Session 1

How Can We Establish and Utilize Information and Knowledge Infrastructure for Collaboration and Innovation?

Chair

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Summary

Masaru Yarime:

Opened the session.

The goal for this workshop is to provide an international and interdisciplinary forum to promote a deeper understanding of technical, economic, legal and institutional conditions for establishing an information and knowledge infrastructure and to discuss how to utilize it for stimulating collaboration and innovation in a way that contributes to global sustainability.

We need to discuss the technical issues as well as the "soft" foundation, that is, economic, organizational, legal and institutional aspects of information and knowledge infrastructure. This includes the incentive structures for relevant actors. We will also hear examples in different fields. One will be the open source software and open standards. The other will be Scientists without Borders.

W. Edward Steinmueller:

I want to talk about timescales of change. What I want to emphasize is that whereas 50 years ago there was a large variety in world leaders, today's leaders are more managerial. 50 years ago we were at the exchange of science in relationship to the semiconductor, and I want to emphasize the importance of the free flow of information and knowledge. We have heard about decoupling of knowledge with intellectual property rights and I do not think we would have the transistor industry or the semiconductor industry of today had in 1956 AT&T not been required by law to disseminate transistor technology broadly throughout the world.

The central premise of this session is that achieving

higher levels of sustainability requires an improvement in the "science commons;" "anti-commons" outcomes negatively affect social welfare.

Broadly speaking, I will be talking about "science commons." This refers to the free flow of information. I will work with a set of definitions. "Science commons" is defined as science being a public good because of its information content. It is most likely to create benefit if it is generally and freely available. (This is a statement of a desirable social norm.) A second meaning is that commercial interests may wish to enclosed parts of this commons in order to achieve greater private return. This might suggest that commons will not exist without some form of intervention, some form of specific action to preserve the commons. That is a lot of what the current political activism with the science commons is about, preserving the free flow of information. The third definition, which has not been completely articulated, but comes through the GIES discussion, is that scientific knowledge is a common cultural heritage and removing barriers to accessing it is a natural extension of human rights. (Access to the commons requires proactive measures.) Each of these different meanings has different policy implications.

As an example of science as a public good (definition 1), is Stephen M. Babcock, a professor at the University of Wisconsin who invented a simple but reliable test for measuring the butter fat content of milk. He refused to take out a patent for his invention and is reported to have said that this is what the taxpayers pay his salary for. Another example is Donald Knuth, who designed TeX, a typesetting language for mathematical equations that is broadly used. He placed his software in the public domain. Companies such as Adobe have been built on his ideas. He stated that much of the progress in computer science made in his lifetime would not have been possible if software had been patentable.

To illustrate the second definition, enclosing the commons, there is the history of AT&T, which was required by law to provide technology in settlement of a lawsuit that it had engaged in anticompetitive behavior within the US market. Without this opening of the gates, what would the history of the semiconductor industry have been like? The general argument made today is that intellectual property is necessary for innovative investment. I, however, am convinced that patent and copyright are less important than other means of appropriating the returns from innovation. Much of the movement toward stronger intellectual property is because particular industries, specifically the pharmaceutical industry, have a specific interest in preserving the gap between the cost of production and the cost of sale, and the only way they can do is to have a very strong intellectual property rights regime. That does not mean that it is appropriate for other industries or beneficial for human kind or even for commercial interests.

To illustrate the third definition, cultural heritage, we must recognize that the industrialized world has benefited enormously from the ability of scientists and inventors as well as their ideas. Viewing science as a common cultural heritage of human beings is a natural way to return this benefit to the world. In global terms, having science as a common culture is a good place to start. This viewpoint accords with basic ethical principles and also enhances the legitimacy of systems of market exchange. Practically speaking, this involves a series of questions about organizing access. How to take account of different capabilities and experiences? This raises a larger agenda about the resources that are required.

The counterargument to this picture is a "markets for knowledge" idea. In this argument, the enormous complexity of the world makes finding, verifying and applying knowledge in many cases more costly than producing it. There is the possibility that bad information may crowd out good information and we therefore need intermediaries.

Is there social value in intellectual property? It can provide a basis for action, it can prevent "development

races" and can provide a resource for other activities. It is the notion of the republic of science versus the republic of commerce. In science, priority, being first to discover, is the thing that drives the system. Without disclosure, there cannot be priority. In commerce, disclosure reduces competitive advantage. Firms do publish, but there rationale is to gain access to networks, to advertise their achievement or to reward scientists and engineers.

