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Special Feature:
ICT Governance
— Technology vs. Legal System —

Coping with the Multifaceted Character of Universities
— Establishing Information Security Policies

For Safety and Security in the Network Society

The Role of Copyrights in an Era When Anybody Can Be a Creator

The UPKI Project : Protecting the Information which Universities provide to the internet

Hitoshi Okada

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NII Interview: Hitoshi Okada＋Atsuko Tsuji

Coping with the Multifaceted Character of Universities

Establishing Information Security Policies

ICT Governance

—Technology vs. Legal System—

Tsuji: We often hear the terms "information security" and "information security policy" these days.

Okada: The IT Strategy Headquarters was established in the days of the Mori administration, and people talked about building the nation by means of information technologies. It was at that time that the importance of information security began to receive a great deal of attention. At the time, there were repeated incidents in which the websites of government ministries and agencies were altered by crackers and so on, and how to make our systems more secure from outside attacks became a serious issue. This included things like not creating security holes and taking measures against computer viruses.

Information security policy was established to make sure that not just the engineers in charge but everyone in the ministry or agency was aware of the importance of information security. The level of awareness differed depending on the ministry or agency. In order to make the level uniform, the National Security Information Center created Standards for Information Security Measures for the Central Government Computer Systems in 2005.

Tsuji: I understand that you recently received an Order of Merit* from the cabinet secretariat for establishing security policies for universities. Why did you choose universities?

Okada: Universities have networks for each of their functions - research, education and administration. Moreover, the very nature of a university makes the circumstances very different from those of a government agency. For a government agency, in addition to ensuring the safety of information with respect to external attack, which I mentioned a moment ago, the completeness of the information (in other words, increasing the accuracy of the information) and the usability (in other words, ensuring that the information is useful) are of fundamental importance. But in the case of a university, things are not so simple. Studies have been conducted for some time by volunteers at the Institute of Electronics, Information and Communication Engineers and by NII and other university members, and so we put together unified government standards. These consist primarily of rules for Internet use, procedures that should be conducted by network managers when an incident occurs and so on. But to tell the truth, universities are the biggest challenge.

Tsuji: What particular challenges do educational institutions present?

Okada: Well, for example, in the case of a company, the employees and the company have a contractual relationship, so if rules are established they can be expected to be observed. And if they're disobeyed, there's disciplinary action. Apparently at some U. S. universities, students sign a contract when they enter. In the case of Japan, though, the responsibilities of students are not clear. Furthermore, if there

Note: On February 4, 2008, the National Institute of Informatics (Working Group for Information Security Policy for National Universities and Institutions./ Director: Hideaki Sone, Professor, Tohoku University / Deputy-Director: Hitoshi Okada Associate Professor, NII) and the Institute of Electronics, Information and Communication Engineers (Network guideline working group) were awarded Orders of Merit at the Prime Minister's residence for jointly establishing standardized and usable information security regulations (Sample regulations for information security) suitable for institutions of higher education.

Atsuko Tsuji
Editorial Writer, The Asahi Shimbun

are violations of the rules, it's not something that can simply be corrected by imposing a penalty. As an educational institution, it is the university's responsibility to teach students how to use the network correctly and safely. Before the students use the network in a dangerous manner, resulting in unexpected accidents, the university should make them able to understand and avoid the risks. The role of the university is not to tighten control from a criminal law standpoint as in the case of the community at large. It's to guide the students toward proper use.

Tsuji: Together with the points you've just noted, what is the sense of the authorities with regard to university administration?

Okada: There are precedents, so it's become easier to get them to understand. I go around to universities throughout Japan and explain these matters, and if I begin with an actual case that occurred, I find they understand immediately that this isn't something that affects only other people. Some universities have not only had to pay money due to improper use of software but are also being audited as well.

Tsuji: How about research area?

Okada: That's a major headache. One of the characteristics of a university is that there are people with various skill levels. In some cases, they're careless about the use for research purposes of servers that would be avoided in the private sector. Or in the case of databases as well, they lower the restrictions in order to invite user opinions. The result is that while this provides more freedom of operation, it also increases the opportunities for attacks by people just out of curiosity. You can't provide protection just by building a high wall. Increasing safety without losing usability — that's a major conundrum. And the engineers are between a rock and a hard place. They can't make good progress at ensuring maximum effectiveness for the technology without support in terms of systems. We plan to give them some help by working with attorneys and people who understand the situation in the private sector.

One other important role of universities is the development of new software — the kind that people didn't even envision previously. One example is file exchange software. As long as you use it properly, it's a revolutionary achievement that can enable the direct distribution of information. Now, a government agency can simply prohibit its use. But if universities issued a blanket prohibition on things, saying that they're dangerous, new technologies would never be nurtured.

It's only when you think about the issues in advance that engineers are able to create with peace of mind and provide the results to society.

Tsuji: So in that sense as well, the engineers need help.

Okada: The more creative a technology is, the more likely it is that it's never been envisioned as a concept. So you can't keep up if you rely only on a legal interpretation. It's only when you think about the issues in advance that engineers are able to create with peace of mind and provide the results to society. This is a mechanism for extending a helping hand to engineers. There's also a movement toward something called preventive law. Even in the researcher's world, however, there's a big gap between the legal interpretation and the policy theory used to create future laws. These two things need to be closer together.

Tsuji: I imagine the mission of NII will expand as well.

