

Evolving Internet with Various Deficiencies

Chon Pyo Lee *

This essay attempts to expose a few issues of current internet by means of pinpointing its deficiencies and then suggest solutions for some of the exposed problems. Internet has been made feasible from development of many factors over time, and expected to evolve further. In spite of its development up to now and the optimistic expectation for its further evolution in the future, current internet has not yet evolved adequately enough to be a valuable companion to those seeking quality information, while swamped by immaterial chatting, e-mail and simple entertainments and threatened by uncertainties of both legal and security-related issues. Future internet must complement these shortcomings and this essay purports to examine them and then suggest directions to fill the deficiencies indicated.

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I. Introduction

This essay attempts to expose a few issues of current internet by means of pinpointing its deficiencies and then suggest solutions for some of the exposed problems. Internet is a network of networks enabling many things including: E-mail and other communications, transactions exemplified by e-commerce, e-entertainment including

* Professor, School of Economics, Seoul National University, San 56-1, San 56-1, Sillim-dong, Gwanak-gu, Seoul 151-746, Korea, (Tel) +82-2-880-6391, (E-mail) chonpyo@plaza.snu.ac.kr. I gratefully acknowledge the financial support from the Advanced Strategy Program (ASP) of the Institute of Economic Research, Seoul National University.

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gaming, and broadcasting *via* expected convergence of broadcasting and high-speed internet multicasting in a near future. Today's internet is a versatile medium compared with the telephone for voice exchange on the one hand, and compared with the TV broadcasting with content unilaterally chosen by the broadcaster with little consultation with the viewers for whom the programs of TV are broadcasted on the other. Internet is thus said application-blind compared with the telephone in accommodating more functions than simple voice exchange, and content-blind compared with the TV in allowing interactions between broadcaster and viewers. As its present state, internet is thus both application-blind and content-blind, and that further implies versatile future developments in many aspects of content and applications. It is moreover designed to operate over different underlying communications technologies including those yet to be introduced and to support multiple and evolving applications and services. It does not impede or restrict particular applications (although users and internet service providers may make optimizations taking the requirements of particular applications or classes of optimizations into their account.)

Internet has been made feasible from development of many factors over time, and expected to evolve further. Indeed, its development comprises several factors; infrastructure consisting in telephone networks and others, network services, applications transforming inputs to outputs that are regarded valuable to users, software and hardware for materializing communication and other applications, content to be utilized *via* internet services, and institutional settings that have legal effects in the society in taking any action with regard to internet use.

However, in spite of its development up to now and the optimistic expectation for its further evolution in the future, it can still be inferred that today's internet may not have been developed sufficiently enough to accommodate the various demands of many, especially in the dimension of supplying valuable information at reasonable price to its users. Firstly, the *de facto* system of using it is being endangered by many uncertainties in legal arrangements. Secondly, it is conditioned by incomplete security provisions without immediate prospect of resolution. Most of all, its web information is biased towards commercial and/or not-high-quality information. Therefore, it can be said that current internet has not yet evolved adequately enough to be a valuable companion to those seeking

quality information, while swamped by immaterial chatting, e-mail and simple entertainments and threatened by uncertainties of both legal and security-related issues. It can further be said that it has thereupon induced underutilization in carrying out many important real world businesses with confidence. Future internet must complement these shortcomings and this essay purports to examine them and then suggest directions to fill the deficiencies indicated.

In Section II a brief history of internet evolution is sketched. In Section III layering structure of internet is explained, and in Sections IV, V, and VI various weaknesses are indicated with some comments occasionally together with ways to overcome relevant deficiencies. Accordingly, in Section IV deficiencies of current internet are explored in view of various elements in the hourglass architecture of internet. Specifically, a serious weak point in provisioning of content thus far overlooked is pinpointed and it is argued that provision of high-quality information sources has to be encouraged. Various uncertainties in the layer of law and institutions are also expounded and its danger in delivering the benefits of internet only to a few economies resulting in strengthened digital divide at the country-level on the globe is warned in Section V. In Section VI deficiencies associated with security provisions of current internet is considered. Google's attempt to establish a database of books in libraries is appraised in Section VII. Both its positive side of providing the quality content thus far neglected and negative side of monopolizing potential of such important task are considered. In addition, a possibility of misleading signals on the quality information in case it manages the book search along the line of its key word search with sponsored advertising thus far practiced is argued. In Section VIII a few remarks are made.

