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ICT Risk Rating of e-Commerce

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ICT Security and Society

- **The reliability of the Internet society is threatened in various ways**, which is being driven by Internet fraud, defamation, spreading false information, and the suicide communities, through media such as a cellular phone, E-mails, Web, Blog and SNS.
- Unlike the real world where people are face-to-face and where the social norms have been established, in the information world with characteristics of anonymity, **users with insufficient self-defense knowledge are being targeted by criminal activities** on the Internet.
- However, if we fail to overcome these social problems, the **market mechanism is in danger of collapse by the moral hazard of reliability**.

Example: Number of incidents and total financial damage of billing fraud

(December, 2008)	Number of incidents	Approximate total financial damage B¥
Billing fraud	20,481	27.6
(Sub items)		
"Ore-Ore fraud" ("It's me" fraud)	7,615	15.5
Fictitious claims	3,253	3.6
Loan-guarantee fraud	5,074	3.7
Repayment money fraud	4,539	4.7

Resource: The Police Department
http://www.npa.go.jp/safetylife/seianki31/1_hurikome.htm

How do the consumers evaluate the credibility of the EC Web site ?

- Key information that relates to the purchase such as explanation and guarantee of the product,
- Key information that shows **the existence of the provider in the real world such as the company's overview, address, and telephone number.**
- In addition, the legal system of the electronic commerce is ruled by the **Specified Commercial Transactions Law** which imposes providers to describe ID (identity) and attributes such as telephone number, provider's name and address on the EC Web site.

Factors to evaluate credibility of the EC Web sites

By the questionnaire survey

	Factors	Average	SD
EC Web site	Key Information to trust upon EC Web sites (profile, address, phone number)	0.72	0.28
	External evaluation	0.30	0.45
NPO Web site	Activity status information	0.70	0.32
	Social responsibility	0.58	0.42

The continuous existence period of ID and attributes

- Telephone numbers of fictitious companies are warned as "Attention List" or “ **Black List**” on the Web site of credit card companies and the police department.
- We verified the possibility **that the continuous existence period of telephone number ID becomes clues of the trust evaluation of EC Web site** to avoid the phishing.

Existence period of the telephone number ID

The result of investigating the continuous existence period of the telephone numbers of the fictitious enterprises.

Phone number ID related to phishing and net fraud (investigation of 188 cases)			
Recent contract ID	One month available ID in six months	Less than one month available ID	Normal line ID (valid ID more than 12 months)
10	80	81	17

The continuous existence period of ID and attributes

- 91% of the black listed telephone numbers were acquired within half a year, which means that these telephone numbers were obtained just before the Internet fraud occurred.
- There are no 050-, 080- and 090- numbers used for phishing, meaning that the degree of the risk varies depending on types of the telephone (mobile / fixed / IP phone).
- According to the local area code directory, the telephone number of 188 illegal phones concentrates on Tokyo 23 wards.
- The continuous existence period of ID and attributes are effective for the safety or risk evaluation of EC Web sites.

Existence period of phishing Web sites

- The phishing site lives only for four days on an average in fiscal year 2007.