Some of the practical issues that need to be addressed include: How can we extend the science commons? First, we need critical reflection. "Commons" is not a synonym for utopia. Second, some regulation may be necessary. Third, some organization may also be necessary.

Critically reflecting, there are several problems with the knowledge commons construction. It is difficult to anticipate the variety of ways the communities may wish to use information. We need to find ways to organize information standards, a place to put information from various sources together. Persistence is not guaranteed. Wikipedia has sustained itself for some period of time. But there is still a possibility that the community will break down.

We may need to be thinking about some form of regulation. Economics provides the tools for producing more but relies on individual action to divide better. In the case of the knowledge commons, reputation is a strong form of regulation, but only as strong as the community norm. There is the ever-present possibility that private actors have an incentive to expropriate knowledge commons, to build tollbooths to access them.

Some organization may be necessary as well. Variety can be a cost as well as a benefit. There are many open source projects, but many of them have single developers. This raises problems with access since many initiatives are either mono-language (English) or language-based (multi-language nature of Wikipedia). Proactive measures against the formation of "anti-commons" require discipline and energy. "Anti-commons" means dividing the knowledge into different pieces that are owned by different people that have to be coordinated in order to be useful as a body of knowledge.

For sustainability, the question is where to begin work on this substantial and as yet unresolved issue because of the divided nature of viewpoints previously noted. Organization and coordination can adjust the wastefulness of variety but can also suppress innovation.

Conclusions: The formation of knowledge commons is a major opportunity to improve human welfare. There are substantive problems in the creation of knowledge commons, some of which are difficult to overcome. Tools to address problems exist but critical reflection, regulation and organization are still needed (it is not only a technical problem). In the area of sustainability, the problem of selecting priorities is a major impediment to the formation of knowledge commons.

Michiharu Nakamura (Hitachi):
You are defining science very widely. Are you thinking mostly of pure science which is not patentable? Or are you referring to some part of technology?

W. Edward Steinmueller:
My view is that we should group things as science--specifically things that have the “public good” feature of being used in a lot of different contexts. Science-like technologies are the ones for which we should seriously be considering how much intellectual property to maintain. Let us take the example PCR. This is a very, very broadly operable technology and a whole set of domains. My argument would be that we should look very closely at whether the existing structure of ownership of intellectual property of PCR is impeding the applications domain. The flip side of that is that for the technology that we need to develop to improve sustainability, there are lots that we would like to fence off as being broadly, generically applicable and define licensing rules and domains which make them widely available. We were talking earlier about a refrigerator installation technologies. The specific implementation of a system should continue to be a proprietary product, but not the basic principles. There are

elements of scientific and technical knowledge that other people should have access to.

Shulin Gu (Tsinghua Univ.):

This might include not only knowledge but also the means and tools. For example, open software. I wonder how to classify the commons a little bit further.

W. Edward Steinmueller:

I focused on information and knowledge. There is another domain that is considered within the political movement on science commons which is specifically concerned with materials related to science and technology, for example new materials or biomaterials: cultures, gene sequences, all of these kinds of things. It is possible to imagine both proprietary and more open domains for such knowledge. I think the question is: can we define the cases, whether it be knowledge or artifacts, where there is a broad public interest in the availability to many other parties for further development. That does not really get in the path of the pharmaceuticals companies because safe pharmaceuticals are expensive to develop and they need to be protected for the development costs. However, beyond that they have too much return on investment, perhaps. At the first level, it is the question of whether there are platforms of knowledge that can be brought into a global domain for common use. We agree on science, that quantum mechanics should be available to all without any legal restriction. How far should we go?

Shulin Gu:

What is your opinion of a broad, global commons. If some part of the knowledge has the characteristic of a broad public good, do we need a global institutional construction for guidance and monitoring, management?

W. Edward Steinmueller:

That is one approach, but I do not think it is very effective. I think it is much more effective for the community of scientists and engineers to be thinking in terms of the public welfare and benefit of a particular science in identifying and taking action themselves to register new knowledge within the public domain. They should take care of what knowledge is available or not. That is an ethic which also can be coupled to institutions of a much more decentralized type. When I think global, I do not think at the center of the globe there is a place where everything is managed. What I see is a network of cooperating people who exist within a common understanding of the value of the republic of science. This is a reassertion of values, a strengthening of values that have existed for centuries in the formation of scientific communities. Let us go back and reassert that value in these debates about policy, intellectual property, trade restrictions and competitiveness. Let us talk about the desirability of exchanging information and knowledge.

