television. Transmission of information is transformed into mass-communication.
- Then, as the analysis of mass-media becomes more and more sophisticated, a new technological revolution is beginning: information technology, satellites...

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Technology plays, for sure, a determining role in our societies. As Georges Thill[2] said, we are presently moving in a technonature. Our societies are increasingly dependent on the use of electronic and photonic information and communication techniques. These techniques provide industries, governments, people with basic tools for communicating and using information. Moreover, the information and communication industries are becoming a strong component of a nation's industrial power.

This has led some observers to conclude that science policy is not adapted to technology. Hence, the idea of a technological policy made up of specific measures adapted to ensure growth and use of technologies, and not to concentrate national policies on research institutions which elaborate new forms of knowledge.

For example:

1) In the United States, the policy for information technology, in the hands of a good dozen of agencies, is defined according to certain principles:

- not to depend on foreign technology to ensure national security;
- differentiating between financing for civil and military research (70% to 80% of federal financing for information technology research comes from the Department of Defense);
- restricting the access of Eastern countries to technical information and technical apparatus.

Principles that conflict with those of a science policy are:

— development of fundamental research;

— communication of scientific information;

— international exchange programmes.

2) In Japan, the 5th generation computer project is aimed at mobilising researchers for conceiving «intelligent» machines.

3) In the Unietd Kingdom, the national programme was the Alvey program. The response of the economic and social sciences was the PICT program. But the work of OSTI (and its successor the British Library R&D Department) should be recognised as constituting a National Information Science Research Programme.

4) In France, the electronic *filière* was a research programme aimed at providing support for the French electronic industry.

5) Finally in Europe, the ESPRIT programme is very explicitly a technological research programme. The FAST II communication sub-programme was the timid response to this gigantic programme.

Facing this situation, it was not very easy for us in France to launch a basic research programme in information science. It was also difficult to find the approximate structure of this new discipline. A co-word analysis was done on multidisciplinary databases[3]. It revealed the interdisciplinary nature of knowledge about information properties and communication processes (Fig. 1). In fact, we find research coming from diverse disciplinary traditions.

Structurally, information science is one of these new interdisciplines which witness collaboration between a number of mono-disciplines in a significant way: linguistics, psychology, economics, law, politics, sociology, anthropology, computer science, electronics, logic, statistics, mathematics, history, epistemology, philosophy and the mother-discipline, library science and its first information technology, the book (Fig. 2). (For general information, the same scheme is applicable. The discipline is called communication sciences, the mother-discipline being then journalism and the technology, the newspaper.)

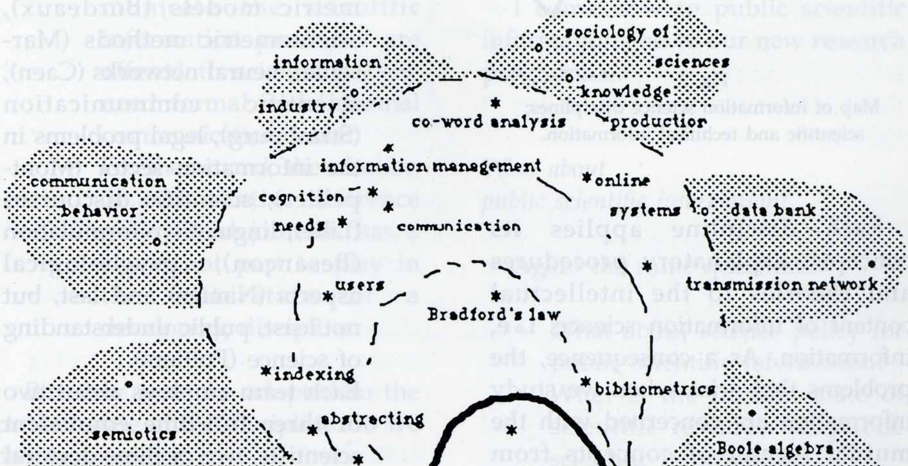

Fig. 1
Map of information science themes: scientific and technical information.
* = central themes; ° = peripheral themes.

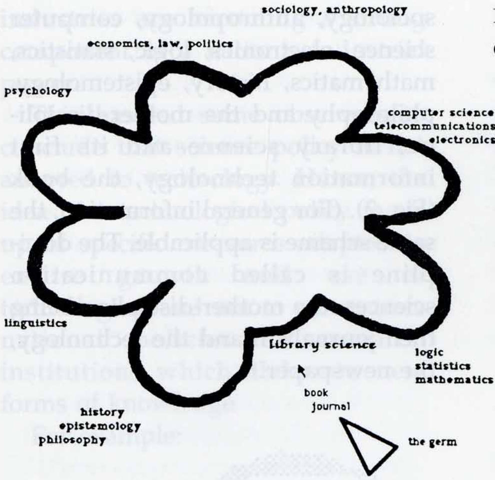

Fig. 2
Map of information science disciplines: scientific and technical information.