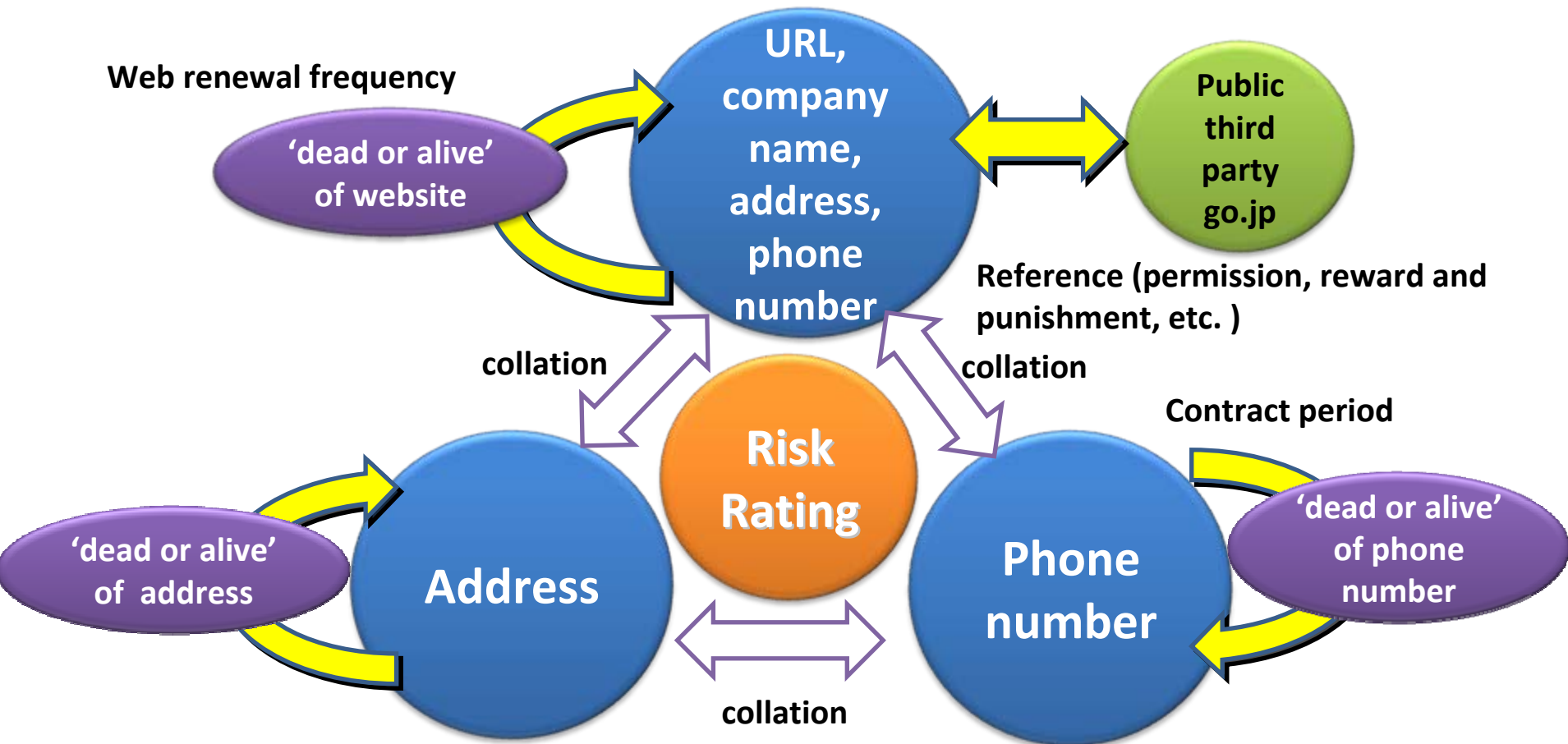
Time of Investigation	Average length of existence (day)	The number of newly generated sites(per month)
2004.Oct.	6.4	1,142
2005.Oct.	5.3	7,197
2006.May	5	11,976
2007.July	4	28,151

The investigation of Anti-Phishing Working Group (2007)

Experiment: Risk rating system of Web EC site

- We obtained **74,000 URLs of EC Web site** linked to the portal site to evaluate the credibility of EC Web sites.
- The telephone numbers, address, and company name were extracted from on each EC Web site , and evaluated the **continuous existence period** of ID and attributes.
- The compliance to the **Specified Commercial Transactions Law** can be applied to the risk estimation of EC Web site.

ID and attributes based risk rating model



The risk rating factor based on the continuity, consistency and compliance.

- The risk rating system was developed, and the evaluation of an actual EC Web site was executed.
- The risk score is calculated based on the following factors:
 - **compliance to the Specified Commercial Transaction Law,**
 - evaluated by **the existence period** of telephone number,
 - **the consistency** of the address determined by the telephone number and the described address,
 - evaluated by **continuous use of URL, frequency of update.**

ICT risk rating system

The image shows a screenshot of the ECナビ (ECNavi) website in a Windows Internet Explorer browser. A red rectangle highlights the search bar area, and a blue arrow points to the search button. The website displays various product categories and a search result for 'Apple 該当商品一覧(1/1ページ)'. Below the website screenshot, there is a table titled 'IdTM Search Result'.

Items						
Shop name	*****	○				
Company	*****	○				
Address	*****	○				
Phone number	*** **	○	contract Period	More than **year**month		
Home page	*****	○	Existence period	More than **year**month	Last Renewal	year****mont h**date**
IdTM Evaluation	★★★					