Hideaki Takeda:

My presentation will focus on the World Wide Web, which is changing the traditional information distribution system. What changes took place? What direction are we going?

When there were no written languages, there was very limited distribution of information; with written languages distribution was still limited, but there were small numbers of information providers and consumers. After Gutenberg, we got better distribution and preservation of information. There were a small number of information providers and a large number of information consumers. In the Internet (WWW) era, we have a great amount of distribution and preservation of information, large numbers of providers and consumers. This balance between providers and consumers is a new phenomenon.

The web has over 20 billion pages over 80 million servers and 0.7 billion users (14% of adults over 15).

Today, the focus is not technology itself but on information and communication activities. "The old computing was about what computers can do; the new computing is about what users can do. Successful technologies are those that mesh already with users' needs. It must support relationships and activities that encourage the users' experiences."

The cycle of information exploitation: collect, create and donate. The Web was invented for scientists, so this

culture of collection, creation and donation is very similar to the culture of the science community.

Another layer to be studied is that of communication activities. It exploits the cycle of human relationships: relate, collaborate and present.

The Web is a communication medium. People have their "home pages" to introduce themselves. Some parts are valuable for research while others are just for communication.

There are new means of communication that have appeared such as blogging and social networking services. The wiki approach as well.

The information layer is well researched; the communication layer has not been researched that much. It is just beginning to be studied.

We are shifting from information to knowledge. Ontology for knowledge sharing. The Web explicates the need for common background knowledge among people. In fixed information distribution, all people are expected to share background knowledge. In flexible information distribution like the Web, that is not guaranteed. Ontology is an explicit specification of a conceptualization.

Ontology in communities. The problem is the relationship among ontologies. Ontology mapping is the new challenge for computer science.

Chikako Maeda (JST):

We have the two layers of information and communication. This is an interesting scheme, but how do you ensure the trustworthiness of information using these schemes? For example, in the scientific and technological information among specialists, you write papers and they are peer-reviewed, but in this scheme it is difficult to ensure that a page is trustworthy. How do you make sure that the science commons is effective? How do you maintain quality?

Hideaki Takeda:

The information layer itself does not guarantee the quality of information. It is the social network or community that guarantees quality and trust. But that raises the question of how to ensure the quality of the community. Communities are flexible. They are difficult to maintain. We currently do not have a good answer or much knowledge about how the communities function. That is why I say the next topic should be community issues.

W. Edward Steinmueller:

The literature in this field is growing very rapidly. There are many people writing about the characteristics of particular communities. There is also a comparative performance and comparative rules of behavior in different communities that may affect their success or achievement.

Chikako Maeda:

In traditional communities like the academic community, the community itself guarantees the quality of the information. In the era of the World Wide Web, it is difficult to construct communities.

Hideaki Takeda:

In the past, the community authorized information. Today, we do not place so much value on the authorization of the community.

W. Edward Steinmueller:

If you go to an open source community, you will be selected or not. It is a process of selection.

Hideaki Takeda:

It becomes an issue of reputation.

Rishab Aiyer Ghosh:

I want to talk about why it is interesting and useful to form communities and how it becomes convenient for them to share value in a way that seems to be a bit different and then look at the specific example of open source.

Transactions essentially want to match a need with a resource. In markets, price acts as a signal to find the best match between needs and resources. In a firm, the market is broken up into groups, needs and resources, or you have information rather than a price within a firm that provides a signal. This means that there are some links between needs and resources that cannot be made. Each is a firm overmarketed when there is information that is not in the price, the cost of organization is less than the cost of all

possible transactions. You choose a market when you want to have the maximum possible interactions in matching, price encapsulates all the information that you want to make the choice and the transaction cost is less than the cost of organization. What if you have a situation where information is not represented in the price and you can reduce transaction costs and/or migration costs? You could call this a network or a commons. Every participant is both a resource and potentially a need. This works by reducing transaction costs and organization costs while increasing information and improving the allocation of resources. This works if you are able to reduce transaction costs and you are able to reduce organization costs. How you do this is not by talking about an explicit transaction taking place but a series of implicit transactions. I call this the "cooking pot." That removes the barriers in terms of individual transactions and reduces the potential transaction costs. Similarly, in networks you can reduce organization costs by removing hierarchy. It becomes a self-organizing network, self-selected leadership structure. This is an attribute of the most successful scientific communities.

