A study on Information Quality and Value of E-business Website Relevant to User/Supplier Perspectives

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Chapter 1 Introduction

The first fully functional digital computer - the ENIAC was completed by John M. and Eckert J. P. of the University of Pennsylvania in 1945. The ENIAC contained 17,468 vacuum tubes, 7,200 crystal diodes, 1,500 relays, 70,000 resistors, 10,000 capacitors and around 5 million hand-soldered joints. It weighed more than 30 short tons (27 t), was roughly 8 by 3 by 100 feet (2.4 m × 0.9 m × 30 m), took up 1,800 square feet (167 m^2), and consumed 150 KW of power, and could add 5,000 numbers in a second which is a very remarkable accomplishment at the time(Martin H. W., 1955; Brian R., 1982).

Since the ENIAC activated at the University of Pennsylvania in 1946, the computer technology had rapid development in only a few decades. Specifically, the small size, low price and powerful Personal Computer（PC）appeared in 1975, the computer have being grown in popularity in the world. At present, computer applications have already been extended to all areas of society for the daily life of people. The computers play a significant role in our society, such as the office automation, multimedia applications (Barkley W. F., 1996; Scott M., 1999).

With the development and popularization of computer, the research on packet switching and packet switched networks started in the early 1960s. In particular, the Advanced Research Projects Agency Network (ARPANET) led to the development of protocols for inter network, and multiple separate networks could be joined into a network together with the protocols (Barry M. L., et al., 2003). In 1982, the Transmission Control Protocol (TCP) and Internet Protocol (IP) were standardized and the concept of a world–wide network called internet has been introduced. Since the entire network was accessed from the public, the Internet has made a tremendous impact on culture and commerce. On the other hand, The Internet has continuously been growing, driving by huge amounts of online information and knowledge, commerce, entertainment, social networking and so on. The Internet has spread at an alarming rates, the detailed situation of growth for Internet of the world is described in the following section.

During the spread of internet in the late 1970s, the study of E-commerce started. It is a system of trading products or services using a variety of electronic media or technologies, such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems(Coffman K. G.; Odlyzko A. M., 1998). Nowadays, the World-Wide-Web (WWW) is the main typical application of computer technology in business.

The first business-to-business (BtoB) online shopping system appeared in 1981(Palmer C., 1988). Since then, E-business becomes a very wide range of business practices for organizations and companies in the world. There are no longer obvious difference between the domestic market and international markets. The detailed development of E-business is described in the following section.

In our real society where the amount of information distribution is increasing, a number of problems related to business activities have occurred, such as copyright infringement, falsification of information, information leakage, unauthorized use of information. Even in the problem of information quality, the occurrence of corporate losses caused by incorrect information is never the less. In fierce market competition, companies need to collect and to analyze a variety of information for their superiority and market share continuously. Because the quality of information has a great influence on the management decision-making of companies, the evaluation of the quality of information should be performed and its proper measurement should be verified in advance.

The study on the quality of goods has been done in the field of quality management for a long time. The history for the study of data quality and integrated database system also has extended over nearly half of a century. However, a number of studies have been limited to confined fields or individual organizations. Around 1990, a great number of comprehensive researches were widely conducted. One of the typical research groups was composed by Wang R.Y. et al. in Massachusetts Institute of Technology (MIT). From 1995, many scholars published many papers on their studies (Wang et al. 1996; Kahn et al. 2002; Lee et al. 2002; Xu et al. 2004; Mouzi et al. 2007). Besides, International Conference on Information Quality has been held every year since 1996, which covers general information, administration system and management, no longer limited to the data and the database. In Japan, JSIM (Japan Society for Information and Management) is one of the leading associations in this field. It delivered several papers in the journal (Seike N., 2008; Sekiguchi Y., 2008) and translated books written by R.Y. Wang et al. However, Japanese researches in this field are still not so as active as in U.S.

On the other hand, a number of scholars also discussed the value of information in the previous studies of information theory. They were mainly focused on the viewpoint of providers who makes information. However, the circumstances, preferences and sensibility of users have a deep impact on information value in reality. Because information values have properties of subjective, we need to consider the user's evaluation in order to provide higher value information. At present, the study of the system or effective methodology depending on user's context and the value which they are not consciousness is still immature. The study of implementing methodology is also few.

It is recognized as serious research project how to flush out the high-quality information leading to the development of enterprises from the large amount of information data immediately. Since improving the competitiveness of enterprises is expected by providing the high quality and valuable information, we consider that the information quality evaluation system and information value improvement system deeply impacting on the business decision-making of companies would be very important.

1.1 Situation of Internet and E-business

According to the survey of internet in the word by the International Telecommunication Union (ITU) in 2014. The global Information & Communication Technology (ICT) development are increasing rapidly, it had galloped ahead more than 2.712 billion people in 2013 from around 500 million people in 2001. The average annual users of Internet had increased by about 15.72% in the 12 years. The penetration rate of population in internet is from

8.1% in 2001 to 37.9% in 2013 of the world. The number of internet user is expressed in the figure1, and the figure2 is the Percentage of the global ICT development.

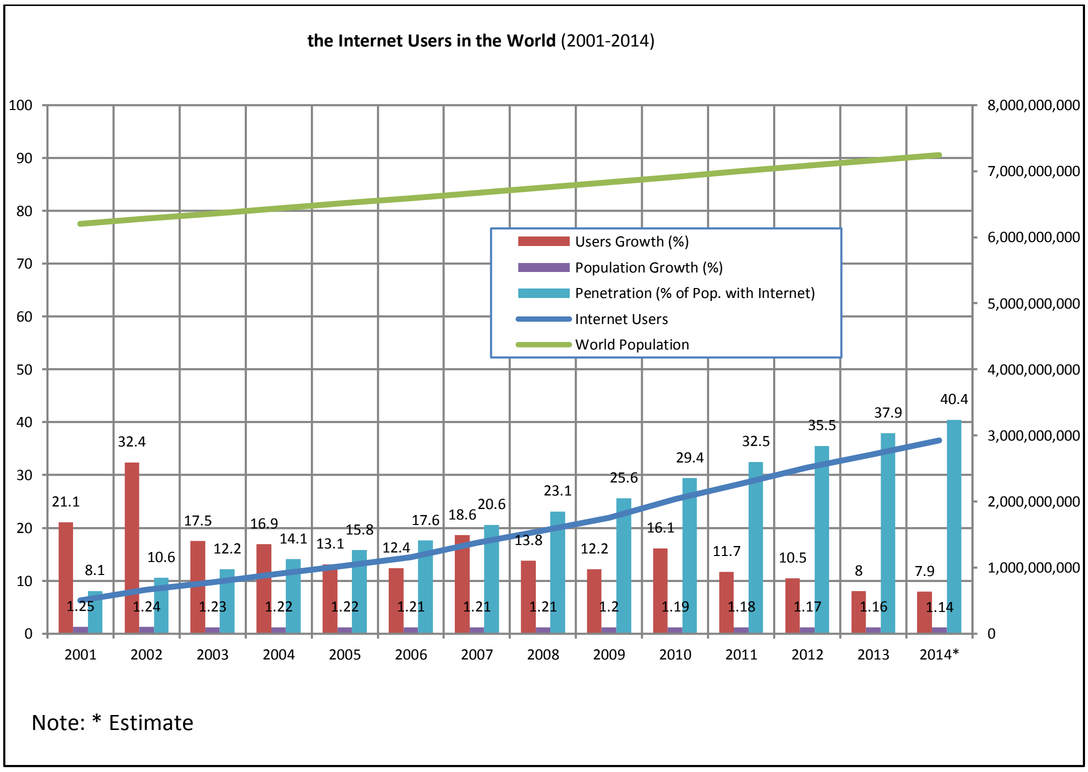

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Figure 1　　Internet Users in the World (2001-2014)

The number of Internet users are that of an individuals accessing to the internet at home. The meaning is that this indicator does not record use, or frequency of use, but only access. The Internet users have on minimum or maximum age limits, and they can access to the Internet at any time. Although the hardware equipment may or may not be owned by the household, the hardware equipment must be kept on working conditions, and the Internet subscription service must be active. The household also has multiple devices and services. The data of Internet users are collected through annual household surveys administered by individual countries based on ITU guidelines. On the other hand, the United Nations Statistics Division (UNSD) also has recommended collection of data on households accessing the Internet outside home, but this is not a Core ICT Indicator. Therefore, the definition of an "Internet User" is an individual who can access the Internet, via computer or mobile device at home where the individual lives (ITU, 2010).

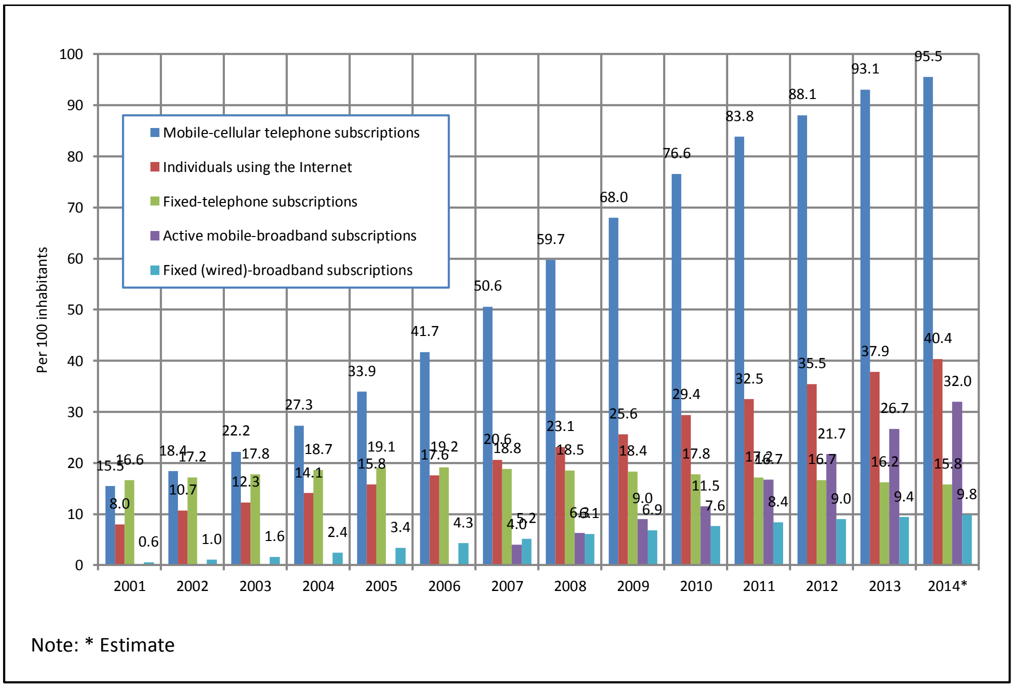

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Figure 2　　Percentage of Global ICT Developments in per 100 Inhabitants

From the suvery of ITU in 2013, Internet penetration rate and Internet users by region are expressed in figure 3. The report breaks down the results regions by regions. In the order of the penetration rate, North America has the highest rate of 84.9%, and has the low number of Internet users in the world of 10.7%. The following rate is the rate of 68.6% in Europe, has the number of Internet users in the world of 20.2%. And Oceania has the Internet penetration rate of 67.5%, the lowest number of Internet users in the world of 0.9%. In addition, Asia has a low Internet penetration rate of 31.7%, and has 45.1% in the number of Internet users of the highest rate. Africa has the rate of 21.3% with the number of Internet users of 8.6%. The world wide rate of penetration ranges from 8.1% in 2001 to 37.9% in 2013.

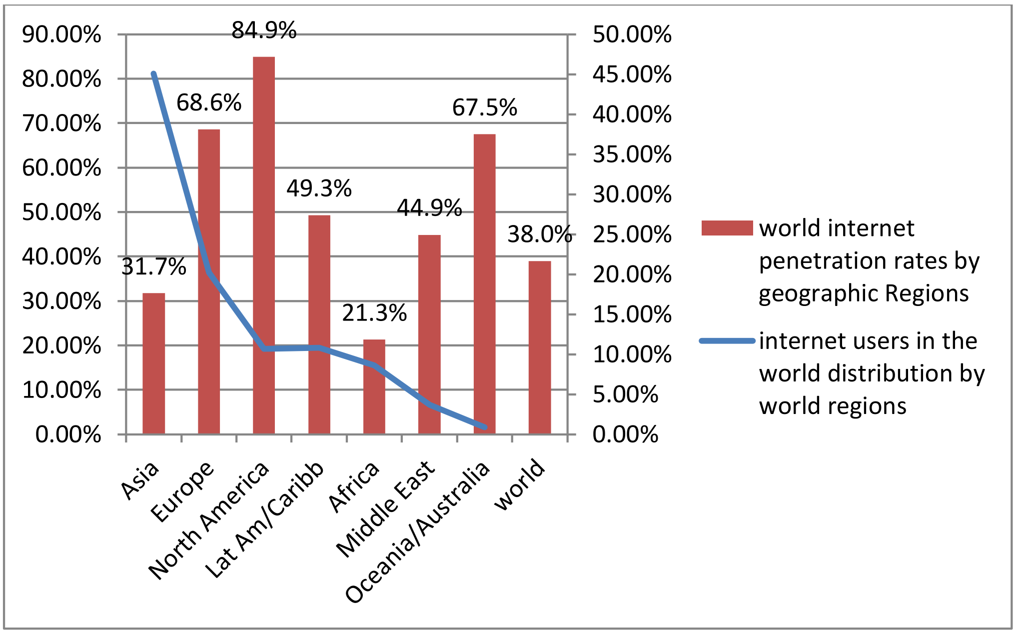

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Figure 3 Internet Penetration Rate and Internet Users by Region in 2013

The distribution of Internet users in the top 20 countries is expressed in figure 4. Nearly 75% (2.1 billion) of all the Internet users (around 2.9 billion) of the world are in the top 20 countries, and each of the other 178 countries has less than 1% of total Internet users with 25% (0.7 billion) of total percentage.

China with most internet users (642 million in 2014) accounts for nearly 22% of total, and has more users than the next three countries combined (United States, India, and Japan). Among the top 20 countries, India is the lowest penetration rate of 19%, but has the highest yearly number of user growth. Although, United States, Germany, France, U.K., and Canada are at the opposite end of the range, they have the highest penetration rate of more than 80%.

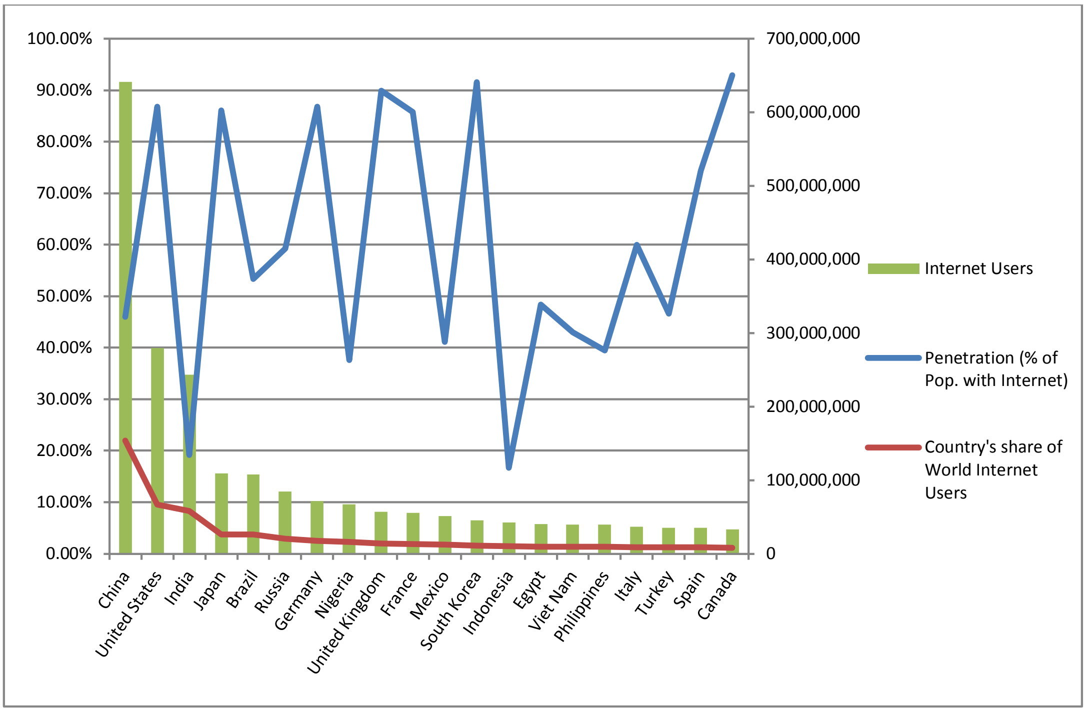

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Figure 4 List of Top 20 Countries by Internet Users in 2014

Throught the development of information technology and internet, E-commerce is also rapidly expanding. According to the investigation report for some countries by eMarketer[1], the UK is the highest E-commerce user penetration rate (87%), followed by countries are Germany (81%), Japan (78%), U.S.A (73%), China (49%), Russia (40 %), Brazil (36%), and the lowest is Indonesia (9.5%).

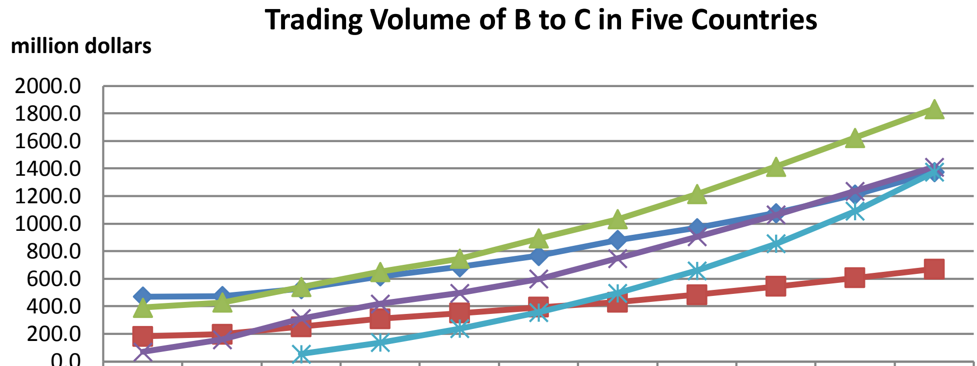
Here trading volumes of business-to-consumer (BtoC) E-commerce market in some countries are expressed in the figure 5. According to the statistical research by EnfoDesk[2] Analysis Think Tank in 2014, the trading volume of BtoC in China reached around $124.48 billion with increasing rate 59.4% from 2009 to 2013, and the trading volume has a growth of about 35 times in 4 years from 2009. From the report of Ministry of Economy, Trade and Industry of Japan (METI)[3], the trading volume of BtoC in Japan is $104.96 billion with increasing rate of 17.4% from

[1] http://www.emarketer.com/
[2] http://www.enfodesk.com/
[3] http://www.meti.go.jp/

2009 to 2013, and the growth rate slowed down.

Figure 5 is a transition of the trading volume of BtoC which based on the development of Internet infrastructure and national economic in five countries by Euromonitor International[4]. The total of trading volumes is $ 2.5 billion in 2012, and is estimated to reach upwards of $ 6.7 billion in 2018. Thailand has the most of trading volumes in five countries in 2012 followed by Singapore, Indonesia, Malaysia and Vietnam. However, with the expansion of E-commerce market in Indonesia and Vietnam, they are estimated to outstrip Singapore in 2018.

From the latest forecasts by eMarketer, the worldwide BtoC E-commerce sale will increase by 20.1% in 2014 to reach $1.500 trillion from $1.221 trillion of 2013. In fact, E-commerce has a remarkable development in the world.



	2008	2009	2010	2011	2012	2013*	2014*	2015*	2016*	2017*	2018*
Singapore	469.4	473.9	525.8	618.2	684.5	767.2	881.6	968.7	1076.3	1210.3	1373.8
Malaysia	181.0	196.9	251.4	308.6	350.1	392.4	429.6	484.6	543.1	605.4	670.2
Thailand	390.1	426.6	540.4	650.7	744.9	892.5	1032.3	1214.1	1412.9	1623.7	1831.5
Indonesia	68.3	158.9	310.3	417.6	495.6	598.9	747.7	904.7	1062.1	1234.7	1410.1
Vietnam			53.6	137.4	237.1	356.6	495.5	658	854.5	1089.4	1373.8

Note: * Estimate (Source: METI of Japan; Euromonitor International)

Figure 5 Trading Volume of BtoC in Five Countries

1.2 Research Perspective and Purpose

As described in the previous section, with the progress of related technologies and the rapid spread of the Internet, E-commerce has obtained a central position

[4] http://www.euromonitor.com/

in business activities. It is not only a phenomenon in large companies and IT companies, but also in the small and medium-sized manufacturing and retail industries.

On the company's website as the E-commerce platform, several kinds of information such as corporate image, reliability, product introduction, customer support, customer evaluation, sales and payment procedure, are presented, and visitors to the website, here we call them as a user, make purchasing activities while referring to these information. Of course, there are important factors unrelated to the website itself such as the quality of product, the trend of product, etc. However, as long as the company has a website, it is necessary to pay attentions to the user evaluation and to whether the site itself is appropriate for the purpose of the business activities.

The problem consciousness of this paper is how to establish an evaluation system of e-commerce website and to lead to its improvement. And the main perspectives of website evaluation are the user perspective, website designer's perspective, and suppliers' (or company's) perspective lead by objectives for running the website.

The improvement in general is proceeds as following way; analyze the present situation, discover problems, and consider them from various viewpoints. There are many quantitative and qualitative methodologies proposed. Here we adopt questionnaire survey on information quality for the user perspective evaluation method, graph theoretical measures related to website structure and indicators on the items' frequency for the website designer's perspective, and quantitative measure of "value" in the value engineering adapting to information on website for the company's or suppliers' objective perspective.

The users' perspective evaluation is an evaluation from outside of website, and the perspective of website designer we treat here is to consider improvement website from a structure point of view. Although there are various types of factors that affect the user evaluation on information quality such as website structure or item related values, one of our research positions is to associate them with some of user information quality evaluation factor.

On the other hanc, if the information quality evaluation values by users are good, we consider that any website not matching company's objectives to run is not good one. Moreover the relationship between the users' evaluation values and companies' objectives are not clear. Therefore in this thesis, we also investigate website in the objective perspective of company as supplier from information value not from the information quality point of view.

The purpose of this thesis is to propose two types of evaluation systems which might derive supplier to improvement of E-business website in order to gain success in E-business. One of them is from users' perspective and the other is from suppliers' (or company's) perspective.

1.3 Research Method

In order to achieve the research purpose, some appropriate research methods is needed. Although the research methods sometimes need to be improved during the progress of research, this study will do with some research methods in the following.

(1) Various existing literature associated with the information quality, value and evaluation method are referred.

(2) We use some analysis methods of a survey of user evaluation with questionnaire and statistical methods for principal component analysis.

(3) In order to integrate the evaluation of user perspective and expert perspective, we introduce the fuzzy theory to deal with uncertainty.

(4) We propose user oriented information quality evaluation system.

(5) We also propose the total evaluation system for E-business website.

(6) Information value improvement system is established based on the existing research.

(7) The systems are applied to some existing websites.

1.4 Structure of Thesis

This thesis consists of 6 chapters described in figure 6:

In chapter 1, background, perspectives, research method, purpose of this thesis, and structure of this thesis are described in detail.

In chapter 2, some existing quality management systems, the history of information research, criteria and method of information quality as a previous study are reviewed. We also show metrics for the classification of information quality items made by Wang R. Y. et al. who are main members of a research group in this field. They proposed the metrics which have 16 items and 4 categories. In this thesis, we conduct some survey based on these metrics.

The core parts of this thesis consist of 3 chapters each of which has somehow different perspectives with each other. The first core part is chapter 3 where our proposed information quality evaluation systems is described from Website users' perspective. The second one is chapter 4 where we try to combine the user oriented information quality values with much more abstract metrics which are accounted for Website suppliers' perspective. In chapter 5, the information values defined is in order to improve Website from suppliers' perspective. Some details are described in the followings.

In chapter 3, we describe user oriented information quality evaluation system for website based on questionnaire items Wang R. Y. et al. proposed in which fuzzy integral is mounted in the integration phase. A methodology for evaluating Website using fuzzy linguistic approach was proposed by Herrera-Viedma et al. (1997), and they also proposed fuzzy qualitative models using Linguistic Ordered Weighted Average (LOWA) and Linguistic Weighted Average (LWA) as aggregation operations for linguistic information (Herrera F. et al., 1997). We made a questionnaire on two major search engines and applied our proposed evaluation method and MLIOWA (Majority guided Linguistic Induced Ordered Weighted Average) a method Herrera-Viedma et al. proposed to see the difference between the total values and properties of our method.

We think that any evaluation method should lead a set of proper suggestions or practices or controls for improvement. However user oriented information quality defined in chapter 3 is not easy to control because items we used in the questionnaire are too abstract to manage and factors contains several abstract elements in each items. For the improvement system of Website we propose two types of methods one of which is described in chapter 4 and the other is in chapter 5.

In chapter 4, following the method in chapter 3 we try to find some explanation variables for users' evaluation factors as dependent variables in multivariable regression model. We adopt some link-based or term-based theoretical evaluation metrics as explanation variables and each factors, the integration values, is objective value to be improved. We chose six business Websites and limited 20 pages which seemed to be nearer to each top page for each Website, then calculated values for explanation variables. The user oriented information quality values are also worked out from questionnaire to Japanese University students on each Website. Then the regression models are given.

We think the regression model construction method proposed in chapter 4 are effective for improvement of Website, but we need large quantity of values for explanation variables and for dependent variables to obtain proper model. In chapter 5, we propose another method for evaluating website by introducing different metrics from user oriented information quality indices. We try to define the information value using "cost" and "functional degree" of webpage. The total information value of a Website is defined as an aggregated value of webpages from Website owner's perspective not from users'. The last part of this chapter is dedicated to an illustrative example of applying our proposed method to 3 Websites in order to show how to calculate the information value.

In chapter 6, we describe the overall conclusion of this thesis. We established three systems. These are the user oriented information quality evaluation system, the total information quality user evaluation system, and the information value improvement system.

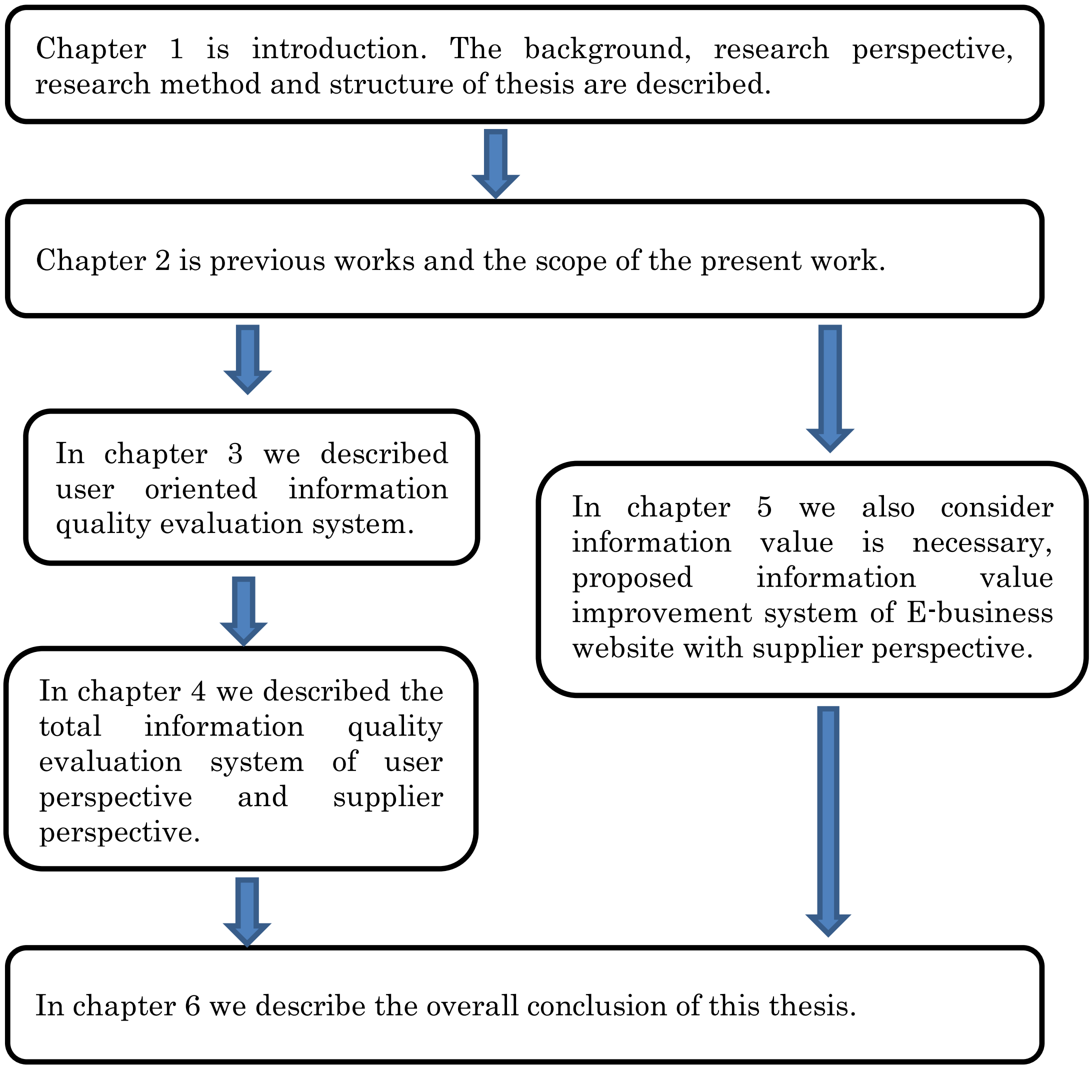


Figure 6 Structure of Thesis

Chapter 2 Previous Works and the Scope of the Present Work

In this chapter, we pick up some metrics, method and the series of works related to our topics. We introduce some metrics of data and information, and make a comparison of viewpoint of Wang R. Y. et al. with other scholars'. We think the viewpoint of Wang R. Y. et al. is the most appropriate for evaluation of information quality of our thesis by users' perspective. In order to make a comparison with our method, we refer to some overviews on the methodology in the quality of website by Herrera-Viedma E. et al. As the website designer's perspcetive, we introduce major web quality dimensions by Aladwani A. et al. and theoretical web metrics by Dhyani D. et al. For a method to evaluate a website form suppliers' perspective, we defined the information value by applying the definition of "value" in the Value Engineering.

2.1 Data and Information Quality Research

With the rapid development of the information society, many organizations and companies recognized the significance of data and information. They have increasingly invested in technology and human resources to collect, store, and process vast quantities of data, and also have made an effort to translate this data into a variety of information suitable for some business applications, such as improving business processes, making smart decisions, creating strategic advantages and so on. However, they have not taken the concept of quality of data and information into mind.

On the other hand, many scholars incorporate the viewpoint of quality of data and information into these issues not only in technical ways but also in nontechnical ways.

As a research area, data and information quality began to attract the research community's attention in the late 1980s. To address data and information quality concerned, many scholars started to investigate the issues at MIT (Wang R.Y., and Madnick S.E., 1989; Wang R.Y., and Madnick S.E., 1990).

With the development of research, the Total Data Quality Management (TDQM) program was formally launched to underscore data quality as a research area in 1992 (Madnick S.E. and Wang R.Y., 1992). Pioneering works of the early TDQM and the later MIT Information Quality (MITIQ) program have made a solid foundation for data and information quality research and attracted a large number of researchers to conduct cutting-edge research in this field.

Since the initial work was performed at the TDQM program and the MITIQ program, a growing number of researchers from information systems, and other disciplines have been engaged in actively conducting data and information quality research. Although researches are particularly immature in comprehensive methodologies for information quality evaluation and improvement, some good achievements and results were gained.

Although there is a tendency to use data quality (DQ) to refer to technical issues and information quality (IQ) concerning to nontechnical issues, we do not distinguish DQ from IQ in this thesis. We consider that an interdisciplinary research should be done in this area.

As we know, IQ is very critical in organizations. In spite of active researches and practices, comprehensive methodologies of evaluation and improvement seem to be insufficient in this field. Table 1 is the summary of academic research on the multiple dimensions of IQ and Table 2 is a list of practitioners' sampling items for IQ research. We analyzed the classifications and research areas of some scholars in Table 1. As mentioned earlier, Wang R. Y. and Strong D. M. are leading scholars in this research field of DQ and IQ. We also know that Wang R. Y. is a major proponent of DQ and IQ research developing a set of concepts, models, and methods for this field in many papers, and his proposed methods on DQ and IQ are applied by many organizations. For example, the U.S. Navy used them to the Naval Command, Control, Communication, Computers, and Intelligence (C4I) information architecture.

Zmud R.W focuses on management of information technologies and systems in facilitating a variety of organizational behaviors and efforts. He chooses especially practical use related to items characterizing accuracy, quantity, factuality, reliability, timeliness, readability etc.

Jarke M. and Vassiliou Y. investigate database systems from knowledge base point of view. Then they introduce believability, syntax, semantics, aliases, privileges, and origin etc. And they are also interested in working data warehouse, and also introduce an item, data warehouse currency.

Delone W. H. and Mclean E. R. investigate information technology and system, and develop a model which is called the Delone and Mclean model. For testing IS success, they apply their model to measure the E-commerce success by introducing several items in view of information quality.

Ballou D. P. and Pazer H. L. are interested in data quality, and pick up only four items such as accuracy, consistency, completeness, and timeliness from data base point of view. They especially investigate the tradeoff relationship between accuracy and timeliness.

The original research area by Wand Y. is related to ontology based on knowledge and information system, so that he introduces correctness, unambiguousness, completeness, and meaningfulness.

As we see above, the viewpoints of Wang R. Y. and Strong D. M. seems to be most appropriate for evaluation of information quality, and adopt this viewpoint in our thesis.

For the criteria of information quality with the purpose of making information quality guarantee, Wang R. Y. and Strong D. M. advocated 16 items in 4 categorizations as follow.

- Accessibility: It is the degree of acquiring information quickly and easily, and reflects the ease of data attain-ability. Accessibility can be measured as the maximum of two terms: zero and one minus the ratio of currency to volatility.
- Appropriate Amount of Information: It is the degree of quantitative information seemed to be appropriate for the present work. In fact, it reflects the data quantity neither too little nor too much. A general metric that embeds this trade-off is the minimum of two simple ratios: the ratio of the number of data units provided to the number of data units needed, and the ratio of the number of data units needed to the number of data units provided.

- Believability: It shows the degree of data's accuracy and reliability. Among other factors, it may reflect an individual's evaluation of the credibility of the data source, comparison to a commonly accepted standard, and previous experience.
- Completeness: It is the depth and the width for the present work without any loss of information. It could be viewed from many perspectives and lead to different metric. At the most abstract level, one could define the concept of schema completeness, which is the degree to which entities and attributes are not missing from the schema. At the data level, one could define column completeness as a function of the missing values in a column of a table.
- Concise Representation: Briefly, it is important to work out concise data.
- Consistent Representation: It reflects the degree of being expressed in a unified format. The consistent representation could not only be viewed from a number of perspectives, but also from the redundant data values across tables. A metric measuring Consistent Representation is the ratio of violations of a specific Consistent Representation type to the total number of Consistent Representation checking subtracted from one.
- Ease of Manipulation or Operation: It is the degree of ease of editing or processing operation, and application to other work.
- Accuracy, Free-of-Error: It is the degree of accuracy. If one counted the data units in error, the metric would defined as the number of data units in error divided by the total number of data units subtracted.
- Interpretability: It is the degree of definition with appropriate languages, symbols and units. And the definitions are clear.
- Objectivity: It shows the degree of non-bias or non-prejudice. Information is unbiased, unprejudiced, and impartial.
- Relevancy: It is the degree of usability. Information is applicable and helpful for the tasks at hand.
- Reputation: It is the degree of high consideration on the sources and the contents.
- Security: It shows the degree of limitation to the availability of

information with the purpose of ensuring safety.

- Timeliness: It is the degree of recentness. Recently, the data is used for the tasks. It is just the same as Accessibility. Timeliness could be measured as the maximum of two terms: zero and one minus the ratio of currency to volatility.
- Understandability: It reflects the degree of ease of understanding (interpretation), which is easily comprehended.
- Value-Added: It is the degree of usefulness and favorable situation, is beneficial and provides advantages from its use.

In addition, these 16 items above are classified into 4 categories shown in Table 1. We give a brief explanation of categories.

The first one is the intrinsic characteristics of information quality, consisting of the accuracy and objectivity of credit reputation.

The second one is the contextual characteristics of information quality, consisting of timeliness or completeness of the appropriate amount of value-added relationship.

The third one is the representational characteristics of information quality, consisting of interpretability, understandability, consistent representation and concise representation.

The fourth one is the accessibility of information quality, consisting of accessibility, security and ease of manipulation or operation.

With regard to the user oriented information quality for evaluation system introduced in the following sections, we would examine the extracted factors based on the dimensions and categories mentioned above. If the result of the category classifications by analyzing data from the questionnaire were significantly different from classification proposed by Wang R. Y. and Strong D. M., it might be needed to consider some ways of explanation referring to the other academics' view or practitioners' view in Table 1 or Table 2.

Table 1 Academics' View of Information Quality

	Intrinsic IQ	Contextual IQ	Representational IQ	Accessibility IQ
Wang and Strong	accuracy, believability, reputation, objectivity	value-added, relevance, completeness, timeliness, appropriate amount	understandability, interpretability, concise representation, consistent representation	accessibility, ease of operations, security
Zmud	accurate, factual	quantity, reliable/timely	arrangement, readable, reasonable	
Jarke and Vassiliou	believability, accuracy, credibility, consistency, completeness	relevance, usage, timeliness, source currency, data warehouse currency, non-volatility	interpretability, syntax, version control, semantics, aliases, origin	accessibility, system availability, transaction availability, privileges
Delone and Mclean	accuracy, precision, reliability, freedom from bias	importance, relevance, usefulness, informativeness, content, sufficiency, completeness, currency, timelines	understandability, readability, clarity, format, appearance, conciseness, uniqueness, comparability	usableness, quantitativeness, convenience of access

Goodhue	accuracy, reliability	currency, level of detail	compatibility, meaning, presentation, lack of confusion	accessibility, assistance, ease of use (of h/w, s/w), locatability
Ballu and Pazer	accuracy, consistency	completeness, timeliness		
Wand and Wang	correctness, unambiguous	completeness	meaningfulness	

(Source: Lee Y., Strong D., Kahn B., and Wang R. Y. (2002))

Table 2 Practitioners' View of Information Quality

	Intrinsic IQ	Contextual IQ	Representational IQ	Accessibility IQ
DoD	accuracy, completeness, consistency, validity	timeliness,	uniqueness,	
MITRE	accuracy, believability, reputation, objectivity	value-added, relevance, completeness, timeliness, appropriate amount	understandability, interpretability, concise representation, consistent representation	accessibility, ease of operations, security
AT&T and Redman	accuracy, consistency,	completeness, relevance, comprehensiveness, essentialness, attribute	clarit of definition, precision of domains, naturalness, homogeneity,	

		granularity, currency/cycle time	identifiablility, minimum unnecessary redundancy, Semantic consistency, Structural consistency, Appropriate representation, formate precision, format flexibility, ability to represent null values, efficient use of storage, representation consistency	
Vality			metadata characteristics	
IRI	accuracy,	timeliness		reliability (of delivery)
Unitech	accuracy, consistency, reliability	completeness, timeliness,		security, privacy
Diamond Technology Partners	accuracy			accessibility
HSBC Asset Management	correctness,	completeness, currency	consistency	accessibility,

(Source: Lee Y., Strong D., Kahn B., and Wang R. Y. (2002))

2.2 Evaluation of the Quality on Web

In chapter 3, we intend to propose a user oriented evaluation method of information quality and apply it to website search engine as database system. From this perspective, we also refer to an existing methodology in the quality of website. Herrera-Viedma E. et al. (2006) gave a methodology for evaluation of websites using fuzzy linguistic approach originated in Zadeh L. A. (1975). Herrera-Viedma E. (2004) has also proposed fuzzy qualitative models using Linguistic Ordered Weighted Average (LOWA) and Linguistic Weighted Average (LWA) which are aggregation operators for linguistic information (Herrera F. et al. 1997).