II. A Brief History of Internet Evolution with Emphasis on the Key Trends in Its Development

The evolution of internet can be divided into 3 phases: experimental period, internet building in U.S., global expansion and thereupon global internet systems building. The beginning of internet could be identified with the establishment of backbone network NSFNET (succeeding ARPANET) in U.S., which had been extended to regional and campus networks with U.S. government support. Its

initial motivation was to connect heterogeneous computers to provide a powerful potential for its future development after computer-networking technologies had been stabilized and the cost effectiveness was proven. The accumulated technological innovations culminating at WWW contributed much at this juncture. Indeed, its Web device added its own protocols for information exchange onto top of the fundamental internet protocols and provided a standard way of presenting information, be it text or graphics. Various and specialized software which made use of internet's basic protocols and frequently were closely linked to the Web software have supported such applications as real-time audio or video streaming, voice telephony, text messaging, and others.

Later NSFNET relaxed restrictions on commercial traffic and made room for commercial internet service providers (ISP), under the worry of overburdening network resources and of unfair competition still lingering.

The backbone concept was adopted in order to exploit the economies of scale in both demand and supply for the design of national internet system. It was an interlinking superstructure of regional network which in turn aggregated all networks in the region. In other words, it retained hierarchal network topology. It was replaced at the date of its retirement by such large network service providers as MCI and Sprint, which happened to be telecommunication operators at the time of liberalizing telecom market. Overtime the backbone capacity has been supplemented and strengthened by cable and wireless services, consisting of mobile access derived from the opening up of radio-frequency spectrum and satellite ventures. It had, however, such problems as fragmentation of networks, technical limitation of technological components, weakness of gateways between networks, lack of training and support for the users and lack of information about the networks connected to the internet, seen in a fundamental way.

The internet system developed from U.S. has then been expanded globally, firstly to Europe and thereafter to Asia-Pacific and others, as the building of the national research and academic network of U.S. was consolidated and the commercialization of the internet began in earnest. As for an instance, the Coordinating Committee on Intercontinental Research Networking was set up in Europe to promote the evolution of open international research network and contributed to global expansion. In the main, international networks

were built by integrating existing national networks, rendering uneven development between countries caused by economic and technological gaps, cultural differences and financial settlement based on peering regime. At this juncture, so called the 'battle of the systems' was unavoidable, in the face of competing technologies. Collaboration between countries involved was also indispensable.

As a whole, however, the global internet system has been controlled by the U.S., as U.S. has been the location of plentiful internet resources and it has been less expensive to transmit traffic to locations on the globe through U.S. indirectly rather than to connect them directly in many cases and countries. It was a reflection of the original design which took U.S. as its topological center, and dominant U.S. commercial firms to be major players.

III. Layering Structure of Internet

Current internet is used to be visualized to have an 'hourglass architecture' since it has narrow waist representing the basic network services provided by the internet and the wider regions above and below representing the applications and underlying communications technologies, respectively. It retains the metaphor of minimal required elements in the middle narrowest point made up of communication links and routers operated by internet service providers, lying along with an ever increasing set of choices filling the wider top and bottom, that in turn standing for infrastructure at the bottom (*e.g.*, LANs, ATM, and frame relay) and the applications and services at the top (*e.g.*, e-mail, the WWW, and the internet radio), respectively. In addition, it is described to have a few attributes such as followings.

1. End-to-end architecture; as the network provides a communication fabric connecting the many computers at its ends and offers a very basic level of services, data transport, while the intelligence, the information processing needed to provide applications is located in or close to the devices attached to the edge of the network,
2. Scalability; as it can support a growing amount of communications-growth in the number of users and attached devices and growth in the volume of communications per devices and in

total, and

3. Distributed design and decentralized control; as the control of the network is distributed except for a few key functions, namely, the allocation of address blocks and the management of top-level domain names, and thereupon no single entity controls the internet in its entirety.

The above design principles mean that the internet is open from the standpoint of users, service providers, and network providers, and as a result it has been open to change in the associated industry base as well as in the technologies they supply and use. Benefited from its scalability and robustness, the relative deficiencies among components of today's internet can be expected to be filled up over time.