What happens when you have a transition to these sorts of communities is that the recognized price does not measure everything, and you are able to work more efficiently even if you cannot measure things with price. Like firms, you are able to provide more knowledge about resources that you cannot price in markets. The information you give is hard to compute but can be placed in different contexts. Unlike a firm, but like a market, you are able to find the best match. With open source software, the first person in the world to solve the problem will solve it. Where you make proprietary software within a firm, the solution must be within the firm in order to solve any problems you encounter.

When you remove transactions, how is it possible for the participants to perceive that they are receiving value? In a barter transaction, each individual feels that they are getting a benefit. In a price transaction it is exactly the same thing, but there are more transactions involved. You attach value to money. When you go to the cooking pot model, you throw something in and you get something out and it works as long as each individual feels that they are getting more from the system that they are putting into it. Since information is reproducible and does not cost anything, everyone gets their own personal copy of the entire cooking pot. Each person is making a profit and is in some senses being selfish; each gets much more to what they put in. People who are participating in this network think that they are selfish and others are not. In surveys of the open-source community, if we ask people whether they get more of the community than they put in, they say yes to a high degree. On the other hand, if we ask them about others and whether they are giving more than they put in, they still think others are selfish, but not so much. That is because of this dynamics. The fact is that information can be reproduced instead of the traditional IPR model of creating artificial scarcity. What is happening here is that the infinitely reproducible nature of knowledge is being taken advantage of to give people a sense of value so that they do not actually need to be altruistic, but they could be rational and selfish and still contribute to the community.

Open source is not a public domain in the legal sense but is a public good in an economic sense. It is copyrighted software which is distributed under licenses that ensure recipients are free to use the software, free to distribute it, to modify it and distribute modifications. Some licenses require the recipient to redistribute under the same license, including for any modifications. The choice is no longer “do I let my competitors have it or not.” It becomes more complex. Do I let my competitors build upon it in a shared pool but not let them have it for themselves? This is an expropriation. You are able to prevent your competitors from expropriating your contribution. It is a protected commons. You are putting a fence around it, not around your property but around a commons so that anything that goes in there if it is built upon will stay in the common pool.

There are a number of innovations that have emerged

to the open-source community such as scripting languages that have made a big difference in how websites and software are developed. Most programmers in developing countries work in scripting languages like Perl and Python rather than traditional programming languages. Dynamic Web servers are another example, application development, multimedia and clustered computing. Sometimes, open-source products just copy what proprietary products are doing but that is only to the extent that no open-source product existed before. Linux did copy UNIX, but if it did not copy that you would not have an operating system on which to build. What open-source shows is that it is entirely possible to have a natural monopoly of the technology such as the World Wide Web or e-mail systems but because IPR is not tied to it, you have a natural monopoly in technology but full competition in the supply of the technology.

There have been process innovations such as massively distributed development. This is a clear ecosystem, user-driven development, a development that is not just from simple input from users. This is something that open source has exploited enormously, especially in its early stages. The Apache Web server started because people who were leading websites shared their modifications to Web servers. Rapid prototyping is another example similar to the scripting languages. There are also quantifiable improvements. You can see these improvements because the software is out there and available. You may not measure the monetary value, but you can measure when each line of code was added and by whom.

There are different ways to evaluate the software. Substitution cost is one. We use that to work backwards to see how much it would cost the company to create the value of the source code distribution. It is a lot of money, a lot of time and a lot of effort. It is doubling like Moore's Law every 18-24 months. It is maintained very frequently, so half the code gets replaced every 5 years.

This is also global. Per capita contribution is very high in North America, Scandinavia and Australia. If you weight by Internet users, it is more balanced. Large parts of Latin America and Russia become more significant. If the weighting is by wealth, there is even more balance. India and China become the highest contributors by wealth. It is clearly a global community and global effort, but it depends on wealth, distribution of Internet and access to technology.

Open source is an ecosystem. The classic question is how there can be an economics around open source when you cannot make money selling the software. If you have employment, programmers do not actually work in companies who make money selling software. Most work in custom software for the end user sector. The same goes for spending. Today's software ecosystem is consistent with open-source software where few people in firms make money selling software. They make money with the provision of software services.

Open-source software is written primarily by individuals who have no organizational affiliation. Corporations are making up an increasing share as well as universities and development groups. Almost 60% of companies in other manufacturing sectors say that they use open source in their software products, which is quite high. We find that a lot of open source is being used in embedded software, and network equipment, and wireless routers. It is being used to substitute for internal R&D. The Nokia N800 uses a LINUX platform. Because of this, they were able to take a risk on an individual product which they would not have done if they had to spend money on it. They were able to substitute their research and development and spend the money instead on better screens or better marketing.

