



*Science, Technology and Civil Society:
Empowering Roles of Scientists and Engineers*

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これからの科学技術と社会

- 科学技術と社会のよりよいコミュニケーションをめざして -

Science and Technology for Society:

Creating New Relationships

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1. Predicament of Civil Society in Advanced Scitech Society

- Today, many civil society organizations (CSOs) are playing vital roles to make our societies better and more livable, with much of accumulation of relevant expertise and experience.
- But, in the fields related to S&T, most of them have yet less expertise and little support from experts community, though everyone needs scitech knowledge to make better understanding, judgment and choices under the enormous impacts of S&T.

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At first, what is the predicament faced with civil society in advanced scientific and technological (scitech) society? It is the scarcity, or worse, lack, of scitech expertise and support from professional scientists and engineers.

In contemporary society, one of hallmarks of advancement of society is the maturity of civil society in which people can freely exchange their views and opinions and act together in solidarity with others, regardless of their gender, age, vocation, natality, in order to make their society more livable. In fact, many civil society organizations (CSOs) are playing vital roles in various fields such as environmental and consumer protection, peace making and so forth, on various levels of local, national and global politics.

However, when it comes to the issues deeply associated with science and technology, most of CSOs and individuals have less expertise and little support from professional scientists and engineers. Under the enormous impacts of development of S&T, both positive and negative, we all need scientific and technological knowledge, or scitech expertise, to make better understanding of issues we face, better judgment and choices, and better commitment to actions to make their lives and society better. But, most of us cannot afford to learn it sufficiently or to hire scientists and engineers for our own problem solving. And it seems that this predicament is more serious in Japan as well as less developed countries than other advanced industrial countries.



2. Responses of Scitech to the needs and concerns of Civil Society : Traditional

- Traditional social contributions of scitech community has been exclusively limited to industrial and economic prosperity, or to intellectual progress of *mankind*, which is a vague conception.
- Only possible answer to the predicament of civil society is the promotion of “**scientific literacy**”, while it is in fact limited and little help for people’s needs and concerns, because:
 - Too many disciplines, too much knowledge to learn, but people cannot afford to do it since they are occupied by their own business (i.e. matter of opportunity cost).
 - Problems faced with people are often highly uncertain and contested even among experts.

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2.1 Traditional Contributions

When the public, or civil society organizations (CSOs) are faced with such a difficulty, what kinds of contributions does the expert community make?

The traditional contributions have been exclusively limited to industrial and economic development, or to the intellectual progress of “mankind”, which is too a vague and remote concept as compared to the concreteness and acuteness of needs and concerns of the public.

And only possible answer to the predicament of civil society has been the promotion of “scientific literacy”. But it is in fact limited and often little help for people’s needs and concerns. It is because there are too many disciplines and too much knowledge for people to learn. In this highly advanced scitech society, people are faced with diverse issues which require knowledge of multiple disciplines, but they cannot afford to do it since they are occupied by their own businesses; that is, it is a matter of opportunity cost. And another reason for the limit of scientific literacy is that the problems faced with people are often cutting-edge issues and therefore highly uncertain and contested even among experts, such as the future environmental impacts of genetically modified organisms (GMOs). It is impossible for lay people to give definite answers to such a question. Scientific literacy is not enough!



2. Responses of Scitech to the needs and concerns of Civil Society : New

- ✱ We need more direct intermediate roles of scientists and engineers between S&T and civil society to empower people, straightly responding to their needs and concerns.
- ✱ It is promoting and supporting public access to scientific capacity of knowledge production as well as to knowledge itself.
- ✱ In other words, *in order to expertise democracy, it is necessary to democratize the expertise*, which entails a new set of conceptions and models of S&T.

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2.2 New Contributions

Thus, it is clear that the traditional ways of social contribution of scitech community is not enough, or even helpless to respond to public needs and concerns. We have to invent new ways of contributions and new roles of scientists and engineers.

Then, what type of contributions should we conceive? In the first place it must be more direct intermediating roles to bridge S&T and civil society, empowering people more straightly. It is to promote and support public access to scientific capacity of knowledge production as well as to knowledge itself. In other words, in order to *expertise democracy*, to make civil society more intellectually competent, it is necessary to *democratize the expertise*.

3. A New Set of Concepts for Empowering the Public through S&T (1)

1. Extending “social accountability” of scientists and engineers:
 - Accountability to needs and concerns of civil society, not only industrial society;
 - Accountability to empowering the public to produce their own knowledge to make their lives better, not limited to promotion of knowledge diffusion (*explanation*).

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graph LR
    SC([Scitech Community]) --> IS[Industrial Society]
    SC --> CS[Civil Society]
    IS --> PNC([People's needs & concerns])
    CS --> PNC
  
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In order to realize the democratization of expertise, we need a new set of conceptions and models of S&T. This is what I want to talk in the latter part of my presentation.

At first, I would like to propose to extend a set of conceptions associated with scitech activities in order to make them more suitable to empower civil society more straightly.