Each of the constituents of internet, namely network, application, content, law, and institution, has been developed over time and still being in development. At current stage, some has been developed adequately enough in the sense that its supply is greater than its demand at the moment. Network infrastructure is an example. Sudden fade-away of the notion of information superhighway once in high fever around 1996 pinpoints the point of no immediate need of network expansion. However, the other constituents are not in oversupply, suggesting some need for their development and expansion. Application and content would be the examples for the case of short supply.

At the early days of internet, formation of internet connecting various networks was the utmost important and indispensable task. Internet protocols enabling the connection of networks utilizing various software including operating system and a few applications were the answer critical for the task of interconnection. Standard set of protocols to communicate across the networks and the efforts of the companies and organizations that operate different networks to keep its elements interconnected were the response to the need, too.

Consequent to them, even if the ordinary users were merely connected with one of ISPs and each ISP controls and operates only a fraction of global network, an ISP was able to forward the user's communication through several other networks, none of which it controls, and thereupon to complete the connection. Upon established interconnection, further developments of application as well as enhancement of previously used applications were regarded

necessary and important.

Upgrading of the local access infrastructure has always been considered critical. As an increasing number of users tended to have broadband internet connections, uses of various internet protocol (IP) based telephony services were to increase alongside with video applications, for example. A number of services that could compete with existing broadcasting and entertainment businesses could also emerge, including internet delivery of music and internet radio broadcasting. However, deploying broadband pervasively to meet all these demands would need substantial investments, while today's scene is depicted with a consequence of having the two major kinds of local exchange carriers armed with DSL and cable companies for cable network, respectively; let alone mobile wireless carriers supplement them to some degree, dependent on spectrum allocation to be made, of course. As of its kind satellite ventures also deploy broadband communication delivered from space especially for sparsely populated areas.

Differential degrees of advancement in the areas of network facilities, internet connectivity, and applications, content, and services are noteworthy. Backbone capacity has grown through the interactions of ISPs and equipment manufacturers (router vendors and communication circuit suppliers). The advancement implied higher speed, better performance, and increased accommodation of more users and more connections. Simultaneously, ISP market has been enlarged and diversified. Not only overall market size has been increased but also various providers differing in size, types of services they provide and types of interconnections they have with other providers have come to have rendering different effects; some as the tier I provider constituting the internet's backbone and serving consumers at large, and many small tier II providers focusing on particular segment of market. Peering, transit and other interconnection arrangements have also played a vital role in enabling the interlinking.

In view of wide spread deployment and adoption, substantial commercial investment, and broad societal awareness, the internet has become a mainline piece of the communication infrastructure. Further expansion into the foreseeable future appears very natural and inevitable, and, new technologies and new applications that leverage these technologies and new opportunities will continue to emerge. However, it is noticed that there is also some looseness in

the internet's internal coordination mechanism, in developing standards and arranging interconnections. Policy authorities have taken hand-off stance thus far, it can be said, in the belief that internet will continue to expand, mature, and evolve and that intervention could threaten that potential success. If the hand-off attitude is to be continued further, the future may not be so optimistic, though.

Many efforts were attempted to resolve the loose end. At the same time many reviews and reassessments were also made to figure out the desirable shape of internet. As one of them, dominating state of proprietary software like MS DOS (later WINDOWS) was questioned and envied whether be appropriate. Thereupon, as the reaction to it, free software movement appeared with some successes like LINUX and its associated derivatives. In the same vein, the granting of monopoly of limited duration *via* intellectual property right model as for the way of encouraging creative innovation was questioned. It was suspected that the innovative flexibility at the edge was not hampered through the *de facto* unlimited grant of monopoly to proprietary software. The comparative advantage of the model of granting monopoly for a limited time to innovators has been discussed in comparison with such substitutes as government subsidy model for social research institutions for innovation that render their outcomes to public domain later and/or the assistance model to private institutions with compulsory licensing of their fruits later.

IV. Deficiencies in the Layered Structure and Related Issues

The layered structure implies that all constituents would better go along to function as expected for a well running internet. However, as indicated above some are in short supply whereas some are in excess supply. Of course, the former is more serious than the latter. The former components include applications with its underlying software in the sense that the number of applications is not sufficient enough to satisfy various possible applications required and that the price of employing some applications is too high even if the application has been widely deployed. Development of applications and content at the edge looks unduly repressed as explained later.