Each discipline applies its concepts, explanatory procedures and theories to the intellectual content of information science, i. e. information. As a consequence, the problems that arise when we study information are concerned with the mutual receipt of concepts from different branches of science.

Information science research programme

The Department of Higher Education started, in 1985, a four year support programme for fundamental information science research in close collaboration with CNRS, INRIA and CNET. The two main goals of this programme were:

1) *To create or develop a limited number of research teams:* Ten in four years. Teams grouping professors, scientists, students and technicians undertake fundamental research. They also train research students and six of them offer a post-graduate diploma. They are working on cultural and information industries (Grenoble), bibliometric models (Bordeaux), scientometric methods (Marseille), neural networks (Caen), scientific communication (Strasbourg), legal problems in the information sector (Montpellier), scientific discourses (Lille), linguistic reformulation (Besançon), psychological aspects (Nantes) and last, but not least, public understanding of science (Poitiers).
Each team employs about two or three full-time equivalent scientists, two or three doctoral students and one or two technicians. Each team receives around £10,000 per current expenses (salaries are not included).

2) *To create a scientific environment* for the expected growing community of information scientists. The effective development of scientific disciplines and professions requires

some intellectual and social conditions, some nurturing conditions. The institutional weaknesses of developing disciplines can again show up in a variety of ways. The most typical indications are the failure of communication and the maldistribution of authority:

- For the first, we know that the growth of a discipline is possible only if many opportunities to communicate the scientific information produced are offered to scientists. They need formal and informal communication tools.
- For the second, the creation of authoritative reference groups and journals has a significant part to play in the maturation of a developing discipline.

But they must be adapted to the present state of the discipline. So we choose to create:

- an annual summer school;
- an annual Anglo-French meeting (with the collaboration of the R&D Department of the British Library).

In 1989, the programme was evaluated by a research group specialising in evaluation studies of research programmes. They use qualitative methods such as interviews, quantitative methods and, again, co-words analysis. So it was possible to measure in part the impact of the programme on knowledge construction in the field and to compare its production with the production of other French and British research at the same time.

A science policy for public scientific information

I come now to public scientific information and to our new research programme.

What about public scientific information?

Again the same questions:

- What about science policy for public scientific information?
- What is the present state of scientific research on public scientific information?
- Are there national public information science research programmes?

If the answer is negative for the first question, it is positive for the third. Currently, I think that there are some examples of national research programmes in the field: in the United States, the NAS; in Britain the Science Policy Support Group of the

ESRC, have instigated national research programmes for which the props are public scientific information and «public information science».

A difference from information science can be noted here. Information technology is not, at the moment, heavily used in the field. But we must realise that the electronic museum is not a futurist view. Indeed, use of electronic texts, of electronic images and of electric sounds in exhibits, use of image databanks, computerisation of museum collections are the first indicators of the progressive introduction of information technology in this sector.

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If you have the opportunity to visit the *Cité des sciences et de l'industrie* at La Villette in Paris, I think that you will be surprised by the number of electronic screens and the relative absence of scientific or technical objects.

If you correlate this trend with the result of a recent study on the cultural practices of French people where it is said that these practices have been mainly introduced by the use of the new information and communication technologies, I think that the future, is not so distant. We are entering upon a new phase in man's culture, the screen and walkman culture.

What about our research programme?

Again, before preparing the programme, we have done a co-word analysis (not yet completed) using multidisciplinary French databases. The mapping of the research areas is presented in Fig. 3.

Study of attitudes and preceptions appear to be the main research area followed by the important group of technical research oriented towards the conservation and the presentation of scientific and technical objects.

Keeping the same interdisciplinary structure of the discipline, and adding only education and replacing the «logic, stat, math» group by the «chemistry, physics, biology» group to take into account the curative techniques, we obtain