3.1 Extension of “Social Accountability” of Scientists and Engineers

First of all, it is the extension of the range of “social accountability” of scientists and engineers. The concept of accountability is often understood as the responsibility of explanation of one’s conducts and events. But it is at the same time the responsiveness to needs and concerns of civil society, not only those of industrial society. The public as citizens expect experts to solve their problems and in case of publicly funded research they pay much money to it as taxpayers. So that scientists and engineers should bear and fulfill their responsibility to meet public demands, especially by means of empowerment of people to produce their own knowledge outcomes, not only knowledge diffusion or explanation.



3. A New Set of Concepts for Empowering the Public through S&T (2)

2. Extending the concept of “scientific literacy”:

- Scientific literacy should be redefined as a **collective property of a community** rather than personal one.
- It is an intellectual asset of community consisted of **network** of human, knowledge, and other R&D resources.
- “**Scientifically literate**” means that any members of community can afford to access to resources to learn and produce relevant knowledge for their problem solving.

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3.2 Extension of “Scientific Literacy”: Literacy as Collective Property

The second element of new concepts is an extended conception of “scientific literacy”, namely, scientific literacy is not only what is our mind but also what is in our community. In the traditional conception, scientific literacy is a personal ability to understand and judge scientific and technological issues. But we should extend it to the extent that it involves social, collective nature. It is a collective property of the community where people live. It is an intellectual asset of community consisted of network of human, knowledge, and other R&D resources. Therefore, the adjective of “scientifically literate” means that any members of community can afford to access to resources to learn and produce relevant knowledge for their problem solving.

3. A New Set of Concepts for Empowering the Public through S&T (3)

3. Social robustness of knowledge:

- Multiplicity of knowledge sources:
 - It is not limited to a single discipline.
 - It is not limited to professional works of experts, but also involves “local knowledge” of various people.
 - Robust scientific knowledge emerges from the exchange of information and opinions from multiple points of views and contexts.
- Robustness of knowledge should involve social values as well as scientific facts and values:
 - Social values are not only industrial and economic values but also political values such as empowerment, fairness and justice.
- **Public proof** rather than **scientific proof**.

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3.3 Extension of the “Robustness” of Knowledge: Social Robustness of Knowledge

The last element of new concepts is the “social robustness of knowledge”, which has two aspects.

On the one hand, this concept is defined in terms of the “multiplicity of knowledge sources”. By this term, I mean following points. Firstly, it means that the basis of knowledge is not a single discipline. Secondly, it is not limited to professional works of experts, but also involves so-called “local knowledge” of various people. People have their own knowledge and experiences in their daily lives and vocations, and such a knowledge are often indispensable for understanding and solving problems such as environmental problems of local sites. Lastly, the multiplicity means that the robust scientific knowledge emerges from the exchange of information and opinions from multiple points of views and contexts. Controversy and mutual criticism are essential for making knowledge more reliable.

On the other hand, the concept of “social robustness of knowledge” means that the basis of robustness of knowledge should involve social values as well as scientific facts and values, and that social values are not only industrial and economic values but also political values such as empowerment, fairness and justice.

To sum up, combining the multiplicity and social values, it may be said that robustness of knowledge is based on “public proof” rather than scientific proof.

4. Emerging model of Practice: Empowering the Public through the Science Shops (1)

☀ *Science shops provide independent, participatory research support in response to concerns experienced by civil society on a demand driven and affordable basis.*

- Analogue of legal advice office, from which they can have scitech support.
- Originated in Dutch student movement in early '70.
- USA: Community-based Research (CBR)
- Today: 70 science shops exist in Europe alone. Most of them are located in the Netherlands, Austria, Denmark, France, Germany, Romania, and the UK.
- Expanding network:
 - Int'l conference *Living Knowledge*: JAN 2001, FEB 2005
- EC promotes the Science Shops: *Science & Society Action Plan 2002*

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As the final section of my presentation, I would like to introduce you an emerging model of practice to empower the civil society directly. It is the science shops.

4.1 What is the Science Shop

The science shops are activities analogous to that of legal advice office. They provide independent, participatory research support in response to concerns experienced by civil society on a demand driven and affordable basis. They originated in Dutch student movement in early '70s and in USA there has been a counterpart called "community-based research center" that has a different origin in '60s. Today, about 70 science shops exist in Europe alone. Most of them are located in the Netherlands, Austria, Denmark, France, Germany, Romania, and the UK. In USA, it is estimated that more than 500 community-based research centers. And in Asia, Korea has several science shops. Many of them are located in universities and some are independent NPOs. Especially in Netherlands, all universities have one or more science shops and they are incorporated into curricula of university education. And recently, the activities and network of science shops in European countries are supported and promoted by European Commissions as a program of *SCIENCE & SOCIETY ACTION PLAN 2002*.

4. Emerging model of Practice: Empowering the Public through the Science Shops (2)

☀ Characteristics of Science Shops:

- Independence: university-based, NPO-based, or mixed.
- Demand-driven, directly responding to public needs and concerns
- Participatory research: partnership of experts and lay user groups, facilitating interaction between experts' and user's perspectives, experiences and knowledge.
- Knowledge production as well as transfer, enhancing public access to R&D resources, not limited to public awareness/understanding of scitech.
- Affordable basis

☀ Merits of Science Shops

- Not only for users but also for scientists, engineers, students and universities with which SS are affiliated.
- PUST: via SS, People can learn what S&T really are.