The methodology of Herrera-Viedma E. et al. (2006) is very interesting, since they tried to implement the concept of fuzzy majority. In order to do that, they proposed to apply the concept of majority which guides Linguistic Induced Ordered Weighted Averaging (MLIOWA). Here we give definitions of three operators and a brief explanation of their methodology.

Definition 1 (Yager and Filev, 1999)

For a given weighting vector of n dimension $W = (w_1, \ldots, w_n)$ with $\sum_i w_i = 1,\ 0 \le w_i \le 1$, IOWA operator Φ_W of dimension n is defined as a function from n-tuples of pair of values as following

$$\Phi_W((u_1, p_1), \ldots (u_n, p_n)) = \sum_{i=1}^{n} w_i p_{\sigma(i)},$$

where σ is a permutation of {1,…,*n*} satisfying

$$u_{\sigma(i+1)} \le u_{\sigma(i)}, \forall i = 1, \ldots, n-1.$$

In the definition above, inputs are supposed to be pair of numerical values. When a value of p_i is an element of a totally ordered label set such as $S=\{s_i: s_i \leqq s_j$ for $0 \leqq i<j \leqq T\}$, u_i is calculated from those values and with a fixed number $0 \leqq \alpha \leqq T$ as $sup_i = \#\{ind(p_j): |ind(p_i)-ind(p_j)|<\alpha\}$, where a function “ind” is defined by ind(p) = i if the value of the variable p is s_i in S. In case that α=1, sup_i represents the number of variables p_j whose value is just equal to that of p_i. Since sup_i can be considered as a kind of majority degree of same opinion, if Q is a linguistic quantifier usually expressed by a non-decreasing trapezoidal fuzzy member ship function, shown in the figure 7 for example,

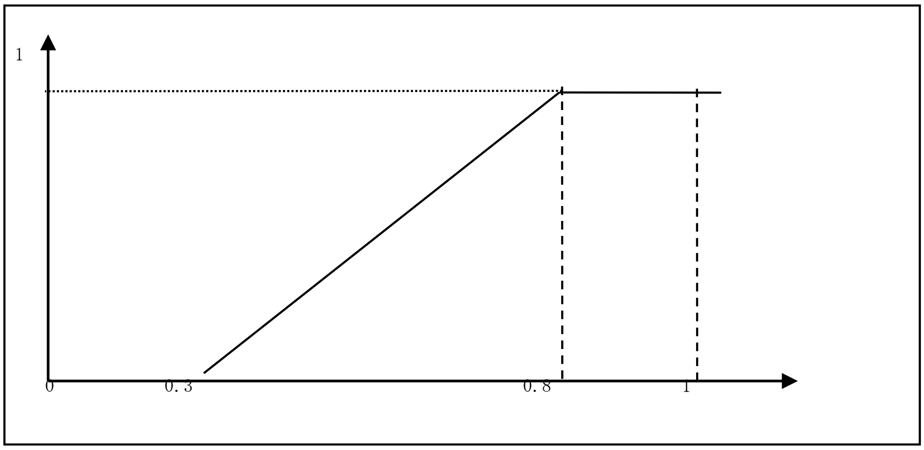


Figure 7 Linguistic Quantifier for “most”

The concept of fuzzy majority is represented by means of the weight vector calculated as follows;

$$w_i = \frac{Q\left(\frac{sup_{\sigma(i)}}{n}\right)}{\sum_{j=1}^{n} Q\left(\frac{sup_j}{n}\right)}.$$

According to these values, they give the following definition.

Definition 2

A majority guided linguistic IOWA (MLIOWA) of dimension n is defined as

$$\Phi_Q(p_1,\ldots,p_n) = \Phi_Q((\sup_1, p_1),\ldots,(\sup_n, p_n)) = s_k \in S,$$
$$with \quad k = round\left(\sum_{i=1}^{n} w_i ind(p_{\sigma(i)})\right).$$

where σ is a permutation of {1,...,n} satisfying,

$$\sup_{\sigma(i+1)} \geq \sup_{\sigma(i)}, \forall i = 1,\ldots,n-1,$$

and the function *round*( ) rounds to one decimal point to have integer value.

If each variable p_i has own importance degree I_i as a value in S, a weighted MLIOWA is applied to obtain the aggregation value.

Definition 3

For a weighting vector $I = (I_1,\ldots,I_n) \in S^n$ corresponding to variables p_i, let

$$u_i = \frac{\sup_i + ind(I_i)}{2},$$

with $\sup_i = \#\{ind(I_j): |ind(I_i) - ind(I_j)| < \alpha\}$. Then a weighted MLIOWA of dimension n is defined as

$$\Phi_Q^I(p_1,\ldots,p_n) = \Phi_Q((u_1, p_1),\ldots,(u_n, p_n)) = s_k \in S,$$
$$with \quad k = round\left(\sum_{i=1}^{n} w_i ind(p_{\sigma(i)})\right).$$

where σ is a permutation of {1,…,n} satisfying $u_{\sigma(i+1)} \ge u_{\sigma(i)}, \forall i = 1,\ldots,n-1$, and w_i are given by

$$w_i = Q\left(\frac{u_{\sigma(i)}}{n}\right) \Big/ \sum_{j=1}^{n} Q\left(\frac{u_j}{n}\right).$$

After giving these definitions, Herrera-Viedma E et al. recommended to use these operators to calculate the majority guided by linguistic aggregation value of website as following steps:

(1) Collect the evaluation values for each dimension of information qualities from visitors of website. The weight of each dimension is estimated beforehand in a certain method.

(2) Calculate the aggregation values of each visitor by applying the weighted MLIOWA with a value for α_2 and with a linguistic quantifier Q_2.

(3) Calculate the aggregation value of all visitors by using MLIOWA with a value for α_1 and with a linguistic quantifier Q_1.

In the previous paper, Herrera-Viedma E. proposed an evaluation system using LOWA and LWA (Herrera-Viedma E. 2004). He pointed out that the "relevance" is the most important dimension among all the information qualities dimensions and proposed to calculate its evaluation degree in a different way from others. His chief concern was a set consisting of element of DTD of XML such as "title, authors, abstracts, introduction, body, conclusions, bibliography", and our concern is a website search engine as a database system. We will go on our proposal of our system in the following chapter 3.

2.3 Major Web Quality Dimensions and Theoretical Web Metrics

There are various types of researches about World Wide Web aiming to improve its capacity for serving information more effectively. One is so-called user perceived method based on questionnaire to users, for which items and categorization into some dimension are critical matters.

In our previous study of information quality evaluation system, we assumed to have four categories from the academic view of information quality, and make questionnaire items taking them in mind.

According to Aladwani A. et al. (2002), three categorizations of web quality have been identified: technical adequacy, web content, and web appearance, which yielded 102 representative items. Table 3 summarizes the web quality dimensions and sample items. These major web quality categorizations are primarily used when we make the questionnaire items.

Here we recommend the categorization of Aladwani et al., since the information quality is much wider concept, so that web quality and the perception of marketing are not clearly recognized.

Table 3 Major Web Quality Dimensions

	Technical adequacy	Web content	Web appearance
Sample items	security; ease of navigation; broadcast services; limited use of special plug-ins; search facilities; anonymity; availability; valid links; reliability;	usefulness of content; completeness of content; clarity of content; uniqueness of content; broadness of content; originality of content; currency of content; conciseness of content; accuracy of content; finding contact info.;	attractiveness; distinctive hot buttons; changing look; organization; proper use of fonts; proper use of colors; proper use of graphics; graphics-test balance; proper

	browser sniffing; personalization or customization; seedy page loading; interactivity; ease of access; multi-language support; protected content; bookmark facility	finding people without delay; finding site maintainer; finding links to relevant sites; finding firm's general info.; finding products/services details; finding customers' policies; finding customer support; finding FAQ list; finding free services; using limited registration forms; finding online help; diversity of content; finding free info	use of multimedia; style consistency; proper choice of page length; good labeling; text-only option; proper use of language/style; color consistency

(Source: Aladwani A., and Palvia P., 2002)

There are also many researches specializing web metrics on network, graph, information theories. Among them, we refer to a work of Dhyani D. et al. (2002). They select metrics originated from diverse areas such as classical informatics, library science, information retrieval, sociology, hypertext, and econometrics. We focus on metrics such as web-page-quality metrics entirely specific to the Web. They showed a taxonomy of them as in figure 8, which classifies many types of metrics into the following groups.

-Web graph properties: Represent a website as a graph structure where many nodes are linked together by hyperlinks. As examples of graph-based metrics, we have centrality, compactness, stratum, depth and imbalance which quantify structural properties of the website both macroscopic and microscopic scales.

-Web Page Significance: Significance metrics formalize the notions of "quality" and "relevance" of Web pages with respect to information needs of users. We have Boolean spread activation, most-cited, TFxIDF, vector spread activation for measuring the web relevancy. In order to give values of these metrics, we need a series of query terms, and watch the response. We also have measures for web quality such as impact factor, PageRank, SALSA, and PicASOW.

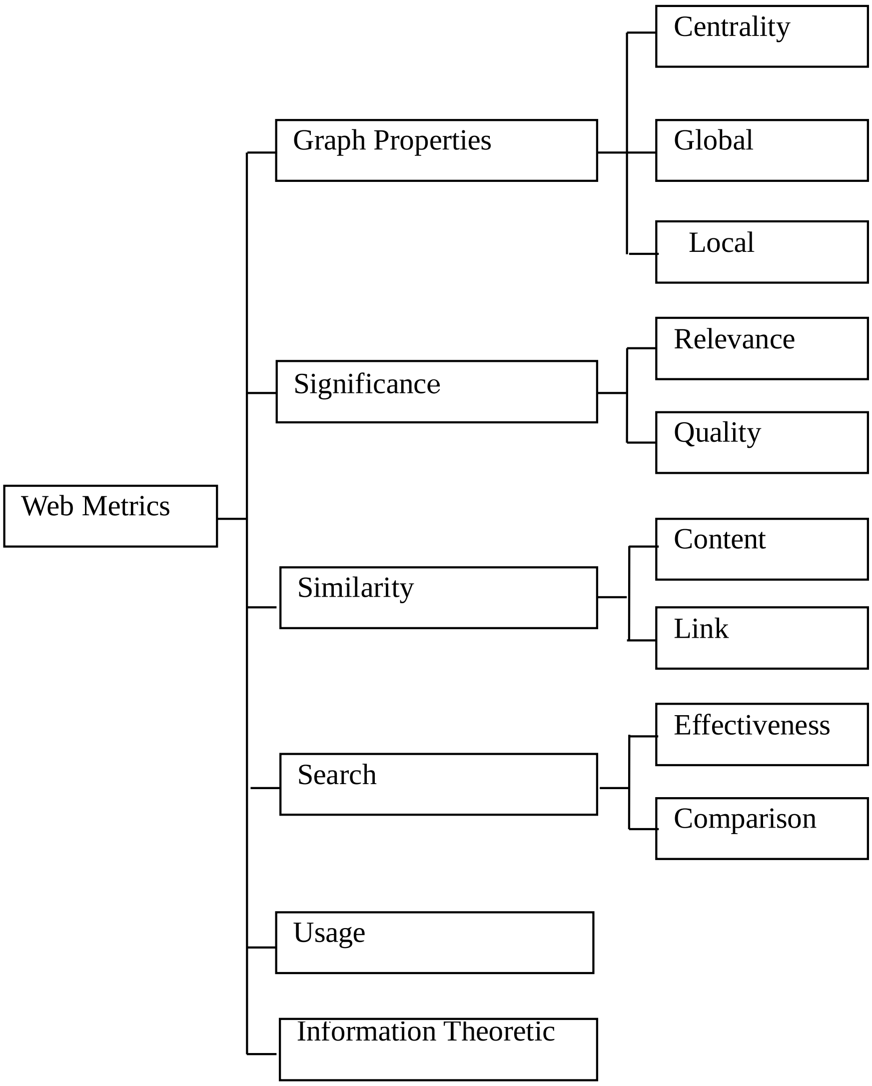
-Web page similarity: Similarity metrics based on clustering method. There are three types of similarity metrics such as content-based, link-based, and usage-based. For the content-based metric, we need to compare web text. The link-base metric relies on graphical structure of the website, and the usage-based metric is based on patterns of document access.

-Web page search and retrieval: These metrics evaluate the performance of web search engine and retrieval services. Its effectiveness is measured by "precision and recall" which have relationship with the vector spread activation metric.

-Usage Characterization: Usage characterization metrics measure user behavior, like as patterns and regularities in the way users browse web.

-Information Theoretic: Information theoretic metrics capture properties related to information needs, production and consumption. For example, the metric of desirability of a page is the probability that the information is needed, which is measured by applying stochastic distribution model. The metric of survivability is kind of lifetime of web pages also based on the probabilistic theory.

From those metric above, we need to choose several ones as the explanatory variables. The choice is not definite and might be changeable according to the characteristic of website. The way to estimate the value of certain metric is difficult sometimes, and costly.



(Source: Dhyani D., Keong W, and Bhowmich S., 2002)

Figure 8 A Taxonomy of Web Metrics

2.4 The Scope of the Present Work

2.4.1 Related Works

During our series of research, we began to focus on data and information quality in 2008, and the user oriented information quality evaluation model has been proposed. In the model, we combined the users' perspective with the experts' perspective to evaluate the information quality.

In 2009, based on the existing studies about information quality assessment, we proposed a user oriented information quality evaluation system. In this system, we combined the perspective of experts with that of users by applying the fuzzy integral. We also compared this method with MLIOWA proposed by Herrera-Viedma E. et al.

We also proposed a total information quality evaluation system as the development of the user oriented information quality evaluation system in 2010. In the system, we introduced theoretical metrics to evaluate a website. When the values of user evaluation are calculated, integrate them for the comprehensive evaluation.

Throughout the study of user oriented information quality, we have recognized that different types of evaluation from suppliers' (or company's or organization's) point of view are required. For the evaluation from this perspective, we introduced the definition of information value by referring to the definition of "value" in VE (value engineering). The information value is described in the next section.

2.4.2 Information Value

Based on the existing researches, we know that the value methodology such as VA (Value Analysis), VE (Value Engineering), and VM (Value Management) is commonly applied in most research areas. It can be applied to a wide variety of applications, for example, industrial or consumer products, construction projects, manufacturing processes, business procedures, services, business plans and so on (SAVE International, 2012). In this thesis, we refer to the definition of values in VE (Value Engineering) to define information value of website.

At present, various researches focused on the value engineering have been used extensively in organizations. Value Engineering is a research are to improve the value of products and services systematically by using the ratio of function and cost as in the formala,

$$Value = Function/Cost,$$

where functions are measured by performance level required for the article and the costs are measured in material in ordinary case.

From this formula, it is clear that there are four ways to increase the value such as “reducing cost without changing functions”; “improving functions without changing cost”; “improving functions more than costs”; “improving functions and reducing the cost”. It goes without saying that the combination of these ways may be most effective, and cost analysis and function analysis with engineering techniques are very important to improve the value.

Chapter 3 User Oriented Information Quality Evaluation System with Fuzzy Measures

We consider an evaluation system of information quality from the users' perspective. A methodology for evaluating information quality integrated with Fuzzy Structured Modeling (FSM) is proposed based on Modified Structuring Modeling Method (MSMM) and Fuzzy Integral. We hope our system can evaluate information of high quality, help organizations to enhance competitive capability in markets and to acquire market share or profits. It is also expected that our system may serve to evaluating information system in business circle.

In our integrated evaluation method, we firstly analyze the principal factors through the questionnaires obtained by the feedbacks from consumers who use the information database, and then we figure out the average values of the extracted factors. In this step, the dimensions previously considered by former researchers are examined. Secondly, proper values are assigned to the weight vectors by some experts using FSM, MSMM or Analytic Hierarchy Process (AHP). Finally, fuzzy measure is introduced to calculate the integrated evaluation value with fuzzy integral.

Concerning evaluation of quality on the website, there are some other works using fuzzy qualitative methods such as LOWA (Linguistic Ordered Weighted Average) and LWA (Linguistic Weighted Average). We also refer to them and show the result to compare it with our methodology providing practical examples on evaluation of search engine for Google and Yahoo webs.

In this chapter, we propose an improved version of comprehensive evaluation method on information quality by using fuzzy theory based on the original researches of Wang R.Y. et al. (1996) and others'. We also give an example on the application for website's search engines.

The chapter component is as follows: We give a brief notion on existing researches on information quality and evaluation system of website in section 3.1. In the section 3.2, our evaluation system is introduced. As we need to calculate the weights of each dimension or information quality factors and we use fuzzy integral to have the integrated value, a brief description is also given in this section. In section 3.3, we give an illustrative example by applying our method for tow searching database systems on the website. The discussion and conclusion follows in the last section.

3.1 Existing Research

Due to former researches on information qualities, several dimensions were already specified and classified into fewer categories. Although these dimensions and categorizations may be different depending on researchers' view point, we adopt basic dimensions by Wang et al. described in 2.1 of chapter 2.

We quote one evaluation method in which a fuzzy qualitative method originally based on LOWA and LWA are applied. There are several researches on the evaluation method, one of which is a contribution to the evaluation of website. We give a description of it in 2.2 of chapter 2.

3.2 User Oriented System for Evaluating Database

The characteristic of our method is an integrated evaluation of both the experts' perspective and users' perspective. Here "expert" means not only system researchers but also database designers, developers, providers, and so on, and users are indefinite or anonymous people who visit a website with the view of looking up some things.

Figure 9 shows the flow of User Oriented Information Quality Evaluation System we proposed, in which there are three processing parts. The top part is concerned in user perspective, and the detail will be shown in 3.3.1. The middle part is concerned in expert perspective, and the detail will be in 3.3.2. Then the integration of two perspectives is implemented in the bottom part, the detail will be in 3.3.3.

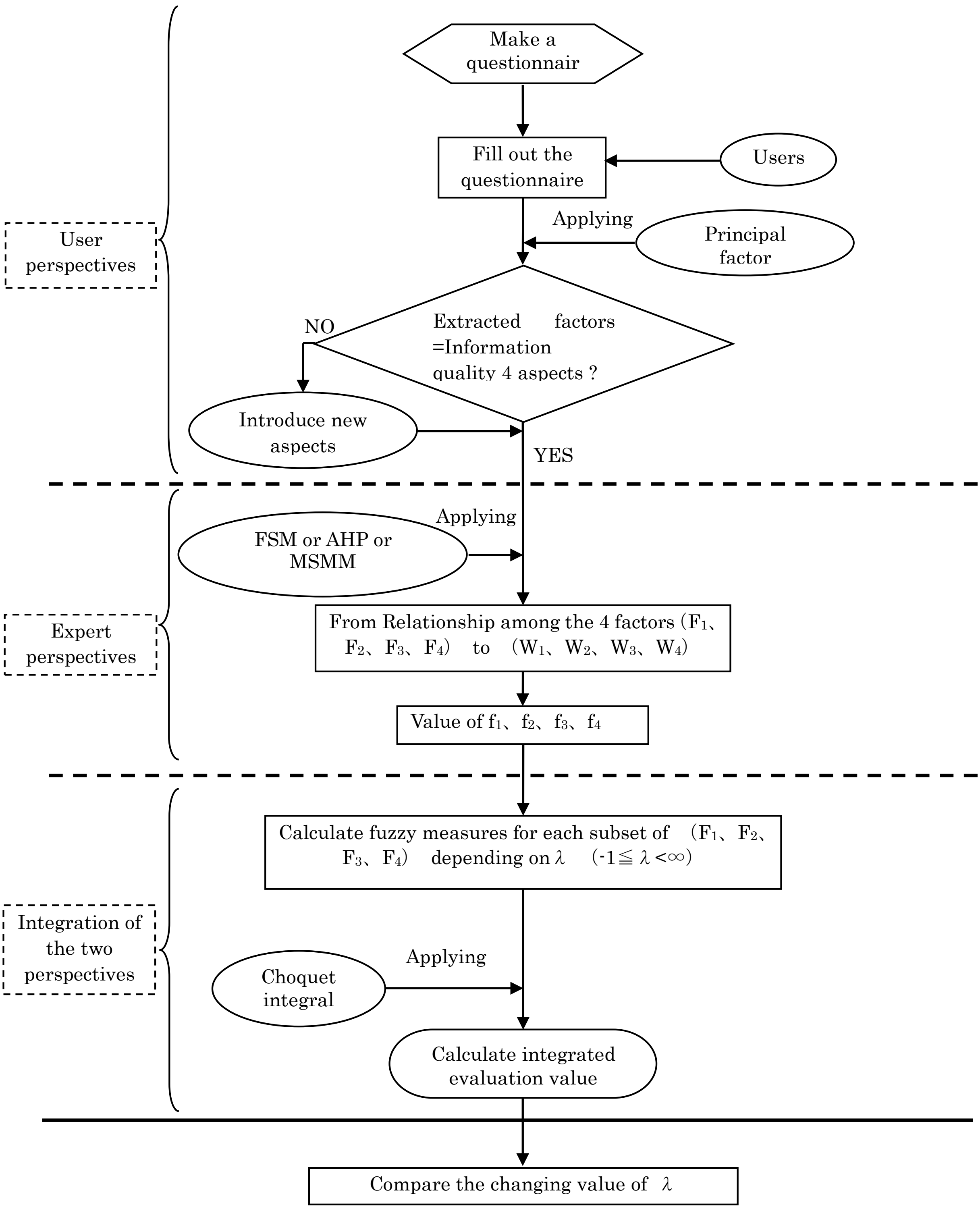


Figure 9 User Oriented Information Quality Evaluation System (IQES)

3.2.1 User Evaluation and Extraction of Factors

The primary method used here is the one that Wang et al. used in making a survey on user oriented information quality evaluation. They chose 16 dimensions shown in section 2 among the proposed items and made four or five questions which are related to each of those dimensions as a result of making a survey.

In the same way, we would analyze the principal component, and extract the coefficients, and then we find out whether the results are accordant with the described 4 categories shown in table 1. Allowing some changes in the items, if the result is coincident with one of existing categorizations, we may proceed to assigning weights process. On the contrary, it would be necessary to reconsider the items of questionnaire taking into account of the characters of users, their circumstance, type of information and the subjects they would use. As a matter of couuse, it is possible to bring new categories.

After the determination of category classification, we would calculate the average of each factor's scores, and use them as the users' perspective evaluation value.

3.2.2 Expert Evaluation with Assigning Weights

In this part, we assign weights to each of extracted factors. As the method for this kind of work, FSM or AHP are very popular and reasonable to be applied.

We also have MSMM to obtain a weight vector in which opinions or knowledge or experiments of multi-participants from different points of view are mounted. Especially as information producer and provider, it is suitable not only for the calculation of the weights but also for amelioration procedure stage.

These methods basically use a paired comparison and express them as a square matrix, in which some priority values are set provide in each cell. After some matrix calculation, a structure of items is obtained. Then, if the structure is considered to be satisfactory and acceptable, we find the eigenvector for the maximum real eigenvalue for meeting the aimed weight vector.

3.2.3 Integration

In two parts mentioned above, the average values of factor scores of each extracted factor are reflected in users' perspective evaluation and weight vectors reflected in experts' perspective evaluation are already calculated before. Therefore, we integrate these values to do synthetic judgment.

The simplest method for this task is to calculate the weighted average. However, if we put two or more categories together, it will be unfortunately considered that the total weight of those categories may be less than or greater than their simple summation. These variations are dependent on the sort of information or characteristics we want to aggregate.

From this point of view, we proposed a User Oriented Information Quality Evaluation System based on fuzzy integral. In figure 9, the scheme using Choquet integral is described. To use Choquet integral, let X be the universe of all the sets. For subsets A and B which are described as the set of the relevant items, the following equality with respect to fuzzy measure μ holds.

$\mu(\varphi)=0$(φ is empty set), $\mu(X)=1$,

$$\mu(A \cup B)= \mu(A)+\mu(B)+\lambda\mu(A)\mu(B),$$

where λ is considered as a variable taking values $-1<\lambda<1$.

3.3 Illustrative Example in Two Cases

We made a questionnaire survey on the information qualities of Google and Yahoo as website search engine in July of 2009. 120 Japanese students took part in the survey who belong to the Faculty of Management Science of a certain university in Japan, July in 2009. The questionnaire sheet has two parts, one is the face part in which the frequency levels of use of each search engine and search engine itself are queried, and the other is evaluation parts in which examinees assess the search engines in view of each of 16 information dimensions.

We apply our method and the way explained in 2.2 of chapter 2, then compare the results.

3.3.1 Apply IQES System

Questions in the survey sheet in evaluation part are expressed in such a way that "How do you think of reliability degree of Google(or Yahoo) as website search engine?" or "Does Google(or Yahoo) provide reliable information?, etc. The answer should be prepared as "Lowest(s_0)", "Very Low(s_1)", "Low(s_2)", "Middle(s_3)", "High(s_4)", "Very High(s_5)", "Highest(s_6)". For the factor analysis, the linguistic expressions are translated into numerical values (=$ind(s_i)$).

3.3.1.1 Extraction Factors

The scree plot shown in Figure 10 gives us information about how many factors should be taken as main factors. Taking the cumulative contribution proportion into consideration, it seems sufficient that four factors will be considered in our analysis since the cumulative proportion is about 70.0%.

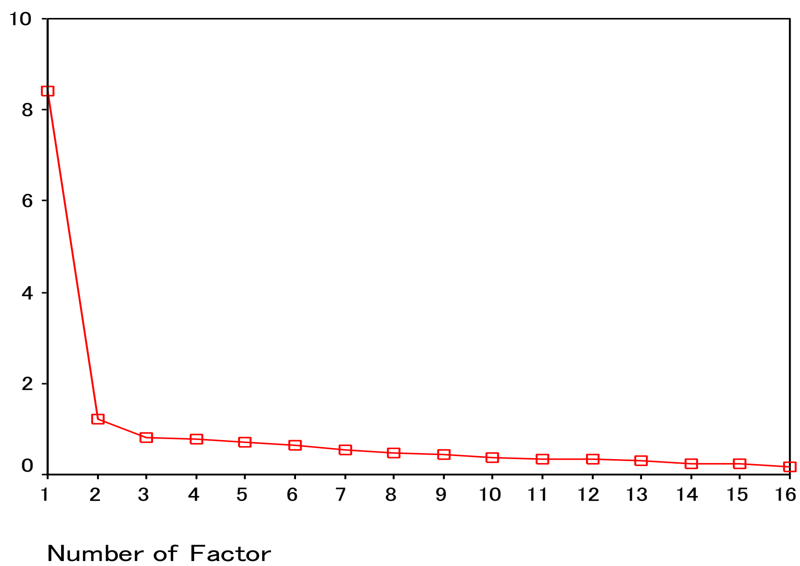


Figure 10 Scree plot of factors

Table 4　　Resulted Factors

Factor Matrix with Varimax Method

	Factors			
	Representationl IQ	Intrinsic IQ	Contextual IQ	Accessibility IQ
Understandability of Contents	.783	.203	.312	.163
Interpretability of Expression	.737	.190	.199	.381
Consistent Representation of Data	.646	.266	.429	.030
Concise Representation of Data	.588	.239	.499	.195
Security of Introducing Site	.496	.475	.120	.415
Objectivity of Data	.226	.848	.180	.032
Believability of Data	.180	.794	.286	.196
Reputation of Introducing Site	.329	.679	.057	.361
Value-added of Data	.078	.588	.473	.340
Relevancy	.315	.115	.767	.189
Ease of Manipulation or Operation	.221	.157	.671	.157
Timeliness of Data	.239	.245	.600	.218
Completeness of Data	.509	.270	.523	.286
Appropriate of Amount of Data	.297	.170	.209	.776
Accessibility to Acquiring Information	.113	.265	.431	.677
Accuracy of Data	.437	.426	.270	.471

Principal Factor Analysis

The distribution of dimensions into 4 factors is shown in table 4. Although some items are not stable, the factors approximately consistent with the 4 categories of those of Wang et al.. We adopt their categorization such as “Representation IQ”, “Intrinsic IQ”, “Contextual IQ”, and “Accessibility IQ” without the necessity of introducing new interpretations into the four aspects.

In this step, we also calculate the average of each factor’s scores as the users’ perspective evaluation value. As there are some people who seldom use Google or Yahoo in 120 respondents to the questionnaire, we took the averages over who use the site more than sometimes.

Table 5 represents the average value. We have test of significance to test significance level. The test of independent sample are represented in table 6.

We use the formulae for T-test of independent sample in the follow,

$$t' = \frac{\mathrm{m}_X - \mathrm{m}_Y}{\sqrt{\frac{{S_X}^2}{n} + \frac{{S_Y}^2}{m}}}$$

$$C = \frac{\frac{S_X{}^2}{n}}{\frac{S_X{}^2}{n} + \frac{S_Y{}^2}{m}}$$

$$k = \text{Int}\frac{1}{\frac{C^2}{n-1} + \frac{(1-C)^2}{m-1}}$$

The consequence of *t*-test between corresponding values is that it appears the difference in “Accessibility IQ” with the significant probability 1% "highly significant", the difference in “Contextual IQ” with the significant probability 5% “authoritative”, and no difference in others.

Table 5 Average Points of the Factors

		representational	intrinsic	contextual	accessibility
Google	average	0.044	0.054	0.219	0.257
	number of samples	90	90	90	90
	SD	0.976	0.958	1.022	0.853
Yahoo	average	0.019	-0.004	-0.106	-0.158
	number of samples	103	103	103	103
	SD	1.030	0.957	0.950	1.042

Table 6 Test of Independent Sample

		Test of levene for homoscedasticity		test of the difference between the two population mean		
		F value	Significance probability	t value	Degrees of freedom	Significance probability (both sides)
representational	It is assumed equal variances.	0.31	0.578	0.175	191	0.861
	Do not assume equal variances.			0.176	189.713	0.861
intrinsic	It is assumed equal variances.	0.005	0.941	0.417	191	0.677
	Do not assume equal variances.			0.417	187.528	0.677

contextual	It is assumed equal variances.	0.237	0.627	2.285	191	0.023
	Do not assume equal variances.			2.274	183.062	0.024
accessibility	It is assumed equal variances.	0.865	0.354	3.001	191	0.003
	Do not assume equal variances.			3.041	190.236	0.003

3.3.1.2 Weight Assignment

By comparing with the importance in pairs of the 4 factors and expressing them in a 4×4 matrix, reachable matrix could be figured out after a suitable matrix operation. Here we give the original matrix considering the overcoming degree of each of four factors to others using values in [0, 1], then calculate the reachable matrix to obtain the matrix and a structural model shown in figure 11. Figure 11 represents the matrix and the structural model from the matrix with the α-cut 0.7.

From left to right and from top to bottom, the entries of the matrix represent the overcoming degree of the factor correspond to the row against the factor to column. The factors are sequentially set in order of that in table 5.

The factor related to the "Contextual IQ", set in the bottom in the structural model, is the most important, while the factors being related to the "Representation IQ", set in the top, is of less importance.

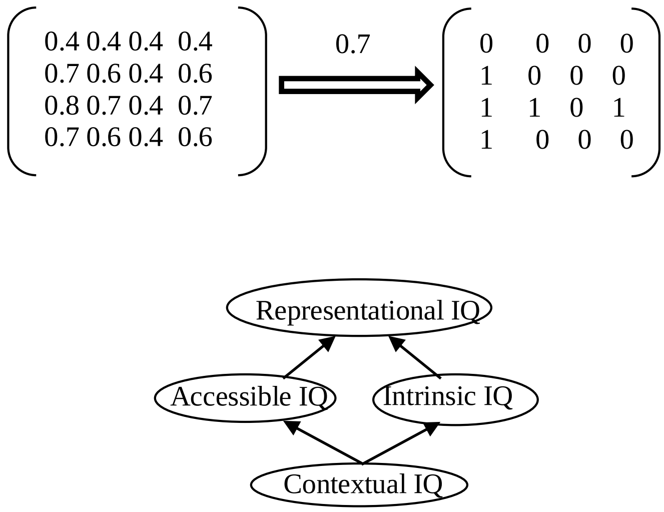


Figure 11 Reachability Matrix and the Structural Model

Once we have the valid structured model, go on the calculation of the eigenvector corresponding to the maximum real positive eigenvalue of the matrix. In order to have the weight vector, the standardization is performed resulted in the vector shown in the table 7. The vectors are the value integrated the evaluation of Google and Yahoo.

Table 7 Weights of the Factors

Representational	Intrinsic	Contextual	Accessibility
0.186	0.260	0.293	0.260

3.3.1.3 Integration

From the weight of each factor determined as the values in table 5, we work out the value for λ which satisfies the relation in 3.3.3 by solving the cubic polynomial equation. However, since the value of λ is dependent on the subset A and B, there could be 10 different values for λ. In this chapter, we will show two types of way for the fuzzy measures.

One is by introducing one more variable c which represents the ratio of the weights (Nakajima N. et al. 2006). In this system, the value of λ is supposed to be independent on the pair of subsets and is determined as the root of the following equation,

$$c + g_2 c^2\lambda + g_3 c^3\lambda^2 + g_4 c^4\lambda^3 = 1.$$

In the equation above, g_2 is the sum of product of each two weights, g_3 is the sum of product of each three weights, and g_4 is the product of all. Changing the value of λ ($-1<\lambda<\infty$) and calculate the value of c, we could see the range of integration values.

The figure 12 shows the graph of the comprehensive evaluation value resulted by calculating fuzzy integral of modified averages with the fuzzy measures. The horizontal axis is the λ-axis, and the value on vertical axis represents the integrated evaluation degree. Here, we should notice that some average values in table 5 are negative and the modification of the average values by adding 1 is done before calculating the integral.

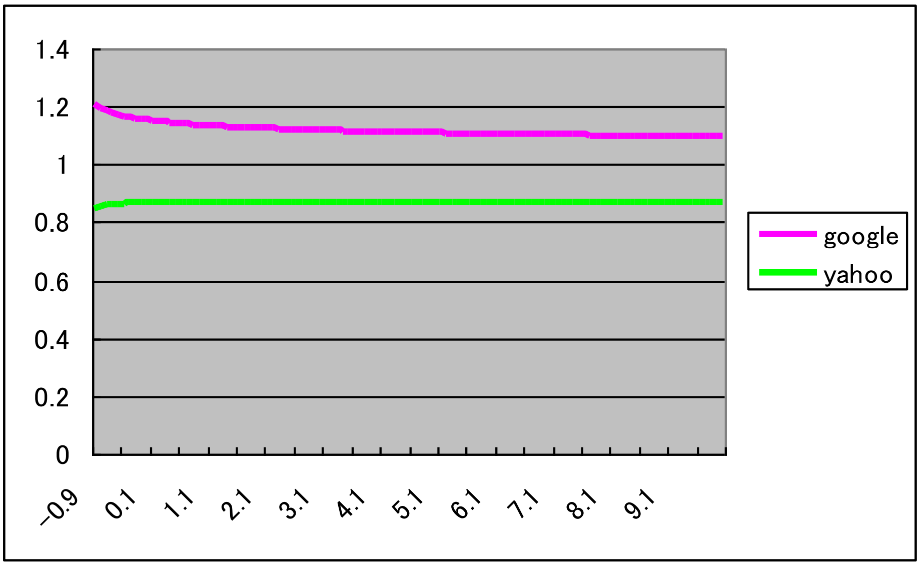


Figure 12 Graph of the Integrated Evaluation

We propose the other way for determining the fuzzy measures using the contribution rate in factor analysis. As we saw in the first step of 3.4.1, four factors are extracted with the cumulative contribution rate r_{RICA}=70.0%, the details of that are r_R=19.5% for “Representation IQ”, r_I=19.0% for “Intrinsic IQ”, r_C=18.1% for Contextual IQ”“, and r_A=13.4% for “Accessibility IQ”.

From these values, determine λ’s by the following formulae;

$$\begin{cases} \mu_{AC} = \dfrac{r_A + r_C}{r_{RICA}} = w_A + w_C + \lambda_{AC} w_A w_C \\ \mu_{ACI} = \dfrac{r_A + r_C + r_I}{r_{RICA}} = \mu_{AC} + w_I + \lambda_{ACI} \mu_{AC} w_I \\ 1 = \mu_{ACI} + w_R + \lambda_{ACIR} \mu_{ACI} w_R \end{cases} ,$$

As the calculation process, in the first step we need obtain the value of λ. We use the integrated value of Google and Yahoo in table 7. The next step, when we have the λ, μ can be calculated. In order to compare the evaluation value of Google and Yahoo, we need use the individual value of Google and Yahoo in table 5 to calculate μ. Some evaluation values are minus, we need to adjust minus value to plus value by all of them plus 0.158 (the minimum value is -0.158) in table 8.

where $\mu_{AC}=\mu(\{\text{Accessibility IQ, Contextual IQ}\})$ and so on, and if resulted $\lambda \leqq -1$ then define λ=0.99. Setting the average values for “Google” in the descending order, these three λ’s are enough to calculate the fuzzy integral. For “Yahoo”, we need λ_{RI}, λ_{RIC}, and λ_{RICA}.

The result is shown in table 9. The evaluations are 1 for Google and 0.46 for Yahoo. Although it is obvious that the fuzzy measures, except for only one factor, do not reflect expert’s perspective when the measure is greater than -1, the values in the weight vector in perspective of expert works as corrector.