There are other examples like Wikipedia or SNP consortium. SNP keeps basic information public within the consortium. There are also examples of the firms such as Xerox where the technicians do contribute to a common pool. Phillips has an open-source-like community. There are collaborative lending platforms in the financial sector.

Policy recommendations: It is important not to have a dramatic approach to intellectual property rights and to consider alternatives and actual disclosure benefits. Empirical data show that open source is a much higher

source of new ideas than patents. Support should be provided for contribution to public goods, and it should be treated as time spent as a charitable donation.

Michiharu Nakamura:

More enterprises are coming to open software. A lot of them want to get reliable software, which means they have to participate. We have a patent pool system. In standardization, a single company does not have all the patents. They are licensed to everybody.

Rishab Aiyer Ghosh:

Patent pools will only apply to members of the pool.

W. Edward Steinmueller:

Why not free riding?

Rishab Aiyer Ghosh:

Open source developers do not worry about that. The US talks about how much it uses from piracy, but that assumes that Microsoft would actually sell the same number of copies that are pirated. The assumption is that the value of the good is what the producer wants to sell it at, but I think the value is actually close to zero because it is infinitely reproducible. There are social norms that people recognize. People understand that if you do not contribute in some way, you are not going to get the benefits. A lot of users who just use something are said to be free riding, but their reaction is also recognized as valuable. Perhaps you are writing in order to be famous. There are economists who blog all the time. They should be worried about free riding, but in fact they are the ones who are benefiting because millions of people are reading what they write because it is a blog.

Ellis Rubinstein:

My remarks are on information and knowledge infrastructure for collaboration and innovation.

I am trying to provide an example for your consideration in the form of Scientists without Borders. We are creating an information commons to drive innovation for global sustainability.

The mission of the New York Academy of Sciences is to advance scientific knowledge, resolve the major science-based global challenges and increase the number of scientifically informed individuals. The second is the one that relates to the one I am going to show you. This was the most difficult for us to actually act on in the paper-based world, but in a world that is based on virtual discussions and collaborations that did not exist in a similar way in the past, I would contend that we can suddenly do something fairly dramatic. Throughout our history we have tried to bring people together physically and have them talk about things that cross bridges and barriers in science hopefully to advance scientific knowledge among the small group and then to traditional publishing and dissemination. We are unique in that we are the only academy in a particular location that is global, the only way we could serve our global members was to send a print publications. That is the old model of having information and shoving it out with no interactivity.

Etiology of the idea of Scientists without Borders: I realized that we needed to integrate and create bridges because people do not have full information about the challenges faced. We looked for an integrated approach that could deal at all areas of the problem, water, environment, women's issues, micro-financing. In all these areas you have the opportunity to try to do something. It was obvious that the needs were for integration among projects that were well-meaning but not getting synergy. We needed some capacity to do coalition building or building of bridges. We were generally good at that, but the question was how to do this in places like Africa. I had some partial answers in terms of a multiplicity of actors and some technological and strategic multipliers.

We identified science-based needs, logistical needs and political needs. Over several years of the World Economic Forum and in my reading it was obvious that there were huge numbers of actors out in the field trying to help in various ways. However, they are almost entirely independent of each other. The multipliers identified were on the technological side, Google Earth, Wikipedia, eBay and Scientists without Borders. Strategic multipliers are

also beginning to develop: Gates foundation, Clinton Global Initiative, Touch Foundation, Earth Institute/ Millennium Promise, Scientists without Borders.

There were lots of "without borders" organizations, but the scientific community was not necessarily doing anything. What would it mean to bring science together in some interesting way? What we are building is a website that brings organizations together into a community. The website covers all sciences, engineering and technology. Perhaps in the future we can also link to micro-financing. It allows you to search a number of different ways to match availability and demand.

This will only succeed if we get individuals in the community to realize that they have a better chance of succeeding in what they want to do if they participate, help somebody else and eventually get help for what they want to do down the road.

W. Edward Steinmueller:

I would like to hear about the phasing of the project. How can you actually get it off to a credible start? This is a difficult problem for many such communities.

Ellis Rubinstein:

People would look at "Scientists without Borders" and have fantastic notions about what to do. We have people who are trying to volunteer. Our plan is really to try to be as practical as we know how to be, and we will start with Ghana as our first site where we demonstrate our capacity by asking organizations in Ghana to start putting their stuff in. We will use this to identify issues and unanticipated problems.