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4.2 Characteristics and Benefits of Activities of Science Shops

The science shops have several characteristics as follows, and some of them reflect the essence of three concepts I mentioned before. First, science shops are independent and neutral organization, based on university, NPOs or mixed form of them. Second, their research activities are demand-driven, directly responding to needs and concerns of users. Their users ask them to give some technical advice, to produce research results to solve their problems such as environmental problems they face, or to develop some technical devices designed to meet users' needs. Thirdly, the research of science shops are basically participatory ones in which users and experts cooperatively produce the results through the exchange of their perspectives, knowledge, experiences and values. Furthermore, the service of science shops is not simply the *transfer of knowledge* but also *production of knowledge* to meet users' needs and demands. Finally, all the services are provided on lower prices or for free, because most of users don't have enough money.

Additionally, the activities of science shops are beneficial not only for users but also for scientists, engineers, students and universities with which they are affiliated. And more generally, science shop activities can promote so-called public understanding of science and technology (PUST). People can learn through the science shops what S&T are, appreciating its great potential and limits.



Benefits of SS on SciTech Community

For students

- Practical knowledge & skills for R&D and communication
- New insights for designing their own works
- Possibilities of new career courses

For researchers/teachers

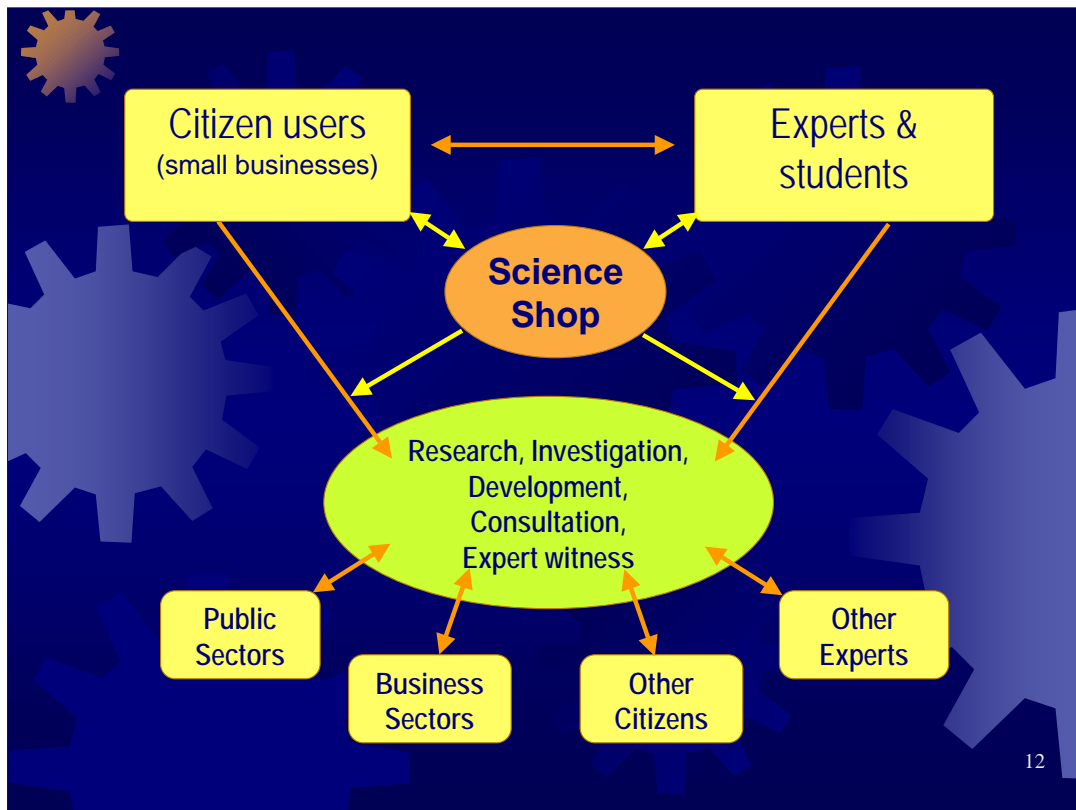
- New R&D topics/tasks assimilating social needs and relevance
- Learning from society and the publics
- Interdisciplinary projects
- Curriculum designing

For universities

- Social contribution through SS
- New form of Social *raison d'être*

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These are the benefits of science shops for providers of service, especially in case of university-based science shops.



This slide shows how the science shops work among various social actors.



Conclusion

A New Dream of Scientists and Engineers

- New job opportunities for young researchers and students.
 - New values and meaning of becoming scientists and engineers: S&T for civil society
- New life opportunities for retired scientists and engineers: precious resource for society!

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Finally, I would like to briefly conclude my presentation by saying that such a practice of science shops represents a new form of dreams of scientists and engineers, young or old. It is to make more tangible and helpful empowerment of the public.