Table 8　　Adjusted Average Points of the Factors

		representational	intrinsic	contextual	accessibility
google	average	0.202	0.211	0.376	0.415
	number of samples	90	90	90	90
	SD	0.976	0.958	1.022	0.853
yahoo	average	0.176	0.154	0.052	0
	number of samples	103	103	103	103
	SD	1.030	0.957	0.950	1.042

Table 9　　Evaluation Values Using Contribution Rate

google	λ AC	λ ACI	λ ACIR	Evaluation value
	-0.99	-0.99	0.746	
	μ AC	μ ACI	μ ACIR	
	0.637	0.715	1.02	1
yahoo	λ RI	λ RIC	λ RICA	Evaluation value
	2.140	1.121	-0.99	
	μ RI	μ RIC	μ RICA	
	0.388	0.462	0.46	0.46

3.3.2　　Apply MLIOWA and Weighted MLIOWA

We also applied the methodology quoted in 2.2 of chapter 2 to our data by setting;

p_1="Believability of Data",

p_2="Objectivity of Data",

p_3="Reputation of Introducing Site",

p_4="Accuracy of Data",

p_5="Value-added of Data",

p_6="Accessibility to Acquiring Information",

p_7="Security of Introducing Site",

p_8="Appropriate of Amount of Data",

p_9="Timeliness of Data",

p_{10}=”Interpretability of Expression”,

p_{11}=”Understandability of Contents”,

p_{12}=”Consistent Representation of Data”,

p_{13}=”Concise Representation of Data”,

p_{14}=”Relevancy”,

p_{15}=”Ease of Manipulation or Operation”,

p_{16}=”Completeness of Data”,

the linguistic value set is S={“Lowest(s_0)”, “Very Low(s_1)”, “Low(s_2)”, “Middle(s_3)”, “High(s_4)”, “Very High(s_5)”, “Highest(s_6)”}, and α=1. Then the values in Definition 3 are listed up in table 10, and the aggregation values given by MLIOWA with the “most” linguistic quantifier are 4.433 for “Google” and 4.447 for “Yahoo”.

The variables are defined as follow in table 10.

ind(I(p)): the significance degree of linguistic value

sup_i: quantity of the same ind(I(p))

u_i/n: (ind(I(p))+ sup_i)/$s_{(n)}$

Q(u_i/n): the fuzzy set

w_i: Q(u_i/n) /∑ Q(ui/n)

Table 10 List of Values for Weighted MLIOWA

	ind(I(p))	sup_i	u_i/n	Q(u_i/n)	w_i
p_1	**4**	5	0.75	0.90	**0.08**
p_2	**5**	4	0.75	0.90	**0.08**
p_3	**4**	5	0.75	0.90	**0.08**
p_4	**3**	2	0.42	0.23	**0.02**
p_5	**5**	4	0.75	0.90	**0.08**
p_6	**5**	4	0.75	0.90	**0.08**
p_7	**3**	2	0.42	0.23	**0.02**
p_8	**4**	5	0.75	0.90	**0.08**
p_9	**5**	4	0.75	0.90	**0.08**

p_{10}	2	5	0.58	0.57	0.05
p_{11}	2	5	0.58	0.57	0.05
p_{12}	2	5	0.58	0.57	0.05
p_{13}	2	5	0.58	0.57	0.05
p_{14}	4	5	0.75	0.90	0.08
p_{15}	4	5	0.75	0.90	0.08
p_{16}	2	5	0.58	0.57	0.05
total				11.40	1

3.4 Conclusion

In this chapter, based on the existing studies about information quality assessment, we proposed a user oriented Information Quality Evaluation System with fuzzy integral. Although the determination of the fuzzy measures for the fuzzy integral remains invalid, we could see that this method effectively combines the perspectives of the experts and of users. The resulted values from two types of λ in the illustrative example describe the same conclusion.

On the other hand, the result given by the methodology using MLIOWA and weighted MLIOWA indicates the opposite conclusion. We need much more precise investigation on the reason, but the majority oriented method might affect the popularity, that is the fact that the number of "High" estimation for "Yahoo" is greater than that for "Google" affect the result. Talking on the simple average of $ind(p_i)$, "Google" is superior to "Yahoo". Our proposed method is tends to be influenced by statistical values much more than MLIOWA.

Chapter 4 User Evaluation System for E-business Website

We think that for a company, not only offering high-quality products and services to customers but also attracting customers' attention to their products in order to make much more profit is important matter. In the field of marketing, the customer satisfaction is one of main subjects to investigate and many kinds of research method are proposed. Companies have become to open the electronic commerce portal website as their principal system of selling, advertising, and servicing for their customers. In the process of doing business in electronic commerce, web advertisement, design, style etc. have great impact on customers' impression and desire. Therefore, with the purpose of making a great success of electronic commerce during the furious competition in the market, a company must pay attention to customer evaluation for their website. And it is also necessary to improve them to obtain higher evaluation value together with offering high-quality products and services.

As mentioned in chapter 3, we consider that evaluating website in view of customers is very important, and analyze the principal component to extract some factors. In fact, customers could not know design of website about information technology, but during the process of doing business in electronic commerce, webpage linkage topology, relevancy of retrieved data, design, style, etc. have great impact on customers' purchase activity. From this situation, we consider website designer's perspective.

Following the method in chapter3, we try to find some explanation variables for users' evaluation factors as objective variables in multivariable regression model. In this chapter, we focus on the relationship between user oriented evaluation and theoretical web evaluation scores with website designer's perspective. The user oriented evaluation is performed by conducting a survey on basis of existing metrics of the information quality and major web quality dimensions. We adopt some scores which represent the web graph properties, the web page significance, etc. for the theoretical web evaluation. Proposing a method to combine these two different types of evaluation values properly may help to improve the website much more suitably then ad hoc way.

The rest of this chapter organizes as follows: we refer some existing related researches to this chapter in the next section. Our proposed system comes up in the following section 4.2. We also give an illustrative example in 4.3 in order to show how the system works. The discussion and conclusion is in the last section.

4.1 Existing Research

There are many research and papers on web pages. Huizingh E. proposes a framework to analyze and categorize the capabilities of websites in view of content and design, and applied it for Yahoo and DYP, the Dutch Yellow Pages, (Huizingh E., 2000). The main categories in his research are the industry types and the size of website, and he mainly used χ^2-test to clarify the relationships between each two of factors in the categories. Aladwani A., and Palvia P., developed a user-perceived web quality measuring method. They used a questionnaire on target website, and applied factor analysis to distinguish main factors affected on users' evaluation (Aladwani A., and Palvia P., 2002). In their paper, they gave a list of classified items on web quality, which we refer in this chapter.

As another type of perspective, there are many theoretical evaluation metrics with numerical scores. Dhyani et al. picked up these metrics originated from diverse areas such as classical informatics, library science, information retrieval, sociology, hypertext, econometrics (Dhyani D., Keong W, and Bhowmich S., 2002). For example, Boolean spread activation by Yuwono B, and Lee D., (Yuwono B, and Lee D., 1996), link based and term based similarities by Weiss R., et al. (Weiss R., et al 1996), are these types of metrics. There are some researches on colors of website's pages which may effect on the customer's responses (Pelet J-E., and Papadopoulou P., 2010).

We also have several researches on web metrics some of which are based on network theory or graph theory. Kleinberg J. investigates the hyperlinked network structure in view of hubs and authorities and links among them

(Kleinberg J., 1998). The concept of information quality also can be applied as this type of measuring method (Lee Y., Strong D., Kahn B., and Wang R. Y., 2002)..

A customer perspective evaluation is very important for business activity, but it is not easy to improve the website directly from their opinion. Our idea is to use theoretically well-established metrics to explain important factors of customers' evaluation. In this chapter, we propose a total system of customer oriented information quality evaluation of website and a method to improve the values of important factors extracted from the customer evaluation.

4.2 Total Information Quality User Evaluation System for E-business Website

The characteristic of our method is a combination of the information quality evaluation based on customer oriented website evaluation system with major web quality dimensions and well established metrics for website based on network or graph or information theory, called the theoretical metrics.

Figure 13 shows the flow of the evaluation method we proposed, in which there are three processing phases. The first phase is concerned in quality dimensions and theoretical metrics, and the details are shown in 4.2.1. The second phase is concerned in user evaluation system for E-business website, the details are in 4.2.2.

4.2.1 Quality Dimensions and Theoretical Metrics

In this chapter, we need to make questionnaires according to certain criteria. Questionnaires items are based on major web quality dimensions referring to information quality estimation standard and the existent web metrics. We also chose theoretical web metrics some of which are adopted as explanatory variables in a regression formula.

- Major Web Quality Dimensions

There are various types of researches about World Wide Web intending to improve its capacity for serving information more effectively. One is user perceived method based on questionnaire to users, for which items and categorization into some dimensions are critical matters.

In our study of information quality evaluation system mentioned above, we supposed to have four categories from academic view of information quality, and made questionnaire items taking them in mind.

Here we recommend the categorization of Aladwani et al., since the information quality is much wider concept then web quality and the perception of marketing is not clearly recognized. Then according to them, we investigated their proposed 102 representative dimensions in three categories, and primarily used them when we make the questionnaire items.

- Theoretical Web Metrics

We already mentioned these metrics in 2.3 of chapter 2.

In this chapter, we choose following metrics as candidate for explanatory variables: “compactness”, “stratum”, “hub weight”, and “authority weight” from web graph properties group, “Boolean spread activation”, “TF×IDF”, and “vector spread activation” from web relevancy metric group, “complete hyperlink similarity”, and “term-based similarity” from similarity property group.

Before giving the definitions for these metrics, we need some preparations. At first, let $\{P_1,..., P_N\}$ be the set of nodes (web pages) in the website, and let c_{ij} be the number of links that have to be followed to reach node *j* from node *i*. In case of no such link set $c_{ij} = K$ with some big number *K*. Put $OD_i = \sum_{j=1}^{N} c_{ij}$, the “out distance” of a node *i*, and $ID_i = \sum_{j=1}^{N} c_{ji}$, the “in distance” of a node *i*.

Then the compactness (Cp) and stratum (St) are defined as

$$Cp = \frac{K}{K-1} - \frac{\sum_{i,j} c_{ij}}{(N^2 - N)(K-1)}, \qquad (1)$$

$$St = \frac{\sum_i |OD_i - ID_i|}{LAP}, \ where\ LAP = \begin{cases} \dfrac{N^3}{4} & if\ N\ is\ even \\ \dfrac{N^3 - N}{4} & if\ N\ is\ odd \end{cases}. \qquad (2)$$

Kleinberg J. defined a good hub as a page that points to many good authorities, and a good authority as a page that is pointed by many good hubs (Kleinberg, J., 1998). This is a mutually reinforcement relationship, then hub and authority weights can be obtained as each element of the principle eigenvector of AA^t and A^tA respectively with

$$A = (a_{ij}),\ with\ a_{ij} = \begin{cases} 1 & if\ c_{ij} = 1 \\ 0 & otherwise \end{cases}$$

In order to define term related metrics, we need query terms $Q_1,\ldots, Q_M$, and let $X_{i,j}$ be the occurrence of Q_j in P_i.

For other term related metrics, we need the term frequency of Q_j in P_i, denoted by $TF_{i,j}$. Here "frequency" means the number of Q_j appears in the page. Letting $TF_{i,\max}$ be the maximum value of $TF_{i,j}$ through all Q_j (j=1,…,M)in P_i, the reduced version of TFxIDF ($S_{i,q}$) and the Vector spread activation ($RV_{i,q}$) are defined as

$$S_{i,q} = \sum_{j=1}^{M} \frac{1}{2}\left(1 + \frac{TF_{i,j}}{TF_{i,\max}}\right) \times IDF_j,\ where\ IDF_j = \log\left(\frac{N}{\sum_{i=1}^{N} X_{i,j}}\right), \quad (4)$$

$$RV_{i,q} = S_{i,q} + \sum_{j \neq i} \alpha a_{ji} S_{j,q}\ . \quad (5)$$

IDF_i is called the "inverse document frequency", and α is a positive value less than 1. By Yuwono B, and Lee D., the optimal value of α is 0.2, (Yuwono B, and Lee D., 1996).

We have two kinds of similarity metrics. One concerns to link structure called the "complete hyperlink similarity (S_{ij}^{links}), which is a weighted average of three types of values. The other concerns to terms called the "term-based similarity(S_{ij}^{terms})", which is calculated from TF's. To define them, we need some additional notations;

$c_{ij}^{\bar{k}}$ ="the length of a shortest path from P_i to P_j not traversing P_k",

A_{ij} ={x; there is at least one path from P_x to both P_i and P_j} "set of common ancestors",

D_{ij} ={x; there is at least one path both from P_i and P_j to P_x} "set of common descendants".

Then three types of values are defined as

$$S_{ij}^{spl} = \frac{1}{2^{c_{ij}}} + \frac{1}{2^{c_{ji}}},$$

$$S_{ij}^{anc} = \sum_{x \in A_{ij}} \frac{1}{2^{(c_{xi}^{\bar{j}} + c_{xj}^{\bar{i}})}}, \quad S_{ij}^{dsc} = \sum_{x \in D_{ij}} \frac{1}{2^{(c_{ix}^{\bar{j}} + c_{jx}^{\bar{i}})}}.$$

And ,

$$S_{ij}^{links} = w_s S_{ij}^{spl} + w_a S_{ij}^{anc} + w_d S_{ij}^{dsc}, \qquad (6)$$

with some corresponding weights w_s, w_a, and w_d.

Finally we define

$$w_{i,j}^{TF} = \frac{1}{2}\left(1 + \frac{TF_{i,j}}{TF_{i,\max}}\right), \quad w_{i,j}^{ds} = \frac{1}{\sqrt{\sum_{Q_j \in P_i} (w_{i,j}^{TF} w_{i,j}^{at})^2}},$$

$$w_{i,j}^{at} = \begin{cases} 10 & if\ Q_j\ is\ in\ titls\ of\ P_i \\ 5 & if\ Q_j\ is\ in\ headers\ or\ keywords\ or\ address\ of\ P_i. \\ 1 & otherwise \end{cases}$$

Then

$$S_{i,j}^{terms} = \sum_{l=1}^{M} w_{i,l} w_{j,l} \text{, with } w_{i,l} = w_{i,l}^{TF} w_{i}^{ds} w_{i,l}^{at} . \qquad (7)$$

Except for compactness and stratum, all metrics are defined for each web page (P_i) or for each pair of pages (P_i, P_j). Thus we have to choose some statistical values which indicate the total property of website concerning to the metric. Here we use average, standard deviation, skew-ness, and kurtosis.

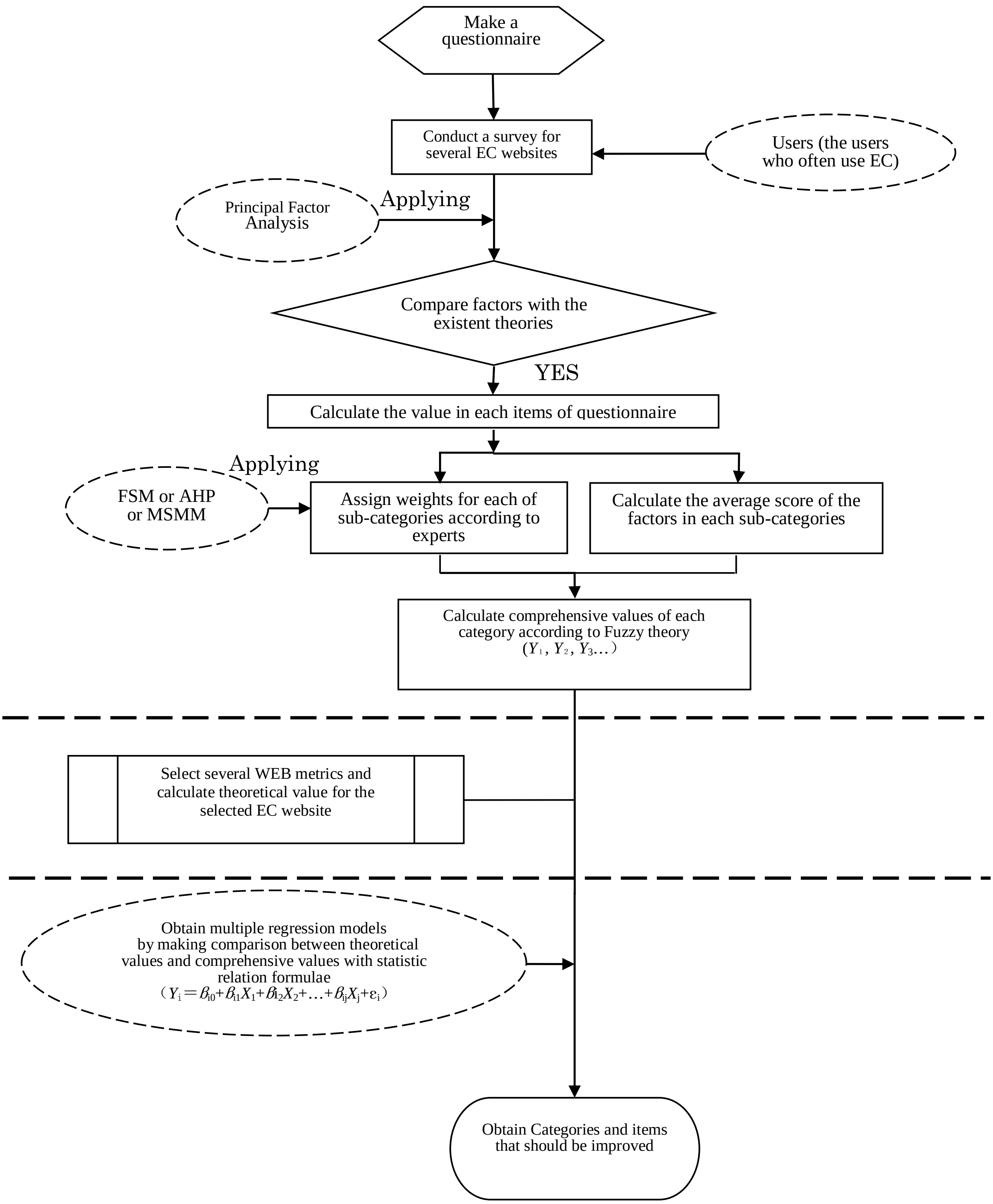


Figure 13 Total Information Quality User Evaluation System (TIQES)

We focus on the relationship between user oriented evaluation and theoretical web evaluation scores. The user oriented evaluation is performed by conducting a survey on the basis of existing metrics of the information quality and major web quality dimensions. We adopt some scores which represent the web graph properties, the web page significance, etc. for the theoretical web evaluation.

In this chapter we just proposed a total system to evaluate some sort of websites and give the outline of a method to construct a model where the evaluation factors can be explained with other variables. It seems that the set of effective explanatory variables and the concrete values for coefficients are dependent on the characteristics of website.

For the study of customer satisfaction in electronic commerce, customers' evaluation system for the website can be one of important indices, and eventually helps web content providers enhancing websites and predicting the consequences of changes in certain attributes from the users' view point. We expect our user evaluation system can be an entrance for the customer satisfaction evaluation system.

4.2.2 User Evaluation System for E-business Website

The main idea of our method is to combine user perceived web quality dimensions and well established metrics for evaluation of website in various points of view. We called the latter type of metrics the theoretical metrics, that is network or graph or information theory based metrics.

Our total evaluation system is composed of three processing phases in the flow shown in Figure 13. The first phase is concerned in the user oriented website evaluation. The second phase is concerned in theoretical web metrics. And the third phase is comparison evaluation. The details are as in the following.

- Phase1: Questionnaire, Extracting Factor, and Weighting Process

We proposed a user perceived evaluation system for E-business website with existent quality evaluation system. At first, we make the questionnaire including several items referring to major web quality dimensions and information quality estimation standard.

From the list of web quality dimension, we choose items seemed to be necessary or important for all the websites under consideration, and make the questionnaire sheet on them. Then conduct a survey with the sheets to the users who usually use the E-business website.

Next we apply the principal factor analysis in order to extract the main factors. For example, if there are four factors we named Y_1, Y_2, Y_3, and Y_4. Compare them with existent categorization, and discuss the meaning of factors until consensus of all the responsible members is made. It might be happen that the reconsideration of questionnaire items is not evadable.

After that, we classify the questionnaire items which belong to each category, and calculate the average values of factor scores for each category.

Meanwhile, we assign weights to each item. Although FSM or AHP are very popular for this kind of task, we recommend the Modified Structural Modeling Method, since this method was contrived to clarify the relationship between ill-defined problems by multi-participants, and the method are well illustrated to achieve the consensus (Nagata K., Kigawa Y., Cui D., and Amagasa M., 2007).

Unlike our evaluation system for information quality shown in chapter 3, we do not calculate the integrated evaluation values of all categories, and each value of categories is considered as a value of dependent variable.

- Phase2: Evaluation by Theoretical Web Metrics

We try to calculate evaluation scores of the individual theoretical web metrics. At this phase, first we select several metrics and collect data with which we can calculate corresponding score values effectively. It is sometimes required to perform practical investigation of the linkage connection properties one by one, and to submit some query words for search engine on each website.

- Phase3: Evaluation Comparison

At the final phase, we will perform the multivariate regression analysis using datum obtained in the previous phases. We take the factors obtained in the first phase as dependent variables and some of theoretical metrics as explanatory variables.

$$Y_i = \beta_{i0} + \beta_{i1}X_1 + \beta_{i2}X_2 + \ldots + \beta_{ij}X_j + \varepsilon_i$$

It requires plenty of data in order to determine all the variables and coefficients for an effective regression model. Once we have a stable family of formulae for some type of website, the regression model allows us to improve user evaluation values for the website by reconstruct it so as to ameliorate values of some explanatory variables.

4.3 Illustrative Example

There are some researches on the user-oriented website evaluation and on the theory based website metric scores. We try to find some explanation variables for users' evaluation factors as dependent variables in multivariable regression model. We proposed a total information quality user evaluation system (TIQES) expected to improve users' evaluation factors comparing the relationship between user oriented evaluation and theoretical web evaluation scores from suppliers' perspective. In this chapter, we focus on some of important theoretical metrics and user evaluation related items, and aim at expressing formulae concretely by conducting a survey on existing websites. We also apply several methods to find proper set of variables for the formulae and investigate the differences among them.

We selected the six business website of Japanese companies, and chose three selling articles from each website and one term "company's general information" for query terms.

The questionnaire survey was made to 45 Japanese students in a certain University in Japan, June in 2011. We asked them to surf over the web pages looking for each query term in several minutes before answering to questionnaire items. The 36 questionnaire items are chosen from 106 dimensions of Aladwani et al., and we adopted 10 levels Likert scale for answers.

We simultaneously performed survey on links, term frequencies, and calculated the metric values.

4.3.1 Evaluation by Information Quality Evaluation System

One of main characteristics in this phase is to integrate the experts' perspective and user perceived evaluations. Here "expert" means not only system researchers but also database designers, developers, providers, and so on. Users are indefinite or anonymous people who usually visit a website with the view of looking up something.

However, we do skip the weight assignment process by experts, and just the average of each factor throughout samples is used for the value of the response variable. Since samples are University students, they are not necessarily familiar with E-commerce.

For the factor extraction, we use SPSS 17.0.

- Factor extraction

According to the categorization of Aladwani et al., we first performed factor analysis with factor number three expecting to have factors corresponding to their "Technical adequacy", "Web content", and "Web appearance". The result was not so optimistic, and needed to perform several trials with factor number four, five, and six to have most reasoning factors.

Together with the property of scree-plot shown in figure14, and the value of accumulated proportion in table 11, we mainly took the meaning of items in mind to determine the number of factors. Eventually we extracted four factors with accumulated proportion 58%, and three of them are seemed to be corresponding to "Technical adequacy", "Web content", and "Web appearance", but the rest is composed of items from "Technical adequacy" and "Web content".

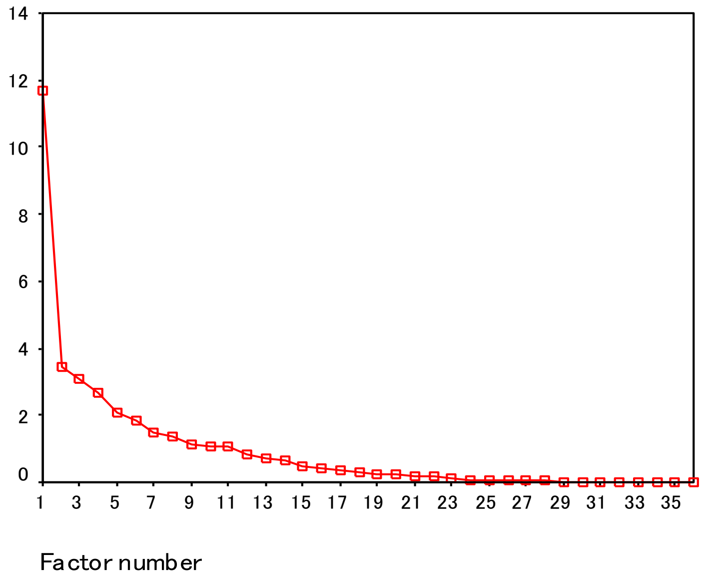


Figure 14　Scree-plot of Factors

Table 11　Accumulated Proportions

Factor	Primary Eigenvalue			Propotion after varimax rotation		
	Sum	Variance%	Accumulated Variance%	Sum	Variance%	Accumulated Variance%
1	11.700	32.499	32.499	6.624	18.401	18.401
2	3.437	9.547	42.046	5.383	14.954	33.355
3	3.069	8.525	50.571	5.014	13.927	47.282
4	2.685	7.458	58.030	3.869	10.748	58.030
5	2.082	5.783	63.813			
6	1.834	5.093	68.906			

Factor Extracting Method: Principal component analysis

The extracted factors and their component items are shown in the table 12. The capital letters in front of items' caption indicates the categories T="Technical adequacy", C="Web content", and A="Web appearance".

The factor1 is mainly explained by "Security", "Ease of navigation", "Broadcast services", "Anonymity", "Protected user information", "Reliability", "Search facility", and "Interactivity" which are all in the category of technical adequacy. The captions of "Finding online help" and "Finding contact Information" in the web content category have high factor loadings for the factor1, but they also have high factor loadings for the factor 3. Thus we consider this factor 1 as the factor of "Technical adequacy".

The factor 2 is mainly explained by "Proper choice of page length", "Proper use of multimedia", "Proper use of fonts, colors, graphics", "Graphics-text balance", "Style consistency" from the web appearance category. This factor is highly related to the factor of "Web appearance".

The factor 3 is a factor of "Finding free information", "Finding site maintainer", "Finding FAQ list", "Uniqueness of content", "Broadness of content" from the category of web content. This factor has "Attractiveness" and "Distinctive hot buttons" from the category of web appearance with high factor loadings, but these two captions can be took as we content's property by users. Thus I consider this factor as the factor of "Web content".

The factor 4 is mainly explained by "Personalization or customization" and "Multi-language support" from technical adequacy category, and "Finding customer support" and "Clarity of content" from web content category. This might be different type of category from those which Aladwani et al. proposed. We consider this factor as the factor of "Customer support direction".

Table 12　　Factors and Their Loadings

	Factors			
	1	2	3	4
T_Security	.781	.079	.108	-.032
T_Ease of navigation	.700	.160	.219	-.102
T_Broadcast services	.697	.026	.190	.308
T_Anonymity	.688	.049	.054	-.115
T_Protected User Information	.679	.341	-.023	.330
T_Reliability	.623	.111	-.033	.484
C_Finding Online Help	.617	.300	.334	-.079
T_Search facilities	.576	.210	.214	.114
C_Finding Contact Information	.554	.300	.372	.321
T_Bookmark Facility	.542	.140	.478	.010
T_Interactivity	.513	.225	.253	.301
C_Finding Links to relevant sites	.341	.052	-.006	.160
A_Proper Choise of Page Length	.278	.790	.001	-.026
A_Proper Use of Multimedia	.387	.771	-.115	.229
A_Proper Use of Fonts, Colors, Graphics	.070	.753	.158	-.159
A_Graphics-Text Balance	-.050	.745	.071	.129
T_Limited use of special plug-ins	.117	.662	.208	-.092
A_Style Consistency	.081	.600	.068	.282
C_Finding Products/Services details	.370	.598	.326	-.078
C_Accuracy of Content	.495	.524	-.014	.462
C_Usefulness of Content	.450	.490	.189	-.238
C_Completeness of Content	.350	.353	.224	-.216
C_Finding Free Information	.162	-.115	.830	-.122
A_Attractiveness	.006	.252	.764	.259
A_Distinctive Hot Buttons	.040	.261	.716	.272
C_Finding Site Maintainer	.375	-.073	.680	.150
C_Finding FAQ List	.023	.378	.627	.042
C_Uniqueness of Content	.177	.296	.572	.549
C_Broadness of Content	.487	.030	.546	-.062
T_Valid links	.401	.029	.512	.037
T_Personalization or Customization	.228	.027	.319	.701
C_Finding Customer Support	.031	.277	.438	.648
T_Multi-language support	.110	-.027	.330	.624
C_Clarity of Content	.398	.341	.326	-.583
T_Availability	.489	.446	-.034	.568
C_Finding Firm's General Information	-.011	-.110	-.065	.463

4.3.2　Evaluation by Theoretical Web Metrics

Although we may need to look around all the website's pages and check up their linkage structure and keywords frequency in order to faithfully calculate the theoretical web metrics, we restricted only 20 pages including the top page related to search key words for our targeted pages. For the link structure, the most fundamental data is the table of c_{ij}, the number of minimum links from node i to j, with an additional information of the uniqueness of the minimum link. If the minimum link is unique, then that affects the calculation of $c_{ij}^{\bar{k}}$ and the intermediate page should be notified. For the term-based metrics, the list of frequency of each keyword is important. And the keywords should be counted by assorting according to their attribute.

Almost all the metric's values are calculated using MS-EXCEL and its functions. For the calculation of the principal eigenvectors for hub and authority weights, we used a free computer algebraic system called PARI/GP (http://pari.math.u-bordeaux.fr/; 2011/07/25).

Table 13 is the list of c_{ij} of ten pages in one of our six websites, where the underlined number is the shortest distance with unique path and the second shortest path has larger value by one. From this table, "compactness" and "stratum" are calculated using (1) and (2) with N=20 and K=10.

Table 13 Example of Shortest Link List

	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
P_1	0	1	1	1	2	1	2	2	1	1
P_2	1	0	2	2	2	2	3	2	2	2
P_3	1	1	0	1	1	1	2	2	2	2
P_4	1	2	1	0	1	1	1	1	1	1
P_5	1	2	2	1	0	2	1	1	2	2
P_6	1	1	1	1	1	0	1	1	1	2
P_7	1	1	1	1	1	1	0	1	2	1
P_8	1	1	1	1	1	1	2	0	1	1
P_9	1	1	2	1	1	1	2	1	0	1
P_{10}	1	2	2	1	1	2	2	2	1	0

The paths from P_2 to P_3, P_4, P_6, and P_{10} with length 2 are passing through P_1

and other paths have length at least 3. And the path from P_2 to P_5 with length 2 passes through P_{14} and other paths have length at least 3.

We calculated the complete hyperlink similarity (S_{ij}^{links}) using (6), shown in table 14 as an example. Here the weight values are set 1/3, and the table is triangular matrix with positive entries at most four.

Table 14　　Example of Complete Hyperlink Similarity

S_{ij}^{links}	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
P_1		2.9	3.0	3.2	3.1	3.0	2.8	3.0	3.0	2.9
P_2	2.9		2.3	2.3	2.3	2.4	2.1	2.4	2.3	2.1
P_3	3.0	2.3		3.0	2.8	2.8	2.5	2.7	2.3	2.3
P_4	3.2	2.3	3.0		3.2	3.0	2.9	3.1	3.0	2.9
P_5	3.1	2.3	2.8	3.2		2.8	2.8	3.1	2.7	2.7
P_6	3.0	2.4	2.8	3.0	2.8		2.8	3.0	2.8	2.4
P_7	2.8	2.1	2.5	2.9	2.8	2.8		2.7	2.3	2.4
P_8	3.0	2.4	2.7	3.1	3.1	3.0	2.7		2.9	2.7
P_9	3.0	2.3	2.3	3.0	2.7	2.8	2.3	2.9		2.7
P_{10}	2.9	2.1	2.3	2.9	2.7	2.4	2.4	2.7	2.7	

For the calculation of term-based similarity and other related values, table 15 of frequency of each keyword is essential. The first column of each keyword's column is for title, the second column is for headers or keywords or address, and the third column is for others.

Using these values, first we calculated TF_i and TF_{max} then TFxIDF ($S_{i,q}$) for each of pages are obtained using (4). For the Vector spread activation ($RV_{i,q}$) with α=0.2 in (5), the calculation was preformed using the values in table 13 by looking at the table of linkage occurrence corresponding to the matrix A. Thus we have the table of those values shown in table 16, and the term-based similarities are also given as a triangular matrix using (7).

Table 15 Frequency of Keywords

EC3	Q_1			Q_2			Q_3			Q_4		
P_1					1						4	1
P_2						2			1	1	2	6
P_3									2			1
P_4		1										
P_5		1										
P_6		1										
P_7				1	1	4			2			
P_8									3			
P_9									1		2	1
P_{10}					3	1			2			4
P_{11}				1		2		2	2			
P_{12}									1		1	1
P_{13}												
P_{14}					1	3			1			
P_{15}								1	1			
P_{16}											5	2
P_{17}												2
P_{18}									3			
P_{19}					1	3						
P_{20}					1	1						

In the table 16, we call the values $w_{i,k}$ of keyword Q_k (k=1,2,3,4) the term-based weight of Q_k.

Table 16 Term-based Weight, TF×IDF, and Vector Spread Activation

EC3	$w_{i,k}$ (k=1,2,3,4)				TF×IDF	Vector Spread Activation
	Q_1	Q_2	Q_3	Q_4	$S_{i,q}$	$RV_{i,q}$ (α=0.2)
P_1	0	0.14	0	0.99	1.04	3.51
P_2	0	0.05	0.02	1	0.97	1.56
P_3	0	0	0.94	0.35	0.97	3.39
P_4	1	0	0	0	1.90	5.3

P_5	1	0	0	0	1.90	4.24
P_6	1	0	0	0	1.90	4.34
P_7	0	1	0.07	0	0.96	3.86
P_8	0	0	1	0	0.69	3.58
P_9	0	0	0.06	1	0.96	3.81
P_{10}	0	0.97	0.09	0.24	1.17	2.92
P_{11}	0	0.66	0.75	0	1.13	3.23
P_{12}	0	0	0.12	0.99	1.00	3.07
P_{13}	0	0	0	0	0.00	2.38
P_{14}	0	1	0.08	0	0.97	2.72
P_{15}	0	0	1	0	0.69	2.82
P_{16}	0	0	0	1	0.92	1.64
P_{17}	0	0	0	1	0.92	3.75
P_{18}	0	0	1	0	0.69	3.4
P_{19}	0	1	0	0	0.92	1.87
P_{20}	0	1	0	0	0.92	3.39

4.3.3 Evaluation Comparison

Now we have the list of values for each of six websites, one is that of user perceived four factors and the other is that of 26 theoretical metrics i.e., compactness, stratum, and the average, the standard deviation, the skew-ness, and the kurtosis of hub weight, authority weight, link-based similarity, term-based similarity, TFxIDF, and vector spread activation.

As we see in the table 12, the factor2 is considered to be a factor of web appearance, and we think that factor could not be explained by any of 26 metrics.

We constructed a multivariate regression model whose dependent variable is one of factor 1, factor 3, and factor 4, and whose explanatory variables are some of 26 metrics which are chosen carefully considering multicollinearity. Eventually we chose following 14 metrics for the primary variables; “compactness”, “Hw_std (standard deviation of hub weights)”, “Aw_skew (skewness of authority weights)”, “Tbs_average (average of term-based Similarities)”, “Tbs_std”, “Tbs_kurt (kurtosis)”, “Lbs_std (std of link-based Similarities)”, “Lbs_skew”, “Lbs_kurt”, “S_average (average of TFxIDF)”, “S_std”, “S_skew”, “RV_std (std of vector spread activations)”, and “RV_skew”.

The results of regression model analysis by SPSS are shown in table 17, table 18, and table 19 for the factor1, factor3, and factor4 respectively. In table 17, factor1 can be explained by 3 explanatory variables, two of which are “S_average” and “Lbs_std” with "highly significant" level and the other of which is “RV_skew” with “authoritative” level. And the adjusted coefficient of determination, adjusted R^2, is 0.997. In table 18, factor3 can be explained by only 1 explanatory variable, “RV_skew”, with “authoritative” level. And the adjusted coefficient of determination, adjusted R^2, is 0.740. In table 19, factor4 can be explained by 2 explanatory variables, “RV_skew” and “Aw_skew”, with "highly significant" level. And the adjusted coefficient of determination, adjusted R^2, is 0.985.

Table 17 Regression Model for the Factor1

	coefficients		Normalized Coefficients	t-Value	Significance level
	B	Standard Error	β		
constant	-1.054	0.052		-20.269	0.002
S_average	1.592	0.044	0.931	36.182	0.001
Lbs_std	-1.636	0.111	-0.337	-14.739	0.005
RV_skew	0.12	0.022	0.136	5.455	0.033

Table 18 Regression Model for the Factor3

	coefficients		Normalized Coefficients	t-Value	Significance level
	B	Standard Error	β		
constant	-0.179	0.083		-2.157	0.096
RV_skew	0.986	0.253	0.89	3.897	0.018

Table 19 Regression Model for the Factor4

	coefficients		Normalized Coefficients	t-Value	Significance level
	B	Standard Error	β		
constant	0.338	0.037		9.135	0.003
RV_skew	0.952	0.053	1.016	17.962	0
Aw_skew	0.235	0.04	0.33	5.875	0.01

Therefore we have a regression model for response variables Y_1 (=factor1), Y_3 (=factor3), and Y_4 (=factor4) with explanatory variables X_1 (=Aw_skew), X_2 (=Lbs_std), X_3 (=S_average), X_4 (=S_skew), and X_5 (=RV_skew).

$$\begin{cases} Y_1 &= -1.054 - 1.636\,X_2 + 1.592\,X_3 + 0.120\,X_5 \\ Y_3 &= -0.179 + 0.989\,X_4 \\ Y_4 &= 0.338 + 0.235\,X_1 + 0.952\,X_5 \end{cases}$$

The variables X_1 and X_2 are only the link related variables, and X_3, X_4 and X_5 are term related variables.

4.4 Conclusion

In this chapter, we proposed a Total Information Quality User Evaluation System for E-business website. In this system, we investigated a user percieved E-business website evaluation and link-based or term-based theoretical evaluation metrics as an application of our proposed total systme to some existant real websits. Finally we obtained multivriable regression model for some of extracted user percieved factors as response variables which are explained by at most three theoretical metric related variables.

Although the concrete values calculated from our questionnaire on websites are not reliable and so as the regression formulae itself because of respondants' low maturity in E-commerce, we proved that our total system could be effectively performed and had potential for improving the users' evaluation factores by adjusting theoretical metrics' concerns of suppliers' perspective.