Discussion 1: e-Commerce system design with maximum profit

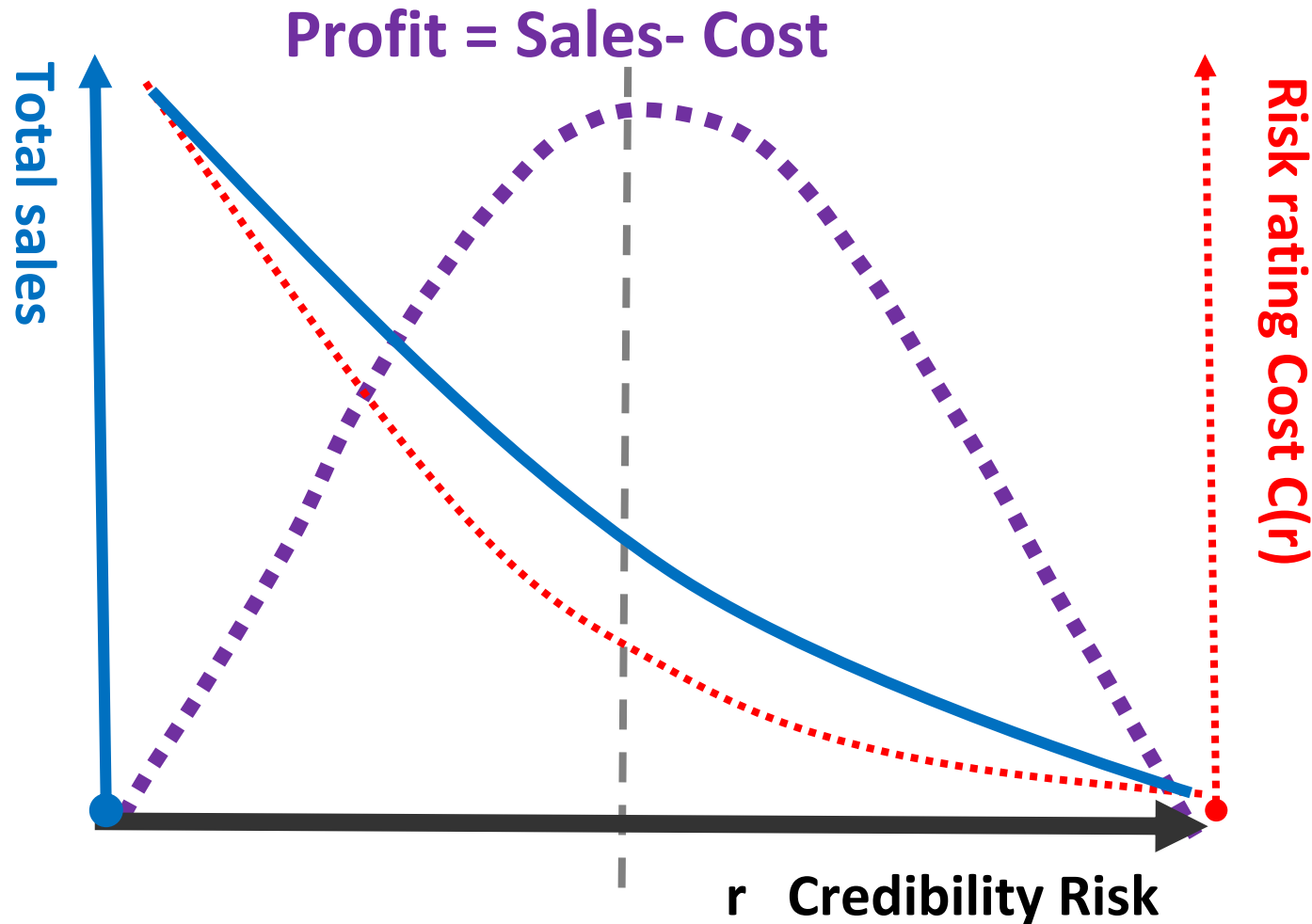
$$\text{Profit} = \text{Sales } S(\mathbf{r}, \dots) - \text{Cost } C(\mathbf{r}, \dots)$$



Sales and risk rating cost

- **The total sales** of EC increase as EC is safe and reliable, and decrease down to a certain quantity as it becomes unreliable. The total sales EC increase monotonically up to the infinity as its credibility gets higher, and decrease down to a certain quantity as it becomes more risky.
- **The cost for risk rating** will become higher if the risk rating is required to be more accurate. The risk rating cost will get higher monotonically up to the infinity as the required accuracy of risk rating is higher, and conversely the cost will monotonically approach to zero as the risk rating is less accurate.

Profit improvement by optimizing risk estimation



Discussion 2: A computational risk rating model based on the existence period

- “Since 1780”, “Ganso (Originator)”, “Sougyo (Foundation)”
- The **existence period of the shop** is increased at a certain rate when shopping is done safely.



Safety rating of an EC Web site

- Let w_i be the safety rate of an EC Web site i at a time unit. The safety rate of the shop i during x time units is expressed as

$$f(x) = w_i^x = e^{-x \log(1/w_i)}$$

- The **existence period** d of the shop is defined as

$$f(d) = 1/e$$

- Then d is equal to the mean of x .
- Older shops are believed to be safer and more reliable all over the world. Equation $f(d) = 1/e$ enables the transformation between the safety rate and the existence period of the shop.
- Namely $w = e^{-1/d}$ $d = 1/\log(1/w)$
- For example $w = 0.99$ corresponds to $d = 99$ time units.