Okada: On the assumption that technologies never before envisioned would be produced in the process of creating regulations for universities, we attached a long commentary, something not done in the case of regulations for government agencies. This is to ensure that the people who read the regulations understand the intent and can accommodate new circumstances. Some of the members of the team that created the regulations are now going one step further in discussions regarding technology and law. What I'd like to do is provide a forum that enables consultations on the social significance of technology and how it should be presented. If possible, I'd like to create a portal site for that purpose.

A Word from the Interviewer

I was struck by the fact that phrases like "one step further" and "in advance" came up a lot during this interview. Most of us tend to think of information security as a passive endeavor, I think he was saying that what will be important for Japan's future is action taken in advance — in other words going on the offensive in information security. I have high hopes that the "one step further" efforts of the NII will help ensure that creative technologies like *Winny* do not lead us in an unhappy direction.

ICT Governance

—Technology vs. Legal System—

For Safety and Security in the Network Society

The dissemination of cell phones and the Internet in society has occurred with breathtaking speed, and for this reason the technology has outpaced effective security measures. ICT governance aims to exercise control and achieve a balance between technology and security in society.

Junk email. The single-ring-and-hang-up solicitation call. Billing fraud. The "one click" scam. These are all new criminal techniques that have been produced in the last dozen years or so. All of them represent abuses of the information and communication technology (ICT* for short) such as cell phones and the Internet.

Each time a problem has arisen, legal and other measures have been devised. Yet one after another new techniques are devised. The situation has long taken on the aspect of a cat-and-mouse game. And in this process, the measures taken to punish wrongdoers make things more inconvenient for all users and may actually restrict citizens who have done nothing wrong.

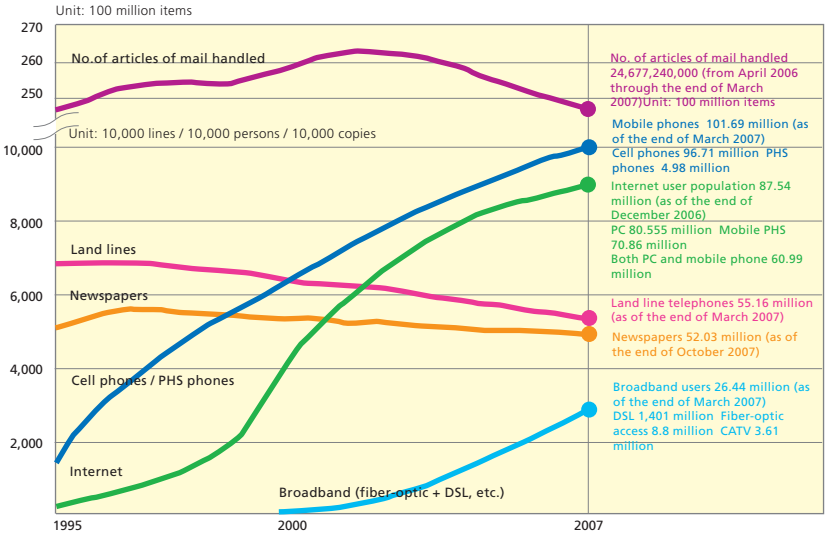
According to the website of the National Police Agency, in FY 2007 there were approximately 85,000 calls to the Internet Hotline Center, and approximately 5,500 arrests were made due to cybercrime. Even judging just from the number of junk emails sent daily, however, this is surely nowhere near the whole story. The true state of ICT crime is currently shrouded in darkness.

You may think that these are the acts of people with malicious intent and they have nothing to do with you. But they are not simply things that affect other people. ICT is rapidly extending to every corner of society. In this situation, any one of us may unintentionally become involved in some kind of detrimental incident or criminal activity.

One example is identity theft, something that has been spotlighted often in recent years. You may take home some work that you weren't able to finish that day so you can do it at home. Or you may accidentally use file sharing software improperly, resulting in a leak of confidential information, and that information may be used in a crime. Your own personal information may even get out and you could become a victim yourself.

What is safety and security in the network society? In this article, we will present a broad overview of a society in which people can live in safety and security, from the standpoint of "ICT governance" that goes beyond mere security. We'll also take a look at the society of the future, in which ICT will be used in previously unheard-of ways.

* ICT: In Japan, the acronym IT has been commonly used to refer to information technology. Recently the use of the acronym "ICT" has become popular, with a "C" (for "communication") having been added to emphasize the increasing importance of communications as well as information technologies ("ICT Policy Overview," Ministry of Internal Affairs and Communications).



(Fig. 1) Dissemination of ICT
While newspaper circulations and the number of items delivered by postal services have decreased steadily during the past ten years, the use of cell phones and the Internet has increased rapidly. ("ICT news release," Ministry of Internal Affairs and Communications)

Hisamichi Okamura
Lawyer and visiting professor, NII

Noboru Sonehara
Professor and Director,
Information and Society Research Division, NII

Safety and Security in the Network Society

In March 2004, there was a leak of information relating to an investigation at the Ebetsu Police Station on the island of Hokkaido. The facts in the case are that the leak occurred when a private PC was taken into the police station by an officer and a leak of investigation information including personal information occurred by means of file sharing software. At first glance, this would appear to be a simple matter of the police officer who brought the private PC into the station neglecting to observe safety procedures. However, the trial** focused on the case not as an individual matter but on whether there was responsibility on the part of management including the officer's superior, in allowing the private PC to be brought into the police station.