Collecting much more reliable data for more website is required and the reseach of other kind of theoretical metrics such as related to design and colors. We also consider some effictive metrics are found from the different research field in ther next chapter.

Chapter 5 Information Value Improvement System of E-business Website

Although we proposed the regression model construction method in chapter 4, we need large quantity of values for explanation variables and for dependent variables to obtain proper model. We propose another method for evaluating website by introducing different metrics from user oriented information quality indices. We try to define the information value using "cost" and "functional degree" of webpage. The information value is defined by applying the definition of the value of product in Value Engineering considering the company's objectives of the website operation. We also integrate some of website metrics, and evaluation degrees by experts in the system. Since the evaluation of values in this chapter is basically performed with uncertainties, fuzzy logic based systems are used in our system. The total information value of a website is defined as aggregated values of webpages from website supplier's perspective not from users'. Of course, some of information quality metrics and Web Quality Dimensions by experts are integrated into our system. Finally, we make performance of the comprehensive evaluation value of website by applying the definition of the value of product in value engineering.

The rest of this study organizes: the details of evaluation system for information value of website are described. In the following section, an illustrative example by applying our proposed method to 3 Websites in order to show how to calculate the information value is described. The discussion and conclusion follows in the last section.

5.1 Evaluation System for Information Value of Website

At present, although almost organizations have not any concrete methodology through which they can analyze and evaluate the value of website and the significance in activities properly, they have website as their own business activity. In this paper, we consider these situations and refer to the existing research. We proposed an evaluation system of website from the perspective of the information value referring the definition of value in VE. The outline of our proposed system is described in Figure 15, and explanations are coming up in the following sections in detail.

5.1.1 Clarification of Objects, Functions, and Parts

Any organization operates a website with some objectives that sometimes depend on their characteristics. Even for organizations running a business, the objective varies according to its scales, products, strategies, business types, etc. In order to effectively analyze and define the objectives of website, we also need to specify the type of website. For instance, we have three major types of business organization according to operation objectives such as “conventional”, “click and mortar”, and “dot com”. Main objective of the conventional type is establishing brand image and improving brand value, that of click and mortar type is paying attention to collection of customer information and so on, and that of dot com type is taking business on the website almost completely. Therefore we first need to clarify and set some objectives for supplying website.

All the pages in the website are connected by the links, and are adapted to traverse each other. The website is composed of many pages, each of which consistent with parts such as graphical image files, titles, sentences, animations and so on. Parts are concrete objects on pages such as links, programs, titles, sentences, graphical images, sound files, and so on. For instance, there must be many graphical images in one page, and each image might have its own performance degree of each function. However, we gather up several objects of same type, and consider it as one part because of calculation convenience. Thus we should distinguish parts of each page.

In our system, the value of single page is computed by aggregating all the values of parts in the page, and the value of part is computed as the fraction of function by cost with the formula of information value. We consider the intrinsic function is independent of each part and its contribution degree is calculated from the objectives of website.

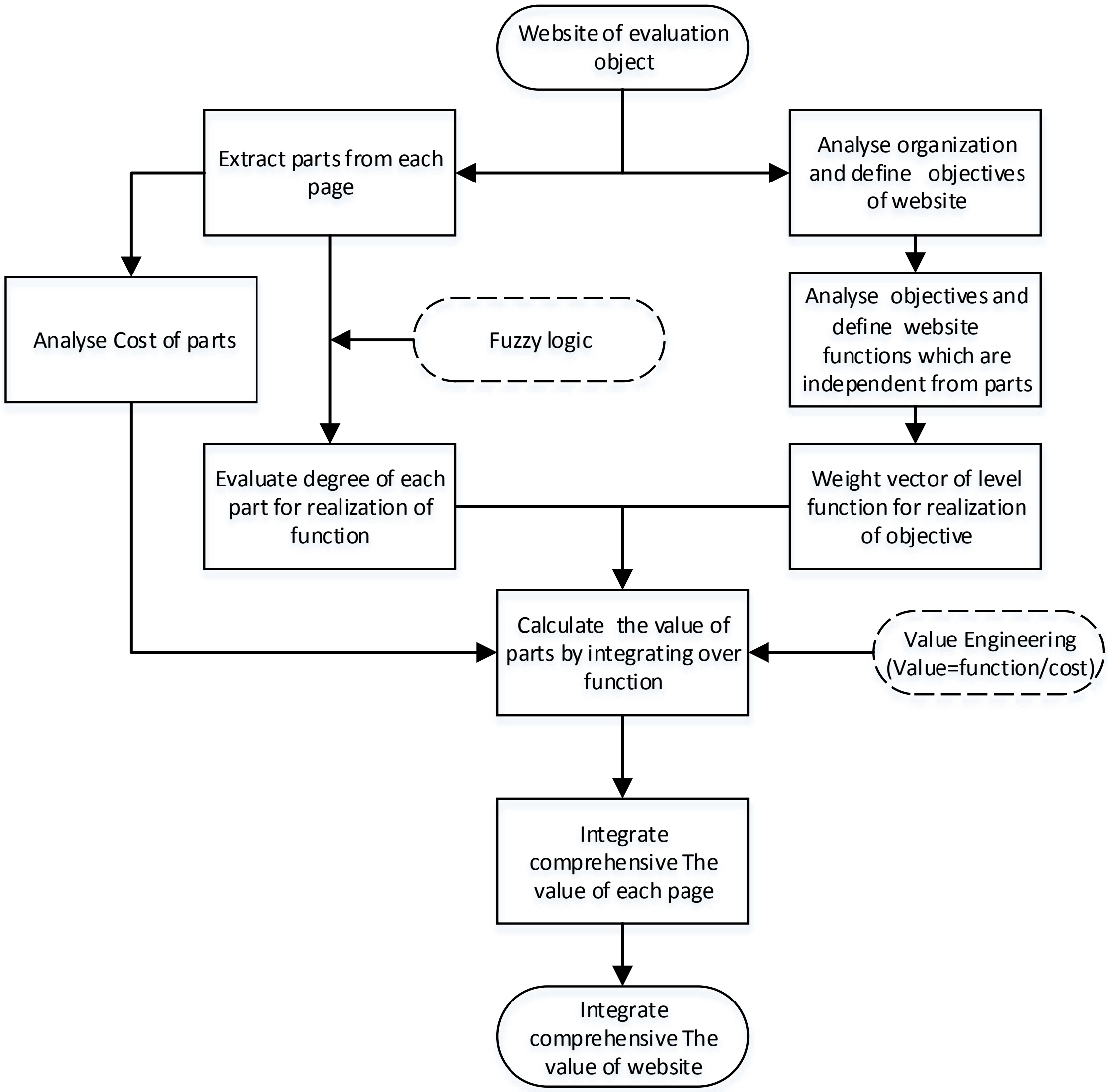


Figure 15 Information Value Improvement System of E-business Website (IVIS)

5.1.2 Functions and Cost of Each Part

After clarification of small number of objectives, find out critical functions $F_1, \ldots, F_n$ of website and give intrinsic degrees to them, $f_1, \ldots, f_n$, using pair-wise comparison method. These degrees should represent the importance degree to accomplish organization's objectives by operating the website when the function is performed 100%. Of course, when we try to define the function we may look at pages and consider parts in it to see what kind of function the parts realize. However the function is an abstract concept and the "intrinsic" function degree should be considered independently on parts.

Now we fix a page, and let $P_1,\ldots, P_t$ be effective parts on the page for realization of functions. For each parts P_i, we need to assess the realization level of functions $F_1,\ldots, F_n$, denoted by $P_{iF1},\ldots, P_{iFn}$. These values can be computed in view of information quality dimensions quoted in 2.1 of chapter 2, because when we have material product the quality of each part is a very important factor to achieve its functions. From some chosen information quality dimensions, assess the realization level of the part, and multiply it to the intrinsic function degree to obtain the function degree of the part P_i,

$$f_{P_iF_1} = P_{iF_1} * f_1, \cdots, f_{P_iF_n} = P_{iF_n} * f_n. \qquad (5\text{-}2)$$

It is not easy to perform this assessment, so we recommend applying fuzzy based method to reflect uncertainty. Moreover any part P_i carries several functions with some percentages, $w_{i1},\ldots, w_{in}$, almost of which might be 0. The pair-wise comparison method is useful to calculate them.

The cost of part on page is expressed using time, information volume, cash, space, position and so on. From existing researches, we recommend some methods for cost analysis. The most simple method is the cash cost of developing pages allocated to each part. This method has certain limitations, because some of the hidden costs can be not taken into account, and developers do not always evaluate each part to calculate total cost of the website. In addition to simple cash cost method, we can also refer to the following method to calculate costs for website.

The function point method is devised by Albrecht A. J., then a non-profit organization called IFPUG (International Function Point Users Group) developed and made it popular. The function point method can be used to estimate the developing cost of an information system by considering the complexity of the required function (Albrecht A. J., 1979).

Boehm B. proposed a method called COCOMO (COnstructive COst MOdel) in 1981. The method is to estimate the cost by analyzing the period and man-hour of development for information systems (Barry B., 1981).

The TCO (Total Cost of Ownership) is proposed by the Gartner Group in the early 1990s. This method is equal to the sum of all costs that information system occurs through life cycles for planning, actually introducing, using, until the destruction eventually.

5.1.3 Information Values

Since the value of parts for realization of function is integrated values of the degree of each part for realizing function and vector of weight of function for realization of objective. When the value of function degree of each part in a fixed page and the weight vector of functions are obtained, calculate the weighted average over all functions to have the total function degree of the part. From the formula of value, the value of the part is given by

$$v_{P_i} = \sum_{j=1}^{n} w_{ij} \, f_{P_i F_j} / c_{P_i}, \qquad (5\text{-}3)$$

where c_{P_i} denotes the estimated cost of the part.

Next, we compute the value of each page by taking the sum of values of parts in the page as

$$V_{H_m} = \sum_{i=1}^{t} v_{P_i}. \qquad (5\text{-}4)$$

Finally values of each page are integrated into the value of the whole website. In this step, we propose to use the hub weight quoted in 4.2, since a page of high hub weight with many links to good authority pages must play a principal role in the websites. Thus for hub weights $W_{H1},\ldots,\ W_{Hs}$, the total value of the website is given by

$$V = \sum_{m=1}^{s} W_{H_m} V_m. \qquad (5\text{-}5)$$

Figure 16 describes the calculation process and the flow of values from parts to the website. As we saw above, we obtain values for parts, pages, and the website in this order. Although the total value of website looked to be an ultimate value, it does not have critical significant itself. We are not able to see whether the value is good or not without comparing it to the value of other websites. When trying to improve the value of website, we need to find out the value of which page affect it or what part is critical to it. So we should store these types of value and analyze the reflection relationships among them.

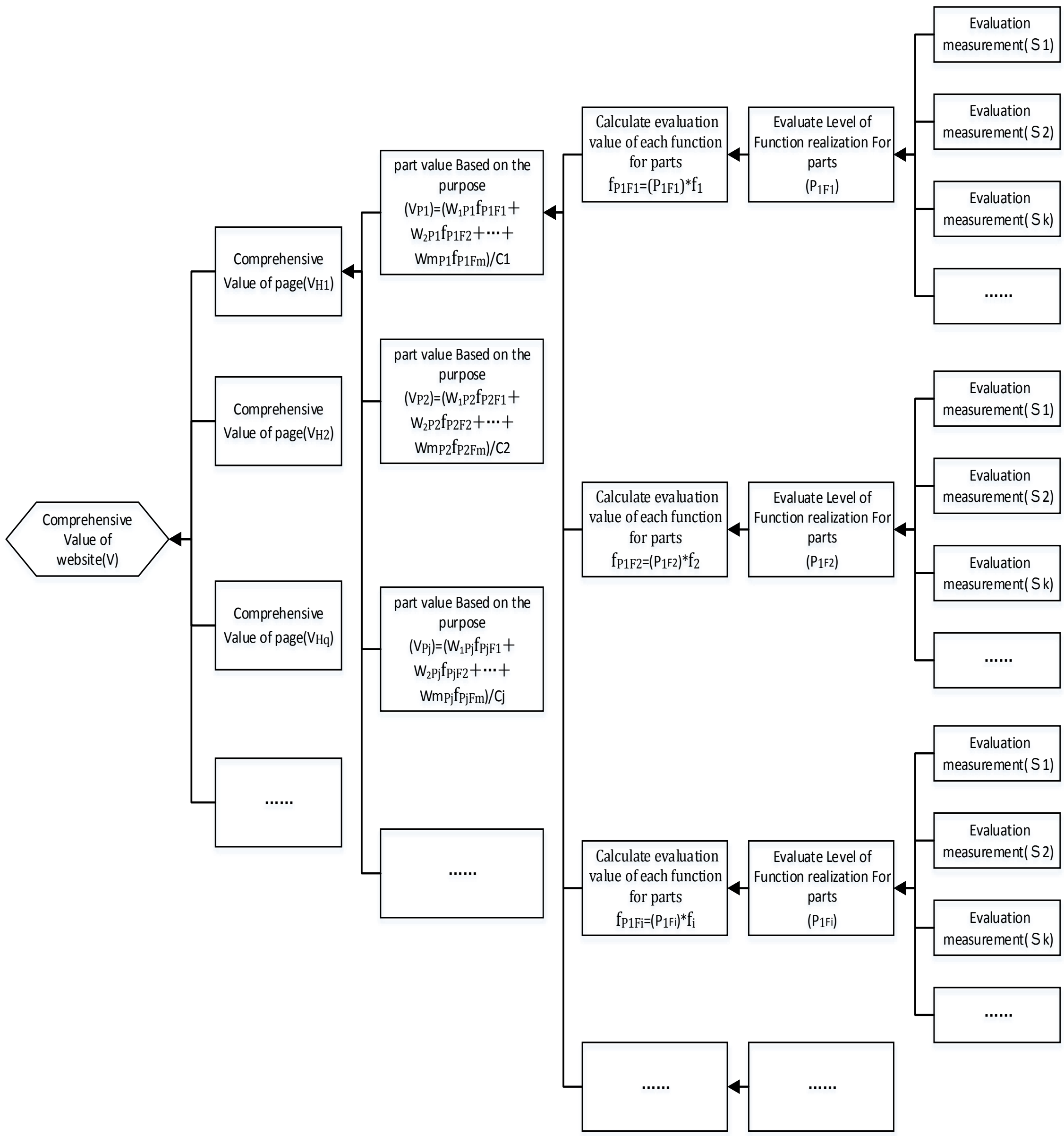


Figure 16 Calculation Process of Information Value

5.2 Implication of Evaluation Method

Based on the formerly proposed method for analyzing and evaluating website, we conducted a practical application. As an evaluation target, we choose some websites of faculties of some certain universities and perform precise investigation of resulted values.

5.2.1 Basic Analyze and Evaluation

1) Selection of website as Research Target

In this section, we select three websites of faculties of universities, named S_1, S_2 and S_3, as the evaluation target, and compare the information value of them.

2) Analysis of website

Definition of objectives

Although the real objectives are different according to organization type, here we choose three websites in the same type of organization and define four common primary objectives as follow.

- Brand or Image Up(TG_1)
- Advertisement(TG_2)
- Multimedia Assisted Instruction and After-Service(TG_3)
- Publishment Organization Information(TG_4)

Definition of functions

Once we determined objectives of website, we can obtain the functions. By referring objectives, nine functions are extracted as follows.

- Instruction(F_1)
- Search(F_2)
- Settlement(F_3)
- Transmission(F_4)
- Embellishment(F_5)
- Advertisement(F_6)
- Image Up(F_7)
- Communication(F_8)
- Risk management(F_9)

Extraction of parts

In this method, the value of each part needs to be calculated at first. Next, the value of each part is integrated to obtain the value of pages. Finally, the comprehensive value of website can be calculated. In this step, we analyze the pages to define seven mainly group of parts as following.

- Menu(P_1)
- Advertisement(P_2)
- Search engine (P_3)
- Information and news (P_4)
- Foot menu(P_5)
- Video, animations, marquee(P_6)
- Text, picture, color and other embellishments(P_7)

The functional achievement of each part will be evaluated in the next section when the three basic works mentioned above are completed.

3) Functional Achievement of Each Part

We define a set of website $\{S_1,\ldots, S_k\}$ each of which is consisting of the set of pages $\{H_{i1},\ldots, H_{ij}\}$ (i=1,...,k). At first, primary objectives of website are defined as $\{TG_1,\ldots, TG_x\}$. Based on the objectives, we define the function as $\{F_1,\ldots, F_y\}$ and assess the realization level of function for each part. As the same time, we need extract the parts of webpages. Effective parts on the page for realizing functions are defined and denoted as $\{P_1,\ldots, P_z\}$.

When we have the parts and functions, the evaluation can be conducted from the data. The table 20 describes an example of the evaluation for P_1 of H_1 in S_1.

Table 20 Evaluation of Realization Level of Function

H_1									
	P_1								
	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9
Accuracy	4	4	1	3	1	1	1	5	4
believability	4	4	1	3	1	1	1	4	4
reputation	4	4	1	3	1	1	1	4	4
objectivity	4	3	3	3	1	1	1	4	4
Value-added	3	4	4	2	3	1	3	4	4
relevance	5	5	5	2	4	2	4	4	5
completeness	4	4	4	1	4	2	2	3	3
timeliness	1	1	3	1	1	1	1	1	1
appropriate amount	3	3	4	1	3	1	1	2	2
Understand-ability	5	4	4	2	3	1	2	4	3
interpretability	4	4	4	2	3	1	2	4	3
concise representation	5	4	5	2	5	3	4	5	4
consistent representation	5	4	5	2	5	4	3	5	4
Accessibility	4	3	4	1	4	1	1	4	3
ease of operations	4	4	5	1	4	1	1	5	4
security	4	4	4	3	3	3	3	4	4

The criteria of information quality proposed by Wang R. Y. and Strong D.M. are applied in this evaluation. We make five evaluation levels such as “very low” as 1, “low” as 2, “middle” as 3, “high” as 4 and “very high” as 5. Those values of evaluation will be used to calculate realization level of function for each part.

5.2.2 Calculation of the Value of Functions and Cost

1) The value of functions

For each function, we obtain the total evaluation value of realization level, say $e_1,\ldots,e_y$, through all the information quality metrics shown the first column of the table 20. And calculate the comparative degree of each function, say $m_1,\ldots,m_y$, applying the ratio based method originally proposed by Amagasa M. (Amagasa M., 2010) from the pair-wise comparison table like as table 21. Then the value of functions for each part, denoted by f_i (i=1,…,y), is calculated using the formula (f). The table 22 describes the evaluation values calculated from table 20 and table21.

$$f_y = e_1 * m_1 + \ldots + e_y * m_y \qquad (5\text{-}6)$$

Table 21　　Comparative Degree of Functions

	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1		0.4	0.6	0.6	0.7	0.9	0.4	0.6	0.6
F2	0.6		0.8	0.7	0.8	0.9	0.5	0.7	0.6
F3	0.4	0.2		0.3	0.6	0.6	0.4	0.4	0.5
F4	0.4	0.3	0.7		0.6	0.7	0.5	0.4	0.5
F5	0.3	0.2	0.4	0.4		0.4	0.4	0.3	0.3
F6	0.1	0.1	0.4	0.3	0.6		0.2	0.2	0.3
F7	0.6	0.5	0.6	0.5	0.6	0.8		0.6	0.6
F8	0.4	0.3	0.6	0.6	0.7	0.8	0.4		0.6
F9	0.4	0.4	0.5	0.5	0.7	0.7	0.4	0.4	

Table 22　　Value of Functions for Parts

	F1	F2	F3	F4	F5	F6	F7	F8	F9
P1	3.5	4.8	0.8	1.5	0.4	0.0	15.9	11.9	4.8
P2	3.2	4.7	0.4	2.2	0.2	0.1	31.8	10.7	1.4
P3	3.3	5.8	0.8	1.2	0.1	0.0	10.8	4.2	2.3
P4	4.1	1.3	0.2	3.8	0.4	0.1	19.5	15.3	3.5
P5	3.5	2.4	0.6	2.2	0.2	0.0	9.2	3.5	1.5
P6	0.9	1.3	0.2	0.8	0.3	0.1	16.4	3.1	1.4
P7	2.4	2.6	0.3	2.0	0.6	0.1	32.4	6.3	2.6

2) The cost

As we mentioned that many scholars have some good ideas, and advocated some method for calculation of cost. For example, the function points method (Albrecht A. J., 1979), COCOMO (Boehm B., 1981) and the TCO (the Gartner Group., the early of 1990s). However the cost calculation method for information on webpages is not yet well established. Thus we propose here a simple method trying to access the cost of each part from a standard cost of a fixed website. In the example, the cost of *"S_1"* is selected as a standard cost T_c. The costs of other sites are calculated based on the number of webpages. In our example, the cost of *"S_2"* is $2T_c$, that of *"S_3"* is $3.1T_c$, since the numbers of pages in these sites are 32, 64, and 98 respectively.

When we check the development cost of one real website, we recognize that costs of the index page and the others, called subpages, have different cost ratio, 18:1. Then we need to divide the total cost into each page reflecting the ratio.

Finally, we integrate the comparative degree of parts calculated from table 23, and the percentage of each part, shown as in table 24, to have the cost value of each part $\{c_1,\ldots, c_z\}$.

Table 23 Comparative Degree of Parts

	P_1	P_2	P_3	P_4	P_5	P_6	P_7
P_1	*0*	*0.1*	*0.7*	*0.6*	*0.4*	*0.4*	*0.5*
P_2	*0.8*	*0*	*0.9*	*0.8*	*0.7*	*0.5*	*0.6*
P_3	*0.4*	*0.2*	*0*	*0.3*	*0.2*	*0.2*	*0.3*
P_4	*0.7*	*0.4*	*0.4*	*0*	*0.4*	*0.4*	*0.5*
P_5	*0.8*	*0.3*	*0.9*	*0.7*	*0*	*0.5*	*0.6*
P_6	*0.7*	*0.5*	*0.9*	*0.7*	*0.7*	*0*	*0.6*
P_7	*0.5*	*0.2*	*0.8*	*0.7*	*0.5*	*0.4*	*0*

Table 24 Percentage of Each Part in Page

	P_1	P_2	P_3	P_4	P_5	P_6	P_7
H_1	*0.19*	*0.1*	*0.02*	*0.1*	*0.1*	*0.24*	*0.25*
H_2	*0.35*	*0.2*	*0.05*		*0.15*		*0.25*
H_3	*0.35*	*0.2*	*0.05*		*0.15*		*0.25*
H_4	*0.4*	*0.06*	*0.06*		*0.08*		*0.4*
H_5	*0.43*		*0.07*		*0.05*		*0.45*
H_6	*0.4*	*0.04*	*0.02*	*0.06*	*0.1*		*0.38*
H_7	*0.4*	*0.05*	*0.05*		*0.1*		*0.4*
H_8	*0.3*	*0.03*	*0.02*		*0.08*		*0.57*
H_9	*0.26*	*0.06*	*0.01*		*0.07*		*0.6*
H_{10}	*0.2*						*0.8*
…							

The comparative degree of parts $\{r_1,\ldots, r_z\}$ and The percentage of each part $\{p_1,\ldots, p_z\}$ in a fixed page are used for calculating each c_i. Here the total number of webpage except for the index page in website is denoted by *a*. And we will calculate the value of each part by the following formula.

$$c_i = r_i * p_i * (1/(18+a) * T_c) \quad (i=1,\dots,z) \qquad (5\text{-}7)$$

Here we can also have the cost of index page by multiplying 18 to the average value of subpages.

Table 25 Cost of Each Part in Page

	P_1	P_2	P_3	P_4	P_5	P_6	P_7
H_1	63.28	2.66	2.37	0.12	1.60	11.85	1.08
H_2	4.13	0.26	0.11	0.00	0.13	0.00	0.04
H_3	4.13	0.26	0.11	0.00	0.13	0.00	0.04
H_4	4.72	0.08	0.14	0.00	0.07	0.00	0.06
H_5	5.07	0.00	0.16	0.00	0.04	0.00	0.06
H_6	4.72	0.05	0.05	0.20	0.09	0.00	0.05
H_7	4.72	0.07	0.11	0.00	0.09	0.00	0.06
H_8	3.54	0.04	0.05	0.00	0.07	0.00	0.08
H_9	3.07	0.08	0.02	0.00	0.06	0.00	0.08
H_{10}	2.36	0.00	0.00	0.00	0.00	0.00	0.11
…							

The table 25 is the cost of each part in page, from which we gained the value of function and cost. Then the value of part can be calculated in next section.

5.2.3 Comprehensive Information Value

When we have the value of functions and cost, the value of parts can be calculated using the formula for the value. Integrating the value of parts, the value of webpage is obtained. At last, the value of website is obtained by integrating the value of webpages. The result of calculation for our example is in table 27.

$$Vp_z=(f_1+\ldots+f_y)/c_z \qquad (5\text{-}8)$$

$$Vh_j= Vp_1+\ldots+Vp_z \qquad (5\text{-}9)$$

$$Vs= Vh_1+\ldots+Vh_j \qquad (5\text{-}10)$$

Table 26　　Value of Each Part in Page

	Vp_1	Vp_2	Vp_3	Vp_4	Vp_5	Vp_6	Vp_7
H_1	12.42	108.44	218.31	7411.79	259.23	37.04	818.47
H_2	10.64	61.04	250.70		188.94		1435.33
H_3	10.64	61.04	250.70		188.94		1435.33
H_4	9.31	203.47	208.92		354.27		897.08
H_5	9.80		199.64		769.94		806.79
H_6	10.34	305.20	698.73	239.09	384.97		889.22
H_7	10.18	244.16	277.46		384.97		844.76
H_8	12.82	406.93	677.09		481.21		592.81
H_9	14.79	203.47	1354.19		549.96		563.17
H_{10}	18.94						363.55
…							

Table 27　　Information Value of Website

Vs_1	*209.08*
Vs_2	*357.55*
Vs_3	*261.89*

In this section, we make an application of our proposed evaluation system of information value to three existant real websites. Using fuzzy based pair-wise comparison method some values are computed for parts and functions. At last, the information value of Website is obtained.

Although we gained the information value of website, the comprehensive information value is not calculated. We need to investigate more real website to obtain some improvement methodology for information value of website, and select some appropriate theoretical parameter to integrate comprehensive information value.

Here we could not integrate theoretical values such as “hub weight”, “authority weight” and so on. These values may have a deep impact on evaluation of website.

5.3 Conclusion

In this chapter, we proposed a new evaluation system of information value of website, and applied our proposed evaluation system to three existent real websites. We defined the value of parts, pages, and website from referring the definition of value in Value Engineering. The concept of information quality dimensions are applied for assessing the realization degree of parts, and the graph theoretical metric for weighting each pages. Some values needed to compute the value of part are obtained using fuzzy based pair-wise comparison method. As the purpose of our research, we established a methodology that will contribute not only to evaluate websites but also to help website supplier to improve the website. This system is oriented as one of important step for our future research.

Chapter 6 Conclusions and Discussion

In this thesis, we considered to especially work on information quality and the value of website organizations possess. In order to improve the information quality and the value of Website for organizations, we proposed three evaluation systems, User Oriented Evaluation System is based on information quality metrics, Total Information Quality User Evaluation System is based on major web quality dimensions and theoretical web metrics, and Information Value Improvement System for E-business Website applies the concept of VE (value engineering).

First, we believed that the user's perspective is essential for evaluation on information quality, and hence we need to more pay attention to user's view. Before conducting our questionnaire survey, we are determined to find some metrics which serve as theoretical facts, otherwise our results derived from the survey may not be justified and accepted. In particular, referring to the result which is well known research done by Wang R.Y. et al, we use the metrics having 16 items and 4 categories in classifying many items for which questionnaire survey is conducted. However, concerning their way and result we should investigate this matter one more time, right from the start, though the our results seems to be satisfactory. We conduct some survey based on these metrics.

Next, we work on the improvement of World Wide Web capacity for which useful information is supposed to be effectively treated. In this field, we use the categorization of Aladwani et al. among many different papers and simultaneously the work of Dhyani et al. for a theoretical evaluation from suppliers' perspective was referred. They pick up metrics originated from diverse areas such as classical informatics, library science, information retrieval, sociology, hypertext, econometrics, etc.

With respect to user-oriented information quality evaluation system, we have a hypothesis which can be described that Website with users' perspectives deserve recognition will be successful to run the business activities of E-business.

In proceeding our study on the evaluation system of user-oriented information quality, there are somehow uncertainty involved and we can't ignore the uncertainty. Thus, we are going to take the uncertainty into our problems. In other words, we use fuzziness as measuring the uncertainty, so that the methodologies we employ here are characterized with fuzzy theory. Owing to the flexible concept, we could develop a user-oriented evaluation system with fuzzy measures in order to make evaluation of users' perspective. Further, though the determination of the fuzzy measures for the fuzzy integral remains invalid, it is obviously understood that this method effectively combines the perspectives of both the experts and the users. Usually the fuzzy measure is characterized by introducing a variable λ, which plays an important role in such a way that additive measure can be changed to non-additive one. The resulted values from two types of λ in the illustrative example lead to the same conclusion. On the other hand, the result given by the methodology using MLIOWA (the Majority guided Linguistic Induced Ordered Weighted Averaging) and weighted MLIOWA indicates the opposite conclusion.

We need much more precise investigation on the reason, but the majority oriented method might affect the popularity, that is based on the fact that the number of "High" estimation for "Yahoo" is greater than that for "Google" affect the result. Taking the simple average of $ind(p_i)$, "Google" is superior to "Yahoo". Our proposed method may tend to be influenced by statistical values rather than MLIOWA.

Then, we develop the evaluation system for total information quality. In the Total Information Quality User Evaluation System, we focus on the relationship between user-oriented evaluation and theoretical web evaluation scores with designer's perspective. The user-oriented evaluation is performed by conducting a survey on the basis of existing metrics of major web quality dimensions. We take some scores which represent the web graph properties, the web page significance, etc. for the theoretical web evaluation. In this system, we investigated a user percieved E-business website evaluation and link-based or term-based theoretical evaluation metrics by applying our proposed total systme to some existent real websits.

In particular, for the study of customer satisfaction in electronic commerce, the customer (user) evaluation system for the website can be one of important indices, and eventually helps web content providers enhancing websites and predicting the consequences of changes in certain attributes from the users' view point. In result, we expect our user evaluation system can be an entrance for the customer satisfaction evaluation system.

Finally, we obtained multiple regression model for considering the extracted user percieved factors as response variables, which are explained by at most three theoretical metric related variables. Each of such models seems to successfully express the situations to some extent as we expected. It was proved that our total evaluation system could be effectively performed and had the potential for improving the users' evaluation factors by adjusting theoretical metrics' concerns.

However, as a further improvement aspect, it will be pointed out that the concrete values calculated from our questionnaire on websites can not be perfectly reliable, so that it also applys to the regression formulae itself because of respondants' low maturity in E-commerce. In addition, we think the methods proposed in TIQES are effective for improvement of Website, but we need more data for explanation and dependent variables to obtain more precise model with sure precision. We proposed information value improvement system with suppliers' perspective.

We established the improvement system on information value of E-business website and make an application for three existent real websites. Using fuzzy based pair-wise comparison method some values are computed for parts and functions. At last, the information value of website is obtained. In brief, our evaluation procedure has a feedback to analyze the improvement process for the information value of website referring to the calculation process of value. In addition, we can have such a feedback flow for each system whenever the need arises, improving the system by finding the undesired parts. This feedback process is an indispensable duty in proceeding the research. We also consider this system orients towards our future research as one of important step.

As our future works, we will combine the information value of website with more theoretical value, and apply our system to more existing website to see how it stably works.

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Appendices

A: Chapter 1

(1) Table A-1 List of Countries by Number of Internet Users in 2012

Country or area	Internet users	Rank	Penetration	Rank
China	568,192,066	1	42.3%	102
United States	254,295,536	2	81.0%	28
India	243,298,994	3	19%	146
Japan	100,684,474	4	79.1%	33
Brazil	99,357,737	5	49.8%	86
Russia	75,926,004	6	53.3%	81
Germany	68,296,919	7	84.0%	22
Nigeria	55,930,391	8	32.9%	128
United Kingdom	54,861,245	9	87.0%	14
France	54,473,474	10	83.0%	24
Mexico	44,173,551	11	38.4%	114
South Korea	41,091,681	12	84.1%	21
Indonesia	38,191,873	13	15.4%	154
Philippines	37,602,976	14	36.2%	118
Egypt	36,881,374	15	44.1%	99
Vietnam	36,140,967	16	39.5%	111
Turkey	35,990,932	17	45.1%	97
Italy	35,531,527	18	58.0%	68
Spain	33,870,948	19	72.0%	45
Canada	29,760,764	20	86.8%	16
Poland	24,969,935	21	65.0%	54
Argentina	23,543,412	22	55.8%	72
Colombia	22,160,055	23	49.0%	87
Iran	20,504,000	24	26.0%	133
South Africa	20,012,275	25	41.0%	108
Malaysia	19,200,408	26	65.8%	51
Pakistan	18,960,037	27	10.0%	173
Australia	18,129,727	28	82.3%	25
Thailand	17,779,139	29	26.5%	132
Morocco	17,770,081	30	55.0%	76
Taiwan	17,656,414	31	76.0%	36
Netherlands	15,559,488	32	93.0%	5
Ukraine	15,115,820	33	33.7%	127
Saudi Arabia	14,328,632	34	54.0%	79
Kenya	13,805,311	35	32.1%	129
Venezuela	12,353,883	36	44.0%	100
Peru	11,287,915	37	38.2%	115
Romania	10,924,252	38	50.0%	85
Chile	10,482,463	39	61.4%	61
Uzbekistan	10,369,924	40	36.5%	117
Bangladesh	10,148,280	41	6.3%	181

Kazakhstan	9,341,977	42	53.3%	80
Belgium	8,559,449	43	82.0%	27
Sweden	8,557,561	44	94.0%	4
Czech Republic	7,632,975	45	75.0%	37
Sudan	7,183,409	46	21.0%	142
Hungary	7,170,086	47	72.0%	45
Portugal	6,900,134	48	64.0%	57
Switzerland	6,752,540	49	85.2%	19
Austria	6,657,992	50	81.0%	29

(Source*: http://www.census.gov/population/international/data/index.html)

(2) Table A-2 Global ICT Developments (2001-2014)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Mobile-cellular telephone subscriptions	15.5	18.4	22.2	27.3	33.9	41.7	50.6	59.7	68.0	76.6	83.8	88.1	93.1	95.5
Individuals using the Internet	8.0	10.7	12.3	14.1	15.8	17.6	20.6	23.1	25.6	29.4	32.5	35.5	37.9	40.4
Fixed-telephone subscriptions	16.6	17.2	17.8	18.7	19.1	19.2	18.8	18.5	18.4	17.8	17.2	16.7	16.2	15.8
Active mobile-broadband subscriptions							4.0	6.3	9.0	11.5	16.7	21.7	26.7	32.0
Fixed (wired)-broadband subscriptions	0.6	1.0	1.6	2.4	3.4	4.3	5.2	6.1	6.9	7.6	8.4	9.0	9.4	9.8

(Source: ITU Statistics (http://www.itu.int/ict/statistics))

(3) Table A-3 Internet Penetration Rate and Internet Users by Region in 2013

	Asia	Europe	North America	Lat Am/Caribb	Africa	Middle East	Oceania/Australia	world
internet users in the world distribution by world regions	45.10%	20.20%	10.70%	10.80%	8.60%	3.70%	0.90%	
world internet penetration rates by geographic Regions	31.70%	68.60%	84.90%	49.30%	21.30%	44.90%	67.50%	39.00%

(Source: ITU Statistics (http://www.itu.int/ict/statistics))

(4) Table A-4 Internet Users in the World in (1994-2014)

Year (July 1)	Internet Users	Users Growth	World Population	Population Growth	Penetration (% of Pop. with Internet)
2014*	2,925,249,355	7.90%	7,243,784,121	1.14%	40.40%
2013	2,712,239,573	8.00%	7,162,119,430	1.16%	37.90%
2012	2,511,615,523	10.50%	7,080,072,420	1.17%	35.50%
2011	2,272,463,038	11.70%	6,997,998,760	1.18%	32.50%
2010	2,034,259,368	16.10%	6,916,183,480	1.19%	29.40%
2009	1,752,333,178	12.20%	6,834,721,930	1.20%	25.60%
2008	1,562,067,594	13.80%	6,753,649,230	1.21%	23.10%

2007	1,373,040,542	18.60%	6,673,105,940	1.21%	20.60%
2006	1,157,500,065	12.40%	6,593,227,980	1.21%	17.60%
2005	1,029,717,906	13.10%	6,514,094,610	1.22%	15.80%
2004	910,060,180	16.90%	6,435,705,600	1.22%	14.10%
2003	778,555,680	17.50%	6,357,991,750	1.23%	12.20%
2002	662,663,600	32.40%	6,280,853,820	1.24%	10.60%
2001	500,609,240	21.10%	6,204,147,030	1.25%	8.10%
2000	413,425,190	47.20%	6,127,700,430	1.26%	6.70%
1999	280,866,670	49.40%	6,051,478,010	1.27%	4.60%
1998	188,023,930	55.70%	5,975,303,660	1.30%	3.10%
1997	120,758,310	56.00%	5,898,688,340	1.33%	2.00%
1996	77,433,860	72.70%	5,821,016,750	1.38%	1.30%
1995	44,838,900	76.20%	5,741,822,410	1.43%	0.80%
1994	25,454,590	79.70%	5,661,086,350	1.47%	0.40%

(Source: ITU Statistics (http://www.itu.int/ict/statistics))

(5) Table A-5 List of Countries by Internet Usage (2014)

Rank	Country	Internet Users	1 Year Growth %	1 Year User Growth	Total Country Population	1 Yr Population Change (%)	Penetration (% of Pop. with Internet)	Country's share of World Population	Country's share of World Internet Users
1	China	641,601,070	4%	24,021,070	1,393,783,836	0.59%	46.03%	19.24%	21.97%
2	United States	279,834,232	7%	17,754,869	322,583,006	0.79%	86.75%	4.45%	9.58%
3	India	243,198,922	14%	29,859,598	1,267,401,849	1.22%	19.19%	17.50%	8.33%
4	Japan	109,252,912	8%	7,668,535	126,999,808	-0.11%	86.03%	1.75%	3.74%
5	Brazil	107,822,831	7%	6,884,333	202,033,670	0.83%	53.37%	2.79%	3.69%