Shopping with minimum risk

- EC Web site i of safety rate w_i sells a certain commodity at the price p_i . The expected quantity S can be procured by ordering quantity a_i to shop i as

$$S = a_1 w_1 + \dots + a_k w_k$$

- The expected loss (risk) is expressed as

$$L = a_1 p_1 (1 - w_1) + \dots + a_k p_k (1 - w_k)$$

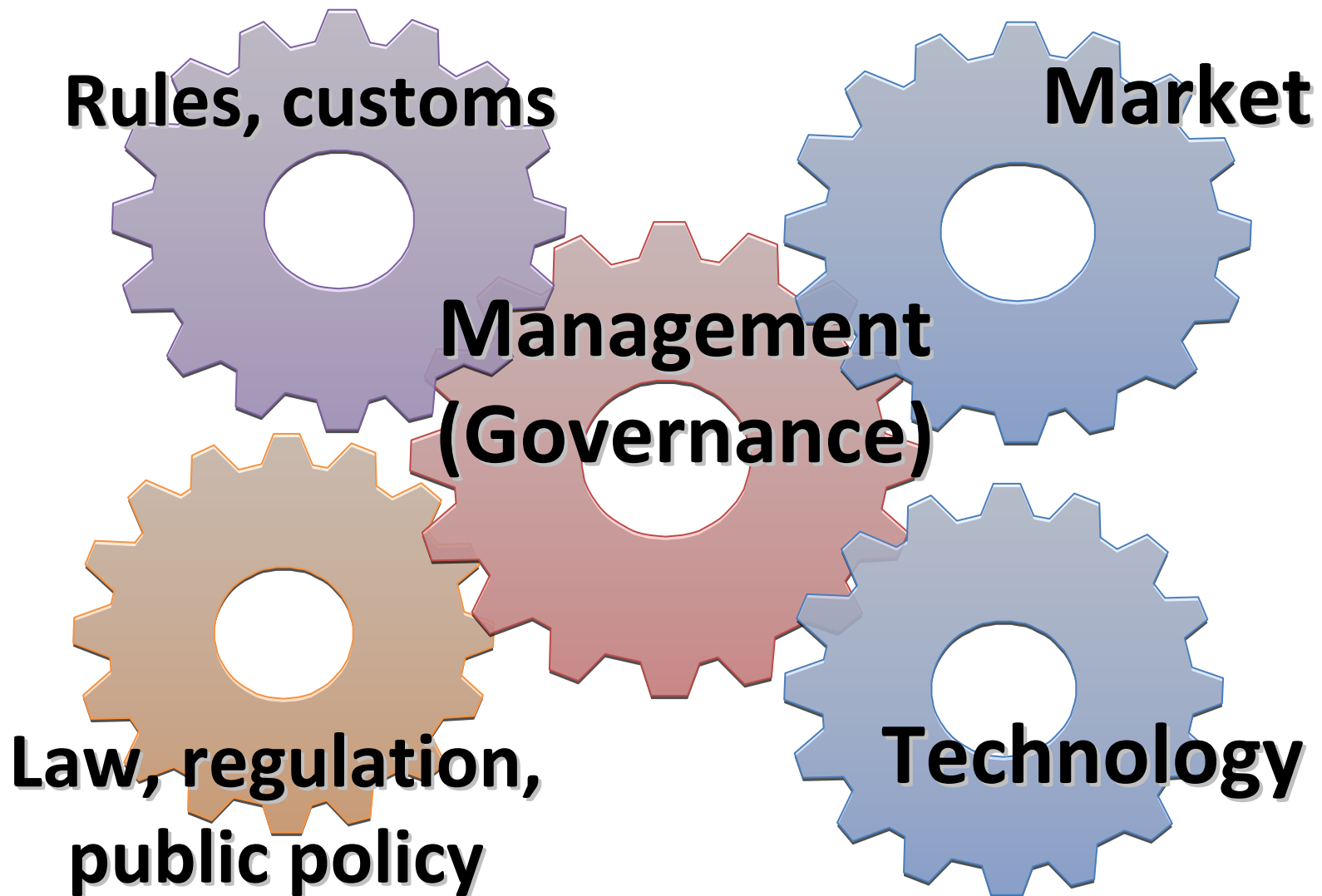
- The intersection of S-plane and L-plane gives the expected loss when quantity S is procured. The L-plane closest to the origin of $\{a_1, \dots, a_k\}$ coordinate makes the risk minimum. Such L-plane passes the intersection of S-plane and a coordinate axis. The minimum L is given by one of