At the time, it was permissible to bring private PCs into the Ebetsu Police Station. Among the security procedures was a requirement that the superior of the PC owner check the entire contents of the PC in the morning and evening. As this would have taken an extraordinary amount of time, it was not what could be called a realistic policy. Considering the fact that a virus check alone takes more than an hour, it was simply impossible.

Hisamichi Okamura is a lawyer who is a recognized authority on ICT related laws, and is also a professor at NII. He says that what is needed is "life-sized security." "There's no sense in having a rule unless it can be observed," Okamura notes. So why are unrealistic rules created? Okamura conjectures that the fault lies in the rapid progress in ICT.

ICT has expanded rapidly in the past 10 years, and this expansion is still accelerating (Fig. 1). People's perceptions have not kept up with the pace of this expansion. One example is the USB drives that are commonly used as portable data devices. These can currently hold up to 32 gigabytes. "These are smaller than a 100-yen cigarette lighter, but they are more than adequate to hold the names and addresses of every one of the world's six billion inhabitants," points out Okamura. We think nothing of carrying these incredible devices around. And sometimes we lose them.

"People seem to think that email is like a sealed letter whose contents are hidden from view," says Okamura. "In reality, email is like a postcard. There's a very high risk of someone seeing what you've written." Although encryption technologies have advanced, at present even 128-bit encryption (2 the power of 128, 2^{128} possible combinations) can be broken in a realistic period of time.

The degree to which ICT is unsafe is greater than we think. And yet we use these technologies with peace of mind and spend very little time worrying about security. This gap in our perceptions is what gives rise to rules that are either extremely loose or extremely strict. And the result is that it is difficult to preserve the safety and security of information.

** Trial of the Ebetsu Police Station information leak: a company employee whose personal information was leaked sued the Hokkaido Prefectural Government for 2 million yen in damages for pain and suffering. After losing in the Sapporo High Court, the employee appealed the case to the Supreme Court, but the appeal was rejected in October 2006, and at that point the lawsuit came to an end.

Too-rapid Progress Produces Distortion

We can get a true sense of how rapid the progress in ICT has been by comparing it to other examples of technical advancement. Development of the automobile began around the end of the 18th century, and the first automobile designed for a mass market, the Ford Model T, went on sale in 1907. From that point, it took around 100 years until mature automobile-based societies developed in advanced countries. During that period, various manners, rules and laws were developed based on the technology and people's degree of maturation with respect to the automobile.

NII professor Noboru Sonehara says that technology

Technology	Market	Rules of society	Legal system
Mechanical engineering Internal combustion engine Car multimedia etc.	Increased efficiency of transportation Ease of movement Satisfaction of owners Satisfaction of desire for self-expression etc.	Driving instruction Driving etiquette Environmental preservation Illegal parking etc.	Driver licensing system Traffic laws Vehicle emission restrictions Insurance system etc.

(Table 1) Technology - Society Spiral (automobile)
As in the case of the automobile, technology and society have affected one another in the course of ICT development.

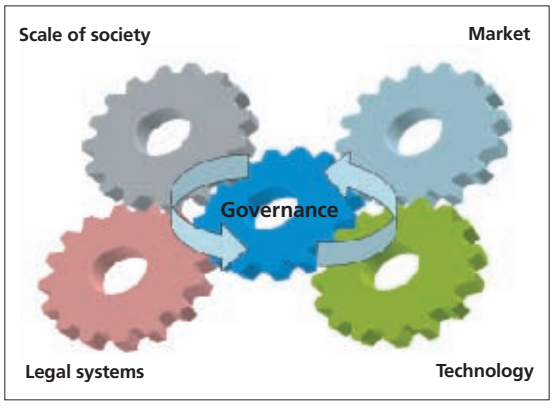
ICT Governance
—Technology vs. Legal System—

and society impact one another as they both mature. The development of the automobile was born out of the demand for rapid movement. Advancements in "technology" resulted in progress in the popularization of the automobile, but conversely this caused the "societal" problem of increased traffic accidents to come to the fore. As a result, people began to teach driving skills and create rules, and later insurance systems and road traffic laws were established (Tab. 1). When these were in place, the demand for one car per household was created. Once again, however, this produced societal problems such as environmental issues resulting from exhaust fuels and the like, traffic jams and so on. To resolve these problems, advanced traffic systems such as ITS (Intelligent Transportation System) and other technologies were developed. And in turn, this required the establishment of rules and legal systems that included these new technologies, and so on.

In the case of the automobile, there was gradual progress until maturity, at which point the next problem occurred, producing new progress. The cycle was of a moderate length. In contrast, ICT has spread and expanded in only one-tenth the time taken by the automobile. As a result, distortions have been produced in the cycle.

In the 1970s and 1980s, when the Internet was a "jungle track," all that was needed were the tacitly understood rules of the hardy souls who traveled along that trail. Once we entered the 1990s, however, the Internet suddenly changed from a jungle track to a public thoroughfare.

"When this happens, underage drivers (users) also begin driving, and traffic accidents begin to occur frequently," says Sonehara. "If we follow the example of the automobile cycle, we're now in the one computer per person age. If this is true, then what we lack is information literacy — in other words, education. And we need to nurture technologies and rules and so on including education in a balanced manner." This is what is meant by ICT society "governance."