6	Russia	84,437,793	10%	7,494,536	142,467,651	-0.26%	59.27%	1.97%	2.89%
7	Germany	71,727,551	2%	1,525,829	82,652,256	-0.09%	86.78%	1.14%	2.46%
8	Nigeria	67,101,452	16%	9,365,590	178,516,904	2.82%	37.59%	2.46%	2.30%
9	United Kingdom	57,075,826	3%	1,574,653	63,489,234	0.56%	89.90%	0.88%	1.95%
10	France	55,429,382	3%	1,521,369	64,641,279	0.54%	85.75%	0.89%	1.90%
11	Mexico	50,923,060	7%	3,423,153	123,799,215	1.20%	41.13%	1.71%	1.74%
12	South Korea	45,314,248	8%	3,440,213	49,512,026	0.51%	91.52%	0.68%	1.55%
13	Indonesia	42,258,824	9%	3,468,057	252,812,245	1.18%	16.72%	3.49%	1.45%
14	Egypt	40,311,562	10%	3,748,271	83,386,739	1.62%	48.34%	1.15%	1.38%
15	Viet Nam	39,772,424	9%	3,180,007	92,547,959	0.95%	42.97%	1.28%	1.36%
16	Philippines	39,470,845	10%	3,435,654	100,096,496	1.73%	39.43%	1.38%	1.35%
17	Italy	36,593,969	2%	857,489	61,070,224	0.13%	59.92%	0.84%	1.25%
18	Turkey	35,358,888	3%	1,195,610	75,837,020	1.21%	46.62%	1.05%	1.21%
19	Spain	35,010,273	3%	876,986	47,066,402	0.30%	74.38%	0.65%	1.20%
20	Canada	33,000,381	7%	2,150,061	35,524,732	0.98%	92.89%	0.49%	1.13%

* Estimate for July 1, 2014

(Source: Internet Live Stats (elaboration of data by International Telecommunication Union (ITU) and United Nations Population Division))

B: Chapter 3

(1) Table B-1 The Data of Survey for GOOGLE (2008)

NO	frequency	Google	Qg1	Qg2	Qg3	Qg4	Qg5	Qg6	Qg7	Qg8	Qg9	Qg10	Qg11	Qg12	Qg13	Qg14	Qg15	Qg16	Qg17	Qg18
1	2	3	5	9	6	6	8	5	7	7	5	7	9	8	8	6	3	5	5	6
2	1	1	8	8	5	8	8	6	8	6	8	8	8	9	7	8	6	8	8	8
3	2	3	8	7	6	7	8	7	8	8	8	7	8	8	7	7	8	4	7	7
4	1	1	8	8	9	7	5	7	7	8	7	8	8	6	8	7	8	7	7	6
5	1	1	6	4	5	4	5	5	6	4	5	6	6	5	5	5	5	6	5	7
6	2	1	5	7	6	6	8	9	4	8	9	8	7	5	7	9	9	6	5	7
7	1	1	4	5	5	5	5	5	6	5	4	6	5	6	5	6	4	5	5	4
8	2																			
9	1	3	3	5	2	3	1	3	6	5	3	4	4	5	3	4	1	3	7	1
10	1																			
11	1	5																		
12	1	1	7	5	4	6	7	5	8	6	6	8	7	6	8	7	9	8	7	6
13	3	3	4	3	6	8	1	6	6	7	3	2	5	5	6	7	8	7	7	6
14	1	2	7	7	4	8	6	7	2	5	6	4	2	5	5	8	7	7	8	6
15	2	3	7	7	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7
16	1	1	3	6	5	5	6	6	7	7	7	8	6	9	6	5	7	7	5	5
17	3	3	8	7	9	6	5	8	8	7	9	9	6	6	6	8	5	9	6	7
18	2	3	8	8	8	9	6	7	9	8	4	8	8	5	6	6	7	3	9	7
19	1	3	5	2	2	10	10	8	0	10	9	1	1	6	2	8	1	10	2	5
20	2	4	7	7	7	7	7	7	7	7	10	5	5	7	4	7	5	7	7	7
21	3	5																		
22	2	4	9	8	9	8	5	6	9	5	7	5	6	6	6	7	7	7	8	8
23	3	3	5	5	4	3	0	5	5	5	5	3	4	2	4	3	5	3	4	2
24	3	4	8	9	8	9	5	9	6	5	5	2	7	4	4	7	4	3	7	5
25	1	1	10	9	5	9	8	10	6	10	9	8	9	8	7	10	10	10	10	10
26	2	3	8	8	8	8	7	8	8	8	8	8	8	8	9	8	9	9	8	8
27	1	3	6	7	7	7	6	6	8	7	7	7	6	5	6	6	6	6	6	6
28	2	1	6	6	5	5	6	7	4	7	7	4	5	5	7	6	5	4	4	4

29	1	3	4	5	5	5	6	6	5	6	4	4	5	5	5	5	4	5	5	5
30	2	3	7	7	5	8	3		3	2	2	4	7	5	5	3	6	7	8	5
31	3	4																		
32	2	2	9	9	9	9	8	9	9	9	9	9	8	8	9	9	10	9	9	9
33	2	4	7	6	7	6	5	6	7	6	7	7	7	7	6	7	6	7	8	7
34	1	3	7	8	8	7	7	6	7	6	7	8	7	8	8	8	7	6	7	7
35	1	1	5	5	5	8	5	10	8	8	8	9	9	8	5	5	5	4	5	8
36	2	2	8	8	10	7	8	7	8	9	10	9	9	8	8	9	7	8	7	7
37	2	1	9	9	9	9	7	9	8	9	10	9	8	8	3	3	3	3	3	3
38	2	4	6	6	7	7	8	6	4	4	6	4	5	4	5	6	6	7	5	6
39	2	5																		
40	3	3	5	4	6	6	4	6	6	6	7	5	6	5	6	6	6	7	5	6
41	2	4																		
42	3	3	6	7	5	4	5	7	2	4	7	7	6	4	5	7	4	5	3	8
43	3	5																		
44	2	5																		
45	2	2	8	5	8	8	5	9	9	9	7	6		9	9	9	10	10	8	7
46	1	1	8	8	9	8	8	8	7	10	9	10	9	9	9	7	10	8	7	8
47	3	2	6	8	6	4	9	9	7	9	9	9	9	8	7	4	9	9	7	9
48	1	4	6	5	5	4	4	3	2	3	8	6	5	4	5	1	2	7	6	3
49	2	4	5	5	7	7	5	8	8	8	7	7	7	8	7	6	5	5	5	6
50	2	4	5	5	5	6	5	8	7	7	10	9	8	5	5	7	8	6	6	7
51	3	4	6	5	7	5	5	6	5	4	5	4	5	5	5	6	6	5	6	5
52	2	2	7	7	5	7	7	5	5	5	5	5	4	5	5	5	3	7	7	5
53	3	3	7	7	5	6	5	8	5	5	8	6	7	6	6	7	6	7	7	7
54	3	3	7	5	7	2	2	5	2	2	9	5	6	10	1	0	1	3	5	5
55	1	5																		
56	1	4	6	5	5	6	6	6	7	4	7	4	5	5	5	4	7	4	6	5
57	2	4																		
58	2	3	10	7	7	6	6	7	8	6	7	7	7	7	7	7	7	7	7	7
59	2	3	7	7	8	6	6	7	7	8	8	8	8	8	8	9	9	8	8	9
60	3	2	8	8	7	9	9	6	7	6	7	7	8	8	8	8	7	7	7	8
61	1	1	5	9	4	9	8	10	8	10	9	10	7	9	7	10	9	8	9	9
62	2	4	5	6	8	8	6	10	8	7	9	7	8	7	8	7	9	8	6	7
63	2	4	10	10	10	10	0	5	6	4	4	8	6	6	1	6	6	8	10	9

64	1																			
65	2	2	6	4	5	6	6	5	5	5	6	5	7	5	5	5	6	4	5	5
66	1	3	6	6	7	7	5	7	6	6	7	7	7	6	5	4	5	4	3	5
67	2	3																		
68	1	3	8	8	7	9	9	8	8	7	8	8	5	8	9	10	9	8	8	9
69	2	4	1	4	5	5	4	1	5	6	4	4	5	5	3	4	4	7	2	4
70	2	3	10	7	6	10	8	5	8	7	6	7	8	7	7	8	6	8	9	8
71	1	5																		
72	1	1	7	8	7	7	5	7	7	7	8	8	8	8	7	7	7	5	7	8
73	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
74	1	5																		
75	3	3	5	6	7	6	4	8	8	7	9	8	8	8	6	8	8	7	9	9

Description:
Frequency 1) every day; 2) 2 or 3 times a week; 3) less than 1 times a week; 4) never used

(2) Table B-2 The Data of Survey for YAHOO (2008)

NO	frequency	Yahoo	Qy1	Qy2	Qy3	Qy4	Qy5	Qy6	Qy7	Qy8	Qy9	Qy10	Qy11	Qy12	Qy13	Qy14	Qy15	Qy16	Qy17	Qy18
1	2	3	5	9	6	6	8	5	8	7	5	7	9	8	8	7	3	5	5	6
2	1	5																		
3	2	1	8	8	7	8	9	9	7	6	9	8	10	7	8	7	8	3	7	6
4	1	2	5	4	8	7	5	4	4	5	6	7	7	5	6	7	7	8	6	6
5	1	2	3	6	5	6	4	5	4	5	6	5	5	4	7	6	7	5	7	6
6	2	3	3	3	4	6	2	3	4	4	4	3	6	5	3	6	7	5	5	6
7	1	1	4	5	6	5	6	5	6	5	4	6	3	6	5	6	3	4	5	4
8	2	1	6	5	6	7	6	8	5	7	9	9	7	7	7	5	8	6	7	7
9	1	1	3	5	7	5	4	6	6	5	3	4	5	3	3	4	1	3	7	2
10	1	1	6	6	6	7	6	8	6	8	6	7	7	6	7	5	5	6	6	6
11	1	1	4	3	8	6	5	7	8	5	3	2	3	3	2	4	2	5	7	5
12	1	3	5	3	4	4	6	5	7	6	6	7	7	6	7	7	7	8	7	6
13	3	3	6	4	7	7	6	8	8	7	8	8	8	7	6	6	9	8	5	5
14	1	1	4	5	7	2	5	5	8	5	6	8	7	5	6	3	5	7	8	7
15	2	2	7	7	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7

16	1	1	8	4	7	5	5	7	7	7	7	8	8	9	3	4	4	8	4	6
17	3	1	6	7	8	7	5	7	5	5	8	8	6	6	6	7	5	8	6	7
18	2	1	7	8	8	8	7	5	7	9	10	7	5	5	5	6	6	3	7	7
19	1	1	8	8	8	8	8	8	6	7	9	9	9	8	9	8	10	10	8	5
20	2	1	7	7	7	7	7	7	7	7	10	5	5	7	4	7	5	7	7	7
21	3	2	5	4	4	4	3	1	1	2	3	0	0	2	0	2	0	0	1	1
22	2	1	9	9	10	9	5	9	9	8	9	7	8	7	6	9	8	7	9	9
23	3	2	5	5	8	8	0	5	5	5	6	6	7	5	8	7	8	9	3	4
24	3	3	8	9	8	9	5	9	6	5	5	2	7	4	4	7	4	3	7	5
25	1	2	8	8	9	9	8	8	9	8	7	8	9	8	6	8	9	9	8	9
26	2	1	8	8	9	8	7	9	9	8	8	8	9	9	9	8	9	9	9	9
27	1	1	8	8	9	8	6	8	9	8	8	9	7	5	6	7	6	6	9	4
28	2	4	5	5	5	5	5	6	5	4	6	5	5	5	5	4	5	4	5	5
29	1	1	6	5	6	5	5	6	5	6	4	6	5	5	5	5	6	5	5	5
30	2	1	7	7	5	8	3	8	3	2	2	4	7	5	5	3	6	6	7	5
31	3	1	6	5	6	5	5	7	2	5	1	5	5	5	5	5	5	6	4	7
32	2	1	8	9	9	8	8	8	9	9	9	9	8	8	9	9	10	9	9	9
33	2	1	7	7	8	7	6	6	7	7	7	6	8	7	7	7	7	7	8	7
34	1	1	6	6	7	6	6	7	7	5	6	7	7	6	8	6	9	6	7	7
35	1	2	5	5	5	8	5	9	8	8	8	8	8	8	5	5	5	5	5	8
36	2	1	8	8	10	6	8	6	9	9	9	9	9	8	8	9	8	8	7	8
37	2	4	3	3	3	3	2	1	8	2	3	2	2	2	8	8	7	8	7	8
38	2	1	6	6	7	7	7	6	8	5	5	5	5	5	5	5	6	7	6	6
39	2	3	5	6	4	5	7	6	5	5	6	6	7	5	6	6	5	5	5	6
40	3	1	8	6	9	8	5	9	6	7	8	7	7	6	8	6	6	8	7	8
41	2	1	5	5	5	5	5	5	5	5	5	3	3	3	7	6	5	3	5	5
42	3	3	6	6	5	4	5	7	3	4	8	7	7	5	5	7	5	6	3	8
43	3	1	8	6	7	8	8	8	7	7	7	4	7	6	7	7	6	6	6	7
44	2	2	7	7	9	8	6	5	7	7	9	8	8	7	7	6	7	7	7	7
45	2	1	7	6	7	8	5	9	8	9	7	7	7	7	7	8	10	10	8	7
46	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
47	3	1	8	8	7	8	6	7	9	8	9	9	9	8	7	7	9	8	9	9
48	1	1	8	7	6	5	6	7	5	6	10	8	7	7	6	7	7	8	7	9
49	2	2	7	7	7	7	5	8	8	8	7	7	7	8	7	6	5	5	5	6
50	2	1	5	5	6	8	5	9	7	7	10	10	9	5	6	7	8	7	7	8

51	3	4	7	7	7	6	5	8	7	4	5	5	5	5	6	7	7	5	7	7
52	2	1	7	7	5	7	7	5	5	5	5	5	4	5	5	5	3	7	7	5
53	3	1	9	8	9	8	8	9	7	8	9	9	7	9	8	8	7	9	8	9
54	3	3	7	5	7	2	2	5	2	2	9	5	6	10	1	0	1	3	5	5
55	1	1	10	8	10	7	6	10	8	7	6	7	8	8	8	7	7	6	8	7
56	1	1	6	5	5	6	6	6	7	5	7	4	5	5	5	5	7	4	6	5
57	2	1	8	8	7	8	8	8	7	8	8	8	7	8	8	8	7	8	9	9
58	2	1	7	7	7	7	7	7	7	3	6	7	7	6	8	8	9	7	8	8
59	2	2	8	8	8	6	6	8	7	9	8	9	8	8	9	9	10	8	8	10
60	3	2	8	8	7	9	9	6	7	8	7	8	8	8	8	8	7	7	7	8
61	1	2	5	8	6	9	8	9	9	8	9	9	7	8	5	9	8	8	8	9
62	2	1	5	5	8	8	6	10	9	7	9	8	7	9	8	7	8	9	7	8
63	2	1	10	10	10	10	0	5	6	7	3	1	3	8	3	3	4	7	7	7
64	1	1	7	8	8	9	6	8	8	8	8	8	9	9	9	9	9	5	8	7
65	2	2	6	4	5	6	6	5	5	5	6	5	5	6	5	5	6	4	5	5
66	1	1	7	7	8	8	5	8	7	7	8	8	8	7	5	5	6	5	5	5
67	2	1	7	5	7	8	10	9	7	8	10	10	9	9	9	9	9	8	8	9
68	1	1	9	8	8	9	9	8	10	7	10	8	7	9	9	10	10	9	9	10
69	2	1	6	5	5	7	4	7	5	5	7	7	5	7	6	4	4	7	2	4
70	2	3	10	7	6	10	9	5	8	7	6	7	7	8	7	6	7	8	7	8
71	1	1	6	5	8	7	3	5	6	6	7	7	8	6	7	8	7	6	7	4
72	1	5																		
73	1	1	5	5	5	5	5	5	5	5	6	6	7	7	5	6	7	5	5	5
74	1	1	5	5	7	10	8	7	7	7	6	5	5	6	4	6	5	6	5	5
75	3	2	7	6	8	8	4	8	8	9	9	9	8	8	8	9	6	7	9	9

Description:

Frequency 1) every day; 2) 2 or 3 times a week; 3) less than 1 times a week; 4) never used

(3) Table B-3 The process of extraction factors (2008)

NO	Factor1_g	Factor2_g	Factor3_g	Factor4_g	Factor1_y	Factor2_y	Factor3_y	Factor4_y
1	-0.55198	0.81232	-0.13569	-0.08327	-0.34901	0.74048	-0.12219	-0.0939
2	0.54554	0.31062	0.24068	0.52538	.	.	.	.
3	-0.07758	0.71023	0.16753	0.5025	-0.45456	1.12485	0.5202	0.57982
4	0.39354	0.39661	0.89829	-0.57433	0.72589	-0.39769	-0.66528	-0.7622
5	0.06284	-0.14137	-0.96599	-1.06684	0.71826	-0.95771	-0.99819	-0.69679
6	0.33533	0.37929	-1.28776	1.46977	0.36682	-1.14626	-1.39196	-1.20979
7	-0.33447	-0.37857	-0.97474	-0.55883	-0.65046	-0.67931	-0.74884	-0.19797
8	.	.	.	.	-0.01493	1.03842	-0.77459	0.20902
9	-0.9461	-0.79865	-0.98101	-1.83781	-1.2674	-0.97957	0.07953	-1.10233
10	.	.	.	.	-0.39594	0.26973	-0.30206	0.43922
11	.	.	.	.	-0.7106	-1.84297	0.27284	-0.44693
12	1.47216	-0.07716	-1.0887	-0.42321	1.3097	0.1893	-1.89807	-0.79601
13	1.28502	-1.90009	-0.49239	-0.73204	0.18317	1.05346	-0.85952	0.02917
14	0.36949	-2.54378	-0.07251	1.59279	0.5187	1.01815	-0.78368	-2.55313
15	0.4137	0.05555	0.14446	0.09415	0.4137	0.05555	0.14446	0.09415
16	-0.10607	1.20065	-1.53948	-0.21778	-1.39908	1.67107	-0.25821	-0.31355
17	0.03126	0.54145	0.5206	-0.03261	-0.05825	0.06228	0.12743	-0.05402
18	0.07286	-0.35524	1.76234	-0.589	-0.82884	-0.04484	0.80681	0.76196
19	-1.71604	-2.38243	-2.55467	6.12613	0.90898	0.74576	0.22978	0.46076
20	-0.57491	-0.21904	0.3469	1.12971	-0.57491	-0.21904	0.3469	1.12971
21	.	.	.	.	-3.018	-2.46063	-0.62534	-0.29954
22	0.51427	-0.87861	1.81721	-0.72351	0.46401	0.0652	2.07351	0.08918
23	-1.00463	-0.78932	-0.75146	-1.69514	0.71394	-0.31713	-0.47303	-1.35121
24	-1.21685	-1.65309	2.17898	0.52	-1.21685	-1.65309	2.17898	0.52
25	1.29762	-0.08505	0.60017	1.96866	0.82309	0.30735	1.12069	0.41432
26	1.12835	0.40808	0.56842	0.27622	1.21491	0.79464	0.95386	-0.05179

27	-0.03725	-0.1136	0.12509	-0.05932	-0.20532	0.19909	1.42672	-0.1077
28	-0.87022	-0.35851	-0.90787	0.86266	-0.73891	-0.24993	-0.773	-0.50291
29	-0.4968	-0.76011	-0.98996	0.1051	-0.37583	-0.46599	-0.4917	-0.44435
30	.	.	.	.	-0.44615	-1.3818	0.87391	-0.93185
31	.	.	.	.	-0.34516	-1.15316	-0.49994	-0.14958
32	1.29878	0.4203	1.17746	0.74679	1.46849	0.56989	0.85107	0.37078
33	0.42511	0.15662	0.21901	-0.748	0.51027	0.06111	0.57245	-0.43401
34	0.4264	0.31776	0.48397	-0.24049	0.89987	0.12955	-0.22948	-0.93548
35	-1.04283	1.80052	-0.65868	0.5301	-0.83668	1.34861	-0.6759	0.60482
36	0.28719	1.28112	0.63107	0.39168	0.76086	1.26416	0.57377	-0.2116
37	-3.61373	2.02609	1.6382	1.39403	3.15463	-2.79308	-1.93871	-2.50813
38	-0.17481	-1.37406	-0.22376	0.75514	0.06197	-0.94055	0.18011	-0.08618
39	.	.	.	.	-0.20272	-0.05413	-1.17959	0.1109
40	0.21461	-0.24064	-0.9784	-0.31144	0.14187	0.15953	0.68923	0.14625
41	.	.	.	.	-0.01993	-1.58124	-0.83073	-0.15946
42	-0.73176	-0.03012	-0.93309	0.19032	-0.5047	0.47728	-1.2185	0.02865
43	.	.	.	.	-0.11947	-0.56901	0.32831	1.16943
44	.	.	.	.	0.10093	0.71748	0.59766	-0.44975
45	.	.	.	.	1.33011	-0.14104	0.02585	0.39645
46	0.51046	1.52654	0.38508	0.57728	-1.07328	-1.2213	-1.84651	-1.12389
47	0.29755	1.98463	-0.8431	0.2683	0.92873	0.92244	0.70127	-0.32666
48	-1.27566	0.01856	-0.75845	-1.20951	0.26106	0.72302	-0.27864	0.05727
49	-0.51441	0.9804	-0.46561	0.11106	-0.7655	0.82772	0.31994	0.18115
50	0.21296	1.11928	-1.25311	0.0246	0.53205	1.135	-0.8538	0.11509
51	-0.15727	-0.88057	-0.11786	-0.70195	0.36763	-1.01092	0.63803	-0.59252
52	-0.47074	-1.49416	0.23835	0.55897	-0.47074	-1.49416	0.23835	0.55897
53	0.09436	-0.09373	-0.17	0.11636	0.3856	0.66066	0.91506	0.94958
54	-3.30757	1.92746	0.2653	-1.97367	-3.30757	1.92746	0.2653	-1.97367
55	.	.	.	.	-0.05683	0.44906	1.86928	-0.35718

56	-0.39201	-0.50894	-0.40589	-0.32656	-0.29058	-0.58275	-0.47311	-0.06992
57	.	.	.	.	0.77239	0.07675	0.5596	0.86327
58	0.28433	0.13855	0.78669	-0.37827	1.42593	-0.55431	0.26456	-0.69622
59	1.30088	0.63723	0.03313	-0.33337	1.44983	0.80474	0.25919	-0.17531
60	0.51437	-0.15148	0.57336	0.75455	0.44451	0.08849	0.46605	1.01206
61	1.1441	0.49738	-0.55526	1.97758	0.69842	0.36768	-0.11346	1.37439
62	0.59941	0.80637	-0.39053	0.38544	0.78849	1.04945	-0.46118	0.30316
63	-0.03705	-1.43062	3.65747	-1.99289	-1.33551	-2.1803	3.72226	-0.68648
64	.	.	.	.	0.6373	0.78912	0.72677	0.08255
65	-0.50739	-0.1806	-0.83767	-0.23134	-0.56871	-0.39349	-0.83036	0.01518
66	-1.51786	0.79319	-0.11139	-0.00613	-1.25209	1.06215	0.63119	0.05055
67	.	.	.	.	1.08544	1.34728	-0.8361	1.27025
68	1.40944	-0.61066	0.359	1.41061	1.6773	0.13935	0.77613	0.88768
69	-0.48892	-0.54075	-1.98012	-0.73764	-1.28058	0.43586	-0.94629	0.43543
70	0.83002	-0.87226	1.09612	0.63476	0.33932	-0.54523	0.84259	0.97958
71	.	.	.	.	0.47351	0.17517	0.00249	-1.23523
72	0.0141	0.86807	0.49489	-0.38473	.	.	.	.
73	-0.36601	-0.56096	-0.84545	-0.44243	-0.1968	0.3325	-1.05027	-0.6647
74	.	.	.	.	-0.78105	-0.92249	-0.07972	1.67951
75	0.98078	1.00853	-0.22218	-0.84939	0.81931	0.83706	0.41879	-0.15749
Average	0.2144	0.910425	-0.178935	-0.46633	0.23515	0.78877	0.1483	-0.125695

(4) Table B-4 The improvement questionnaire of GOOGLE and YAHOO in Japan (2009)

検索エンジンについてのアンケート

1. あなたは Google、Yahoo などの Web 検索エンジンをどの程度使っていますか。あてはまるものの数字に○を付けてください。

① 毎日　② 2、3 回/週　③ 1 回未満／週　④ 使ったことがない

2. 以下の検索エンジンを使う頻度はどの程度ですか。当てはまるものに○を付けてください。

➢ Google　よく使う、まあまあ使う、時々使う、ほとんど使わない、全く使わない

➢ Yahoo　よく使う、まあまあ使う、時々使う、ほとんど使わない、全く使わない

3. 多数と小数いう概念について伺います。

1) 全体の何%くらいから多数だと感じ、何%を超えれば絶対多数だと思いますか？2 つの数字に○を付けてください。

50%　55%　60%　65%　70%　75%　80%　85%　90%　95%　100%

2) 全体の何%以下少数だと感じ、何%以下を超えれば絶対少数だと思いますか？2 つの数字に○を付けてください。

0%　5%　10%　15%　20%　25%　30%　35%　40%　45%　50%

4. 下記は Google、Yahoo が提供する情報についての質問です。それぞれに対し、自らの経験に基づき、その度合いをチェック（∨）してください。ただし、①最低　②非常に低い　③低い　④中間　⑤高い　⑥非常に高い　⑦最高　ということです。

1) 情報データ自体の信頼性についてどう思いますか

① ② ③ ④ ⑤ ⑥ ⑦　Googleについて

① ② ③ ④ ⑤ ⑥ ⑦　Yahooについて

2) 情報データの客観性についてどう思いますか

① ② ③ ④ ⑤ ⑥ ⑦　Googleについて

① ② ③ ④ ⑤ ⑥ ⑦　Yahooについて

3) 信頼のおけそうなデータサイトを表示しますか

① ② ③ ④ ⑤ ⑥ ⑦　Googleについて

① ② ③ ④ ⑤ ⑥ ⑦　Yahooについて

4) 検索された情報の正確さはどうですか

① ② ③ ④ ⑤ ⑥ ⑦　Googleについて

① ② ③ ④ ⑤ ⑥ ⑦　Yahooについて

5) 情報データに付加価値を感じますか

① ② ③ ④ ⑤ ⑥ ⑦　Googleについて

① ② ③ ④ ⑤ ⑥ ⑦　Yahooについて

6) 目的の情報データへの到達性についてどう思いますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

7)　検索された情報データサイトとデータに接続する安全性についてどう思いますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

8)　適量の情報データを表示しますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

9)　情報データが最新のものですか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

10)　理解しやすい状態で表示されますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

11)　表示される情報データは、内容がわかりやすいですか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

12)　情報データの表示形式は統一されていますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

13)　情報データの表示形式は簡潔ですか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

14)　同時に複数の情報を調べる操作の簡易さについてどう思いますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

15)　検索された情報データは加工・編集しやすいですか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

16)　情報データの構成はきちんとしていますか

① ② ③ ④ ⑤ ⑥ ⑦ ① ② ③ ④ ⑤ ⑥ ⑦

Googleについて　Yahooについて

(5) Table B-5 The Data of Survey for GOOGLE (2009)

NO	frequency	Google	Qg1	Qg2	Qg3	Qg4	Qg5	Qg6	Qg7	Qg8	Qg9	Qg10	Qg11	Qg12	Qg13	Qg14	Qg15	Qg16
1	1	1	5	6	4	6	5	5	4	4	6	5	5	5	6	6	5	6
2	2	3	4	4	4	3	4	5	4	5	5	4	4	4	4	4	4	4
3	2	4	4	3	4	4	5	5	5	4	4	4	4	6	4	5	5	4
4	2	3	7	7	7	5	5	4	5	4	4	5	4	4	4	4	4	4
5	1	3	5	5	3	7	3	6	4	6	6	5	6	6	6	4	5	5
6	1	4	6	6	7	6	4	5	6	6	4	5	5	4	4	5	6	4
7	1	1	3	4	7	5	3	5	3	4	3	4	5	5	2	3	2	5
8	1	3	3	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9	1	3	4	4	3	5	3	3	3	4	3	5	4	3	4	4	5	3
10	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	1	3	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	4
12	1	5	4	4	4	4	2	3	2	2	3	2	2	2	6	4	3	3
13	1	1	4	5	4	6	4	6	3	5	2	5	4	4	5	6	5	5
14	1	1	4	5	5	3	5	5	5	5	6	5	5	4	4	5	4	5
15	2	4	4	4	4	4	4	2	4	2	3	1	4	4	2	2	4	4
16	2	5	5	5	5	5	5	4	3	4	4	3	5	4	4	4	4	4
17	1	1	4	3	5	6	4	6	4	4	5	5	4	4	4	4	4	4
18		1	6	5	7	7	7	7	7	2	5	7	6	5	7	7	4	5
19	2	1	4	4	4	4	5	5	5	6	6	5	5	6	6	5	4	4
20	1	1	5	4	4	4	3	6	3	4	5	3	3	4	5	5	3	2
21	2	3	4	3	3	3	4	3	3	2	3	2	4	3	3	4	4	4
22	1	3	6	6	5	6	4	5	5	5	4	5	5	5	4	4	3	4
23	2	2	6	6	6	6	6	6	5	4	5	5	5	6	4	5	5	5
24	2	5	5	6	6	6	5	5	5	4	4	3	3	5	5	5	5	5
25	1	3	4	4	4	3	4	3	4	4	6	3	3	3	3	4	6	3
26	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5
27	1	1	6	6	6	6	5	7	6	5	7	4	5	5	5	5	3	5

28	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
29	2	1	3	4	3	4	3	3	4	3	4	3	4	3	4	3	4	3
30	1	1	5	5	5	6	6	5	4	4	5	4	4	5	5	4	4	6
31	1		5	4	5	4	4	4	4	5	4	5	5	4	4	5	4	4
32	1	4	6	6	5	4	5	3	4	3	6	3	2	4	4	4	4	4
33	1	1	5	5	5	4	4	4	4	4	4	4	5	5	4	5	4	5
34	1	1	5	4	5	5	3	6	4	6	5	5	5	5	6	6	6	5
35	1	1	5	5	5	4	4	5	5	4	5	5	5	5	5	5	5	4
36	1	1	4	5	5	4	5	4	4	4	4	5	5	5	5	5	5	5
37	2	2	4	4	5	4	5	4	3	4	5	4	4	4	4	4	3	4
38	2	2	4	5	6	6	5	5	5	6	5	5	5	5	5	5	5	5
39	1	1	7	6	7	6	6	6	7	6	7	7	6	5	5	7	4	5
40	1	1	5	6	4	6	5	5	5	6	6	6	6	5	6	6	5	6
41	1	1	5	7	6	7	7	7	6	4	7	7	7	7	7	7	7	7
42	2	4	4	4	4	6	3	3	3	4	5	7	7	6	6	7	5	6
43	2	3	5	5	4	5	3	5	4	5	6	4	4	5	4	4	5	5
44	2	3	4	4	4	5	4	5	4	4	5	5	4	4	5	4	4	4
45	2	2	4	3	3	5	2	3	5	5	5	4	3	5	2	2	6	5
46	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
47	2	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
48	2	5																
49	2	2	5	4	5	5	5	4	6	6	5	4	4	5	5	5	6	5
50	1	3	5	6	5	4	4	5	6	6	5	5	5	5	4	4	3	4
51	2	2	5	4	5	5	5	5	5	5	5	6	5	6	5	5	5	5
52	2	4	4	3	5	5	5	5	5	5	5	3	3	3	5	7	7	7
53	3	1	6	5	5	6	4	6	5	5	6	4	5	5	4	5	5	6
54	2	4	4	4	4	5	4	4	5	5	5	4	4	4	4	4	4	4
55	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
56	2	1	4	4	4	4	4	5	5	4	5	4	5	4	4	4	5	4

57	2	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
58	2	3	4	2	5	4	2	4	3	6	6	6	6	6	6	6	3	5
59	4		5	5	5	5	5	5	5	4	4	6	6	6	6	6	5	6
60	1	5	1	1	1	1	3	4	5	4	4	5		4	5	5	7	4
61	3	3	4	4	4	4	3	4	4	4	5	1	4	6	3	6	4	4
62	2	3	3	4	4	4	3	3	4	4	4	3	5	4	3	3	3	4
63	2	3	5	5	4	6	4	5	6	5	5	6	6	6	5	5	5	6
64	1	3	3	3	3	3	4	4	4	4	4	3	4	5	4	4	3	3
65	2	1	5	5	5	5	4	4	5	5	5	4	5	4	5	5	5	5
66	2	1	6	6	6	5	7	6	5	5	7	6	6	7	6	5	6	6
67	2	3	4	4	6	6	7											
68	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
69	1	1	3	3	3	4	3	6	3	1	5	3	2	5	3	6	6	4
70	2	3	3	4	5	5	5											
71	1	2	5	5	5	7	7	7	5	5	5	7	7	7	7	6	6	5
72	2	2	4	5	3	5	5	4	5	5	5	5	5	5	5	5	5	5
73	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
74	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
75	1	1	4	4	4	4	4	4	4	4	3	4	4	2	4	4	4	4
76	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
77	1	2	5	5	6	7	3											
78	1	4	3	3	4	5	4	4	5	5	4	5	5	4	5	5	5	5
79	1	1	5	4	4	3	6	5	3	3	5	3	4	5	3	5	7	3
80	1	5	4	4	4	3	1	1	2	1	4	3	3	4	3	3	3	2
81	2	3	3	4	4	3	4	5	4	4	3	4	4	4	2	4	4	3
82	3	1	6	4	5	4	4	3	2	3	4	3	3	4	4	4	5	3
83	2	4	4	4	4	4	4	5	4	3	6	4	5	7	4	7	4	5
84	2	2	4	4	5	5	4	5	4	5	5	5	4	4	4	5	4	4
85	1	1	4	4	4	4	4	3	4	4	4	5	4	2	3	4	5	4

86	2	1	6	4	7	7	6	7	7	6	4	6	5	6	5	7	7	6
87	2	3	5	4	6	6	5	5	5	5	5	5	5	5	5	5	5	5
88	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
89	1	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
90	1	2	6	6	4	5	5	6	4	5	6	6	6	6	6	6	5	6
91	1	1	4	5	6	5	5	7	5	4	5	6	6	6	5	5	6	5
92	2	1	6	6	6	6	6	7	6	6	6	6	6	6	6	6	6	6
93	2	3	4	4	4	4	4	4	4	3	3	4	4	4	4	4	4	3
94	1	4	5	4	4	4	4	5	3	4	4	3	4	2	3	3	2	2
95	2	2	5	4	7	6	4	7	4	4	4	7	3	4	3	2	3	5
96	1	1	6	6	6	6	5	7	5	6	6	7	7	6	7	7	7	7
97	1	1	6	6	6	6	6	6	6	6	6	6	7	6	7	7	6	6
98	1	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
99	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
100	1	1	6	6	7	7	7	7	7	7	7	7	7	7	7	7	6	6
101	1	1	6	6	7	7	7	7	7	5	6	7	7	7	7	7	6	6
102	1	2	5	6	5	5	4	6	4	6	4	4	6	4	5	4	4	4
103	2	1	4	5	3	4	5	5	2	2	4	3	3	5	2	6	5	3
104	1	3	6	5	4	5	3	7	7	6	6	7	5	7	7	5	3	5
105	2	4	5	5	5	6	5	5	6	6	4	5	5	4	4	4	5	5
106	2	2	4	6	6	6	5	5	6	6	5	7	6	6	6	6	6	6
107	2	4	3	3	3	3	3	3	3	3	3	4	3	4	4	4	4	4
108	2	4	4	4	5	4	4	4	4	4	4	3	4	4	4	4	5	4
109	2	2	4	5	4	4	4	4	4	4	5	4	5	4	5	4	6	5
110	1	1	5	5	4	5	5	4	5	6	5	4	4	4	4	5	4	4
111	1	3	5	5	6	5	5	6	5	6	5	4	4	4	5	6	5	5
112	2	2	4	5	4	3	4	4	4	5	3	3	4	4	4	3	4	5
113	2	2	4	4	5	5	4	5	4	5	4	5	4	4	4	4	4	5
114	2	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	5

115	1	1	5	5	5	6	6	5	5	6	6	5	5	5	6	5	5	5
116	1	1	5	5	6	6	4	6	4	6	4	6	6	6	5	7	5	5
117	1	1	5	5	3	6	5	6	3	5	5	5	5	4	4	6	6	5
118	1	1	4	4	5	5	4	4	5	5	5	5	5	5	5	6	5	5
119	1	1	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4
120	1	1	4	4	4	4	4	6	4	6	6	5	4	2	4	6	4	4

(6) Table B-6 The Data of Survey for YAHOO (2009)

NO	frequency	yahoo	Qy1	Qy2	Qy3	Qy4	Qy5	Qy6	Qy7	Qy8	Qy9	Qy10	Qy11	Qy12	Qy13	Qy14	Qy15	Qy16
1	1	1	4	5	4	5	4	4	4	4	5	6	5	5	5	4	4	5
2	2	1	5	4	4	4	4	5	4	4	5	5	5	4	4	5	5	5
3	2	1	4	3	4	4	5	5	5	4	4	4	4	6	4	5	5	4
4	2	1	7	7	7	5	5	4	5	5	4	5	4	5	4	3	4	5
5	1	1	5	5	6	6	5	4	6	6	6	6	6	6	6	5	5	5
6	1	1	5	4	6	3	4	7	6	6	4	3	3	4	4	5	6	4
7	1	1	4	5	2	3	5	5	3	3	5	2	3	5	4	6	1	4
8	1	1	3	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9	1	1	4	4	3	5	3	3	4	4	3	5	4	3	4	4	5	3
10	3	2	3	3	3	3	3	4	3	3	3	1	3	3	3	3	3	3
11	1	1	6	4	2	3	4	4	4	4	4	4	4	4	4	4	4	4
12	1	1	4	4	4	4	4	3	3	2	3	4	4	4	4	4	3	3
13	1	1	4	5	5	4	4	5	4	3	4	5	4	5	3	4	6	6
14	1	4	4	4	3	4	2	3	4	3	5	4	4	5	5	4	4	4
15	2	1	4	5	6	4	4	3	5	2	4	4	4	4	4	2	4	4
16	2	1	5	5	5	5	5	4	3	4	4	3	5	4	4	3	4	3
17	1	3	4	3	3	4	4	3	4	3	4	4	4	4	4	4	4	4
18		4	4	5	6	4	2	6	7	2	5	7	3	5	3	7	3	5
19	2	1	4	4	5	4	5	5	4	5	5	5	5	5	6	5	4	4