I did not really want people-to-people matching services yet. We want to have the institutional substructure first. The one we would like to do is try to have the African institutions that need help or would like to do things put their needs up so we can begin to have institutional exchanges in phase 2.

If all of those things go well, the last issue is how to develop funding for particular projects that would allow people to have exchanges. However, for us a success would be that if we can create a clear leverage point for the institutions that are already there so that they feel like they are getting help from each other.

The Touch Foundation observed the same thing that I just showed you. Their experience was that institutions think that they should help each other but there is nothing that pushes them to do it. The McKinsey people decided to create a very similar thing to what we are doing to Ghana. They are focusing on Tanzania. They have a small team of people whose main job is to go around to the institutions in Tanzania and show how to leverage their capacity by cooperating. That makes a perfect mesh with us. We could be the database and the leading actors. We are discovering that our concept would be more robust if we did not have to do everything. There are many ideas on the table. eBay could create an exchange service that I would not have to do on my website.

W. Edward Steinmueller:

There is the whole problem of actually pushing through something that is a benefit because of the heterogeneity of the communities with which you encounter.

Floor:

This is a very practical matching service. We need to respond to the needs of these countries. We cannot do it for our American and European NGOs. This could become a resource for the countries. The countries want to have people come in to help build capacity, but it is a monumental challenge to screen the potential applicants. Having research institutes as members of this community takes care of the screening problem.

Ellis Rubinstein:

I would like to believe that if we are starting with the institutions in keeping the institutions as the clearing houses for what they do themselves, then in the beginning we will start with a level of success.

Shulin Gu:

What are the initiatives of the New York Academy of Sciences? Where do your resources come from—both the monetary resources and talent resources?

Ellis Rubinstein:

It is in our mission to do something like this. We are not supposed to make money; we are supposed to do good things. It is possible for us to do this project without a huge infrastructure. We can raise money because people see the value of this. The Academy's power is not in itself but in the alliances that it makes with universities, companies and other academies all around the world. What it is really turning our academy around is the fact that we are a little body that people like to get involved with this kind of the way. To do a project like this and succeed would prove that we are extremely and uniquely valuable in the world.

Yoko Ishikura:

I like the practical aspect of it and the way the Academy set up as a neutral body with all sorts of alliances. It seems like the Touch Foundation tries to fill the gap in terms of covering those who are there. Who is going to do it? At some certain spot? Another is how are you going to make sure that you get enough people there rather than just information? A second question, what is the role of the host government?

Ellis Rubinstein:

The Touch Foundation is a surprise for us. We wondered if we could do it if we did not have people there actually pushing the function. One of the things we did for the last five months was talk to organizations in the field in Africa and ask if they would participate in this or find this useful. We did not know how difficult it would be, but we wanted to try it. When the Touch Foundation showed up, and they were willing to put people in there who would be devoted to making this concept directly to the institutions of the country. Both are in the same position. We want to prove it and they want to prove it. We also have the millennium Project, the Gates and the Clinton people and that might be another source of help. Regarding governments, I do not have any answer. I did not know myself what we could expect the government to do. It does make sense that the government of some place like Uganda or Rwanda would find this extremely useful because we produce a tool for them to know what is going on in their own country and hopefully they will support it in some ways. We are trying to limit the visibility of the New York Academy of Sciences on the website and in the organization. We are not trying to use this for branding.

Shulin Gu:

What is the relationship with the UN millennium Project.

Floor:

The discussion started when there was an active UN Millennium Project. Now that group has been taken over by the United Nations Development Programme and that work continues but not as a project. It is changing how the United Nations Development Programme works.

Ellis Rubinstein:

May want to continue to be partners.

Floor:

The millennium goals are a holistic approach. Regarding governments, they are taking more and more leadership in terms of how they interact with donors and partner organizations. On one hand, there are more and more resources coming; on the other, it is a challenge for the government to have 30 groups working on HIV-AIDS, for example. Governments need to monitor them and approve them. It will help to manage information.

Yoko Ishikura (Hitotsubashi Univ.):

How long did it take to get to this stage?

Ellis Rubinstein:

We thought about it during the last calendar year, but it was last November that we raised the money to get people to get this started. We had to spend five months understanding the kind of issue that we were going to face with different institutions. Our Executive Director has been spending some time doing that and building wireframes for the site. We will launch in October because 150 scientific and medical journals have all agreed to do public health special sections during that month. It will be an unusual event and this is another contribution that we can do at the same time. We would like to have an Asian launch of this at a

press conference here at that time in conjunction with the SDS for them. This is an experiment, but it could not have happened without the concepts that we have been talking about here.