$$S p_i (1 - w_i) / w_i; i = 1, 2, \dots, k.$$

Conclusion

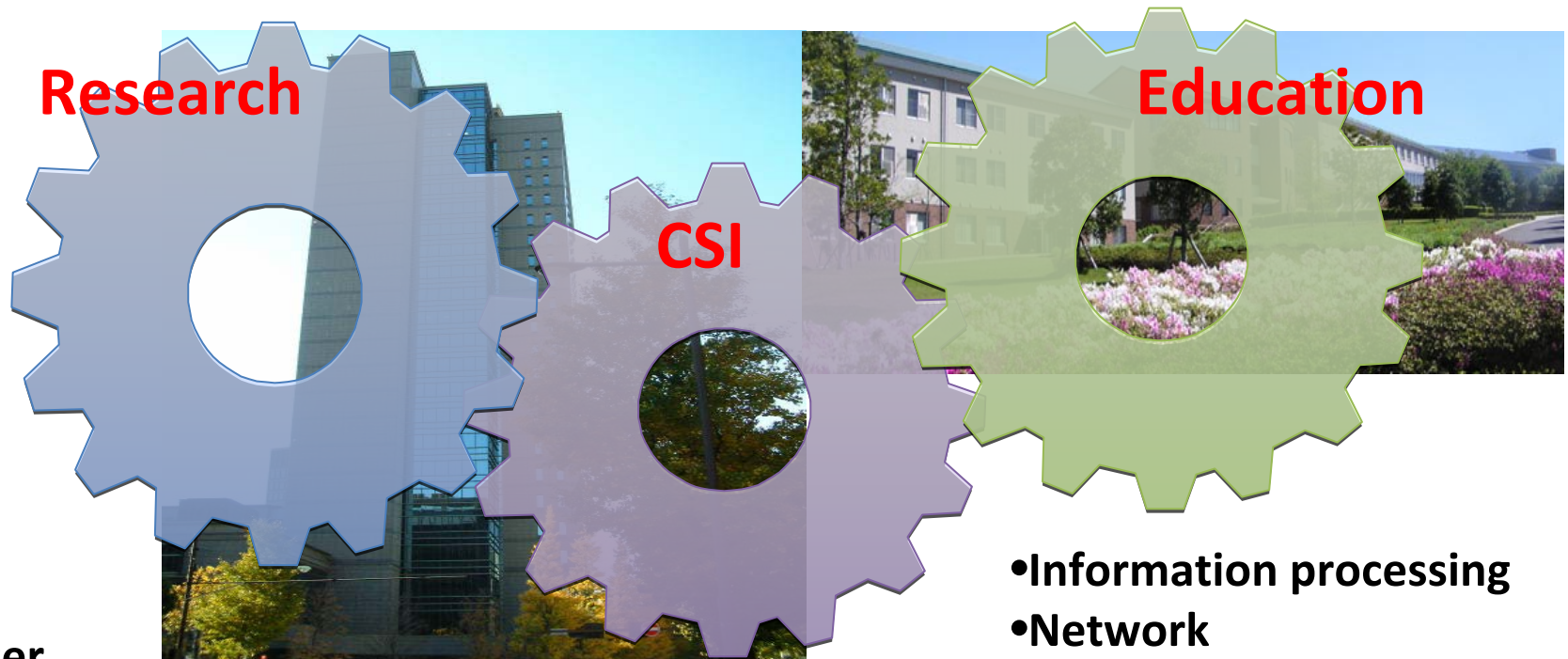
- The credibility of the EC Web site is essential to its healthy growth. A **risk rating** system of EC Web sites is developed to give **risk score** to consumers.
- We showed the existence of the optimum risk rating system. Adequate risk rating will contribute much to the healthy growth of EC Web site.
- Governance of ICT society can be considered the key factor in making sure that **societal regulations and customs, the legal system, the market, and technology** interoperate successfully.
- We will discuss a computational **risk rating model** based on **the existence period of EC Web site**.

ICT Governance Mechanism



Introduction: N. Sonehara

Governance of ICT society, ICT risk and trust management
and Academic Authentication Federation



- Computer
- Architecture
- Content
- Socio-informatics*

- Network service
- Academic contents service
- Academic federation service*
- Grid computing service

- Information processing
- Network
- Media computing
- Grid computing
- Data Centric Social science*

***Thank you very much
for your kind collaboration!
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***For all People in
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