20	1	2	5	4	4	4	3	6	3	4	5	3	2	3	5	5	2	3
21	2	1	4	4	3	3	4	3	3	2	3	2	4	3	3	4	4	4
22	1	1	6	6	5	6	4	5	6	5	4	5	5	5	4	4	3	4
23	2	1	6	6	6	6	6	6	4	4	4	5	5	6	5	6	5	6
24	2	1	5	4	4	5	6	5	4	5	5	5	6	4	6	6	6	5
25	1	1	6	6	4	4	4	3	4	4	7	5	5	3	3	4	6	4
26	1	2	4	4	4	4	4	4	4	4	5	5	5	5	5	4	5	5
27	1	2	6	6	6	5	5	6	5	5	6	4	5	5	6	5	3	5
28	1	2	5	5	5	5	5	5	6	5	4	5	5	5	5	5	5	5
29	2	1	3	4	3	4	3	3	4	3	4	3	4	3	4	3	4	3
30	1	1	5	5	5	5	6	5	4	4	5	4	4	5	5	4	4	6
31	1	1	5	4	5	5	5	5	4	5	4	5	5	4	4	6	4	4
32	1	1	6	6	6	4	5	3	3	2	6	3	3	4	4	4	4	4
33	1	1	4	4	4	3	4	3	4	4	4	4	5	4	4	4	4	4
34	1	4	5	4	4	4	3	5	4	6	5	5	5	4	5	6	6	5
35	1	1	5	5	5	4	4	5	5	4	5	5	5	5	5	5	5	4
36	1	1	5	5	4	4	5	4	4	4	4	5	5	5	5	5	5	5
37	2	2	4	4	4	4	5	4	3	4	5	4	4	4	4	4	4	4
38	2	3	3	3	3	3	2	3	3	3	4	3	4	4	4	4	3	3
39	1	3	5	5	7	6	6	5	6	5	6	5	6	5	5	6	4	5
40	1	1	5	5	6	4	4	4	4	5	5	5	5	5	6	4	4	5
41	1	2	7	6	7	7	7	5	6	6	7	7	7	7	7	7	7	7
42	2	1	5	4	5	6	5	4	5	4	6	7	7	6	6	7	5	7
43	2	2	6	5	5	5	4	5	5	5	6	5	4	5	4	4	4	6
44	2	3	4	4	4	5	4	5	4	4	5	5	4	4	5	4	4	4
45	2	2	4	3	3	5	2	3	5	5	5	4	3	5	2	2	6	5
46	2	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
47	2	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
48	2	3	4	4	4	4	4	4	5	5	4	3	4	3	3	3	3	3

49	2	2	6	5	6	5	5	4	6	5	3	4	4	4	6	5	5	5
50	1	3	5	6	5	4	4	6	6	6	5	5	5	6	4	4	3	5
51	2	4	4	4	5	4	5	5	5	4	5	5	5	5	4	5	5	5
52	2	1	5	3	5	5	5	5	5	5	5	3	3	3	5	7	7	7
53	3	3	5	4	4	6	4	5	4	5	5	4	4	5	4	5	4	6
54	2	2	4	4	4	5	4	4	6	6	6	6	5	4	4	4	4	4
55	3	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
56	2	1	4	4	4	4	4	5	5	5	6	5	5	5	6	6	7	5
57	2	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
58	2	3	4	2	5	4	2	4	3	6	6	6	6	6	6	6	3	5
59	4		5	5	5	5	5	6	5	5	6	5	4	4	6	6	4	6
60	1	1	7	7	7	4	5	6	3	4	4	5		4	5	5	7	4
61	3	1	4	4	4	4	4	4	4	4	6	5	1	2	3	5	3	3
62	2	1	4	5	5	4	4	5	6	5	4	4	3	4	3	3	3	4
63	2	3	5	5	4	6	4	5	6	5	5	6	6	6	5	5	5	6
64	1	3	4	3	3	3	4	5	3	4	5	3	4	5	4	5	3	3
65	2	2	5	5	5	5	4	4	5	5	5	4	5	4	5	5	5	5
66	2	2	7	6	7	7	6	6	7	6	6	7	6	7	6	5	6	6
67	2	1	6	3	6	6	6											
68	2	1	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4
69	1	3	3	5	3	4	3	3	3	1	5	3	2	5	2	3	3	3
70	2	1	5	4	5	4	4											
71	1	1	5	5	5	7	7	5	5	5	5	5	5	7	7	6	6	5
72	2	1	4	5	6	5	5	5	5	5	5	5	5	5	5	5	5	5
73	2	1	4	4	4	4	4	5	4	4	4	5	5	4	4	5	4	5
74	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
75	1	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	4
76	2	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
77	1	1	5	5	6	7	3											

78	1	1	7	6	5	6	6	6	6	6	6	5	6	5	6	6	5	6
79	1	4	3	3	3	3	3	3	3	4	5	3	5	3	4	2	2	3
80	1	1	4	2	4	4	1	1	2	1	5	5	4	1	3	3	3	3
81	2	1	3	3	4	4	4	7	3	4	2	3	4	4	2	3	4	6
82	3	2	3	4	3	4	3	3	3	3	3	4	4	2	3	2	3	2
83	2	1	5	5	4	4	4	5	4	3	6	4	5	7	4	7	4	5
84	2	2	4	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4
85	1	1	4	4	4	4	4	3	4	4	4	5	4	2	3	4	5	4
86	2	3	4	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4
87	2	3	5	4	6	5	5	5	5	5	5	5	5	5	5	5	5	5
88	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
89	1	5	7	7	7	5	5	3	6	5	4	4	4	4	4	4	4	4
90	1	1	6	6	4	5	5	6	4	5	6	6	6	6	6	6	5	6
91	1	3	4	5	6	5	5	7	5	4	5	6	6	6	5	5	6	5
92	2	1	6	6	6	6	6	7	6	6	6	6	6	6	6	6	6	6
93	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
94	1	1	4	4	4	4	4	5	4	2	3	3	4	2	3	5	2	2
95	2	2	5	4	6	7	4	5	4	4	4	5	3	4	3	2	3	5
96	1	5	5	6	5	5	5	5	5	5	5	6	5	5	5	5	4	5
97	1	5	6	6	6	5	6	5	6	6	6	4	5	5	7	4	6	6
98	1	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
99	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
100	1	4	5	5	6	6	6	6	6	6	6	6	6	6	6	5	5	5
101	1	3	4	4	4	5	3	3	6	2	4	6	6	7	6	5	6	5
102	1	1	4	4	5	4	4	5	4	5	4	4	5	5	5	4	4	4
103	2	4	5	3	6	3	5	5	5	5	3	5	5	5	2	2	5	3
104	1	1	4	5	6	5	3	3	7	3	2	6	6	7	7	5	3	5
105	2	2	5	5	3	3	5	4	4	3	4	5	5	3	5	4	3	5
106	2	1	4	5	5	6	5	6	6	6	5	5	5	3	6	6	5	6

107	2	1	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4
108	2	1	5	4	5	4	4	4	4	4	4	3	4	4	5	4	5	5
109	2	1	4	6	4	4	4	4	4	4	5	4	6	4	5	4	6	5
110	1	3	5	5	5	4	5	5	6	4	5	5	4	4	5	4	4	4
111	1	1	5	5	6	5	5	6	5	5	5	5	4	4	5	6	5	5
112	2	2	4	5	4	5	5	3	4	5	3	4	4	4	5	3	4	5
113	2	2	4	4	5	6	4	5	4	5	4	5	4	4	4	4	4	5
114	2	1	5	4	4	4	4	4	4	4	4	5	5	4	4	4	4	5
115	1	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
116	1	3	5	5	6	2	1	1	6	1	4	3	5	6	4	5	5	5
117	1	1	5	5	4	4	5	3	5	4	3	4	5	4	4	3	4	4
118	1	1	4	4	4	4	4	4	5	5	5	5	5	5	5	6	5	5
119	1	1	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4
120	1	4	4	4	4	4	4	4	4	4	6	6	4	2	4	3	4	4

(7) Table B-7 The aggregation values by MLIOWA with the "most" linguistic quantifier for GOOGLE **(2009)**

*w_i

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Qg1	0.1	0.08	0.08	0.14	0.1	0.12	0.06	0.06	0.08	0.04	0.08	0.08	0.08	0.08	0.08	0.1	0.08	0.12	0.08
Qg2	0.12	0.08	0.06	0.14	0.1	0.12	0.08	0.1	0.08	0.04	0.08	0.08	0.1	0.1	0.08	0.1	0.06	0.1	0.08
Qg3	0.2	0.2	0.2	0.35	0.15	0.35	0.35	0.15	0.15	0.1	0.2	0.2	0.2	0.25	0.2	0.25	0.25	0.35	0.2
Qg4	0.3	0.15	0.2	0.25	0.35	0.3	0.25	0.15	0.25	0.1	0.25	0.2	0.3	0.15	0.2	0.25	0.3	0.35	0.2
Qg5	0.25	0.2	0.25	0.25	0.15	0.2	0.15	0.15	0.15	0.1	0.2	0.1	0.2	0.25	0.2	0.25	0.2	0.35	0.25
Qg6	0.25	0.25	0.25	0.2	0.3	0.25	0.25	0.15	0.15	0.1	0.2	0.15	0.3	0.25	0.1	0.2	0.3	0.35	0.25
Qg7	0.2	0.2	0.25	0.25	0.2	0.3	0.15	0.15	0.15	0.1	0.2	0.1	0.15	0.25	0.2	0.15	0.2	0.35	0.25
Qg8	0.32	0.39	0.32	0.32	0.47	0.47	0.32	0.24	0.32	0.16	0.32	0.16	0.39	0.39	0.16	0.32	0.32	0.16	0.47
Qg9	0.47	0.39	0.32	0.32	0.47	0.32	0.24	0.24	0.24	0.16	0.32	0.24	0.16	0.47	0.24	0.32	0.39	0.39	0.47

Qg10	0.39	0.32	0.32	0.39	0.39	0.39	0.32	0.24	0.39	0.16	0.32	0.16	0.39	0.39	0.08	0.24	0.39	0.55	0.39
Qg11	0.39	0.32	0.32	0.32	0.47	0.39	0.39	0.24	0.32	0.16	0.32	0.16	0.32	0.39	0.32	0.39	0.32	0.47	0.39
Qg12	0.39	0.32	0.47	0.32	0.47	0.32	0.39	0.24	0.24	0.16	0.32	0.16	0.32	0.32	0.32	0.32	0.32	0.39	0.47
Qg13	0.47	0.32	0.32	0.32	0.47	0.32	0.16	0.24	0.32	0.16	0.32	0.47	0.39	0.32	0.16	0.32	0.32	0.55	0.47
Qg14	0.47	0.32	0.39	0.32	0.32	0.39	0.24	0.24	0.32	0.16	0.32	0.32	0.47	0.39	0.16	0.32	0.32	0.55	0.39
Qg15	0.39	0.32	0.39	0.32	0.39	0.47	0.16	0.24	0.39	0.16	0.32	0.24	0.39	0.32	0.32	0.32	0.32	0.32	0.32
Qg16	0.47	0.32	0.32	0.32	0.39	0.32	0.39	0.24	0.24	0.16	0.32	0.24	0.39	0.39	0.32	0.32	0.32	0.39	0.32
ind(p_i)	5	4	4	5	5	5	4	3	4	2	4	3	5	5	3	4	4	6	5
choice	1	1	-1	1	1	-1	1	1	1	-1	1	-1	1	1	-1	-1	1	1	1
sup_i	44	46	46	44	44	44	46	8	46	1	46	8	44	44	8	46	46	12	44
sup_i/n	0.46	0.48	0.48	0.46	0.46	0.46	0.48	0.08	0.48	0.01	0.48	0.08	0.46	0.46	0.08	0.48	0.48	0.13	0.46
Q(sup_i/n)	0.33	0.37	x	0.33	0.33	x	0.37	0	0.37	x	0.37	x	0.33	0.33	x	x	0.37	0	0.33
w_s(i)	0.01	0.01	x	0.01	0.01	x	0.01	0	0.01	x	0.01	x	0.01	0.01	x	x	0.01	0	0.01
copy(w_s(i))	0.01	0.01	x	0.01	0.01	x	0.01	0	0.01	x	0.01	x	0.01	0.01	x	x	0.01	0	0.01
copy(ind(pi))	5	4	4	5	5	5	4	3	4	2	4	3	5	5	3	4	4	6	5

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
0.1	0.08	0.12	0.12	0.1	0.08	0.1	0.12	0.08	0.06	0.1	0.1	0.12	0.1	0.1	0.1	0.08	0.08	0.08	0.14	0.1	0.1
0.08	0.06	0.12	0.12	0.12	0.08	0.1	0.12	0.08	0.08	0.1	0.08	0.12	0.1	0.08	0.1	0.1	0.08	0.1	0.12	0.12	0.14
0.2	0.15	0.25	0.3	0.3	0.2	0.25	0.3	0.2	0.15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.35	0.2	0.3
0.2	0.15	0.3	0.3	0.3	0.15	0.25	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.25	0.2	0.2	0.2	0.3	0.3	0.3	0.35
0.15	0.2	0.2	0.3	0.25	0.2	0.25	0.25	0.2	0.15	0.3	0.2	0.25	0.2	0.15	0.2	0.25	0.25	0.25	0.3	0.25	0.35
0.3	0.15	0.25	0.3	0.25	0.15	0.25	0.35	0.2	0.15	0.25	0.2	0.15	0.2	0.3	0.25	0.2	0.2	0.25	0.3	0.25	0.35
0.15	0.15	0.25	0.25	0.25	0.2	0.25	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.25	0.2	0.15	0.25	0.35	0.25	0.3
0.32	0.16	0.39	0.32	0.32	0.32	0.39	0.39	0.32	0.24	0.32	0.39	0.24	0.32	0.47	0.32	0.32	0.32	0.47	0.47	0.47	0.32
0.39	0.24	0.32	0.39	0.32	0.47	0.39	0.55	0.32	0.32	0.39	0.32	0.47	0.32	0.39	0.39	0.32	0.39	0.39	0.55	0.47	0.55
0.24	0.16	0.39	0.39	0.24	0.24	0.39	0.32	0.32	0.24	0.32	0.39	0.24	0.32	0.39	0.39	0.39	0.32	0.39	0.55	0.47	0.55
0.24	0.32	0.39	0.39	0.24	0.24	0.39	0.39	0.32	0.32	0.32	0.39	0.16	0.39	0.39	0.39	0.39	0.32	0.39	0.47	0.47	0.55
0.32	0.24	0.39	0.47	0.39	0.24	0.39	0.39	0.32	0.24	0.39	0.32	0.32	0.39	0.39	0.39	0.39	0.32	0.39	0.39	0.39	0.55

0.39	0.24	0.32	0.32	0.39	0.24	0.39	0.39	0.32	0.32	0.39	0.32	0.32	0.32	0.47	0.39	0.39	0.32	0.39	0.39	0.47	0.55
0.39	0.32	0.32	0.39	0.39	0.32	0.32	0.39	0.32	0.24	0.32	0.39	0.32	0.39	0.47	0.39	0.39	0.32	0.39	0.55	0.47	0.55
0.24	0.32	0.24	0.39	0.39	0.47	0.39	0.24	0.32	0.32	0.32	0.32	0.32	0.32	0.47	0.39	0.39	0.24	0.39	0.32	0.39	0.55
0.16	0.32	0.32	0.39	0.39	0.24	0.39	0.39	0.32	0.24	0.47	0.32	0.32	0.39	0.39	0.32	0.39	0.32	0.39	0.39	0.47	0.55
4	3	5	5	5	4	5	5	4	3	5	4	4	4	5	5	5	4	5	6	6	7
1	1	1	1	-1	1	1	1	-1	1	1	1	-1	1	1	1	1	1	1	1	1	1
46	8	44	44	44	46	44	44	46	8	44	46	46	46	44	44	44	46	44	12	12	5
0.48	0.08	0.46	0.46	0.46	0.48	0.46	0.46	0.48	0.08	0.46	0.48	0.48	0.48	0.46	0.46	0.46	0.48	0.46	0.13	0.13	0.05
0.37	0	0.33	0.33	x	0.37	0.33	0.33	x	0	0.33	0.37	x	0.37	0.33	0.33	0.33	0.37	0.33	0	0	0
0.01	0	0.01	0.01	x	0.01	0.01	0.01	x	0	0.01	0.01	x	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0
0.01	0	0.01	0.01	x	0.01	0.01	0.01	x	0	0.01	0.01	x	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0
4	3	5	5	5	4	5	5	4	3	5	4	4	4	5	5	5	4	5	6	6	7

42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0.08	0.1	0.08	0.08	0.08	0.1	0	0.1	0.1	0.1	0.08	0.12	0.08	0.08	0.08	0.14	0.08	0.1	0.02	0.08	0.06	0.1
0.08	0.1	0.08	0.06	0.08	0.1	0	0.08	0.12	0.08	0.06	0.1	0.08	0.08	0.08	0.14	0.04	0.1	0.02	0.08	0.08	0.1
0.2	0.2	0.2	0.15	0.2	0.25	0	0.25	0.25	0.25	0.25	0.25	0.2	0.2	0.2	0.35	0.25	0.25	0.05	0.2	0.2	0.2
0.3	0.25	0.25	0.25	0.2	0.25	0	0.25	0.2	0.25	0.25	0.3	0.25	0.2	0.2	0.35	0.2	0.25	0.05	0.2	0.2	0.3
0.15	0.15	0.2	0.1	0.2	0.25	0	0.25	0.2	0.25	0.25	0.2	0.2	0.2	0.2	0.35	0.1	0.25	0.15	0.15	0.15	0.2
0.15	0.25	0.25	0.15	0.2	0.25	0	0.2	0.25	0.25	0.25	0.3	0.2	0.2	0.25	0.35	0.2	0.25	0.2	0.2	0.15	0.25
0.15	0.2	0.2	0.25	0.2	0.25	0	0.3	0.3	0.25	0.25	0.25	0.25	0.2	0.25	0.35	0.15	0.25	0.25	0.2	0.2	0.3
0.32	0.39	0.32	0.39	0.32	0.39	0	0.47	0.47	0.39	0.39	0.39	0.39	0.32	0.32	0.55	0.47	0.32	0.32	0.32	0.32	0.39
0.39	0.47	0.39	0.39	0.32	0.39	0	0.39	0.39	0.39	0.39	0.47	0.39	0.32	0.39	0.55	0.47	0.32	0.32	0.39	0.32	0.39
0.55	0.32	0.39	0.32	0.32	0.39	0	0.32	0.39	0.47	0.24	0.32	0.32	0.32	0.32	0.55	0.47	0.47	0.39	0.08	0.24	0.47
0.55	0.32	0.32	0.24	0.32	0.39	0	0.32	0.39	0.39	0.24	0.39	0.32	0.32	0.39	0.55	0.47	0.47	0	0.32	0.39	0.47
0.47	0.39	0.32	0.39	0.32	0.39	0	0.39	0.39	0.47	0.24	0.39	0.32	0.32	0.32	0.55	0.47	0.47	0.32	0.47	0.32	0.47
0.47	0.32	0.39	0.16	0.32	0.39	0	0.39	0.32	0.39	0.39	0.32	0.32	0.32	0.32	0.55	0.47	0.47	0.39	0.24	0.24	0.39
0.55	0.32	0.32	0.16	0.32	0.39	0	0.39	0.32	0.39	0.55	0.39	0.32	0.32	0.32	0.55	0.47	0.47	0.39	0.47	0.24	0.39
0.39	0.39	0.32	0.47	0.32	0.39	0	0.47	0.24	0.39	0.55	0.39	0.32	0.32	0.39	0.55	0.24	0.39	0.55	0.32	0.24	0.39

0.47	0.39	0.32	0.39	0.32	0.39	0	0.39	0.32	0.39	0.55	0.47	0.32	0.32	0.32	0.55	0.39	0.47	0.32	0.32	0.32	0.47
5	5	4	4	4	5	0	5	5	5	5	5	4	4	4	7	5	5	4	4	4	5
-1	1	1	1	-1	1	-1	1	1	1	-1	1	-1	-1	1	1	1	1	-1	1	1	1
44	44	46	46	46	44	1	44	44	44	44	44	46	46	46	5	44	44	46	46	46	44
0.46	0.46	0.48	0.48	0.48	0.46	0.01	0.46	0.46	0.46	0.46	0.46	0.48	0.48	0.48	0.05	0.46	0.46	0.48	0.48	0.48	0.46
x	0.33	0.37	0.37	x	0.33	x	0.33	0.33	0.33	x	0.33	x	x	0.37	0	0.33	0.33	x	0.37	0.37	0.33
x	0.01	0.01	0.01	x	0.01	x	0.01	0.01	0.01	x	0.01	x	x	0.01	0	0.01	0.01	x	0.01	0.01	0.01
x	0.01	0.01	0.01	x	0.01	x	0.01	0.01	0.01	x	0.01	x	x	0.01	0	0.01	0.01	x	0.01	0.01	0.01
5	5	4	4	4	5	0	5	5	5	5	5	4	4	4	7	5	5	4	4	4	5

64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
0.06	0.1	0.12	0.08	0.08	0.06	0.06	0.1	0.08	0.08	0.08	0.08	0.08	0.1	0.06	0.1	0.08	0.06	0.12	0.08	0.08	0.08
0.06	0.1	0.12	0.08	0.08	0.06	0.08	0.1	0.1	0.08	0.08	0.08	0.08	0.1	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.08
0.15	0.25	0.3	0.3	0.2	0.15	0.25	0.25	0.15	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.25	0.2	0.25	0.2
0.15	0.25	0.25	0.3	0.2	0.2	0.25	0.35	0.25	0.2	0.2	0.2	0.2	0.35	0.25	0.15	0.15	0.15	0.2	0.2	0.25	0.2
0.2	0.2	0.35	0.35	0.2	0.15	0.25	0.35	0.25	0.2	0.2	0.2	0.2	0.15	0.2	0.3	0.05	0.2	0.2	0.2	0.2	0.2
0.2	0.2	0.3	0	0.2	0.3	0	0.35	0.2	0.2	0.2	0.2	0.2	0	0.2	0.25	0.05	0.25	0.15	0.25	0.25	0.15
0.2	0.25	0.25	0	0.2	0.15	0	0.25	0.25	0.2	0.2	0.2	0.2	0	0.25	0.15	0.1	0.2	0.1	0.2	0.2	0.2
0.32	0.39	0.39	0	0.32	0.08	0	0.39	0.39	0.32	0.32	0.32	0.32	0	0.39	0.24	0.08	0.32	0.24	0.24	0.39	0.32
0.32	0.39	0.55	0	0.32	0.39	0	0.39	0.39	0.32	0.32	0.24	0.32	0	0.32	0.39	0.32	0.24	0.32	0.47	0.39	0.32
0.24	0.32	0.47	0	0.32	0.24	0	0.55	0.39	0.32	0.32	0.32	0.32	0	0.39	0.24	0.24	0.32	0.24	0.32	0.39	0.39
0.32	0.39	0.47	0	0.32	0.16	0	0.55	0.39	0.32	0.32	0.32	0.32	0	0.39	0.32	0.24	0.32	0.24	0.39	0.32	0.32
0.39	0.32	0.55	0	0.32	0.39	0	0.55	0.39	0.32	0.32	0.16	0.32	0	0.32	0.39	0.32	0.32	0.32	0.55	0.32	0.16
0.32	0.39	0.47	0	0.32	0.24	0	0.55	0.39	0.32	0.32	0.32	0.32	0	0.39	0.24	0.24	0.16	0.32	0.32	0.32	0.24
0.32	0.39	0.39	0	0.32	0.47	0	0.47	0.39	0.32	0.32	0.32	0.32	0	0.39	0.39	0.24	0.32	0.32	0.55	0.39	0.32
0.24	0.39	0.47	0	0.32	0.47	0	0.47	0.39	0.32	0.32	0.32	0.32	0	0.39	0.55	0.24	0.32	0.39	0.32	0.32	0.39
0.24	0.39	0.47	0	0.32	0.32	0	0.39	0.39	0.32	0.32	0.32	0.32	0	0.39	0.24	0.16	0.24	0.24	0.39	0.32	0.32
4	5	6	1	4	4	1	6	5	4	4	4	4	1	5	4	3	4	4	5	4	4
1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	1	-1	1	1	-1	1	1

46	44	12	3	46	46	3	12	44	46	46	46	46	3	44	46	8	46	46	44	46	46
0.48	0.46	0.13	0.03	0.48	0.48	0.03	0.13	0.46	0.48	0.48	0.48	0.48	0.03	0.46	0.48	0.08	0.48	0.48	0.46	0.48	0.48
0.37	0.33	0	0	0.37	0.37	0	0	0.33	0.37	0.37	0.37	0.37	0	x	0.37	x	0.37	0.37	x	0.37	0.37
0.01	0.01	0	0	0.01	0.01	0	0	0.01	0.01	0.01	0.01	0.01	0	x	0.01	x	0.01	0.01	x	0.01	0.01
0.01	0.01	0	0	0.01	0.01	0	0	0.01	0.01	0.01	0.01	0.01	0	x	0.01	x	0.01	0.01	x	0.01	0.01
4	5	6	1	4	4	1	6	5	4	4	4	4	1	5	4	3	4	4	5	4	4

86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107
0.12	0.1	0.08	0.14	0.12	0.08	0.12	0.08	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.08	0.12	0.1	0.08	0.06
0.08	0.08	0.08	0.14	0.12	0.1	0.12	0.08	0.08	0.08	0.12	0.12	0.1	0.1	0.12	0.12	0.12	0.1	0.1	0.1	0.12	0.06
0.35	0.3	0.2	0.35	0.2	0.3	0.3	0.2	0.2	0.35	0.3	0.3	0.25	0.25	0.35	0.35	0.25	0.15	0.2	0.25	0.3	0.15
0.35	0.3	0.2	0.35	0.25	0.25	0.3	0.2	0.2	0.3	0.3	0.3	0.25	0.25	0.35	0.35	0.25	0.2	0.25	0.3	0.3	0.15
0.3	0.25	0.2	0.35	0.25	0.25	0.3	0.2	0.2	0.2	0.25	0.3	0.25	0.25	0.35	0.35	0.2	0.25	0.15	0.25	0.25	0.15
0.35	0.25	0.2	0.35	0.3	0.35	0.35	0.2	0.25	0.35	0.35	0.3	0.25	0.25	0.35	0.35	0.3	0.25	0.35	0.25	0.25	0.15
0.35	0.25	0.2	0.35	0.2	0.25	0.3	0.2	0.15	0.2	0.25	0.3	0.25	0.25	0.35	0.35	0.2	0.1	0.35	0.3	0.3	0.15
0.47	0.39	0.32	0.55	0.39	0.32	0.47	0.24	0.32	0.32	0.47	0.47	0.39	0.39	0.55	0.39	0.47	0.16	0.47	0.47	0.47	0.24
0.32	0.39	0.32	0.55	0.47	0.39	0.47	0.24	0.32	0.32	0.47	0.47	0.39	0.39	0.55	0.47	0.32	0.32	0.47	0.32	0.39	0.24
0.47	0.39	0.32	0.55	0.47	0.47	0.47	0.32	0.24	0.55	0.55	0.47	0.39	0.39	0.55	0.55	0.32	0.24	0.55	0.39	0.55	0.32
0.39	0.39	0.32	0.55	0.47	0.47	0.47	0.32	0.32	0.24	0.55	0.55	0.39	0.39	0.55	0.55	0.47	0.24	0.39	0.39	0.47	0.24
0.47	0.39	0.32	0.55	0.47	0.47	0.47	0.32	0.16	0.32	0.47	0.47	0.39	0.39	0.55	0.55	0.32	0.39	0.55	0.32	0.47	0.32
0.39	0.39	0.32	0.55	0.47	0.39	0.47	0.32	0.24	0.24	0.55	0.55	0.39	0.39	0.55	0.55	0.39	0.16	0.55	0.32	0.47	0.32
0.55	0.39	0.32	0.55	0.47	0.39	0.47	0.32	0.24	0.16	0.55	0.55	0.39	0.39	0.55	0.55	0.32	0.47	0.39	0.32	0.47	0.32
0.55	0.39	0.32	0.55	0.39	0.47	0.47	0.32	0.16	0.24	0.55	0.47	0.39	0.39	0.47	0.47	0.32	0.39	0.24	0.39	0.47	0.32
0.47	0.39	0.32	0.55	0.47	0.39	0.47	0.24	0.16	0.39	0.55	0.47	0.39	0.39	0.47	0.47	0.32	0.24	0.39	0.39	0.47	0.32
6	5	4	7	6	5	6	4	3	4	6	6	5	5	7	7	5	4	6	5	6	3
1	1	-1	1	1	1	1	1	-1	1	1	1	1	1	1	1	1	1	1	-1	1	-1
12	44	46	5	12	44	12	46	8	46	12	12	44	44	5	5	44	46	12	44	12	8
0.13	0.46	0.48	0.05	0.13	0.46	0.13	0.48	0.08	0.48	0.13	0.13	0.46	0.46	0.05	0.05	0.46	0.48	0.13	0.46	0.13	0.08
0	0.33	x	0	0	0.33	0	0.37	x	0.37	0	0	0.33	0.33	0	0	0.33	0.37	0	x	0	x

0	0.01	x	0	0	0.01	0	0.01	x	0.01	0	0	0.01	0.01	0	0	0.01	0.01	0	x	0	x
0	0.01	x	0	0	0.01	0	0.01	x	0.01	0	0	0.01	0.01	0	0	0.01	0.01	0	x	0	x
6	5	4	7	6	5	6	4	3	4	6	6	5	5	7	7	5	4	6	5	6	3

108	109	110	111	112	113	114	115	116	117	118	119	120
0.08	0.08	0.1	0.1	0.08	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.08
0.08	0.1	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.08
0.25	0.2	0.2	0.3	0.2	0.25	0.2	0.25	0.3	0.15	0.25	0.2	0.2
0.2	0.2	0.25	0.25	0.15	0.25	0.2	0.3	0.3	0.3	0.25	0.2	0.2
0.2	0.2	0.25	0.25	0.2	0.2	0.2	0.3	0.2	0.25	0.2	0.2	0.2
0.2	0.2	0.2	0.3	0.2	0.25	0.2	0.25	0.3	0.3	0.2	0.25	0.3
0.2	0.2	0.25	0.25	0.2	0.2	0.2	0.25	0.2	0.15	0.25	0.2	0.2
0.32	0.32	0.47	0.47	0.39	0.39	0.32	0.47	0.47	0.39	0.39	0.32	0.47
0.32	0.39	0.39	0.39	0.24	0.32	0.32	0.47	0.32	0.39	0.39	0.32	0.47
0.24	0.32	0.32	0.32	0.24	0.39	0.39	0.39	0.47	0.39	0.39	0.32	0.39
0.32	0.39	0.32	0.32	0.32	0.32	0.39	0.39	0.47	0.39	0.39	0.32	0.32
0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.39	0.47	0.32	0.39	0.32	0.16
0.32	0.39	0.32	0.39	0.32	0.32	0.32	0.47	0.39	0.32	0.39	0.32	0.32
0.32	0.32	0.39	0.47	0.24	0.32	0.32	0.39	0.55	0.47	0.47	0.32	0.47
0.39	0.47	0.32	0.39	0.32	0.32	0.32	0.39	0.39	0.47	0.39	0.32	0.32
0.32	0.39	0.32	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.32	0.32
4	4	5	5	4	4	4	5	5	5	5	4	4
-1	1	1	1	1	1	-1	1	1	1	1	1	1
46	46	44	44	46	46	46	44	44	44	44	46	46
0.48	0.48	0.46	0.46	0.48	0.48	0.48	0.46	0.46	0.46	0.46	0.48	0.48
x	0.37	0.33	0.33	0.37	0.37	x	0.33	0.33	0.33	0.33	0.37	0.37
x	0.01	0.01	0.01	0.01	0.01	x	0.01	0.01	0.01	0.01	0.01	0.01
x	0.01	0.01	0.01	0.01	0.01	x	0.01	0.01	0.01	0.01	0.01	0.01
4	4	5	5	4	4	4	5	5	5	5	4	4

(8) Table B-8 The aggregation values by MLIOWA with the "most" linguistic quantifier for Yahoo (2009)

*w_i

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Qy1	0.08	0.1	0.08	0.14	0.1	0.1	0.08	0.06	0.08	0.06	0.12	0.08	0.08	0.08	0.08	0.1	0.08	0.08	0.08
Qy2	0.1	0.08	0.06	0.14	0.1	0.08	0.1	0.1	0.08	0.06	0.08	0.08	0.1	0.08	0.1	0.1	0.06	0.1	0.08
Qy3	0.2	0.2	0.2	0.35	0.3	0.3	0.1	0.15	0.15	0.15	0.1	0.2	0.25	0.15	0.3	0.25	0.15	0.3	0.25
Qy4	0.25	0.2	0.2	0.25	0.3	0.15	0.15	0.15	0.25	0.15	0.15	0.2	0.2	0.2	0.2	0.25	0.2	0.2	0.2
Qy5	0.2	0.2	0.25	0.25	0.25	0.2	0.25	0.15	0.15	0.15	0.2	0.2	0.2	0.1	0.2	0.25	0.2	0.1	0.25
Qy6	0.2	0.25	0.25	0.2	0.2	0.35	0.25	0.15	0.15	0.2	0.2	0.15	0.25	0.15	0.15	0.2	0.15	0.3	0.25
Qy7	0.2	0.2	0.25	0.25	0.3	0.3	0.15	0.15	0.2	0.15	0.2	0.15	0.2	0.2	0.25	0.15	0.2	0.35	0.2
Qy8	0.32	0.32	0.32	0.39	0.47	0.47	0.24	0.24	0.32	0.24	0.32	0.16	0.24	0.24	0.16	0.32	0.24	0.16	0.39
Qy9	0.39	0.39	0.32	0.32	0.47	0.32	0.39	0.24	0.24	0.24	0.32	0.24	0.32	0.39	0.32	0.32	0.32	0.39	0.39
Qy10	0.47	0.39	0.32	0.39	0.47	0.24	0.16	0.24	0.39	0.08	0.32	0.32	0.39	0.32	0.32	0.24	0.32	0.55	0.39
Qy11	0.39	0.39	0.32	0.32	0.47	0.24	0.24	0.24	0.32	0.24	0.32	0.32	0.32	0.32	0.32	0.39	0.32	0.24	0.39
Qy12	0.39	0.32	0.47	0.39	0.47	0.32	0.39	0.24	0.24	0.24	0.32	0.32	0.39	0.39	0.32	0.32	0.32	0.39	0.39
Qy13	0.39	0.32	0.32	0.32	0.47	0.32	0.32	0.24	0.32	0.24	0.32	0.32	0.24	0.39	0.32	0.32	0.32	0.24	0.47
Qy14	0.32	0.39	0.39	0.24	0.39	0.39	0.47	0.24	0.32	0.24	0.32	0.32	0.32	0.32	0.16	0.24	0.32	0.55	0.39
Qy15	0.32	0.39	0.39	0.32	0.39	0.47	0.08	0.24	0.39	0.24	0.32	0.24	0.47	0.32	0.32	0.32	0.32	0.24	0.32
Qy16	0.39	0.39	0.32	0.39	0.39	0.32	0.32	0.24	0.24	0.24	0.32	0.24	0.47	0.32	0.32	0.24	0.32	0.39	0.32
ind(p_i)	5	5	4	5	6	5	4	3	4	3	4	4	4	4	4	4	4	5	5
choice	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	1	1	1	-1	1
sup_i	50	50	47	50	9	50	47	10	47	10	47	47	47	47	47	47	47	50	50
sup_i/n	0.46	0.46	0.44	0.46	0.08	0.46	0.44	0.09	0.44	0.09	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.46	0.46
Q(sup_i/n)	0.33	0.33	0.27	0.33	0	0.33	0.27	0	0.27	0	0.27	0.27	0.27	x	0.27	0.27	0.27	x	0.33
w_s(i)	0.01	0.01	0.01	0.01	0	0.01	0.01	0	0.01	0	0.01	0.01	0.01	x	0.01	0.01	0.01	x	0.01
copy(w_s(i))	0.01	0.01	0.01	0.01	0	0.01	0.01	0	0.01	0	0.01	0.01	0.01	x	0.01	0.01	0.01	x	0.01
copy(ind(pi))	5	5	4	5	6	5	4	3	4	3	4	4	4	4	4	4	4	5	5

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
0.1	0.08	0.12	0.12	0.1	0.12	0.08	0.12	0.1	0.06	0.1	0.1	0.12	0.08	0.1	0.1	0.1	0.08	0.06	0.1	0.1	0.14
0.08	0.08	0.12	0.12	0.08	0.12	0.08	0.12	0.1	0.08	0.1	0.08	0.12	0.08	0.08	0.1	0.1	0.08	0.06	0.1	0.1	0.12
0.2	0.15	0.25	0.3	0.2	0.2	0.2	0.3	0.25	0.15	0.25	0.25	0.3	0.2	0.2	0.25	0.2	0.2	0.15	0.35	0.3	0.35
0.2	0.15	0.3	0.3	0.25	0.2	0.2	0.25	0.25	0.2	0.25	0.25	0.2	0.15	0.2	0.2	0.2	0.2	0.15	0.3	0.2	0.35
0.15	0.2	0.2	0.3	0.3	0.2	0.2	0.25	0.25	0.15	0.3	0.25	0.25	0.2	0.15	0.2	0.25	0.25	0.1	0.3	0.2	0.35
0.3	0.15	0.25	0.3	0.25	0.15	0.2	0.3	0.25	0.15	0.25	0.25	0.15	0.15	0.25	0.25	0.2	0.2	0.15	0.25	0.2	0.25
0.15	0.15	0.3	0.2	0.2	0.2	0.2	0.25	0.3	0.2	0.2	0.2	0.15	0.2	0.2	0.25	0.2	0.15	0.15	0.3	0.2	0.3
0.32	0.16	0.39	0.32	0.39	0.32	0.32	0.39	0.39	0.24	0.32	0.39	0.16	0.32	0.47	0.32	0.32	0.32	0.24	0.39	0.39	0.47
0.39	0.24	0.32	0.32	0.39	0.55	0.39	0.47	0.32	0.32	0.39	0.32	0.47	0.32	0.39	0.39	0.32	0.39	0.32	0.47	0.39	0.55
0.24	0.16	0.39	0.39	0.39	0.39	0.39	0.32	0.39	0.24	0.32	0.39	0.24	0.32	0.39	0.39	0.39	0.32	0.24	0.39	0.39	0.55
0.16	0.32	0.39	0.39	0.47	0.39	0.39	0.39	0.39	0.32	0.32	0.39	0.24	0.39	0.39	0.39	0.39	0.32	0.32	0.47	0.39	0.55
0.24	0.24	0.39	0.47	0.32	0.24	0.39	0.39	0.39	0.24	0.39	0.32	0.32	0.32	0.32	0.39	0.39	0.32	0.32	0.39	0.39	0.55
0.39	0.24	0.32	0.39	0.47	0.24	0.39	0.47	0.39	0.32	0.39	0.32	0.32	0.32	0.39	0.39	0.39	0.32	0.32	0.39	0.47	0.55
0.39	0.32	0.32	0.47	0.47	0.32	0.32	0.39	0.39	0.24	0.32	0.47	0.32	0.32	0.47	0.39	0.39	0.32	0.32	0.47	0.32	0.55
0.16	0.32	0.24	0.39	0.47	0.47	0.39	0.24	0.39	0.32	0.32	0.32	0.32	0.32	0.47	0.39	0.39	0.32	0.24	0.32	0.32	0.55
0.24	0.32	0.32	0.47	0.39	0.32	0.39	0.39	0.39	0.24	0.47	0.32	0.32	0.32	0.39	0.32	0.39	0.32	0.24	0.39	0.39	0.55
4	3	5	5	5	4	5	5	5	3	5	5	4	4	5	5	5	4	3	5	5	7
1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	1	1
47	10	50	50	50	47	50	50	50	10	50	50	47	47	50	50	50	47	10	50	50	1
0.44	0.09	0.46	0.46	0.46	0.44	0.46	0.46	0.46	0.09	0.46	0.46	0.44	0.44	0.46	0.46	0.46	0.44	0.09	0.46	0.46	0.01
0.27	0	0.33	0.33	0.33	0.27	0.33	0.33	0.33	0	0.33	0.33	0.27	0.27	x	0.33	0.33	0.27	0	0.33	0.33	0
0.01	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0.01	0.01	0.01	0.01	x	0.01	0.01	0.01	0	0.01	0.01	0
0.01	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0.01	0.01	0.01	0.01	x	0.01	0.01	0.01	0	0.01	0.01	0
4	3	5	5	5	4	5	5	5	3	5	5	4	4	5	5	5	4	3	5	5	7