(Fig. 2) Necessary Governance for an ICT Society
It will be difficult to ensure information and telecommunications safety through technology alone. Comprehensive governance that engages not only technology and markets but also societal norms, education, legal systems and public policy is needed.

ICT Society Governance

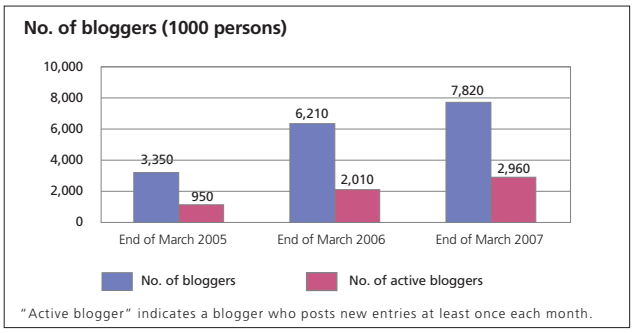
ICT society governance means providing balance among the technologies, rules, laws and criminal penalties, compensation, education and other matters relating to ICT (Fig. 2). It is possible that NII will be directly involved in many of these aspects. At this point, let us take a look at rules / laws and education.

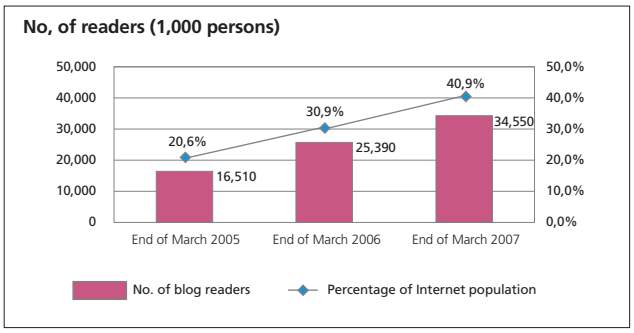
The creation of rules and laws requires commonly accepted norms that will serve as a foundation for these rules and laws. However, the commonly accepted norms that have supported Japan up to now are disappearing.

One example is the disappearance of the lifetime employment system. This signifies a lowering of the feelings of loyalty to the company. For example, what would you do if someone offered you 300 million yen for your company's in-house data? Previously, when you knew the company would take care of you until retirement, you wouldn't even think of biting the hand that feeds you. But if you weigh your feelings of loyalty to a company that you're going to leave in a few years against your lifetime career earnings, that 300 million just might be worth considering. From now on, it will be essential to build relationships of trust between employers and employees.

There have also been frequent incidents of trouble among people who became acquainted over the Internet. There have even been many cases in which someone became angry enough to kill over something he or she read on a blog. "People who are dependent on the Internet may not be communicating with all five senses," says Mr. Okamura. As a result of reading only the text on a PC or cell phone, they misunderstand things, and these misunderstandings cause until irreparable harm results. The "you don't even need to say it" understanding of a time when people communicated face to face is becoming a thing of the past.

The loss of these commonly accepted norms may be deplorable, but at this point there is probably no going back. We need to see this not as "loss" but as





(Fig. 3) Communication of Japanese Culture
There are 7.82 million bloggers worldwide, and their blogs are read by 34.55 million people or 40.5% of the entire Internet population (from "Blog SNS analysis of current and future prediction," Ministry of Internal Affairs and Communications). Of the blogs created worldwide, 37% are written in Japanese (April 2007 survey by the U. S. firm Technorati, Inc.).

"change," and work to create new rules and laws.

NII Aims for ICT Research and Education

Both Sonehara and Okamura think the most important thing is education.

In terms of the ICT governance of Japanese companies, most have been certified under ISO 27000*** and are recognized to be extremely credible. However, the truth is that the current ICT industrial structure is built on sand. Software development involves numerous levels: an outsourcing party and a principal contractor, subcontractor, sub-subcontractor and so on. Even viewing this in the simplest possible terms, the more subcontracting companies there are, the more opportunities there are for copying, and the greater the risk of an information leak and so on. And that risk is not just a simple multiple.

If the outsourcing party and the principal contractors are major corporations that are listed on the First Section of the Tokyo Stock Exchange, the security is impeccable, requiring among other things that employees wear skin-tight full body suits when they handle confidential data. However, the lower you go in the hierarchy, the less the company is able to budget for security. At the lowest level, it is not infrequent that the employees are part-timers who have never received training in security matters. In this situation, claims that have no information leaks are simply not credible.

In 2004, the Organization for Economic Co-operation and Development (OECD) issued an opinion on the "Culture of Security" for small and medium-sized companies. The goal was to raise the security level for all entities involved with ICT. In Japan, there are some 4.3 million companies involved with ICT, including sole proprietorships. There is a need to ensure that a culture of security permeates all of these entities.

What about the general public? In the case of an automobile, you have to take a test to get a driver's license, and to renew that license you have to watch a video about fatal traffic accidents. But in the case of ICT, there are no generally acknowledged rules for educating people with respect to the technology.****

Moreover, the threshold for owning an automobile is high in the sense that you have to buy the vehicle, get insurance and so on. In contrast, ICT adoption could be called "borderless." The transmission of information, which was formerly limited to media such as newspapers and broadcasting stations, has become popularized by the appearance of the tool known as the Internet. It is clear that education will be needed for an even broader stratum. Professor Sonehara argues persuasively that NII should take charge of ICT research and education.