We are still not as good as we should be. Our academy does not yet understand how to get volunteerism working except in very traditional ways. This is a new experiment for us.

Yoko Ishikura:

The timing is perfect in that there is more interest in Africa as well.

Ellis Rubinstein:

In the United States there has been an unbelievable change. People who have never been interested in Africa are now interested. It is been driven by the Internet; over the last 10 years there have been changes in organizations who are now willing to partner in ways that they had not in the past, including companies. There is a conceptual change we are trying to work together in ways we never did before.

We are doing the same things that pharmaceuticals and other big companies are going through. We used to produce publications to the lowest common denominator of interest because the only way you could survive was with a broad publication to a large audience for the lowest price. Therefore, people are only interested in a piece of the publication. All of that is collapsing in the Internet world. These things are the reverse side of it and the things that you can do now.

Masaru Yarime:

I included information and knowledge infrastructure in our title rather than just the information commons because some people thought it was too narrow a topic. However, most of our presentations focused on the issue of the information commons and that is what I would like to focus our discussions on. As far as I understand it, there are a lot of differences between different sectors and fields in terms of the boundaries between the open sphere and the private sphere. I think the mechanism is quite different. Sometimes, people share knowledge and information just because of cost reduction. It is simply too difficult to do it alone. Another one is the reputational aspect. That is a different mechanism from cost sharing schemes. A third mechanism might be like the case of open software where by joining the community you could increase your skills and knowledge so there is a personal benefit. This is my impression but I think it would be better to have more detailed, critical analysis of the mechanisms that are there to create, sustain and utilize this kind of information and knowledge commons, depending on the characteristics of different sectors and fields. That would be one direction which we should think carefully about. That might be a point to address in the final session of this workshop. Before that, I would like to ask Dr. Nakamura about corporate behavior and what is happening in their thinking about what and how to disclose information.

Michiharu Nakamura:

We agree that information and knowledge commons is a very important asset for all the people in the world. That is encouraged by a healthy global patent system. This argument over the first intervention/first submission issue: if we can reach an agreement on it, the entire patent system will be unified. If we have a healthy patent system that operates at low cost, that will secure the information and knowledge commons. The second point is that based on this perception, some industrial companies are becoming much more open. We open our results every year. In the past, we would keep them for six months or one year until we had real products. Today, if we get a new technology or a seed technology, we open it up to all of our partner companies, usually our customers, to work together from the beginning to create final solutions more quickly than before. I think that is a new ecosystem model today among partner companies. This also holds true with universities.

Masaru Yarime:

Is the openness limited to partner companies?

Michiharu Nakamura:

We do not open to our competitors. Eventually, it will be fully open however.

W. Edward Steinmueller:

For me, the second is not a problem. The first is actually a problem. Even if we are to harmonize the global patent system, there still remains a problem at the heart of the anti-commons problem which is that in assembling complex systems there may be a reliance on many different pieces, each one of which is owned by a different company or party and the ability to make varieties of such systems becomes extremely costly. The anti-commons problem is that there is royalty stacking that can exist if the ownership of the knowledge is too diverse. There is a monopoly pricing problem, which is the Microsoft kind of problem, but there is this other problem of royalty stacking, for which we do not have a clear solution. The market does not necessarily produce a commons in that sense. There is a coordination failure.

Michiharu Nakamura:

That issue has been solved to some extent by cross-licensing and patent pools. We need to have an incentive for heavy R&D investments. And there is a balancing act.

W. Edward Steinmueller:

That is why I do not have problems with the second part of the argument. Most of the advantage to companies comes from the early lead, not from the securing of 17 years of patent life. When the question moves into areas of sustainable technologies, then we need to make much more rapid progress. I was disappointed with the UNU map of change because it had 20 years before the reduction occurs. In the UK, where there is a lot of focus on climate change, people say that any time you see a 20 year gap, the commitment to make change is not real. One has to be thinking less than 10 years to make an impact. This is also based on the rate of projected accumulation in the atmosphere. In that respect, we face the problem of how we can accelerate the pace of change. Making a larger commons of technologies and science is what we do.

Michiharu Nakamura:

My impression is that the pressure for speedy development of a new product is a strong incentive for us. Every six months we must ship a new mobile phone.

Hideaki Takeda:

Basically, patents have the effect of sharing knowledge and of course development costs. We need rapid growth and rapid sharing now, so the problem with patents now is the length of the patent. Maybe 1 or 2 years is enough and you do not need 10 years. That is enough to balance the R&D costs and the sharing effects. We need a more flexible patent system for the future.