In the hourglass architecture the edge as for the intelligent facilities is supposed to be very active. Indeed, the feature of edge-based innovation has been regarded critical from the initial design of internet, where the infrastructure should provide a basic service of data transport and the intelligent edge should provide applications. A principle of separation of applications from the underlying transport infrastructure of internet has to be firmly established.

Moreover, the combination of a standardized interface to the network and the location of intelligence at the edge for supporting multiple and evolving applications and services implied that developers can write and field new devices or new software without any coordination with network operators or users or any changes in the underlying transport network. In reality, however, the edges has been constrained either by interventions from intellectual property right holders or influenced by uncertainty associated with legal disputes around IPR issues.

The negative role of intellectual property right (IPR) system should not be underestimated, as Lessig uncovered. At its origin IPR was legitimately regarded a necessary means to encourage creative endeavors and thereupon economic and social development, provided the understanding that knowledge from creative effort is public good with the characteristics of non-exclusiveness and non-rivalry. It has been a tool for allowing a temporary monopoly to the patent holders to compensate the cost incurred for the creation. However, it is sensed recently that creators' right is overprotected at the cost of users' right. Creators have succeeded to strengthen their right by lengthening the duration of temporary monopoly to a larger extent, even by backing their right with criminal charges to the violators of IPR related laws, and most importantly especially in recent days by creating tremendous uncertainties in the interpretation and execution of IPR provisions.

V. Legal Uncertainties and Remedies for Compensating Deficiencies

The above deficiencies can be corrected or modified by their respective countervailing measures. The insufficiency of edge in the hourglass structure can be overcome by activation of edges, which in

turn requires removal of current restraints on the activation of ends. P2P model has been regarded as the representative of ways to vitalize ends. However, it has been repressed on various accounts as exemplified by Napster case; claims on infringement of intellectual property right were the main hindrance, and the undesirable situation was made more difficult by the law of *Digital Millennium Copyright Act*. In other words, legal uncertainties around IPR have been very critical factor which depressed potential creative efforts by hundreds of thousands edges. It is therefore necessary to clear the rules of game of content creation at the edge.

IPR proponents have expanded their coverage in two ways. Firstly, they extended their pre-existing right by lengthening of the period of protection with respect to copyright, by adding such new items (unprotected before) for the IPR protection as IP-protected software, IP-protected business model and IP-protected database (whereas for the latter two U.S. and E.U. have different opinions), and by enactment of the new law of the *DMCA* which criminalizes even the production and distribution of devices circumventing the requirement of not infringing copyrighted materials. Secondly, they attempted many suits in association with the obscurity (which is made feasible as to be explained later in relation to newly introduced items of IPR protection) in interpreting codes with regard to IPR violations. The trouble owing to this strengthened IPR system in one direction is that it raised new issues mostly nontransparent even to IPR lawyers and thereupon amplified many legal disputes inducing lots of confusion.

The uncertainty is magnified with the *Digital Millennium Copyright Act* as suggested above. The *DMCA* is an act which has a provision that prohibits the circumvention of any technological measure that effectively controls access to a copyrighted work. Noteworthy is that it criminalizes various modes of IPR violation by outlawing manufacture, importation or public distribution of any technology primarily produced for the purpose of such circumvention. Thereupon it has invited increasing uncertainties to a large extent, in some incidences being criticized as for the target to be repealed.

Besides, the period of copyright protection had been lengthened by around 20 years on the ground that copying was made easy with the digital technology even if there is no causation between easy-copying due to digital technology and lengthening of protection period of copyrighted materials.