42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0.1	0.12	0.08	0.08	0.08	0.1	0.08	0.12	0.1	0.08	0.1	0.1	0.08	0.08	0.08	0.1	0.08	0.1	0.14	0.08	0.08	0.1

0.08	0.1	0.08	0.06	0.08	0.1	0.08	0.1	0.12	0.08	0.06	0.08	0.08	0.08	0.08	0.1	0.04	0.1	0.14	0.08	0.1	0.1
0.25	0.25	0.2	0.15	0.2	0.25	0.2	0.3	0.25	0.25	0.25	0.2	0.2	0.2	0.2	0.25	0.25	0.25	0.35	0.2	0.25	0.2
0.3	0.25	0.25	0.25	0.2	0.25	0.2	0.25	0.2	0.2	0.25	0.3	0.25	0.2	0.2	0.25	0.2	0.25	0.2	0.2	0.2	0.3
0.25	0.2	0.2	0.1	0.2	0.25	0.2	0.25	0.2	0.25	0.25	0.2	0.2	0.2	0.2	0.25	0.1	0.25	0.25	0.2	0.2	0.2
0.2	0.25	0.25	0.15	0.2	0.25	0.2	0.2	0.3	0.25	0.25	0.25	0.2	0.2	0.25	0.25	0.2	0.3	0.3	0.2	0.25	0.25
0.25	0.25	0.2	0.25	0.2	0.25	0.25	0.3	0.3	0.25	0.25	0.2	0.3	0.2	0.25	0.25	0.15	0.25	0.15	0.2	0.3	0.3
0.32	0.39	0.32	0.39	0.32	0.39	0.39	0.39	0.47	0.32	0.39	0.39	0.47	0.32	0.39	0.39	0.47	0.39	0.32	0.32	0.39	0.39
0.47	0.47	0.39	0.39	0.32	0.39	0.32	0.24	0.39	0.39	0.39	0.39	0.47	0.32	0.47	0.39	0.47	0.47	0.32	0.47	0.32	0.39
0.55	0.39	0.39	0.32	0.32	0.39	0.24	0.32	0.39	0.39	0.24	0.32	0.47	0.32	0.39	0.39	0.47	0.39	0.39	0.39	0.32	0.47
0.55	0.32	0.32	0.24	0.32	0.39	0.32	0.32	0.39	0.39	0.24	0.32	0.39	0.32	0.39	0.39	0.47	0.32	0	0.08	0.24	0.47
0.47	0.39	0.32	0.39	0.32	0.39	0.24	0.32	0.47	0.39	0.24	0.39	0.32	0.32	0.39	0.39	0.47	0.32	0.32	0.16	0.32	0.47
0.47	0.32	0.39	0.16	0.32	0.39	0.24	0.47	0.32	0.32	0.39	0.32	0.32	0.32	0.47	0.39	0.47	0.47	0.39	0.24	0.24	0.39
0.55	0.32	0.32	0.16	0.32	0.39	0.24	0.39	0.32	0.39	0.55	0.39	0.32	0.32	0.47	0.39	0.47	0.47	0.39	0.39	0.24	0.39
0.39	0.32	0.32	0.47	0.32	0.39	0.24	0.39	0.24	0.39	0.55	0.32	0.32	0.32	0.55	0.39	0.24	0.32	0.55	0.24	0.24	0.39
0.55	0.47	0.32	0.39	0.32	0.39	0.24	0.39	0.39	0.39	0.55	0.47	0.32	0.32	0.39	0.39	0.39	0.47	0.32	0.24	0.32	0.47
6	5	4	4	4	5	4	5	5	5	5	5	5	4	5	5	5	5	5	4	4	5
1	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	1	1	1	1	1	1	1
9	50	47	47	47	50	47	50	50	50	50	50	50	47	50	50	50	50	50	47	47	50
0.08	0.46	0.44	0.44	0.44	0.46	0.44	0.46	0.46	0.46	0.46	0.46	0.46	0.44	0.46	0.46	0.46	0.46	0.46	0.44	0.44	0.46
0	0.33	0.27	0.27	0.27	0.33	0.27	0.33	0.33	x	0.33	0.33	0.33	0.27	0.33	0.33	0.33	0.33	0.33	0.27	0.27	0.33
0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	x	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	x	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
6	5	4	4	4	5	4	5	5	5	5	5	5	4	5	5	5	5	5	4	4	5

64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
0.08	0.1	0.14	0.12	0.08	0.06	0.1	0.1	0.08	0.08	0.08	0.08	0.08	0.1	0.14	0.06	0.08	0.06	0.06	0.1	0.08	0.08
0.06	0.1	0.12	0.06	0.1	0.1	0.08	0.1	0.1	0.08	0.08	0.08	0.08	0.1	0.12	0.06	0.04	0.06	0.08	0.1	0.08	0.08
0.15	0.25	0.35	0.3	0.2	0.15	0.25	0.25	0.3	0.2	0.2	0.2	0.2	0.3	0.25	0.15	0.2	0.2	0.15	0.2	0.2	0.2
0.15	0.25	0.35	0.3	0.2	0.2	0.2	0.35	0.25	0.2	0.2	0.2	0.2	0.35	0.3	0.15	0.2	0.2	0.2	0.2	0.2	0.2

0.2	0.2	0.3	0.3	0.2	0.15	0.2	0.35	0.25	0.2	0.2	0.2	0.2	0.15	0.3	0.15	0.05	0.2	0.15	0.2	0.2	0.2
0.25	0.2	0.3	0	0.2	0.15	0	0.25	0.25	0.25	0.2	0.2	0.2	0	0.3	0.15	0.05	0.35	0.15	0.25	0.2	0.15
0.15	0.25	0.35	0	0.2	0.15	0	0.25	0.25	0.2	0.2	0.2	0.2	0	0.3	0.15	0.1	0.15	0.15	0.2	0.2	0.2
0.32	0.39	0.47	0	0.32	0.08	0	0.39	0.39	0.32	0.32	0.32	0.32	0	0.47	0.32	0.08	0.32	0.24	0.24	0.32	0.32
0.39	0.39	0.47	0	0.32	0.39	0	0.39	0.39	0.32	0.32	0.32	0.32	0	0.47	0.39	0.39	0.16	0.24	0.47	0.32	0.32
0.24	0.32	0.55	0	0.32	0.24	0	0.39	0.39	0.39	0.32	0.32	0.32	0	0.39	0.24	0.39	0.24	0.32	0.32	0.39	0.39
0.32	0.39	0.47	0	0.32	0.16	0	0.39	0.39	0.39	0.32	0.32	0.32	0	0.47	0.39	0.32	0.32	0.32	0.39	0.32	0.32
0.39	0.32	0.55	0	0.32	0.39	0	0.55	0.39	0.32	0.32	0.16	0.32	0	0.39	0.24	0.08	0.32	0.16	0.55	0.32	0.16
0.32	0.39	0.47	0	0.32	0.16	0	0.55	0.39	0.32	0.32	0.32	0.32	0	0.47	0.32	0.24	0.16	0.24	0.32	0.32	0.24
0.39	0.39	0.39	0	0.32	0.24	0	0.47	0.39	0.39	0.32	0.32	0.32	0	0.47	0.16	0.24	0.24	0.16	0.55	0.32	0.32
0.24	0.39	0.47	0	0.32	0.24	0	0.47	0.39	0.32	0.32	0.32	0.32	0	0.39	0.16	0.24	0.32	0.24	0.32	0.32	0.39
0.24	0.39	0.47	0	0.32	0.24	0	0.39	0.39	0.39	0.32	0.32	0.32	0	0.47	0.24	0.24	0.47	0.16	0.39	0.32	0.32
4	5	6	1	4	3	1	6	5	4	4	4	4	1	6	3	3	4	3	5	4	4
1	1	1	1	1	1	1	1	1	1	1	-1	1	1	1	-1	1	1	1	1	1	1
47	50	9	3	47	10	3	9	50	47	47	47	47	3	9	10	10	47	10	50	47	47
0.44	0.46	0.08	0.03	0.44	0.09	0.03	0.08	0.46	0.44	0.44	0.44	0.44	0.03	0.08	0.09	0.09	0.44	0.09	0.46	0.44	0.44
0.27	0.33	0	0	0.27	0	0	0	0.33	0.27	0.27	x	0.27	0	0	x	0	0.27	0	0.33	0.27	0.27
0.01	0.01	0	0	0.01	0	0	0	0.01	0.01	0.01	x	0.01	0	0	x	0	0.01	0	0.01	0.01	0.01
0.01	0.01	0	0	0.01	0	0	0	0.01	0.01	0.01	x	0.01	0	0	x	0	0.01	0	0.01	0.01	0.01
4	5	6	1	4	3	1	6	5	4	4	4	4	1	6	3	3	4	3	5	4	4

86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107
0.08	0.1	0.08	0.14	0.12	0.08	0.12	0.08	0.08	0.1	0.1	0.12	0.1	0.1	0.1	0.08	0.08	0.1	0.08	0.1	0.08	0.06
0.08	0.08	0.08	0.14	0.12	0.1	0.12	0.08	0.08	0.08	0.12	0.12	0.1	0.1	0.1	0.08	0.08	0.06	0.1	0.1	0.1	0.06
0.25	0.3	0.2	0.35	0.2	0.3	0.3	0.2	0.2	0.3	0.25	0.3	0.25	0.25	0.3	0.2	0.25	0.3	0.3	0.15	0.25	0.15
0.2	0.25	0.2	0.25	0.25	0.25	0.3	0.2	0.2	0.35	0.25	0.25	0.25	0.25	0.3	0.25	0.2	0.15	0.25	0.15	0.3	0.15
0.2	0.25	0.2	0.25	0.25	0.25	0.3	0.2	0.2	0.2	0.25	0.3	0.25	0.25	0.3	0.15	0.2	0.25	0.15	0.25	0.25	0.15
0.2	0.25	0.2	0.15	0.3	0.35	0.35	0.2	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.15	0.25	0.25	0.15	0.2	0.3	0.2
0.2	0.25	0.2	0.3	0.2	0.25	0.3	0.2	0.2	0.2	0.25	0.3	0.25	0.25	0.3	0.3	0.2	0.25	0.35	0.2	0.3	0.2

0.32	0.39	0.32	0.39	0.39	0.32	0.47	0.32	0.16	0.32	0.39	0.47	0.39	0.39	0.47	0.16	0.39	0.39	0.24	0.24	0.47	0.32
0.32	0.39	0.32	0.32	0.47	0.39	0.47	0.32	0.24	0.32	0.39	0.47	0.39	0.39	0.47	0.32	0.32	0.24	0.16	0.32	0.39	0.32
0.32	0.39	0.32	0.32	0.47	0.47	0.47	0.32	0.24	0.39	0.47	0.32	0.39	0.39	0.47	0.47	0.32	0.39	0.47	0.39	0.39	0.32
0.32	0.39	0.32	0.32	0.47	0.47	0.47	0.32	0.32	0.24	0.39	0.39	0.39	0.39	0.47	0.47	0.39	0.39	0.47	0.39	0.39	0.32
0.32	0.39	0.32	0.32	0.47	0.47	0.47	0.32	0.16	0.32	0.39	0.39	0.39	0.39	0.47	0.55	0.39	0.39	0.55	0.24	0.24	0.32
0.32	0.39	0.32	0.32	0.47	0.39	0.47	0.32	0.24	0.24	0.39	0.55	0.39	0.39	0.47	0.47	0.39	0.16	0.55	0.39	0.47	0.32
0.32	0.39	0.32	0.32	0.47	0.39	0.47	0.32	0.39	0.16	0.39	0.32	0.39	0.39	0.39	0.39	0.32	0.16	0.39	0.32	0.47	0.32
0.32	0.39	0.32	0.32	0.39	0.47	0.47	0.32	0.16	0.24	0.32	0.47	0.39	0.39	0.39	0.47	0.32	0.39	0.24	0.24	0.39	0.32
0.32	0.39	0.32	0.32	0.47	0.39	0.47	0.32	0.16	0.39	0.39	0.47	0.39	0.39	0.39	0.39	0.32	0.24	0.39	0.39	0.47	0.32
4	5	4	5	6	5	6	4	3	4	5	6	5	5	6	5	4	4	5	4	5	4
1	1	1	-1	1	1	1	1	1	1	-1	-1	1	1	-1	1	1	-1	1	1	1	1
47	50	47	50	9	50	9	47	10	47	50	9	50	50	9	50	47	47	50	47	50	47
0.44	0.46	0.44	0.46	0.08	0.46	0.08	0.44	0.09	0.44	0.46	0.08	0.46	0.46	0.08	0.46	0.44	0.44	0.46	0.44	0.46	0.44
0.27	0.33	0.27	x	0	0.33	0	0.27	0	0.27	x	x	0.33	0.33	x	0.33	0.27	x	0.33	0.27	0.33	0.27
0.01	0.01	0.01	x	0	0.01	0	0.01	0	0.01	x	x	0.01	0.01	x	0.01	0.01	x	0.01	0.01	0.01	0.01
0.01	0.01	0.01	x	0	0.01	0	0.01	0	0.01	x	x	0.01	0.01	x	0.01	0.01	x	0.01	0.01	0.01	0.01
4	5	4	5	6	5	6	4	3	4	5	6	5	5	6	5	4	4	5	4	5	4

108	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
0.1	0.08	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.1	0.08	0.08	0.08
0.08	0.12	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.08
0.25	0.2	0.25	0.3	0.2	0.25	0.2	0.25	0.3	0.2	0.2	0.2	0.2
0.2	0.2	0.2	0.25	0.25	0.3	0.2	0.25	0.1	0.2	0.2	0.2	0.2
0.2	0.2	0.25	0.25	0.25	0.2	0.2	0.25	0.05	0.25	0.2	0.2	0.2
0.2	0.2	0.25	0.3	0.15	0.25	0.2	0.25	0.05	0.15	0.2	0.25	0.2
0.2	0.2	0.3	0.25	0.2	0.2	0.2	0.25	0.3	0.25	0.25	0.2	0.2
0.32	0.32	0.32	0.39	0.39	0.39	0.32	0.39	0.08	0.32	0.39	0.32	0.32
0.32	0.39	0.39	0.39	0.24	0.32	0.32	0.39	0.32	0.24	0.39	0.32	0.47
0.24	0.32	0.39	0.39	0.32	0.39	0.39	0.39	0.24	0.32	0.39	0.32	0.47

0.32	0.47	0.32	0.32	0.32	0.32	0.39	0.39	0.39	0.39	0.39	0.32	0.32
0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.39	0.47	0.32	0.39	0.32	0.16
0.39	0.39	0.39	0.39	0.39	0.32	0.32	0.39	0.32	0.32	0.39	0.32	0.32
0.32	0.32	0.32	0.47	0.24	0.32	0.32	0.39	0.39	0.24	0.47	0.32	0.24
0.39	0.47	0.32	0.39	0.32	0.32	0.32	0.39	0.39	0.32	0.39	0.32	0.32
0.39	0.39	0.32	0.39	0.39	0.39	0.39	0.39	0.39	0.32	0.39	0.32	0.32
4	5	5	5	4	4	4	5	4	4	5	4	4
1	1	1	1	1	1	1	1	1	1	1	1	-1
47	50	50	50	47	47	47	50	47	47	50	47	47
0.44	0.46	0.46	0.46	0.44	0.44	0.44	0.46	0.44	0.44	0.46	0.44	0.44
0.27	0.33	0.33	0.33	0.27	0.27	0.27	0.33	0.27	0.27	0.33	0.27	x
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	x
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	x
4	5	5	5	4	4	4	5	4	4	5	4	4

C: Chapter 4

(1) Table C-1 The Questionnaire of EC Site in Japan (2011)

EC サイトに対するアンケート

1) サイトに接続する安全性が高い

1 2 3 4 5 6 7 8 9 10

2) スムーズにナビ機能の利用ができる

1 2 3 4 5 6 7 8 9 10

3) 自動的なコマーシャルなどの放送サイトがある

1 2 3 4 5 6 7 8 9 10

4) 迷惑なプラグインが少ない

1 2 3 4 5 6 7 8 9 10

5) サイト内の検索エンジンで簡単に情報の検索ができる

1 2 3 4 5 6 7 8 9 10

6) いつも目的にあったサイト情報を提供してくれる

1 2 3 4 5 6 7 8 9 10

7) 商品検索や取引ページなどのリンクが有効である。

1 2 3 4 5 6 7 8 9 10

8) ユーザからの指示を受けるごとにインタラクティブな処理が行なわれる

1 2 3 4 5 6 7 8 9 10

9) EC サイトへのアクセスは容易である

1 2 3 4 5 6 7 8 9 10

10) 多言語の利用で他言語のサイトの表示を転換しやすい

1 2 3 4 5 6 7 8 9 10

11) 商品、サービスに関係があるサイト、ページなどを見つけやすい

1 2 3 4 5 6 7 8 9 10

12) 頻繁に参照するページのサイトを登録していつでもすぐに呼び出せる

1 2 3 4 5 6 7 8 9 10

13) オンラインヘルプを利用しやすい

1 2 3 4 5 6 7 8 9 10

14) 登録フォームは速やかに利用できる

1 2 3 4 5 6 7 8 9 10

15) フリー情報、サービスなどのサイトを見つけられる

1 2 3 4 5 6 7 8 9 10

16) 怪しげなページの読み込みが防げる

1 2 3 4 5 6 7 8 9 10

17) 顧客へのサポートを検索でき、利用しやすい

1 2 3 4 5 6 7 8 9 10

18) 顧客に利用ルールについての説明サイトなどを明確に載せている

1 2 3 4 5 6 7 8 9 10

19) アプリケーションの個々のユーザがキー割り当てその他の操作性を変更する

1 2 3 4 5 6 7 8 9 10

20) 目的のページへの到達性が高い

1 2 3 4 5 6 7 8 9 10

21) 不良サイトに対する処理方法は適切である

1 2 3 4 5 6 7 8 9 10

(2) Table C-2 The Calculation Process of Theoretical Value for E-business Websites (2011)

Table C-2-1 Daiei

Xi,j (occurrence of Qj in Pi)

	Q1	Q2	Q3	Q4
P1	0	0	0	0
P2	1	0	0	0
P3	1	0	0	0
P4	0	0	1	1
P5	0	1	1	0
P6	0	0	1	0
P7	0	1	1	0
P8	0	0	1	0
P9	0	0	1	0
P10	0	0	1	0
P11	0	0	0	1
P12	0	0	0	1
P13	1	0	0	1
P14	1	0	0	0
P15	0	0	0	0
P16	1	0	0	1
P17	0	0	1	0
P18	0	0	1	0
P19	1	0	0	0
P20	0	0	0	1

Ri,q (relevance score of Pi with respect to query Q)

	Q1			Q2			Q3			Q4		
P1			0			0			0			0
P2			1			0			0			0
P3			1			0			0			0
P4			0			0			1			1
P5			0		2			3				0
P6			0			0		1				0
P7			0	1	7	11		1				0
P8			0			0	1	24	1			0
P9			0			0	1	3				0
P10			0			0	1	6				0
P11			0			0			0	1	2	8
P12			0			0			0	1	3	
P13			1			0			0			1
P14			1			0			0			0
P15			0			0			0			0
P16			1			0			0			1
P17			0			0			1			0
P18			0			0			1			0
P19			1			0			0			0
P20			0			0			0	1	7	

Loi,k (occurrence of an outgoing link from Pi to Pk)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	1	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P2	1		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P3	1	1		1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P4	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	P5	1	0	0	1		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	P6	1	0	1	1	1		1	1	1	1	1	1	0	0	0	0	0	1	0	1
	P7	1	0	1	1	1	1		1	1	1	1	1	0	0	0	0	0	1	0	1
	P8	1	0	1	1	1	1	1		1	1	1	1	0	0	0	0	0	1	0	1
	P9	1	0	1	1	1	1	1	1		1	1	1	0	0	0	0	0	1	0	1
	P10	1	0	1	1	1	1	1	1	1		1	1	0	0	0	0	0	1	0	1
	P11	1	0	1	1	1	1	1	1	1	1		1	0	0	0	0	0	1	0	1
	P12	1	0	1	1	1	1	1	1	1	1	1		0	0	0	0	0	1	0	1
	P13	1	0	0	1	0	0	0	0	0	0	0	0		1	1	1	0	0	1	0
	P14	1	0	0	1	0	0	0	0	0	0	0	0	1		1	1	0	0	1	0
	P15	1	0	0	1	0	0	0	0	0	0	0	0	1	1		1	0	0	1	0
	P16	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1		0	0	1	0
	P17	1	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0		1	0	1
	P18	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0		0	1
	P19	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0		0
	P20	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	

Lii,k (occurrence of an incoming link from Pk to Pi)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P2	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P3	1	0		1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P4	1	0	1		1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1
	P5	0	0	0	1		1	1	1	1	1	1	1	0	1	1	1	1	0	1	1
	P6	0	0	0	1	0		0	0	0	0	0	0	0	1	0	1	1	1	1	0
	P7	0	0	0	1	1	1		1	1	1	1	1	0	1	1	1	1	1	1	1
	P8	0	0	0	1	0	1	1		1	1	1	1	0	0	0	0	0	1	0	1
	P9	0	1	1	1	1	1	1	0		1	1	1	0	0	0	0	0	1	0	1
	P10	0	1	1	1	1	1	1	0	1		1	1	0	0	1	0	0	1	0	1
	P11	0	1	1	1	1	1	1	0	1	1		1	0	1	0	0	1	1	0	1
	P12	0	0	0	0	1	0	1	1	1	1	1		0	0	0	0	1	0	0	1
	P13	0	0	1	1	1	0	0	0	0	0	0	0		0	0	0	1	0	0	0
	P14	0	1	0	0	1	0	0	0	0	0	0	0	1		1	1	1	0	1	0
	P15	1	0	1	1	0	0	1	1	1	1	0	0	1	1		1	1	0	1	0
	P16	1	0	1	1	0	0	0	0	0	0	1	0	1	1	1		0	0	1	0
	P17	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0		1	0	0
	P18	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0		0	1
	P19	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0		0
	P20	0	0	0	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	1	

Tfi,k						wi,k(TF)				wi,k(at)				wi(ds)	wi,k			
	Q1	Q2	Q3	Q4	max	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
P1	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P2	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P3	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P4	0	0	1	1	1	0.5	0.5	1	1	0	0	1	1	0.71	0	0	0.71	0.71
P5	0	2	3	0	3	0.5	0.8	1	0.5	0	10	15	0	0.06	0	0.49	0.87	0
P6	0	0	1	0	1	0.5	0.5	1	0.5	0	0	5	0	0.20	0	0	1	0
P7	0	19	1	0	19	0.5	1	0.5	0.5	0	56	5	0	0.02	0	1	0.05	0
P8	0	0	26	0	26	0.5	0.5	1	0.5	0	0	131	0	0.01	0	0	1	0
P9	0	0	4	0	4	0.5	0.5	1	0.5	0	0	25	0	0.04	0	0	1	0
P10	0	0	7	0	7	0.5	0.5	1	0.5	0	0	40	0	0.03	0	0	1	0
P11	0	0	0	11	11	0.5	0.5	0.5	1	0	0	0	28	0.04	0	0	0	1
P12	0	0	0	4	4	0.5	0.5	0.5	1	0	0	0	25	0.04	0	0	0	1
P13	1	0	0	1	1	1	0.5	0.5	1	1	0	0	1	0.71	0.71	0	0	0.71
P14	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P15	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P16	1	0	0	1	1	1	0.5	0.5	1	1	0	0	1	0.71	0.71	0	0	0.71
P17	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0
P18	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0
P19	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P20	0	0	0	8	8	0.5	0.5	0.5	1	0	0	0	45	0.02	0	0	0	1

Term-based Similarity between pages Pi and Pj Pj

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Pi	P1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P2	0	1	1	0	0	0	0	0	0	0	0	0	0.7	1	0	0.71	0	0	1	0
	P3	0	1	1	0	0	0	0	0	0	0	0	0	0.7	1	0	0.71	0	0	1	0
	P4	0	0	0	1	0.62	0.71	0.03	0.71	0.71	0.71	0.71	0.7	0.5	0	0	0.5	0.71	0.7	0	0.7
	P5	0	0	0	0.62	1	0.87	0.53	0.87	0.87	0.87	0	0	0	0	0	0	0.87	0.9	0	0
	P6	0	0	0	0.71	0.87	1	0.05	1	1	1	0	0	0	0	0	0	1	1	0	0
	P7	0	0	0	0.03	0.53	0.05	1	0.05	0.05	0.05	0	0	0	0	0	0	0.05	0	0	0
	P8	0	0	0	0.71	0.87	1	0.05	1	1	1	0	0	0	0	0	0	1	1	0	0
	P9	0	0	0	0.71	0.87	1	0.05	1	1	1	0	0	0	0	0	0	1	1	0	0
	P10	0	0	0	0.71	0.87	1	0.05	1	1	1	0	0	0	0	0	0	1	1	0	0
	P11	0	0	0	0.71	0	0	0	0	0	0	1	1	0.7	0	0	0.71	0	0	0	1
	P12	0	0	0	0.71	0	0	0	0	0	0	1	1	0.7	0	0	0.71	0	0	0	1
	P13	0	0.71	0.71	0.5	0	0	0	0	0	0	0.71	0.7	1	0.7	0	1	0	0	0.7	0.7
	P14	0	1	1	0	0	0	0	0	0	0	0	0	0.7	1	0	0.71	0	0	1	0
	P15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	P16	0	0.71	0.71	0.5	0	0	0	0	0	0	0.71	0.7	1	0.7	0	1	0	0	0.7	0.7
	P17	0	0	0	0.71	0.87	1	0.05	1	1	1	0	0	0	0	0	0	1	1	0	0
	P18	0	0	0	0.71	0.87	1	0.05	1	1	1	0	0	0	0	0	0	1	1	0	0
	P19	0	1	1	0	0	0	0	0	0	0	0	0	0.7	1	0	0.71	0	0	1	0
	P20	0	0	0	0.71	0	0	0	0	0	0	1	1	0.7	0	0	0.71	0	0	0	1

Table C-2-2 Izutsuya-online

Xi,j (occurrence of Qj in Pi)

	Q1	Q2	Q3	Q4
P1	0	1	0	0
P2	0	1	1	0
P3	1	0	0	1
P4	0	0	0	1
P5	0	0	1	1
P6	1	0	1	0
P7	1	1	1	0
P8	1	0	0	0
P9	0	0	1	1
P10	0	1	1	1
P11	0	1	1	0
P12	0	0	1	1
P13	0	0	0	0
P14	0	1	1	0
P15	0	0	1	0
P16	0	0	0	1
P17	0	0	0	1
P18	0	0	1	0
P19	0	1	0	0
P20	0	1	0	0

Ri,q (relevance score of Pi with respect to query Q)

	Q1			Q2			Q3			Q4		
P1			0			1			0			0
P2			0			2			1			0
P3			1			0			0			1
P4			0			0			0	1	2	
P5			0			0			1	1	3	
P6			1			0		1	1			0
P7			1	1	3	2			1			0
P8			1			0			0			0
P9			0			0			1		1	1
P10			0		2				1			1
P11			0			1			1			0
P12			0			0			1		2	
P13			0			0			0			0
P14			0			1			1			0
P15			0			0		1	1			0
P16			0			0			0		3	1
P17			0			0			0		2	1
P18			0			0			1			0
P19			0		1				0			0
P20			0			1			0			0

Loi,k (occurrence of an outgoing link from Pi to Pk)

		k																	
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	1	1	0	1	0	0	1	1	0	1	1	0	0	0	0	1	1	0
	P2	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P3	1	1		1	1	1	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P4	1	0	1		1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
	P5	1	0	0	1		0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	P6	1	0	1	1	1		0	1	1	0	0	1	0	1	0	0	0	1	0	1
	P7	1	0	1	1	1	1		1	0	1	1	1	0	0	0	0	0	1	0	1
	P8	1	0	1	1	1	1	0		1	1	1	0	1	0	1	0	0	1	0	1
	P9	1	0	1	1	1	1	0	1		1	1	1	0	1	0	0	0	1	0	1
	P10	1	0	1	1	1	0	1	0	1		1	1	0	0	0	0	0	0	0	1
	P11	1	1	1	0	1	1	1	1	0	1		1	0	0	0	0	0	0	0	1
	P12	1	0	1	1	1	1	1	1	1	1	1		0	0	0	0	0	1	0	1
	P13	1	1	0	1	0	1	1	0	0	0	0	0		1	1	1	0	1	1	0
	P14	1	1	0	1	1	0	0	1	1	0	0	1	0		1	1	0	1	1	1
	P15	1	1	0	0	1	0	1	1	0	1	1	0	1	1		1	0	0	1	1
	P16	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1		0	0	1	0
	P17	1	1	0	0	1	1	0	1	1	1	1	1	0	1	0	0		1	0	1
	P18	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1		0	0
	P19	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1		0
	P20	1	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	

Lii,k (occurrence of an incoming link from P_k to P_i)

		k																	
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P2	1		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	P3	1	0		1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P4	1	0	1		1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1
	P5	0	0	0	1		1	1	1	1	1	1	1	0	1	1	1	1	0	1	1
	P6	0	0	0	1	0		0	0	0	0	0	0	0	1	0	1	1	1	1	0
	P7	0	0	0	1	1	1		1	1	1	1	1	0	1	1	1	1	1	1	1
	P8	0	0	0	1	0	1	1		1	1	1	1	0	0	0	0	0	1	0	1
	P9	0	1	1	1	1	1	1	0		1	1	1	0	0	0	0	0	1	0	1
	P10	0	1	1	1	1	1	1	0	1		1	1	0	0	1	0	0	1	0	1
	P11	0	1	1	1	1	1	1	0	1	1		1	0	1	0	0	1	1	0	1
	P12	0	0	0	0	1	0	1	1	1	1	1		0	0	0	0	1	0	0	1
	P13	0	0	1	1	1	0	0	0	0	0	0	0		0	0	0	1	0	0	0
	P14	0	1	0	0	1	0	0	0	0	0	0	0	1		1	1	1	0	1	0
	P15	1	0	1	1	0	0	1	1	1	1	0	0	1	1		1	1	0	1	0
	P16	1	0	1	1	0	0	0	1	1	0	1	0	1	1	1		0	0	1	0
	P17	1	0	0	1	0	0	0	1	1	1	1	0	0	0	0	0		1	0	0
	P18	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0		0	1
	P19	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0		0
	P20	0	0	0	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	1	

Tfi,k						wi,k(TF)				wi,k(at)				wi(ds)	wi,k			
	Q1	Q2	Q3	Q4	max	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
P1	0	1	0	0	1	0.5	1	0.5	0.5	0	1	0	0	1.00	0	1	0	0
P2	0	2	1	0	2	0.5	1	0.75	0.5	0	2	1	0	0.47	0	0.94	0.35	0
P3	1	0	0	1	1	1	0.5	0.5	1	1	0	0	1	0.71	0.71	0	0	0.71
P4	0	0	0	3	3	0.5	0.5	0.5	1	0	0	0	20	0.05	0	0	0	1
P5	0	0	1	4	4	0.5	0.5	0.63	1	0	0	1	25	0.04	0	0	0.02	1
P6	1	0	2	0	2	0.75	0.5	1	0.5	1	0	6	0	0.17	0.12	0	0.99	0
P7	1	6	1	0	6	0.58	1	0.58	0.5	1	27	1	0	0.04	0.02	1	0.02	0
P8	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P9	0	0	1	2	2	0.5	0.5	0.75	1	0	0	1	6	0.17	0	0	0.12	0.99
P10	0	2	1	1	2	0.5	1	0.75	0.75	0	10	1	1	0.10	0	0.99	0.07	0.07
P11	0	1	1	0	1	0.5	1	1	0.5	0	1	1	0	0.71	0	0.71	0.71	0
P12	0	0	1	2	2	0.5	0.5	0.75	1	0	0	1	10	0.10	0	0	0.07	1
P13	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P14	0	1	1	0	1	0.5	1	1	0.5	0	1	1	0	0.71	0	0.71	0.71	0
P15	0	0	2	0	2	0.5	0.5	1	0.5	0	0	6	0	0.17	0	0	1	0
P16	0	0	0	4	4	0.5	0.5	0.5	1	0	0	0	16	0.06	0	0	0	1
P17	0	0	0	3	3	0.5	0.5	0.5	1	0	0	0	11	0.09	0	0	0	1
P18	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0
P19	0	1	0	0	1	0.5	1	0.5	0.5	0	5	0	0	0.20	0	1	0	0
P20	0	1	0	0	1	0.5	1	0.5	0.5	0	1	0	0	1.00	0	1	0	0

Term-based Similarity between pages Pi and Pj Pj

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Pi	P1	1	0.94	0	0	0	0	1	0	0	0.99	0.71	0	0	0.71	0	0	0	0	1	1
	P2	0.94	1	0	0	0.01	0.35	0.94	0	0.04	0.96	0.91	0.03	0	0.91	0.35	0	0	0.35	0.94	0.94
	P3	0	0	1	0.71	0.71	0.09	0.02	0.71	0.7	0.05	0	0.71	0	0	0	0.71	0.71	0	0	0
	P4	0	0	0.71	1	1	0	0	0	0.99	0.07	0	1	0	0	0	1	1	0	0	0
	P5	0	0.01	0.71	1	1	0.02	0	0	1	0.08	0.02	1	0	0.02	0.02	1	1	0.02	0	0
	P6	0	0.35	0.09	0	0.02	1	0.02	0.12	0.12	0.07	0.7	0.07	0	0.7	0.99	0	0	0.99	0	0
	P7	1	0.94	0.02	0	0	0.02	1	0.02	0	1	0.72	0	0	0.72	0.02	0	0	0.02	1	1
	P8	0	0	0.71	0	0	0.12	0.02	1	0	0	0	0	0	0	0	0	0	0	0	0
	P9	0	0.04	0.7	0.99	1	0.12	0	0	1	0.08	0.09	1	0	0.09	0.12	0.99	0.99	0.12	0	0
	P10	0.99	0.96	0.05	0.07	0.08	0.07	1	0	0.08	1	0.76	0.08	0	0.76	0.07	0.07	0.07	0.07	0.99	0.99
	P11	0.71	0.91	0	0	0.02	0.7	0.72	0	0.09	0.76	1	0.05	0	1	0.71	0	0	0.71	0.71	0.71
	P12	0	0.03	0.71	1	1	0.07	0	0	1	0.08	0.05	1	0	0.05	0.07	1	1	0.07	0	0
	P13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	P14	0.71	0.91	0	0	0.02	0.7	0.72	0	0.09	0.76	1	0.05	0	1	0.71	0	0	0.71	0.71	0.71
	P15	0	0.35	0	0	0.02	0.99	0.02	0	0.12	0.07	0.71	0.07	0	0.71	1	0	0	1	0	0
	P16	0	0	0.71	1	1	0	0	0	0.99	0.07	0	1	0	0	0	1	1	0	0	0
	P17	0	0	0.71	1	1	0	0	0	0.99	0.07	0	1	0	0	0	1	1	0	0	0
	P18	0	0.35	0	0	0.02	0.99	0.02	0	0.12	0.07	0.71	0.07	0	0.71	1	0	0	1	0	0
	P19	1	0.94	0	0	0	0	1	0	0	0.99	0.71	0	0	0.71	0	0	0	0	1	1
	P20	1	0.94	0	0	0	0	1	0	0	0.99	0.71	0	0	0.71	0	0	0	0	1	1

Table C-2-3 Tokyu-dept

Xi,j (occurrence of Qj in Pi)

	Q1	Q2	Q3	Q4
P1	0	1	0	1
P2	0	0	1	1
P3	0	1	0	1
P4	1	0	0	0
P5	1	0	0	0
P6	1	0	0	0
P7	0	1	1	0
P8	0	0	1	0
P9	0	0	1	1
P10	0	1	1	1
P11	0	1	1	0
P12	0	0	1	1
P13	0	0	0	0
P14	0	1	1	0
P15	0	0	1	0
P16	0	0	0	1
P17	0	0	0	1
P18	0	0	1	0
P19	0	1	0	0
P20	0	1	0	0

Ri,q (relevance score of Pi with respect to query Q)

	Q1			Q2			Q3			Q4		
P1			0		1				0		4	1
P2			0			2			1	1	2	6
P3			0			0			2			1
P4		1	0			0			0			0
P5		1	0			0			0			0
P6		1	0			0			0			0
P7			0	1	1	4			2			0
P8			0			0			3			0
P9			0			0			1		2	1
P10			0		3	1			2			4
P11			0	1		2		2	2			0
P12			0			0			1		1	1
P13			0			0			0			0
P14			0		1	3			1			0
P15			0			0		1	1			0
P16			0			0			0		5	2
P17			0			0			0			2
P18			0			0			3			0
P19			0		1	3			0			0
P20			0		1	1			0			0

Loi,k (occurrence of an outgoing link from Pi to Pk)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	1	1	0	1	0	0	1	1	0	1	1	1	0	1	0	1	1	0
	P2	1		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
	P3	1	1		1	1	1	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P4	1	0	1		1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
	P5	1	0	0	1		0	1	1	0	0	1	0	1	1	1	1	1	1	1	1
	P6	1	1	1	1	1		1	1	1	0	0	1	0	0	0	0	0	0	1	1
	P7	1	1	1	1	1	1		1	0	1	1	1	0	0	0	0	0	0	1	1
	P8	1	1	1	1	1	1	0		1	1	1	0	1	0	1	0	0	0	1	1
	P9	1	1	0	1	1	1	0	1		1	1	1	0	1	0	0	0	1	0	1
	P10	1	0	0	1	1	0	0	0	1		1	0	0	0	0	0	0	0	1	1
	P11	1	1	0	0	1	1	1	1	0	1		1	0	0	0	0	0	0	0	1
	P12	1	0	1	1	1	0	0	1	0	1	1		0	0	0	0	0	1	0	1
	P13	1	1	1	1	0	1	1	0	0	0	0	0		1	1	1	0	1	1	0
	P14	1	1	0	0	1	0	0	1	1	0	0	0	0		1	0	0	1	1	1
	P15	1	1	0	0	1	0	1	1	0	1	1	0	1	1		0	0	0	1	1
	P16	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1		0	0	1	0
	P17	1	1	0	1	1	1	0	1	0	1	1	0	0	1	0	0		1	1	1
	P18	1	1	1	0	1	1	1	1	1	1	1	0	1	0	0	1	0		1	0
	P19	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1		0
	P20	1	0	1	0	1	1	0	1	1	1	1	1	0	0	0	0	0	1	1	