The Future Made Possible by ICT Governance

In an ICT society, there are the problems that are most visible, and ICT has the potential to open up new pathways that were heretofore unavailable. As the spread of the Internet has eliminated borders between nations, there are fears that the unique culture of Japan may be engulfed by a global standard.

But Professor Sonehara points out that the opposite may be true. "For example, there are supposedly nearly eight million blog pages worldwide. Of that total, 37% are being written in Japanese (Fig. 3). In the coming age, it may be that, rather than local standards being engulfed by a global standard, new constructs may be born in which the local standard vanquishes the global one." Creating a local standard that makes use of the sensitivity and attention to detail of the Japanese people may be the key.

The cat-and-mouse game of ICT progress and security measures have not been resolved. However, in order to protect the rights of users who have no malicious intent, there is no option but to continue this whack-a-mole game. At the same time, measures from the perspective of ICT governance that aim for control of overall balance will also be essential. These can be achieved through cooperation on the part of legal scholars, engineers and people in many other fields. In this effort, there is a need for NII to conduct research into security and governance as well as education targeting both universities and the general public.

(Written by Tomoaki Yoshito)

*** ISO 27000 is an international standard established by the International Organization for Standardization (ISO). This is the popular term for two standards: ISO/IEC 27001 (JIS 27001), the specification for an Information Security Management System (ISMS), and ISO/IEC 27002 (JIS Q 27002), the code of practice for information security management.

**** The Internet Association Japan (IAJ) is an ICT educational foundation that provides certification with the respect to the rules and manners for Internet use.

The Role of Copyrights in an Era When Anybody Can Be a Creator

The question of copyrights in an IT society is diversifying along with the evolution of IT. What are the issues surrounding copyrights and how should they be solved? We asked Yuko Noguchi, a lawyer and associate professor at NII, who looks at the question from the legal side, and Isao Echizen, an associate professor at NII who deals with the technical aspects.

Yuko Noguchi
Lawyer and visiting associate professor, NII

Isao Echizen
Associate professor in the Digital Content and Media Sciences Research Division, NII

What sort of image does the word "copyright" conjure up for you? Perhaps you think that it's a matter for a small group of novelists, cartoonists or musicians, and has little to do with yourself. It is quite likely that this is how most people felt until recently. But the question of copyrights has become an immediate issue over the past ten years, with the sudden development of IT.

One current example is the increasingly popular websites where people can upload videos to the Internet. All sorts of data such as photos, videos and music are also being transmitted through blogs and social networking services (SNS). But the fact is many of these sites are infringing copyrights. Data that is used with the intention of providing a little "quotation," "introduction," or "recommendation," is often, legally speaking, actually an infringement of copyright. And the people who are using the data have very little awareness of the fact that they are committing the crime of copyright infringement.

Issues Surrounding Current Copyright Law

Obviously it's the arrival of the IT society that is behind this state of affairs. As the phrase "the era when anybody can be a contents creator" suggests, the advent of the IT society means that no anybody can cheaply and easily create, copy, alter and transmit digital contents. This has led to the everyday redistribution and reuse of contents without the permission of the original creators. The question of copyrights is no longer an issue for a small number of people, as it was in the past.

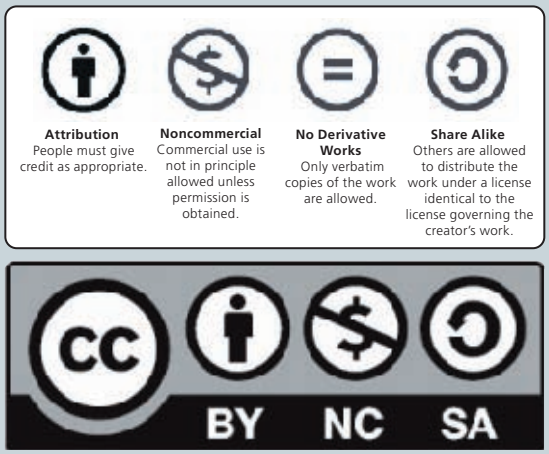
"We are now in a period when we have to reexamine the role of copyrights," says Yuko Noguchi, a lawyer and associate professor at NII. Noguchi's area of expertise is copyrights in the IT society and the role of other intellectual properties. Pointing out the issues surrounding current copyright law, she says, "Copyright laws have been protected in each country since the popularization of the printing press in the 15th century. The present basic structure was prescribed by the Berne Convention, an international treaty enacted in the 19th century. It's safe to say that trying to apply a century-old law to today's IT society is a hopeless task."

Hitherto, creators made their work, and reproducing and widely distributing that work required great technical skill and a great deal of equipment and money. The distributors of this work were therefore limited to a small number of professionals such as publishers and broadcasters. Copyright law was the result of efforts to establish business rules between these specialists, by making rules for the rights of creator and distributor covering notions such as copying and broadcasting. But the popularization of IT has caused an abrupt change in the way in which contents is distributed.

Copyright law now applies to vast sectors of the public who own computers and mobile phones et cetera. Moreover, while illegal copying and distribution was once regarded as the source of losses, on the contrary many creators now hope that the wide transmission, redistribution and reuse of their material will encourage the spread of their work, and bring them fame and profit. Reuse is also leading to the creation of new contents, and unique and hitherto unknown culture is starting to emerge.

Against such a background, copyright law can sometimes end up as a factor that obstructs the efficient use of contents - contrary to the wishes of the creator. It is in this way that conflict is starting to arise between today's society and old-fashioned copyright law.