The IPR protection is expanded to software in the form of patent against the fact that it has been protected by either copyright or trade secret. Giving patent to software not only enlarged the scope of protection but also enabled the patent owner not to disclose the whole substance of patented property in direct violation of the spirit of granting patent. It is surprising to note: "Under American copyright law (in order to qualify to pursue infringers for damage) it is sufficient to register only some sample extracts of a computer program's text rather than the entire body of code in the case of SW patent. Moreover, there is no requirement whatsoever to disclose the underlying 'source code'; copyright protection can be obtained on the basis of a disclosure of just the machine language instruction, which, even were they divulged in their entirety would be difficult and costly to interpret and re-utilize without access to the source code. While this practice surely can be seen to violate the principle that no burden of 'undue experimentation' should be placed on second comers, recalling that the principle is the very requirement holding in the case of patent law. It never was contemplated that one might be able to register a text for a full copyright protection without practically disclosing its content to intended readers."¹

Thus, it is really questionable that how the totality of software is defined; whether revision of a few lines in a program consisting of hundreds of thousand lines constitute a new software, and in a similar vein it is questionable whether improvement of it by rewriting a part of it resulting in a big improvement would in reality be blocked by the IPR of it. In many instances, IPR functions as a threat to entry by others instead of being an inducement device to further creative endeavor. The critical view can be extended to an observation that IPR is nowadays mainly a means to cross license among peers of same kind, excluding other potential entrants.

Patent for business model is not less controversial. Most business models that earned patent have been criticized nothing new but codification of previously existing practices in the concerned community, as exemplified by reverse auction model by Priceline.com and one click purchase model by Amazon.com

More problematic is *sui generis* copyright protection to database, which is extended even to databases that contain only non-copyrightable material. Copyright has to be given to database

¹ See David (2005).

compilation, it is argued by its proponent, as it requires sweat and blow efforts even if it usually lacks 'creative' aspect of IPR. It is therefore at most associated with 'low authorship', whereas the low authorship is not clearly defined in relation with the way how it is to be managed in terms of scope and time compared with normal authorship and how it helped induce re-creative works positioned at the public knowledge domain. It is worried that the strict limitations on the re-use of database content requiring third-party generation or payment for license to extract such materials could inhibit the integration and recombination of existing database content with new materials to provide more useful and sometimes specialized research resources. Related serious concern with it is whether it could deter wide use by opening a door to establish renewable monopolies in both re-generable and non-re-generable scientific data. In that case there would be no room for fair use or illustrative use even with regard to the 'low level authorship'. This could lead to two risks; one is a possibility of low quality of data without wide possible participation of related expertise and the other is the resulting squeeze of public research resources with restrictive access to it economically and institutionally. As a consequence of the above worry U.S. is not favor of copyrighting of database, while E.U. insists it on the ground of recovering 'level playing field' against the advanced database companies in U.S. in database market.

At any rate, the above descriptions on IPR related with software, business model and database indicated quite much of confusion and implied lots of uncertainties as to the right posture on IPR issue. It also predicts overlapping and conflicting claims on IPR that will increase in a near future, resulting in a rise in transaction cost including litigation cost. Rapid increase in the number of IPR lawyers indicates a symptom of it.

It is not less troublesome to note that self-help or copyright management system involves encryption in order to prevent unauthorized copying, by employing digital technologies that limit online copying of electronic information. The marking and monitoring technologies include 'watermarking' that attaches a signal to digital data, which can be detected or extracted later to make assertion about its provenance, authenticity, or ownership, and 'fingerprinting' which embeds a mark in each copy that uniquely identifies the authorized recipient. They can be justified as for a defense tool of IPR. However, this self-help poses a threat to the traditional

safeguards against 'fair use' exemption for research and education, as they enable discretionary control over access to encrypted data, along with assurance for both users and service providers of message authentication and data integrity, as well as privacy and confidential goal irrespective of fair use or not, by leaving the provision of information access to the discretion of copyright holders. Indeed, the self-help measures turn out to be means for curtailing digital piracy, but at the same time appear to be a threat to the achievement of a reasonable regime for the allocation of scientific and technological information goods functioning as an access blocking device.

Self-help can take a form of contract where licensee is obliged not to disclose database to third party. In other case the licensee is enforced to accept 'shrinkwrap' license or other restrictions such as search-only, password protected log-on. When situation is changing rapidly, either frequent updating of content or enhancement of search facilities turns out *de facto* barrier to fair use, constituting another element of uncertainties.