W. Edward Steinmueller:

In the patent literature, there is a long debate on the life of patent and whether it should be reduced. When you try to implement that in practice, the industries that will be most damaged are also the most politically powerful. The commons approach is a different approach which says that you want to make certain bodies of knowledge available for more rapid deployment by setting a license arrangement that is either a free license or a very nominal fixed-charge license designed to recompense the company releasing the technology.

Michiharu Nakamura:

We were the first Japanese company to have an open patent policy. If licenses are requested from our competitors, we say yes.

W. Edward Steinmueller:

In my view, Japanese companies are not the problem. The problem more often than not is of the United States and to a certain extent Western Europe.

Masaru Yarime:

I find the speed of knowledge creation interesting and how it reduces the necessity of protecting intellectual property because it becomes obsolete so quickly.

Michiharu Nakamura:

It makes us more flexible.

W. Edward Steinmueller:

Many years ago I worked on a legal case in which a company that made drilling bits for oil was lucky enough to find a way to inject lubricant into the drilling face. It

turned out that the angle of the size of the aperture was of critical importance, and they patented this. Everyone who made drills had to either infringe the patent or pay for a license. This was a relatively long-lived way a company can earn money just by having knowledge. From a corporate viewpoint, you need to tell the shareholders that we want to have a more flexible policy to increase the rate of knowledge formation, but shareholders would rather have the maximum return on their investment. How do you resolve this?

Masaru Yarime:

One of the factors involves the parameters to create different regimes for the commons? Can we identify them?

W. Edward Steinmueller:

I think the rate of technical change is important.

Masaru Yarime:

Also the importance of combining different bits of knowledge. This may be less important in biology than in information technology. There are also issues of sustainability, public health and poverty reduction.

W. Edward Steinmueller:

We do not have to look very far in health. How much return should the pharmaceuticals industry receive for pharmaceuticals?

Hideaki Takeda:

There is a difference between technology artifacts and technology information such that you can invent another technology with similar effect. You can invent different kinds of compression technologies for videos. This does not happen in medicine. We should look at knowledge of information technology and artifacts in general. We should make a distinction.

W. Edward Steinmueller:

Within artifacts there is a great deal of difference. Just an information artifact is not enough. Even with information, there is a best sorting method and if someone had a patent on it, it would be bad news.

Masaru Yarime:

We heard that contributors to open source software want to contribute because they gain skills and reputation. Is that the only difference?

Rishab Aiyer Ghosh:

The structure is not specific to open source software. The incentives that exist for sharing music, DJs making remixes of music, is not necessarily the same as for software. In the case of software, there are businesses who make hardware or who provide services, and contributions count people who contribute to find jobs. It might be a different model for music, online text or video. They will have different revenue generation potential.

Shulin Gu:

I think a discussion of the global innovation ecosystem should consider putting the scientific commons into the whole framework. I think that is a good approach. It is an important perspective to look at. Second, I would like to hear some experiences and lessons from Chinese experience. The concept of scientific commons is relevant to the relationship between universities and industry. China has been pushing universities and academic institutes into the market, but the results have not been good. In IT, the push is correct, but in other areas, especially agriculture and health, it failed. We did not take the concept of scientific commons seriously into the policy framework. Japan should take account of the lessons from China as a tries to transform its universities. Third, the work on scientific commons has been very limited in the GIES program. I think that we need some prioritization, identification of different aspects of the scientific commons. We have heard about the externalities, benefits for basic needs of human beings compared to cost. Pharmaceuticals is the example. Some very basic, essential pharmaceuticals could be identified as a particular area. Environmental technologies could be another area. It is very important to raise this dimension. Finally, patent pools can be looked at as a very reasonable arrangement from the perspective of companies that have developed the capacity and relevant knowledge. You do cross-licensing to develop a patent pool. It is a

reasonable form of collective action. From the perspective of a less-developed company a patent pool means that the barriers to entry are much higher than before.

Masaru Yarime:

Invite final comments.

W. Edward Steinmueller:

The issue of intellectual commons should be raised and we should say that we as a group are concerned about the various balances between private and public interests but we are not in a position to resolve those interests and make some strong recommendations. On the other hand, there seem to be some very interesting developments in open source and open science communities based on voluntary rather than regulated action that should be considered seriously and balanced against intellectual property rights strengthening.

Masaru Yarime:

Closed session.