Noguchi points out that the questions surrounding copyright law can be broadly split into three main issues. The first is the principle of "copying prohibited." Unless explicit permission is gained, nearly any activity involving IT technologies is illegal. The second issue is that legal use requires the permission of all the copyright holders, and the third is that, even if one tries to obtain the permission of the copyright holder, there is a lack of ways through which to contact them. "One might think that if that is the case then why not change the copyright law so that it meets the current forms of distribution." However,



The World Copyright Rules Suggested by Creative Commons

The Creative Commons (CC) license concept was formulated in 2001 by a group centered on Lawrence Lessig, a law professor, with the aim of achieving a flexible and creative copyright environment. The ethos of the Creative Commons is to achieve freer copyright rules and support the development of healthy data distribution, culture, science and technology, by showing through readily understood labeling that prior permission is given by the author for a degree of "freedom" of use, while maintaining copyrights over contents.

Degree of Freedom to Use, and License Marks

Authors can display which of their rights they wish to keep and which they are willing to waive through a combination of the four Creative Commons license marks. The CC licenses are defined by marks and certificates that are the same across the world, enabling them to be used with ease and peace of mind (above left graphic). As the below left graphic shows, it achieves a middle ground, "some rights reserved," which lies between "all rights reserved" and "no rights reserved." These enables artists to, for example, convey the fact that while they do not wish their musical contents to be used for musical purposes, people are welcome to sample and use it in new songs.
(More details can be found at the Creative Commons website: www.creativecommons.jp)

the number of countries that are party to the Berne Convention is now over 200, and changes cannot be made unless there is a unanimous vote. These 200 countries all have differing views due to their varying economic strength, and the fact is that obtaining unanimity would be extremely difficult.

Noguchi mentions the "Creative Commons" idea as an answer to these issues. The Creative Commons is a copyrights movement that originated in the U.S. in December 2002, and released licenses in Japan in March 2004. Without changing the law, the Creative Commons is trying to solve the issue by enabling individual copyright holders to grant some or all of their rights to the general public, but retain others using various licensing or contract mechanisms. "With the copyright holders themselves providing rules through "licenses" that are more flexible and free than the stipulations of copyright law, the view of the creative commons is that respect for the wishes of the holder will be maintained without obstructing the effective use of contents," explains Noguchi (top figure).

Digital Watermarking Technologies to Address Copyright Law

In addition to legal and social steps for the protection of copyrights, there are also some responses using technology. "A few years ago a certain record company released some CDs called "copy control CDs," which used copy prevention technology. But they led to a huge deterioration in user convenience, and the company attracted much criticism. Apple's iPod and its music management iTunes software, which introduced more flexible rules, flourished on the other hand. Eventually, the record company abandoned the use of copy prevention technology. If you try to fiercely enforce copyrights like this, the problem of inconvenience is bound to arise. Stopping illegal activities solely through technology is probably quite difficult," says Noguchi.

NII's Echizen is researching the optimal technology for protecting copyrights without damaging user convenience.

One concrete solution that he has been looking at for a long time is a technology known as "digital watermarking." By embedding copyright information in digital contents - rather like the watermark on bank notes - it is possible to clarify the details of the copyright holder and anybody who had made illegal copies.

"Since users can carry on using their current media players even if a digital watermark is embedded in the data, they are not inconvenienced in any way. But if the user illegally copies or distributes the contents, both the copyright holder and the illegal copier can be traced from copyright information embedded in the contents that is being circulated. If users are told that this sort of technology is being employed it exerts a psychological pressure that makes them reluctant to copy the contents, and also raises general awareness about copyrights. In addition to its uses in the protection of copyrights, it also makes it possible to determine the distribution routes of contents by embedding content IDs. This means that the use of digital watermarks makes it easier for contents creators to find out how their work is being watched or listened to, and I think that this helps to motivate them to make even better contents," explains Echizen.

Noguchi and Echizen agree that thus far the tendency has been to concentrate too much on the copyright infringement - the negative aspect of contents copying and alteration - and that from now on it is vital that we should look forward to the positive side of the IT society's arrival, namely the vitalization of information distribution.

"It is vital that copyright issues are looked at from a variety of perspectives and that approaches are made on several fronts, including reviews of the legal system, sorting out what the most suitable technologies are, R&D, and educational activities for general users. There is a need to promote a social system design that allows the invigoration of intellectual activity without the infringement of rights, while maintaining a balance in all the fields involved. We hope to contribute to this by making the most of the NII's interdisciplinary features."

(Written by Kumi Yamada)

The UPKI Project : Protecting the Information which Universities provide to the internet