The prime response to these legal uncertainties looks lying in open source movement that seeks the general public license (GPL) for many occasions. It intends to transfer as many information sources as possible to public domain from private domain, in deviation from current IPR provisions. It is a reaction to the lost fairness between creator and user of recent IPR regime where powerful few with effective lobbying have been dominating with increasing number of IPR lawyers. It opens the possibility to commercial ventures of licensing and direct marketing of ancillary and complementary goods and services along with the so-called 'Copyleft' principle. At the same time it aims at maintaining network neutrality such that network operators could not intervene in the free creative activities at the edge. Discrimination by network operators to the use of network by the edge is alerted. In all this is not looked sufficient to remove the uncertainties associated with IPR problem, though.

Being a response to the so called public good problem in the provision of information good, however, IPR system of itself is not necessarily the single solution. It is a substitute to other means of providing public good; such as by means of employing tax-financed public institutions for procurement of it or of delegation of inventive activities to private sector with an assistance of its R&D expenditures and then obtaining of the results of innovative efforts for

public domain. Among candidates for the method of getting the public good of intellectual creation IPR system can not be the best on all accounts, as it by permitting monopoly for a limited time to the private of invention has inherent problem in the sense that the resulting monopoly profit from the temporary monopoly may not be appropriate enough without any guarantee to lead other users of it for further productive reuses. It may not be a good compromise between the author's right for the inventor and user's right for general public, in favoring the former and creating so many uncertainties in using the invented outcome to the latter. Therefore, it may have to be modified to enable ordinary users to enjoy the outcome legally by paying some to compensate the inventive activities and by securing enough revenue from it to support the continuous inventive activities by employing alternatives to it. If this direction is to be taken it will surely supplement current IPR system. In this case even the GPL may not be necessary, since it can take care of the negative role of IPR to a large extent.

VI. Incomplete Security Provisions in Need of Quick Fixing

In addition to loopholes discussed with the elements of hourglass architecture and IPR regime, other kinds of deficiency were observed with respect to securities in internet use. Security in internet has been a weak spot so often neglected. There have been spam, cyberattack, private databases accumulated and indexed by portals, and, thereupon, insecure feeling and loss of consumer confidence in many uses of internet including e-mail, e-commerce, and e-entertainment. If consumers do not believe that their critical information is protected from irreparable damage or unauthorized access affected by the insufficient confidence, they would not continue to embrace the digital lifestyle. This would surely hurt digital economy. Hence, solutions for giving confidence to consumers that their information is protected from malicious intent and theft will be needed to protect companies and then economy.

Trust building has been noted to be the internet's immediate task. Lack of quality-of-service guarantee, routing protocol inadequacies, centralized naming architecture were recognized its weaknesses and thereupon there have been anxiety both on operational errors and denial-of service attack.

Usual economic life is made to be constrained with these insufficient security provisions. Especially e-commerce transactions would be severely restrained without security guarantee in its details of contract and accompanying payment and settlement. Transactions in internet can be carried out anonymously, and this decreases accountability and increases potential misuse, fraud, and insecurity, too. These resulted, in turn, lowered trust in cyber-economy and discouraged economic activities thus far.

The security is endangered probably never less with e-mail communication, in today's internet. Phishing and cracking are common in internet. Some IPR holders venture to attach watermarking or filtering mechanism as a means of protecting their IPR at the cost of users' privacy as noted above. Law permits employers to monitor the e-mail of their employees in various countries and ISPs are allowed to monitor the traffics in their confine to our surprise. People may not use internet to today's degree when they realize all the danger of insecurity at using internet in detail, and thereafter when their privacy is recognized threatened and thereupon economic fortunes hampered.

In a fundamental sense, no media is completely secure to their users, and security in using internet is no exception. People have been using internet despite above security weaknesses. Therefore one might not be very sensitive about it. However, as internet use has become so prevalent to everyone the loss of trust can not be unduly overlooked. Currently access control is carried out by means of identification number and other biometric measures for authentication of access. Defensive means such as virus scan SW, firewalls, and virtual private networks are used, whereas the firewall can be located at PC level, application level, and/or operating level. These measures are expected to provide a first defense line with packet filtering router (that discriminates source address, destination address and port along with packet monitoring and auditing) and allowable service designation, of HW nature and SW nature, respectively.

