

## Raising awareness and knowledge of and sharing scientific, technical and industrial cultures: an imperative

Summary of the report by Mrs Maud Olivier, deputy,  
and Mr Jean-Pierre Leleux, senator,

Very many reports – including parliamentary reports – have addressed scientific, technical and industrial culture (CSTI) and have regularly underscored the shortcomings of its dissemination (public-understanding activity).

Although these reports saw a public policy challenge in the need to remedy this situation, CSTI does not however appear to have been considered with full respect for its importance, in other words a national priority.

Against this background, this report, enriched by the prior ones, shows that the development of the sharing of CSTIs has resulted from the voluntarism of a multitude of players and underscores the urgency of giving new impetus to their activities. Therefore, it aims at proposing frameworks for action, in terms of governance or national strategy, in line with the scale of contemporary needs as regards the public-understanding activity related to scientific, technical and industrial culture. It also intends to make concrete proposals applicable in the present context.

The rapporteurs also proposed new terminology. First, by substituting the plural – CSTIs – for the singular – CSTI – hitherto employed, in order to better underline the specific aspects of the three notions composing them. Second, by referring henceforth to the 'sharing' of CSTIs and no longer their dissemination as the latter term harks back to vertical relations between experts and non-experts rather than promoting a democratisation of knowledge.

### Development of the sharing of CSTIs results from the voluntarism of many players

The sharing of CSTIs is central to two series of major goals: democratisation of access to knowledge and excellence of the educational and research systems.

### *Democratisation of access to knowledge*

This goal of democratisation is pursued by the players of informal and formal education alike.

□ **Informal education** – in other words the know-how and knowledge dispensed outside the institutional system of school and university establishments – involves traditional players – museums and associations – and new players – science centres, regional or local authorities and the European Union.

Among these players, three give specific features to the French mechanisms for the sharing of CSTIs: associations, centres of scientific, technical and industrial culture (CCSTIs) and Universcience.

### 1. Associations

Highly numerous and varied by their means and goals, associations are very important field players. Although they face a fragile financial situation owing to the progressive disengagement of the State, they have nevertheless contributed to anchoring CSTIs in the remotest territories and also in working-class districts.

### 2. CCSTIs

During the years following the creation in 1979 of the CCSTI in Grenoble, CCSTIs have grown in number and contributed, like associations, to promoting scientific, technical and industrial cultures in the regions and territories, thanks most often to the combined action of academics, regional or local authorities and even companies. Yet, great disparities in terms of their means exist between CCSTIs.

### 3. Universcience

Resulting from the amalgamation, in 2010, of the Palais de la Découverte and the Cité des Sciences et de l'Industrie, Universcience plays a central role as the national reference pole and regional centre for scientific, technical and industrial cultures. However, this duality is a source of difficulties between Universcience and the other players. The Act of 22 July 2013 on higher education and research puts an end to these misunderstandings by transferring to the regions the management of the funds devoted to CSTIs amounting to 3.6 million euros.

□ **Formal education**, in response to the criticisms expressed in several reports, has introduced reforms aimed at making the teaching of sciences more concrete through experimentation starting from the earliest age, the Hands-on method being the most iconic example. The aim was also to stimulate scientific and technical career interests and promote project work to encourage self-reliance in pupils and a multidisciplinary approach in programmes.

This distinction between formal and informal education must not be exaggerated. Indeed, the

various players have found it necessary to cooperate: the national education sector has decided to open up more to the outside world, especially in the direction of associations or science centres.

Furthermore, the **digital revolution** has also contributed to the rapprochement between the two educational systems. People outside the formal education system have been able to engage with it thanks to digital technologies and action taken by the players of informal education (associations and CCSTIs).

Conversely, by eroding the knowledge monopoly held hitherto by teachers, the digital revolution has introduced new relations between the latter and learners, for example through a greater interactivity of lessons.

### *Excellence of educational systems and research*

Through the second goal of the sharing of CSTIs, France – like other States – has wished to strengthen the efficacy of its educational system and research bodies.

Educational systems are, indeed, faced with the challenge of school and university failure. Various measures have therefore been taken to allow the most disadvantaged to access knowledge. With a view to social cohesion, the aim is also to promote life-long learning, so as to facilitate the adaptation of employees to the speed of technological change.

A second challenge has arisen from the increasing pressure exerted by international rankings, above all the PISA (programme for international student assessment) and the Shanghai ranking. These rankings have given rise to many criticisms in France regarding their relevance. Nevertheless, as far as the PISA is concerned, it is not ruled out that, as was the case in Germany, the mediocre results obtained in France for many years and especially in the 2012 tests, may give rise to a public debate and reforms. Turning to the Shanghai ranking, the criteria – limited to the number of publications, of Nobel prizes and of Fields medals – do not take account of professional outlets.

As for research bodies, the idea of competitiveness has taken hold among them, owing to the stiff competition among States in the globalisation context. Through the Horizon 2020 programme, the European Union has thus encouraged the Member States to strength the scientific excellence of Europe, and take account of the goals of that programme in their research policy, as laid down in the Act of 22 July 2013 on higher education and research.