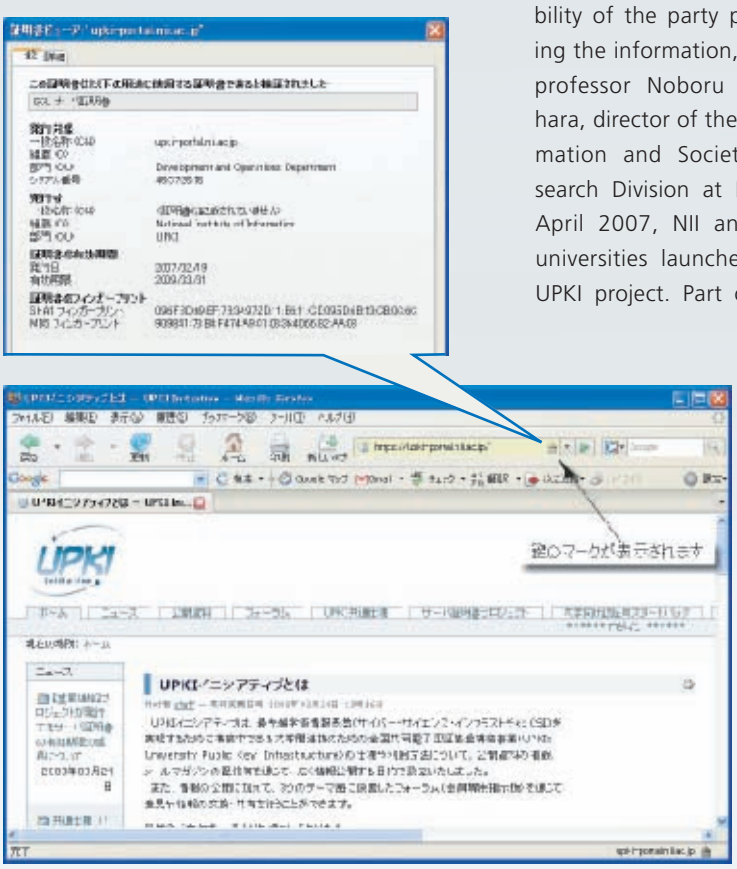
In 2006, Japan's prefectural police department received around 61,500 calls regarding cyber crime. The figure illustrates just how great the problem is. Universities that provide information over their websites et cetera have to fulfill their responsibilities for safety and security as a member of society. How should information provided at universities be protected? Here we introduce the University Public Key Infrastructure (UPKI) project, which began as a secure collaboration between the universities and NII.

On April 8, 2008, a message was posted on the bulletin board of a certain university reading, "Tuition for the first semester of 2008 has been cancelled due to the buildings' asbestos problems and their inadequacy to stand an earthquake."The message was, however, totally false, and another message from the Dean had to be published to refute the rumor. This is just one example of the abuse of bulletin boards, the information infrastructure at universities.

Building a Secure and Safe Infrastructure

Nowadays all universities have their own websites on which they introduce their education systems, research facilities, and so on.

Many people use information through the Internet, and its influence on society is great. "Is this really the university's website? Making sure such worries don't arise is the responsibility of the party providing the information," says professor Noboru Sonehara, director of the Information and Society Research Division at NII. In April 2007, NII and the universities launched the UPKI project. Part of the work includes activities to secure the website servers.



(Fig. 1) Pad Lock Icon and its detail (top)

Measures to prevent spoofing and defacing, and secure the information posted on websites, were first taken at sites offering online shopping through electronic transactions, and banks involved with money. For example, perhaps you have notice that e-mail sent by banks has a Pad Lock Icon on it. This mark attests to the fact that the sender is the person it claims to be, and is operated under the Public Key Infrastructure (PKI), a security infrastructure. The UPKI project, adding a 'U' for university, aimed to incorporate this concept into the information provided by universities.

As Professor Sonehara explains, "A system to secure the information that universities themselves provide will be major factor in coming era and the branding of universities." Evaluating the strength of universities changes with the times. Until recently this had meant whether or not a university had large experimental facilities or how advanced its Internet facility was; but now the question of its ability to safely provide information has been added to these.

Look out for the Pad Lock Icon!

Users of the information have to be able to easily see whether or not the website is trustworthy. The websites certified by the UPKI project display a Pad Lock Icon on the top right of their address (Fig. 1). "However, just because the mark is there doesn't necessarily mean the site is trustworthy," warns Hideki Higuchi, deputy-manager of the NII's Cyber Science Infrastructure Development Department. "Please check to see if the certifying organization itself is trustworthy." Higuchi hopes that users will double-click the Pad Lock Icon and verify the details that appear.

For example, if you look at the details displayed by double-clicking the key mark that shows a website has been certified by the UPKI project, you will find that the National Institute of Informatics is cited as the issuer, and that it has been certified by the NII (top of Fig. 1). The NII is a trustworthy organization, so the website too is therefore safe. Of course, the NII cannot just issue certificates as it pleases — there is a certification authority that has recognized NII's right to issue certificates. In addition, your web

Professor Noboru Sonehara, who has continued to work on the UPKI project.

Mr. Hideki Higuchi, Deputy-Manager the man in charge of administrative work such as issuing certificates.

browser will display a warning if the certification authority is not registered by the vender of the web browser you use.

For Operation that Maximizes Collaboration

There are a number of procedures that a university has to go through in order to have its website authorized. The person in charge of the university must be first of all registered with NII.

The NII screens the university applying for registration, and issues a digital server certificate if they decide the university deserves to be certified. The universities have to create a key pair, a public key and a private key, for operational purposes. In general the public key serves to encrypt information, and it is made public for the use of anyone. The private key is used to decrypt the encrypted information. When, for example, personal information is sent to the university, the public key automatically encrypts the information, which is then decoded by the university using the private key. The safety of information exchanges on the university website is thus assured by this key pair. Mr. Higuchi is calling for more universities to participate in the project: "Server certificates are an essential for improving the security and trustworthiness of university websites."

Recently, by promotion and other activities, the necessity which guarantees safety of information provided by universities is being understood. The project — which started with the participation of just the seven national universities,* Tokyo Institute of Technology and the High Energy Accelerator Research Organization — has now spread to private universities and collleges. There are currently about 60 organizations participating, to whom around 500 certificates have been issued.