Furthermore, there are additional measures for purporting security in current internet. For example, SSL (secure socket layer) or TLS (transport layer security) is employed for the sake of Web security. Secure socket is said to have given quite much security in file transfer. However, the provisions are not complete and costly. These insufficient provisions, moreover, cannot satisfactorily overcome the

insecurity in internet after all. Enhanced certificate management with respect to public key, private key, and name-space is required together with bettered interface. Networked information system security can, it is considered, be improved through more effective cryptographic authentication and security management protocols. In this regard, faster encryption and authentication/integrity algorithm are noted desirable together with multicast communication authentication. The principle of least privilege such that users are accorded the minimum access necessary to accomplish a task is seen to be the guiding rule.

Considered along its development path, it can very well be understood that internet as it is has been underprovided against insecurity and vulnerability for good reason. The high fixed costs, high switching costs, low marginal costs together with network externality in many IT markets have brought out dominant firms associated with first-mover advantages. Time to market was considered critical and under this condition of seeking first-mover privilege most firms in the layers of hourglass architecture were naturally induced to be reluctant to investing on security measures. For example, operating system vendors may have little incentive to offer complex access control mechanism, as this gets in the way of application development. Thereupon security measures are mostly relegated to end users and it has induced adoption of such technologies as public key infrastructure and led to an illusion that encryption is the prime issue in security provision. Application vendors have dumped security and administration costs to end users this way, on the other side of the same coin.

Security is a public good with the characterization of underinvestment. Individual producers may not invest on the provision of public good of security. Hence, incentives in security market are not properly aligned. Moreover, technologies for it are not well understood. In the information age, alas, trustworthy information is increasingly difficult to locate.

Security for producer is not necessarily compatible with consumer privacy; since for the maximum private information is useful and convenient to the producer, whereas this immediately implies threat to consumer privacy that, in turn, can lead to price discrimination against the interest of consumer. To counter this trade-off and to protect privacy legal preparation such as data-breach law requiring consumer notification with tough enforcement policies can be

devised.

Insecurity in itself limits today's internet. But normal utilization of internet is further restricted with the so called self-help measures taken by IPR owners. The technical self-help measures can be seen as a provision against security weakness from the view point of IPR equipped producers. But they together with firewall result in lower transparency and trust than otherwise. The lower transparency and trust must be a serious cost to the society as a whole and therefore unconditional welcome of security provisions taken by a constituent of society may not warranted. The technological means must be harmonized with institutional measures to obtain a happy mean of security and trust for society as a whole.

Loopholes in security concerns must be filled by technical and institutional measures. Skillfully engineered attacks targeted to take advantage of end users' naivete steal personal information for serious financial gain. To counteract them a few technical measures can be employed. For example, against phishing an enlarged burden to phishers can be taken as for economic and legal measure. Employment of watermarking and filtering could also be monitored seriously to avoid their abuse of invading privacy.

Industries can join together to create a trusted community. Producers would better be advised to build trust by relying on the trusted third party like VeriSign, BizRate, Trust.e, BBBonline Reliability Program, and AOL Certified Merchant Guarantee. They would surely help increase trust and thereupon security to some extent. In European Union there has been a sharp increase in legislative action to reduce risk in network transaction by increasing national norms related with digital transaction. Technical control system comprising cryptographic procedure and digital signature and legal control system for reducing system security and partner security have been employed to establish trust, even if these are not regarded sufficient to obtain secure trust.

Internet includes the sites of illegal activities, such as identity theft, illegal transactions, and non-protected speech, such as child pornography. Law enforcement used to have means to target these illegal activities, without undermining basic democratic principles. It should assume the same role in the today's internet as well in tomorrow's internet. Thereupon, future navigation services together with laws surrounding them should be made to find out a workable balance among the services' desire to use individual information to

improve services, the individual's right to privacy, and the government's legitimate need to know.

VII. Quality Information and Google's Book Search

Another serious deficiency to notice is the fact that the information in the numerous web pages is not necessarily quality information in the sense that it educates and nurtures its user. In a sense, the feature is understandable as the most information is supplied by the web creators voluntarily without anticipating any direct compensation from those who visit their web site. It is the information the suppliers push intensely, but not necessarily accompanied by equivalent pull by its users. Indeed, web owners want as many visitors as possible, and this means that the information given at those web sites may not be nutritious enough to usual information consumers. Of course, there are some educational sites and other nutritious and non-profit sites. But they are rather exception than rule in current internet. Most useful, nutritious sites require usage fees. Due to the implicit tradition thus far cultivated of free access to web sites in the current internet, the visit to fee-requiring, nutritious sites tends to be discouraged. The visit to the quality sites associated with fee payment thereupon resulted in underutilization of them thus far.