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### **Urgency of finding a new impetus to the development of the sharing of knowledge**

This need embodies two main aspects:

Improving the sharing of knowledge and simplifying the governance of CSTIs.

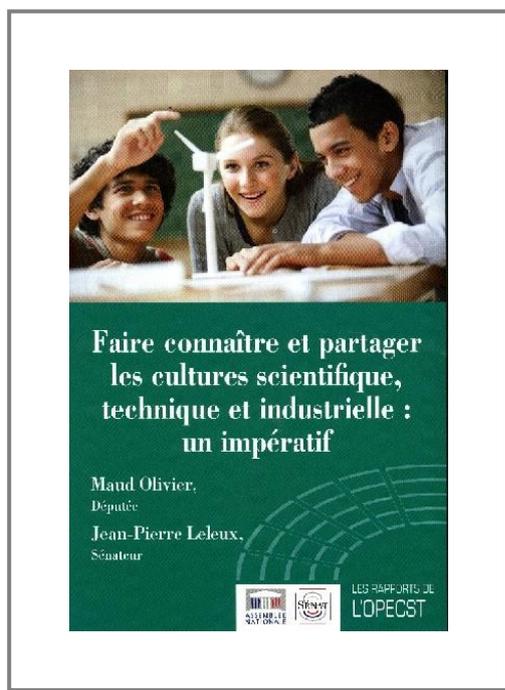
#### ***Improving the sharing of knowledge***

This improvement requires the systematic introduction of the sharing of CSTIs in the educational system and also the reduction of inequalities of access to knowledge and scientific and technical professions.

The systematic introduction of the sharing of CSTIs in teaching establishments demands, to be effective, that the initial and further training of teachers should form part of the development of this sharing. It is at this price that the students of teacher training colleges (ESPE) which were opened last autumn, and teachers already in post, will be able to foster an interest in science among pupils and students and stimulate scientific and technical career interests. In this respect, with reference to ESPE students, it will be important that the final exam, especially the eligibility tests, should grant greater importance to the teaching

skills of candidates, and in particular, hands-on methods.

As for inequalities of access to knowledge and scientific and technical professions, this work-stream is proving to be all the bigger as, following the publication of the 2012 PISA tests, France has been labelled the champion of inequalities owing to the worsening of social inequalities by the educational system. The fight against 'segregative democratisation' according to the specialists of the French educational system, will imply, inter alia, reviewing the procedures of academic orientation and the academic streams system.



The work-stream on gender inequalities is equally crucial in view of the persistent difficulties encountered by women in accessing scientific and technical studies and jobs, despite remarkable academic skills. It is therefore proposed, in particular, to make the amount of subsidies or grants paid to the various players (associations, universities and research bodies) contingent on measures promoting gender equality. But it will also appear essential that teachers and the public orientation service must be

trained so that they give greater encouragement to young girls to consider scientific studies, engi-neering sciences and research.

Last, the sharing of knowledge must be improved in order to promote a culture of calmer dialogue between science facilitators, technology, industry and the public. Such a goal requires that science facilitators – scientists, media and companies – and decision-makers and also citizens should assume their share of responsibility.

To develop the outreach activities of researchers, it is important to really obtain institutional recognition of these activities by ensuring that the new responsibility of the High council for the assessment of research and higher education (HCERES) is correctly applied.

Students could also be encouraged to become involved in outreach activities. Referring to the media, they will have to make a greater effort to promote sciences and technology among the general public and children. A better treatment of sciences and technology will also require an improvement in the training of journalists. In this respect, modules in the history of sciences and technology will have to be introduced into the teaching given by journalism schools.

Companies should, for their part, contribute to improving the visibility of the industrial strand of CSTIs, for example by making a dense network of speakers available to school establishments or else by promoting – together with the other players – industrial tourism.

To allow a more fruitful participation of citizens in the public debate, the OPECST is called on to repeat and develop its experience in the organisation of citizens' conferences, while the regions are encouraged to set up places of permanent debate as well as sciences and technology observatories.

Last, as regards decision-makers, the organisation of training sessions in Parliament or at the Institute for Science and Technology Studies (IHEST), to which would be added an industrial component (IHESTI), could contribute to improving their perception of scientific, technological and industrial challenges.

### *Improvement and simplification of the governance of CSTIs*

Within France, this goal involves the appointment of CSTI referent advisers by the various members of government, and better inter-ministerial coordination which could be steered by the minister for research. This is one of the prerequisites to allow the State as a

strategist, which all the players want to see asserting itself, to perform its tasks.

As for a renovated territorial governance, its set-up will require the development of infra-, inter- and supra- regional synergies, in liaison with the national research strategy, as well as the introduction of a funding and quality label mechanism serving as a basis for associative action.

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By their recommendations, the rapporteurs have endeavoured to respond to the demand of the players for a strong national governance respecting their independence and diversity but promoting coherence in their activities by allowing them to pool their work.

They also wanted to insist on the fact that raising awareness and knowledge of and sharing scientific, technical and industrial cultures formed a major political goal which cannot be foregone otherwise the very concept of the knowledge society would be negated and the risk would be taken of jeopardising the need for social cohesion by further widening the gap between experts and non-experts.

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