Future plan of the Project

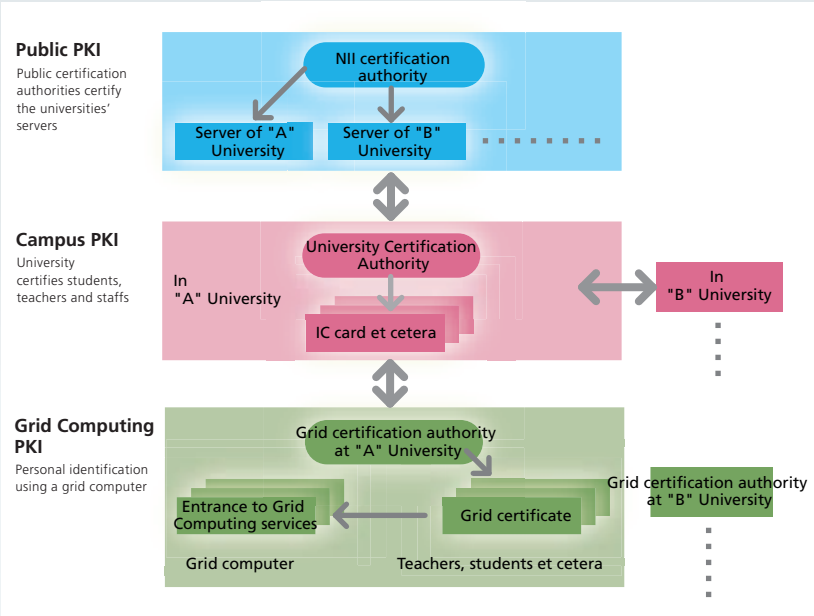
NII is pursuing the construction of the Cyber Science Infrastructure (CSI) in conjunction with universities and research institutions. The CSI is trying to prepare super-high-speed network and various information infrastructure in order to share their computers, other equipment, basic software, academic contents and researchers. The UPKI project, which aims to protect the university information, is a part of this infrastructure. It currently serves mainly to authorize websites. It is highly likely that UPKI's technologies will go on to be used in areas such as exchanges of important information between universities, and the personal anthentication of students, teachers and staffs. (Fig. 2).

Professor Sonehara is already looking way into the future. "Since ICT has grown so big I'd like to do the network being used to its maximum. What we're aiming for is a society in which people can access the academic information they need, wherever they are, and with safety," he says. The lectures are attended by people who are anthenticated through the network, and if an information infrastructure can be prepared that also gives these people trustworthy information then it will be possible to provide it to people anywhere in the country.

The UPKI project is carrying on with grass-root like work of increasing the number of participant organizations, and it is to be hoped that what lies at the end of this road is the development of a safe and secure communication infrastructure that encompasses the all Japan.

(Written by Akiko Ikeda)

*The seven former Imperial universities (Hokkaido, Tohoku, Tokyo, Nagoya, Kyoto, Osaka and Kyushu).



(Fig. 2) The three-tier UPKI model. It aims to achieve safety and security throughout the whole university.

NII ESSAY

"Meaning" — What Does it Mean?

Shinichi Satoh
Professor, Digital Content and Media Sciences Research Division, National Institute of Informatics

I work on research about extracting meaning from videos. But what exactly is "meaning?" People often say that something or the other has a meaning, or is meaningless. "Nothing that he says has any meaning," or "This book means something to you," for example. We describe something as meaningful when it imparts some beneficial information to us. But this is somewhat unsatisfactory, as meaning varies from person to person.

Categorizing the Meaning of Videos

Let's imagine that we've made a system for extracting meaning from videos. Somebody may say: "I see, something is extracted from the videos, and this might mean something to you. But it's meaningless information to me, so your system hasn't actually extracted any meaning." The results would therefore become impossible to verify.

There's a project called TRECVID, in which enthusiasts from around the world with an interest in analyzing the meaning of videos and retrieval participate. This project also comes up against the problem of meaning. So they decided to limit their work to some dozens of conceptual categories about which the vast majority of people would be able to agree upon the meaning of the videos.

The categories include, for example, bridges, dogs, airplanes, mountains and nighttime et cetera (the full list can be viewed here: http://www-nlpir.nist.gov/projects/tv2007/tv2007.html). Ground truth data showing whether or not each shot in the study images belongs to each concept category is made, based upon which a meaning extraction system is created. This truth data can be something of an awkward customer, and while everybody has to share the task of labeling the data it is at this stage that we start to see discrepancies in meaning caused by human input.

Meaning that Differs According to Each Person's Experiences

There used to be an "animals" category, and this was the source of huge disparities in recognition at the time. Research showed that while some people were categorizing dogs, cats and horses et cetera in the animal category, other thought that it included humans. In the next the year of the project, it was clearly specified that the category did not include humans.

One shot featured a yellow-painted American fire engine. This was unusual, but as it was the same shape as the fire engines one usually sees in movies and it was loaded with a ladder, it ought to have been identified as a fire engine. However, some people placed it in the "emergency vehicle" category, while there were even some who classified it as a "bus." When we checked we found that the Chinese students had been treating all these vehicles as buses - they had never seen a fire engine that shape. Meaning depends on people's experiences; the world of meaning is profound.

Weaving Information into Knowledge
NII

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