Overall quality of whole web sites is further tainted with the commercial policy of search engines, as they post the results of search guided by various pay-for-placement programs. Search behavior is accordingly much affected by the efforts of web owners than the degree of appropriateness of the web to the searchers. Moreover, fraudulent and misleading claims in the webs are not properly filtered.

Upholding of nutritious, quality content is utmost important. In contrast to low quality content in the usual commercial web sites, the quality information is believed to be located in many books. With respect to the quality information in books a few attempts to digitize the library and then to put the results on line can be remembered. As for examples, Yahoo and MS initiated open content alliance, and Amazon has been offering online access to books on a 'pay-per-view' basis. These are to actively utilize public knowledge commons that have thus far been neglected. Recent notable concern along the line

is Google's book search project. It is to put some part of any book on line as for the trigger for the search of the whole book.

The project is expected to have significant effect as it is supposed to have targeted to all books in all libraries in the end. However, as itself the project is not looked whole-heartly welcome by all, as it could minimize the role of library in the community, the central knowledge institution in any civilized society. In addition, it is suspected that the company could seek nominal fee for every search to sustain it economically, similar to the iTunes in the case of music downloading, whereas the fee may be divided among copyright holder, library and the company, or the company would the searching with some advertizing. If this is to be the case the business model defining the project could institute a monopolization of access to quality information by the company, thereby resulting in both excessive richness of the company at the expense of everybody and probable underutilization of knowledge assets in public commons. At the same time, if the Google's influence on prioritizing in the process of supplying searched commercial information at web sites is to be repeated even to the search of quality information. the unjustifiable influence by the company on the ways people think about the quality information would be unavoidable. This outcome can not be welcome in democratic society.

Even higher quality content is preserved in academic, professional journals. However, the information in most journals is not available on line. The supply of and demand for information in them render them isolated in the library stacks, with less than sufficient circulation. In the supply side the information in the journals is supplied by scholars in academia and business laboratories. Their research outcomes are usually supported by research grants. The grantees are obliged to reveal their research outcomes by submitting them to the journals even if they have to pay submission fee. The supply of their product to the journals is enforced in the very institution where either getting tenure or promotion is mainly determined by the articles published in the journals and thereafter cited. In the demand side the demand for the high-quality information in the journals originates mostly from academic scholars, too. In many cases the information is too professional to be enjoyed by non-professionals. Indeed, it can be said, the information market associated with the journals is very restricted market. Henceforth, it can easily substituted by online circulation instead of being

published in the paper journal and then being *de facto* hidden in the library stacks. It is therefore necessary and productive to transfer the research publishing at paper journals to online journals.

In order to transfer the offline publishing to online circulation the usage of paper journal has to be changed. If the current publishing capability of screening submitted articles and making available better ones separated from less-better ones were to be transformed to be an independent service and the current practice of using articles from paper journal is replaced with online journal the transfer can be accomplished. When the transfer is made, then, even higher-quality information can become accessible online to many.

VIII. Final Observations

MS became the biggest company of the world helped by almost monopolizing in the operating system, which was indispensable to most using PC. To counter it IBM which was the biggest giant before the MS assisted substantially among many the free software movement. The movement would have restrained MS's excessive charge for its operating software somewhat. Likewise, Google which became a giant due to its key word search model has initiated the book search project. It is expected to give fortune to the company at far as it would adopt a model similar to iTunes in music industry. However, the potential danger from the project as conjectured above is significant. Hence, it is interesting to observe that MS appears as a challenger to mitigate its possible excessive pricing.

Seen at large, internet looks great in spite of many deficiencies indicated above and *de facto* monopolists in several segments of market. There have been some means and efforts to fill the gaps. But there are still many for which corrective measures are unknown upto now. Further evolution of internet would make up deficiencies. Happenings occurred thus far lead us to some optimism. They induce us to expect that market works, even with the temporary monopoly created by IPR regime, insufficient security due to negligent behavior by many participants guided by improper incentive scheme, and greedy endeavors associated with consumers' demand for entertainment, desire for quality information and secure transaction and other discourses in online community. They will be overcome through further evolution process.

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