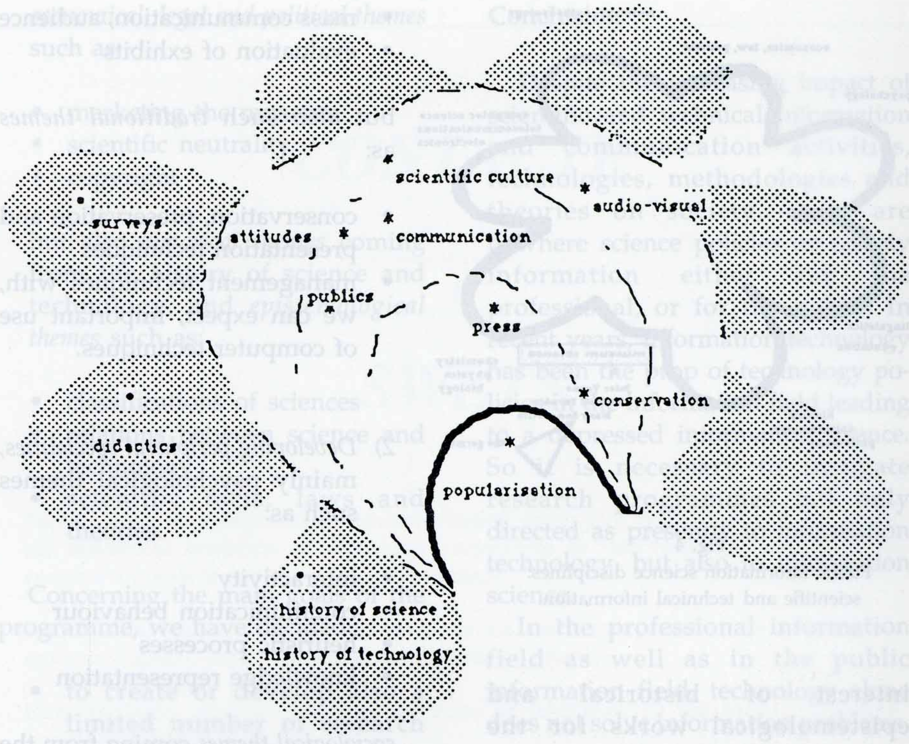

Fig. 3
Public information science themes: scientific and technical information.
* = central themes, ° = peripheral themes.

again a simplified representation of the field and propose to use it to determine some of the orientations of the programme (Fig. 4).

After some discussions between scientists and science policy makers from the Ministry of Research and Technology and the Ministry of Culture, we were able to define a programme that we are now launching: its title is «Scientific and technical Museology». The objective of this programme is to support the construction of fundamental knowledge on what we called scientific and technical culture on one side, and on history and the epistemology of science and technology on the other.

It seems important to us to create this sub-programme in order to attract communities of historians of science and technology and of epistemologists given the great

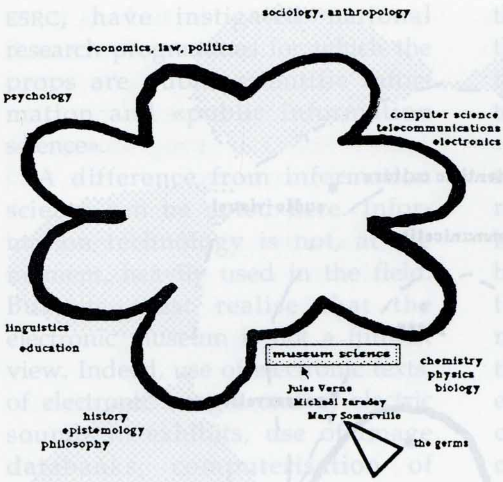

Fig. 4
Public information science disciplines:
scientific and technical information.

interest of historical and epistemological works for the understanding of science.

Another important feature is that we impose a necessary link, a partnership, between scientists and museums of professionals in science centres to try to improve the scientific as well as the professional activities.

The overall research will, we hope, bring results:

1) *Conforming the core specialities on the field:* mainly *socio-cultural themes* such as:

- message elaboration and perception
- mass communication, audience
- evaluation of exhibits

but also such *traditional themes* as:

- conservation, preservation and presentation techniques
- management techniques with, we can expect, important use of computer techniques.

2) *Developing peripheral specialities,* mainly psychological themes such as:

- interactivity
- communication behaviour
- heuristic processes
- knowledge representation

sociological themes coming from the sociology of sciences:

- actors
- institutions
- social networks

linguistic themes such as:

- reformulation processes
- terminological factors
- vocabularies

educational themes such as:

- school science
- scientific literacy

economical, legal and political themes such as:

- marketing the museum
- scientific neutrality
- copyright

but also *historical themes* coming from the history of science and technology, and *epistemological themes* such as:

- classifications of sciences
- relations between science and technology
- scientific facts, laws and theories.

Concerning the main goals of the programme, we have decided:

- to create or develop also a limited number of research teams;
- and to create a scientific environment for the expected growing community of public information scientists.

The evaluation will be done continuously by integrating in a database all the documents produced by scientists, experts, committees and by doing co-work analysis on the content.

Conclusion

Despite the increasing impact of scientific and technical information and communication activities, technologies, methodologies and theories on society, there are nowhere science policies on society information either for the professional, or for the public. In recent years, information technology has been the prop of technology policies in the information field leading to a depressed information science. So it is necessary to instigate research programmes not only directed as presently to information technology, but also to information science.

In the professional information field as well as in the public information field, technology alone does not solve information problems.

References

[1] S. Toulmin, *Human Understanding*. Princeton, NJ, Princeton University Press, 1972.

[2] G. Thill, *Techno-démocratie, mode d'emploi*, ESPRIT [s.l., s.n.] 1982, p. 80-81.

[3] See e. g. J. P. Courtial, M. Callon and M. Sigogneau, «Is indexing trustworthy? Classification of articles through co-word analysis», *Journal of Information Science*, 9, (2), 1984, p. 47-56.