Lii,k (occurrence of an incoming link from P_k to P_i)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P2	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P3	0	0		1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0
	P4	0	0	1		1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1
	P5	0	0	0	1		1	1	1	1	1	1	1	0	1	1	1	1	0	1	1
	P6	0	0	0	1	0		0	0	0	0	0	0	0	1	0	1	1	1	1	0
	P7	0	0	0	1	1	1		1	1	1	1	1	0	1	1	1	1	1	1	1
	P8	0	0	0	1	1	1	1		1	1	1	1	0	0	0	0	0	1	0	1
	P9	0	1	1	1	1	1	1	1		1	1	1	0	0	0	0	0	1	0	1
	P10	0	1	1	1	1	1	1	1	1		1	1	0	0	1	0	0	1	0	1
	P11	0	0	1	1	1	1	1	1	1	1		1	0	1	0	0	0	1	0	1
	P12	0	0	0	0	1	0	1	1	1	1	1		0	0	0	0	0	0	0	1
	P13	0	0	0	0	1	0	0	0	0	0	0	0		0	0	0	0	0	0	0
	P14	0	0	0	0	1	0	0	0	0	0	0	0	1		1	1	1	0	1	0
	P15	0	0	1	1	0	0	1	1	1	1	0	0	1	1		1	1	0	1	0
	P16	1	0	1	1	0	0	0	0	0	0	1	0	1	1	1		0	0	1	0
	P17	1	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0		0	0	0
	P18	1	1	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0		0	1
	P19	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0		0
	P20	1	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	0	1	0	

Tfi,k						wi,k(TF)				wi,k(at)				wi(ds)	wi,k			
	0	1	0	5	5	0.5	0.6	0.5	1	0	5	0	21	0.05	0	0.14	0	0.99
P1	0	2	1	9	9	0.5	0.61	0.56	1	0	2	1	26	0.04	0	0.05	0.02	1
P2	0	0	2	1	2	0.5	0.5	1	0.75	0	0	2	1	0.47	0	0	0.94	0.35
P3	1	0	0	0	1	1	0.5	0.5	0.5	5	0	0	0	0.20	1	0	0	0
P4	1	0	0	0	1	1	0.5	0.5	0.5	5	0	0	0	0.20	1	0	0	0
P5	1	0	0	0	1	1	0.5	0.5	0.5	5	0	0	0	0.20	1	0	0	0
P6	0	6	2	0	6	0.5	1	0.67	0.5	0	19	2	0	0.05	0	1	0.07	0
P7	0	0	3	0	3	0.5	0.5	1	0.5	0	0	3	0	0.33	0	0	1	0
P8	0	0	1	3	3	0.5	0.5	0.67	1	0	0	1	11	0.09	0	0	0.06	1
P9	0	4	2	4	4	0.5	1	0.75	1	0	16	2	4	0.06	0	0.97	0.09	0.24
P10	0	3	4	0	4	0.5	0.88	1	0.5	0	12	12	0	0.06	0	0.66	0.75	0
P11	0	0	1	2	2	0.5	0.5	0.75	1	0	0	1	6	0.17	0	0	0.12	0.99
P12	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P13	0	4	1	0	4	0.5	1	0.63	0.5	0	8	1	0	0.12	0	1	0.08	0
P14	0	0	2	0	2	0.5	0.5	1	0.5	0	0	6	0	0.17	0	0	1	0
P15	0	0	0	7	7	0.5	0.5	0.5	1	0	0	0	27	0.04	0	0	0	1
P16	0	0	0	2	2	0.5	0.5	0.5	1	0	0	0	2	0.50	0	0	0	1
P17	0	0	3	0	3	0.5	0.5	1	0.5	0	0	3	0	0.33	0	0	1	0
P18	0	4	0	0	4	0.5	1	0.5	0.5	0	8	0	0	0.13	0	1	0	0
P19	0	2	0	0	2	0.5	1	0.5	0.5	0	6	0	0	0.17	0	1	0	0
P20	0	1	0	5	5	0.5	0.6	0.5	1	0	5	0	21	0.05	0	0.14	0	0.99

Term-based Similarity between pages Pi and Pj Pj

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Pi	P1	1	1	0.35	0	0	0	0.14	0	0.99	0.38	0.09	0.98	0	0.14	0	0.99	0.99	0	0.14	0.14
	P2	1	1	0.37	0	0	0	0.05	0.02	1	0.29	0.05	0.99	0	0.05	0.02	1	1	0.02	0.05	0.05
	P3	0.35	0.37	1	0	0	0	0.07	0.94	0.41	0.17	0.7	0.46	0	0.07	0.94	0.35	0.35	0.94	0	0
	P4	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P5	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P6	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P7	0.14	0.05	0.07	0	0	0	1	0.07	0	0.97	0.71	0.01	0	1	0.07	0	0	0.07	1	1
	P8	0	0.02	0.94	0	0	0	0.07	1	0.06	0.09	0.75	0.12	0	0.08	1	0	0	1	0	0
	P9	0.99	1	0.41	0	0	0	0	0.06	1	0.25	0.05	1	0	0	0.06	1	1	0.06	0	0
	P10	0.38	0.29	0.17	0	0	0	0.97	0.09	0.25	1	0.7	0.25	0	0.97	0.09	0.24	0.24	0.09	0.97	0.97
	P11	0.09	0.05	0.7	0	0	0	0.71	0.75	0.05	0.7	1	0.09	0	0.72	0.75	0	0	0.75	0.66	0.66
	P12	0.98	0.99	0.46	0	0	0	0.01	0.12	1	0.25	0.09	1	0	0.01	0.12	0.99	0.99	0.12	0	0
	P13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	P14	0.14	0.05	0.07	0	0	0	1	0.08	0	0.97	0.72	0.01	0	1	0.08	0	0	0.08	1	1
	P15	0	0.02	0.94	0	0	0	0.07	1	0.06	0.09	0.75	0.12	0	0.08	1	0	0	1	0	0
	P16	0.99	1	0.35	0	0	0	0	0	1	0.24	0	0.99	0	0	0	1	1	0	0	0
	P17	0.99	1	0.35	0	0	0	0	0	1	0.24	0	0.99	0	0	0	1	1	0	0	0
	P18	0	0.02	0.94	0	0	0	0.07	1	0.06	0.09	0.75	0.12	0	0.08	1	0	0	1	0	0
	P19	0.14	0.05	0	0	0	0	1	0	0	0.97	0.66	0	0	1	0	0	0	0	1	1
	P20	0.14	0.05	0	0	0	0	1	0	0	0.97	0.66	0	0	1	0	0	0	0	1	1

Table C-2-4 Japanet

Xi,j (occurrence of Qj in Pi)

	Q1	Q2	Q3	Q4
P1	0	1	1	0
P2	0	0	0	0
P3	0	0	0	0
P4	0	0	0	0
P5	0	0	1	0
P6	0	0	1	0
P7	0	1	1	1
P8	0	0	1	1
P9	0	0	1	1
P10	0	0	1	1
P11	0	0	1	1
P12	0	0	1	1
P13	0	0	0	0
P14	0	1	1	0
P15	0	1	1	0
P16	0	1	1	1
P17	0	0	1	1
P18	0	0	1	1
P19	0	1	1	0
P20	0	0	1	0

Ri,q (relevance score of Pi with respect to query Q)

	Q1			Q2			Q3			Q4		
P1			0		2	1		16	24			0
P2			0			2			1			0
P3			0			0			0			0
P4			0			0			0			0
P5						0		10	17			0
P6			0			0		5	11			0
P7			0		1	2		2	5		2	6
P8			0			0		5	8		1	4
P9			0			0		1	3		2	1
P10			0			0		2	3			1
P11			0			0		1	1		1	
P12			0			0		1	2		2	
P13			0			0			0			0
P14			0		1	2		7	11			0
P15			0		3			1	1			0
P16			0		2			1	3		3	1
P17			0			0		1	2		2	1
P18			0			0		2	4			2
P19			0			2		1	2			0
P20			0			0		1	1			0

Loi,k (occurrence of an outgoing link from Pi to Pk)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	0
	P2	1		1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	0	0
	P3	1	1		1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	P4	1	0	1		1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
	P5	1	0	0	1		0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	P6	1	0	1	1	1		0	1	1	0	0	1	0	0	0	0	0	1	0	1
	P7	1	0	1	1	1	1		1	0	1	1	1	0	0	0	0	1	1	1	1
	P8	1	0	1	1	1	1	0		1	1	1	0	1	0	1	1	1	1	1	1
	P9	1	0	1	1	1	1	0	1		1	1	1	1	1	1	1	1	1	1	1
	P10	1	0	1	1	1	0	1	0	1		1	1	1	0	1	1	1	0	1	1
	P11	1	1	1	0	1	1	1	1	0	1		1	0	0	1	1	1	0	1	1
	P12	1	0	1	1	1	1	1	1	1	1	1		0	0	0	0	1	1	1	1
	P13	1	1	0	1	0	1	1	0	0	0	0	0		1	1	0	1	1	1	0
	P14	1	1	0	1	1	0	0	1	1	0	0	1	0		1	1	0	1	1	1
	P15	1	1	1	0	1	0	1	1	0	1	1	0	1	1		1	0	0	1	1
	P16	1	0	1	0	0	0	0	0	0	0	0	0	1	1	1		0	0	1	0
	P17	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	0		1	0	1
	P18	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1		1	0
	P19	1	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1		0
	P20	1	0	1	0	1	1	0	0	1	0	1	1	1	1	1	0	0	1	0	

Lii,k (occurrence of an incoming link from P_k to P_i)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	1	1	1	0	1	0	0	1	1	1	0	0	1	1	1	0	1	1
	P2	1		0	0	1	0	1	1	0	1	1	1	0	0	1	1	1	1	1	1
	P3	1	0		1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1
	P4	1	0	1		1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1
	P5	0	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
	P6	1	1	0	1	0		0	0	0	0	0	0	1	1	0	1	1	1	1	0
	P7	1	1	0	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1
	P8	1	1	0	1	1	1	1		1	1	1	1	1	0	0	0	0	1	0	0
	P9	1	1	1	1	1	1	1	1		1	1	1	1	0	0	0	0	1	0	0
	P10	1	1	1	1	1	1	1	0	1		1	1	1	0	1	0	0	1	1	1
	P11	1	1	1	1	1	1	1	1	1	1		1	0	1	0	0	0	1	1	1
	P12	1	1	0	0	1	0	1	1	1	1	1		0	0	0	0	0	0	1	1
	P13	1	1	1	0	1	0	0	1	0	0	0	0		0	0	0	0	0	1	0
	P14	0	1	1	0	1	0	0	1	0	0	0	0	1		1	1	1	1	1	0
	P15	0	1	1	1	0	0	1	1	1	1	0	1	1	1		1	1	1	1	0
	P16	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1		0	1	1	0
	P17	1	1	0	1	0	1	1	1	1	1	1	1	1	0	0	0		1	0	0
	P18	0	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	0		0	1
	P19	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1		1
	P20	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	

Tfi,k						wi,k(TF)				wi,k(at)				wi(ds)	wi,k			
	Q1	Q2	Q3	Q4	max	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
P1	0	3	40	0	40	0.5	0.54	1	0.5	0	11	104	0	0.01	0	0.06	1	0
P2	0	2	1	0	2	0.5	1	0.75	0.5	0	2	1	0	0.47	0	0.94	0.35	0
P3	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P4	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P5	0	0	27	0	27	0.5	0.5	1	0.5	0	0	67	0	0.01	0	0	1	0
P6	0	0	16	0	16	0.5	0.5	1	0.5	0	0	36	0	0.03	0	0	1	0
P7	0	3	7	8	8	0.5	0.69	0.94	1	0	7	15	16	0.05	0	0.22	0.64	0.73
P8	0	0	13	5	13	0.5	0.5	1	0.69	0	0	33	9	0.03	0	0	0.98	0.19
P9	0	0	4	3	4	0.5	0.5	1	0.88	0	0	8	11	0.08	0	0	0.64	0.77
P10	0	0	5	1	5	0.5	0.5	1	0.6	0	0	13	1	0.08	0	0	1	0.05
P11	0	0	2	1	2	0.5	0.5	1	0.75	0	0	6	5	0.14	0	0	0.85	0.53
P12	0	0	3	2	3	0.5	0.5	1	0.83	0	0	7	10	0.09	0	0	0.64	0.77
P13	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P14	0	3	18	0	18	0.5	0.58	1	0.5	0	7	46	0	0.02	0	0.09	1	0
P15	0	3	2	0	3	0.5	1	0.83	0.5	0	15	6	0	0.06	0	0.95	0.32	0
P16	0	2	4	4	4	0.5	0.75	1	1	0	10	8	16	0.05	0	0.39	0.41	0.82
P17	0	0	3	3	3	0.5	0.5	1	1	0	0	7	11	0.08	0	0	0.54	0.84
P18	0	0	6	2	6	0.5	0.5	1	0.67	0	0	14	2	0.07	0	0	1	0.09
P19	0	2	3	0	3	0.5	0.83	1	0.5	0	2	7	0	0.14	0	0.23	0.97	0
P20	0	0	2	0	2	0.5	0.5	1	0.5	0	0	6	0	0.17	0	0	1	0

Term-based Similarity between pages Pi and Pj Pj

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Pi	P1	1	0.4	0	0	1	1	0.66	0.98	0.64	1	0.85	0.64	0	1	0.37	0.43	0.54	0.99	0.98	1
	P2	0.4	1	0	0	0.35	0.35	0.43	0.35	0.22	0.35	0.3	0.23	0	0.43	1	0.51	0.19	0.35	0.56	0.35
	P3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P5	1	0.35	0	0	1	1	0.64	0.98	0.64	1	0.85	0.64	0	1	0.32	0.41	0.54	1	0.97	1
	P6	1	0.35	0	0	1	1	0.64	0.98	0.64	1	0.85	0.64	0	1	0.32	0.41	0.54	1	0.97	1
	P7	0.66	0.43	0	0	0.64	0.64	1	0.77	0.98	0.68	0.93	0.98	0	0.66	0.41	0.96	0.96	0.71	0.68	0.64
	P8	0.98	0.35	0	0	0.98	0.98	0.77	1	0.77	0.99	0.93	0.77	0	0.98	0.31	0.56	0.68	1	0.96	0.98
	P9	0.64	0.22	0	0	0.64	0.64	0.98	0.77	1	0.67	0.95	1	0	0.64	0.2	0.9	0.99	0.71	0.62	0.64
	P10	1	0.35	0	0	1	1	0.68	0.99	0.67	1	0.87	0.68	0	1	0.32	0.45	0.58	1	0.97	1
	P11	0.85	0.3	0	0	0.85	0.85	0.93	0.93	0.95	0.87	1	0.95	0	0.84	0.27	0.79	0.9	0.89	0.82	0.85
	P12	0.64	0.23	0	0	0.64	0.64	0.98	0.77	1	0.68	0.95	1	0	0.64	0.2	0.9	0.99	0.71	0.63	0.64
	P13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	P14	1	0.43	0	0	1	1	0.66	0.98	0.64	1	0.84	0.64	0	1	0.4	0.45	0.53	0.99	0.99	1
	P15	0.37	1	0	0	0.32	0.32	0.41	0.31	0.2	0.32	0.27	0.2	0	0.4	1	0.5	0.17	0.31	0.53	0.32
	P16	0.43	0.51	0	0	0.41	0.41	0.96	0.56	0.9	0.45	0.79	0.9	0	0.45	0.5	1	0.92	0.49	0.49	0.41
	P17	0.54	0.19	0	0	0.54	0.54	0.96	0.68	0.99	0.58	0.9	0.99	0	0.53	0.17	0.92	1	0.61	0.52	0.54
	P18	0.99	0.35	0	0	1	1	0.71	1	0.71	1	0.89	0.71	0	0.99	0.31	0.49	0.61	1	0.97	1
	P19	0.98	0.56	0	0	0.97	0.97	0.68	0.96	0.62	0.97	0.82	0.63	0	0.99	0.53	0.49	0.52	0.97	1	0.97
	P20	1	0.35	0	0	1	1	0.64	0.98	0.64	1	0.85	0.64	0	1	0.32	0.41	0.54	1	0.97	1

Table C-2-5 Takasimaya

Xi,j (occurrence of Qj in Pi)

	Q1	Q2	Q3	Q4
P1	0	0	0	0
P2	1	0	0	0
P3	1	0	0	0
P4	0	1	0	1
P5	0	1	1	0
P6	0	1	0	0
P7	0	1	0	0
P8	0	0	1	1
P9	0	0	0	0
P10	0	1	0	0
P11	0	1	0	0
P12	0	0	0	1
P13	0	0	1	0
P14	0	1	1	0
P15	0	0	1	1
P16	0	0	0	0
P17	0	0	1	0
P18	0	0	1	0
P19	0	1	0	1
P20	0	0	1	0

Ri,q (relevance score of Pi with respect to query Q)

	Q1			Q2			Q3			Q4		
P1			0			0			0			0
P2		1				0			0			0
P3		1				0			0			0
P4			0			3			0		2	
P5			0		1	1			1			0
P6			0			2			0			0
P7			0		3				0			0
P8			0			0		1			1	
P9			0			0			0			0
P10			0		1				0			0
P11			0			2			0			0
P12			0			0			0		5	
P13			0			0			1			0
P14			0			2		1	1			0
P15			0			0		6	1		5	
P16			0			0			0			0
P17			0			0			6			0
P18			0			0			1			0
P19			0		7	1			0			1
P20			0			0			1			0

Loi,k (occurrence of an outgoing link from Pi to Pk)

		k																	
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	0
	P2	1		0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	0
	P3	1	1		1	1	1	1	0	0	1	0	0	1	1	1	1	0	0	1	0
	P4	1	0	1		1	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1
	P5	1	0	0	1		0	0	1	1	1	1	1	1	1	1	0	0	0	1	1
	P6	1	0	1	1	1		0	1	1	0	0	1	0	0	1	0	0	0	0	1
	P7	1	1	1	1	1	1		1	0	1	1	1	0	0	0	1	1	1	0	1
	P8	1	1	1	1	1	1	0		1	1	1	0	1	0	1	1	1	1	0	1
	P9	1	1	0	0	1	1	0	1		1	1	1	0	1	0	1	0	0	0	1
	P10	1	1	0	0	0	0	1	0	1		1	1	0	0	0	1	1	1	0	1
	P11	1	1	1	1	0	1	1	1	0	1		1	0	0	0	1	1	1	1	1
	P12	1	1	0	0	0	1	1	1	1	1	1		0	0	0	1	1	1	1	1
	P13	1	1	0	0	1	1	1	0	0	0	0	0		1	1	1	1	0	0	1
	P14	1	1	1	1	1	0	0	1	1	0	0	1	0		1	1	1	0	0	0
	P15	1	1	1	1	1	0	1	1	1	1	1	1	1	1		1	0	0	1	1
	P16	1	0	1	0	0	0	1	1	1	0	1	1	1	1	1		0	0	1	0
	P17	1	1	1	0	0	1	1	0	0	1	1	0	0	1	0	0		1	0	1
	P18	1	1	1	0	1	1	1	0	0	1	1	1	1	0	0	1	1		0	0
	P19	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	1	1		0
	P20	1	0	1	0	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	

Lii,k (occurrence of an incoming link from P_k to P_i)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
	P2	1		0	0	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1
	P3	1	0		1	0	1	1	1	0	0	1	1	0	1	0	1	1	1	1	0
	P4	1	0	1		1	0	0	0	0	0	1	0	0	0	1	1	0	0	1	1
	P5	0	0	0	1		1	1	1	1	1	0	0	0	1	0	0	0	0	1	1
	P6	0	1	0	0	0		0	1	1	1	1	1	1	1	0	1	1	1	1	0
	P7	0	0	0	0	1	1		1	1	1	1	1	1	0	0	1	1	1	1	1
	P8	0	1	1	1	1	1	1		1	1	1	1	0	0	0	0	0	1	0	1
	P9	0	1	1	1	1	1	1	1		1	1	1	1	1	1	0	0	1	0	1
	P10	0	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	0	1
	P11	0	1	1	1	1	1	1	1	1	1		1	0	1	1	1	1	0	0	1
	P12	0	0	0	0	1	1	0	0	1	1	1		0	0	0	0	0	0	0	1
	P13	0	1	0	0	1	0	0	0	0	0	0	0		0	0	0	1	1	1	0
	P14	0	0	0	0	1	1	1	1	0	1	0	0	1		1	1	1	1	1	0
	P15	0	1	1	1	0	1	1	1	1	0	0	0	1	1		1	1	0	1	0
	P16	0	1	1	1	0	1	0	0	0	1	0	0	1	1	1		0	0	1	0
	P17	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0
	P18	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0		0	1
	P19	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0		0
	P20	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	

Tfi,k						wi,k(TF)				wi,k(at)				wi(ds)	wi,k			
	Q1	Q2	Q3	Q4	max	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
P1	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P2	1	0	0	0	1	1	0.5	0.5	0.5	5	0	0	0	0.20	1	0	0	0
P3	1	0	0	0	1	1	0.5	0.5	0.5	5	0	0	0	0.20	1	0	0	0
P4	0	3	0	2	3	0.5	1	0.5	0.83	0	3	0	10	0.11	0	0.34	0	0.94
P5	0	2	1	0	2	0.5	1	0.75	0.5	0	6	1	0	0.17	0	0.99	0.12	0
P6	0	2	0	0	2	0.5	1	0.5	0.5	0	2	0	0	0.50	0	1	0	0
P7	0	3	0	0	3	0.5	1	0.5	0.5	0	15	0	0	0.07	0	1	0	0
P8	0	0	1	1	1	0.5	0.5	1	1	0	0	5	5	0.14	0	0	0.71	0.71
P9	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P10	0	1	0	0	1	0.5	1	0.5	0.5	0	5	0	0	0.20	0	1	0	0
P11	0	2	0	0	2	0.5	1	0.5	0.5	0	2	0	0	0.50	0	1	0	0
P12	0	0	0	5	5	0.5	0.5	0.5	1	0	0	0	25	0.04	0	0	0	1
P13	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0
P14	0	2	2	0	2	0.5	1	1	0.5	0	2	6	0	0.16	0	0.32	0.95	0
P15	0	0	7	5	7	0.5	0.5	1	0.86	0	0	31	25	0.03	0	0	0.82	0.57
P16	0	0	0	0	0	100	100	100	100	0	0	0	0	0.00	0	0	0	0
P17	0	0	6	0	6	0.5	0.5	1	0.5	0	0	6	0	0.17	0	0	1	0
P18	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0
P19	0	8	0	1	8	0.5	1	0.5	0.56	0	36	0	1	0.03	0	1	0	0.02
P20	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0

Term-based Similarity between pages Pi and Pj Pj

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Pi	P1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P4	0	0	0	1	0.34	0.34	0.34	0.67	0	0.34	0.34	0.94	0	0.11	0.54	0	0	0	0.35	0
	P5	0	0	0	0.34	1	0.99	0.99	0.09	0	0.99	0.99	0	0.12	0.43	0.1	0	0.12	0.12	0.99	0.12
	P6	0	0	0	0.34	0.99	1	1	0	0	1	1	0	0	0.32	0	0	0	0	1	0
	P7	0	0	0	0.34	0.99	1	1	0	0	1	1	0	0	0.32	0	0	0	0	1	0
	P8	0	0	0	0.67	0.09	0	0	1	0	0	0	0.71	0.71	0.67	0.98	0	0.71	0.71	0.01	0.71
	P9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	P10	0	0	0	0.34	0.99	1	1	0	0	1	1	0	0	0.32	0	0	0	0	1	0
	P11	0	0	0	0.34	0.99	1	1	0	0	1	1	0	0	0.32	0	0	0	0	1	0
	P12	0	0	0	0.94	0	0	0	0.71	0	0	0	1	0	0	0.57	0	0	0	0.02	0
	P13	0	0	0	0	0.12	0	0	0.71	0	0	0	0	1	0.95	0.82	0	1	1	0	1
	P14	0	0	0	0.11	0.43	0.32	0.32	0.67	0	0.32	0.32	0	0.95	1	0.78	0	0.95	0.95	0.32	0.95
	P15	0	0	0	0.54	0.1	0	0	0.98	0	0	0	0.57	0.82	0.78	1	0	0.82	0.82	0.01	0.82
	P16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	P17	0	0	0	0	0.12	0	0	0.71	0	0	0	0	1	0.95	0.82	0	1	1	0	1
	P18	0	0	0	0	0.12	0	0	0.71	0	0	0	0	1	0.95	0.82	0	1	1	0	1
	P19	0	0	0	0.35	0.99	1	1	0.01	0	1	1	0.02	0	0.32	0.01	0	0	0	1	0
	P20	0	0	0	0	0.12	0	0	0.71	0	0	0	0	1	0.95	0.82	0	1	1	0	1

Table C-2-6 Azby.nifty

Xi,j (occurrence of Qj in Pi)

	Q1	Q2	Q3	Q4
P1	0	1	0	0
P2	0	0	1	0
P3	0	0	0	1
P4	0	0	0	1
P5	0	0	1	0
P6	1	0	0	0
P7	1	0	0	0
P8	1	0	0	0
P9	0	0	1	0
P10	0	1	1	0
P11	0	0	1	0
P12	0	0	1	0
P13	0	1	0	0
P14	0	0	1	0
P15	0	0	1	0
P16	0	1	0	0
P17	0	0	1	1
P18	0	0	1	0
P19	0	0	1	0
P20	0	0	0	1

Ri,q (relevance score of Pi with respect to query Q)

	Q1			Q2			Q3			Q4		
P1			0		4				0			0
P2			0			0			5			0
P3			1			0			0			2
P4			0			0			0		2	
P5			0			0			3			0
P6			2			0			0			0
P7			1			0			0			0
P8			1			0			0			0
P9			0			0			2			0
P10			0		3				1			0
P11			0			0			8			0
P12			0			0		2				0
P13			0			1			0			0
P14			0			0			4			0
P15			0			0			2			0
P16			0			0			1		1	1
P17			0			0			3			0
P18			0			0			1			0
P19			0			0			2			0
P20			0			0			0			4

Loi,k (occurrence of an outgoing link from Pi to Pk)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	0	1	0	1	1	1	1	1	0	1	1	0	0	0	1	1	1	0
	P2	1		0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	1	0	0
	P3	1	1		1	1	0	1	0	1	0	0	0	1	1	1	1	0	1	1	0
	P4	1	0	1		1	1	1	0	1	0	1	1	0	1	0	1	1	0	1	1
	P5	1	0	0	1		0	0	1	1	1	1	1	0	1	1	0	1	0	1	1
	P6	1	0	1	1	1		0	1	1	0	0	1	0	1	1	0	1	1	0	1
	P7	1	0	1	1	1	1		1	0	1	1	0	1	0	1	1	0	1	0	1
	P8	1	1	0	1	1	1	0		1	1	1	0	1	1	0	1	1	1	0	1
	P9	1	0	1	1	1	1	0	1		1	1	1	0	1	0	1	1	1	0	1
	P10	1	0	1	1	1	0	1	0	1		1	1	0	1	1	0	1	1	0	1
	P11	1	0	1	0	1	1	1	1	0	1		1	0	1	1	1	1	0	0	1
	P12	1	1	0	0	1	1	1	1	1	1	1		1	0	1	1	1	1	1	1
	P13	1	1	0	1	0	1	1	0	0	0	0	0		1	1	0	1	1	1	0
	P14	1	1	0	0	1	1	0	0	1	1	0	1	0		1	1	1	0	1	1
	P15	1	1	0	1	0	1	1	0	1	1	1	0	1	1		1	0	0	1	1
	P16	1	0	0	0	0	0	0	1	0	1	0	0	1	1	1		0	0	1	0
	P17	1	0	1	1	0	1	1	1	1	1	1	1	0	1	0	0		1	0	1
	P18	1	0	1	1	0	1	1	1	0	1	1	1	1	0	1	1	1		0	0
	P19	1	1	0	1	1	0	1	0	0	1	1	0	0	0	1	1	1	1		0
	P20	1	0	1	0	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	

Lii,k (occurrence of an incoming link from P_k to P_i)

		k																			
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
i	P1		1	0	1	0	0	0	0	0	0	1	1	0	1	1	1	1	0	1	1
	P2	1		0	0	0	0	0	1	1	0	1	1	0	1	1	1	1	0	1	1
	P3	1	0		1	0	0	0	1	1	1	0	1	1	0	1	0	1	1	0	1
	P4	1	0	1		1	1	1	0	1	1	1	1	1	0	0	1	1	0	0	1
	P5	0	0	0	1		1	1	1	1	1	1	1	0	0	1	0	1	0	1	1
	P6	0	0	0	1	0		0	0	0	0	0	0	1	1	0	1	1	1	1	0
	P7	0	0	0	1	1	1		1	1	1	1	0	1	1	0	1	1	1	1	1
	P8	0	0	0	1	1	1	1		1	1	1	1	0	1	0	1	1	0	1	1
	P9	0	1	1	1	1	1	1	1		1	1	1	0	0	1	0	1	0	1	1
	P10	0	1	1	1	1	1	1	1	1		1	1	0	0	1	0	0	1	0	1
	P11	0	1	1	1	1	1	1	1	1	1		1	0	1	0	0	1	1	0	1
	P12	0	0	1	1	0	1	1	1	1	1	1		0	0	0	0	1	1	0	1
	P13	0	0	1	1	0	1	1	0	0	0	0	0		0	0	1	0	0	1	1
	P14	0	1	0	1	1	0	1	1	1	0	0	0	1		1	1	1	0	1	1
	P15	0	0	1	1	1	0	0	1	0	1	1	0	1	1		1	1	1	0	1
	P16	0	1	0	1	1	0	1	1	0	1	1	0	1	1	1		0	0	1	0
	P17	1	0	1	1	0	1	1	0	1	1	1	0	0	0	1	1		0	0	0
	P18	0	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0		0	1
	P19	0	1	0	1	1	0	1	1	0	1	0	1	1	0	1	1	1	0		0
	P20	0	0	0	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	

Tfi,k						wi,k(TF)				wi,k(at)				wi(ds)	wi,k			
	Q1	Q2	Q3	Q4	max	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
P1	0	4	0	0	4	0.5	1	0.5	0.5	0	20	0	0	0.05	0	1	0	0
P2	0	0	5	0	5	0.5	0.5	1	0.5	0	0	5	0	0.20	0	0	1	0
P3	1	0	0	2	2	0.75	0.5	0.5	1	1	0	0	2	0.47	0.35	0	0	0.94
P4	0	0	0	2	2	0.5	0.5	0.5	1	0	0	0	10	0.10	0	0	0	1
P5	0	0	3	0	3	0.5	0.5	1	0.5	0	0	3	0	0.33	0	0	1	0
P6	2	0	0	0	2	1	0.5	0.5	0.5	2	0	0	0	0.50	1	0	0	0
P7	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P8	1	0	0	0	1	1	0.5	0.5	0.5	1	0	0	0	1.00	1	0	0	0
P9	0	0	2	0	2	0.5	0.5	1	0.5	0	0	2	0	0.50	0	0	1	0
P10	0	3	1	0	3	0.5	1	0.67	0.5	0	15	1	0	0.07	0	1	0.04	0
P11	0	0	8	0	8	0.5	0.5	1	0.5	0	0	8	0	0.13	0	0	1	0
P12	0	0	2	0	2	0.5	0.5	1	0.5	0	0	10	0	0.10	0	0	1	0
P13	0	1	0	0	1	0.5	1	0.5	0.5	0	1	0	0	1.00	0	1	0	0
P14	0	0	4	0	4	0.5	0.5	1	0.5	0	0	4	0	0.25	0	0	1	0
P15	0	0	2	0	2	0.5	0.5	1	0.5	0	0	2	0	0.50	0	0	1	0
P16	0	0	1	2	2	0.5	0.5	0.75	1	0	0	1	6	0.17	0	0	0.12	0.99
P17	0	0	3	0	3	0.5	0.5	1	0.5	0	0	3	0	0.33	0	0	1	0
P18	0	0	1	0	1	0.5	0.5	1	0.5	0	0	1	0	1.00	0	0	1	0
P19	0	0	2	0	2	0.5	0.5	1	0.5	0	0	2	0	0.50	0	0	1	0
P20	0	0	0	4	4	0.5	0.5	0.5	1	0	0	0	4	0.25	0	0	0	1

Term-based Similarity between pages Pi and Pj　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　Pj

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Pi	P1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
	P2	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P3	0	0	1	0.94	0	0.35	0.35	0.35	0	0	0	0	0	0	0	0.93	0	0	0	0.94
	P4	0	0	0.94	1	0	0	0	0	0	0	0	0	0	0	0	0.99	0	0	0	1
	P5	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P6	0	0	0.35	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	P7	0	0	0.35	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	P8	0	0	0.35	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	P9	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P10	1	0.04	0	0	0.04	0	0	0	0.04	1	0.04	0.04	1	0.04	0.04	0.01	0.04	0.04	0.04	0
	P11	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P12	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P13	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
	P14	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P15	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P16	0	0.12	0.93	0.99	0.12	0	0	0	0.12	0.01	0.12	0.12	0	0.12	0.12	1	0.12	0.12	0.12	0.99
	P17	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P18	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P19	0	1	0	0	1	0	0	0	1	0.04	1	1	0	1	1	0.12	1	1	1	0
	P20	0	0	0.94	1	0	0	0	0	0	0	0	0	0	0	0	0.99	0	0	0	1

Table C-3 Number of Link for 6 E-business Website

Daiei																				
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
P1	0	1	1	1	2	1	2	2	2	2	2	2	1	1	1	1	1	2	1	2
P2	1	0	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
P3	1	1	0	1	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	2
P4	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P5	1	2	2	1	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P6	1	2	1	1	1	0	1	1	1	1	1	1	2	2	2	2	2	1	2	1
P7	1	2	1	1	1	1	0	1	1	1	1	1	2	2	2	2	2	1	2	1
P8	1	2	1	1	1	1	1	0	1	1	1	1	2	2	2	2	2	1	2	1
P9	1	2	1	1	1	1	1	1	0	1	1	1	2	2	2	2	2	1	2	1
P10	1	2	1	1	1	1	1	1	1	0	1	1	2	2	2	2	2	1	2	1
P11	1	2	1	1	1	1	1	1	1	1	0	1	2	2	2	2	2	1	2	1
P12	1	2	1	1	1	1	1	1	1	1	1	0	2	2	2	2	2	1	2	1
P13	1	2	2	1	2	2	2	2	2	2	2	2	0	1	1	1	2	2	1	2
P14	1	2	2	1	2	2	2	2	2	2	2	2	1	0	1	1	2	2	1	2
P15	1	2	2	1	2	2	2	2	2	2	2	2	1	1	0	1	2	2	1	2
P16	1	2	2	1	2	2	2	2	2	2	2	2	1	1	1	0	2	2	1	2
P17	1	2	2	1	1	1	2	1	1	1	1	1	2	2	2	2	0	1	2	1
P18	1	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	0	2	1
P19	1	2	2	1	2	2	2	2	2	2	2	2	1	1	1	1	2	2	0	2
P20	1	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	2	0

Izutsuya

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
P1	0	1	1	1	2	1	2	2	1	1	2	1	1	2	2	2	2	1	1	2
P2	1	0	2	2	3	2	3	3	2	2	3	2	2	3	3	3	3	2	2	3
P3	1	1	0	1	1	1	2	2	2	2	2	2	1	1	1	1	1	2	1	2
P4	1	2	1	0	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
P5	1	2	2	1	0	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
P6	1	2	1	1	1	0	2	1	1	2	2	1	2	1	2	2	2	1	2	1
P7	1	2	1	1	1	1	0	1	2	1	1	1	2	2	2	2	2	1	2	1
P8	1	2	1	1	1	1	2	0	1	1	1	2	1	2	1	2	2	2	2	1
P9	1	2	1	1	1	1	2	1	0	1	1	1	2	1	2	2	2	1	2	1
P10	1	2	1	1	1	2	1	2	1	0	1	1	2	2	2	2	2	2	2	1
P11	1	1	1	2	1	1	1	1	2	1	0	1	2	2	2	2	2	2	2	1
P12	1	2	1	1	1	1	1	1	1	1	1	0	2	2	2	2	2	1	2	1
P13	1	1	2	1	2	1	1	2	2	2	2	2	0	1	1	1	2	1	1	2
P14	1	1	2	1	1	2	2	1	1	2	2	1	2	0	1	1	2	1	1	1
P15	1	1	2	2	1	2	1	1	2	1	1	2	1	1	0	1	2	2	1	1
P16	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	0	2	2	1	2
P17	1	1	2	2	1	1	2	1	1	1	1	1	2	1	2	2	0	1	2	1
P18	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	0	2	2
P19	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	1	0	2
P20	1	2	1	2	1	1	1	1	1	1	1	1	2	2	2	2	2	1	2	0

Tokyu

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
P1	0	1	1	1	2	1	2	2	1	1	2	1	1	1	2	1	2	1	1	2

P2	1	0	2	2	2	2	3	2	2	2	3	2	2	1	2	1	3	2	2	2
P3	1	1	0	1	1	1	2	2	2	2	2	2	1	1	1	1	1	2	1	2
P4	1	2	1	0	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
P5	1	2	2	1	0	2	1	1	2	2	1	2	1	1	1	1	1	1	1	1
P6	1	1	1	1	1	0	1	1	1	2	2	1	2	2	2	2	2	2	1	1
P7	1	1	1	1	1	1	0	1	2	1	1	1	2	2	2	2	2	2	1	1
P8	1	1	1	1	1	1	2	0	1	1	1	2	1	2	1	2	2	2	1	1
P9	1	1	2	1	1	1	2	1	0	1	1	1	2	1	2	2	2	1	2	1
P10	1	2	2	1	1	2	2	2	1	0	1	2	2	2	2	2	2	2	1	1
P11	1	1	2	2	1	1	1	1	2	1	0	1	2	2	2	2	2	2	2	1
P12	1	2	1	1	1	2	2	1	2	1	1	0	2	2	2	2	2	1	2	1
P13	1	1	1	1	2	1	1	2	2	2	2	2	0	1	1	1	2	1	1	2
P14	1	1	2	2	1	2	2	1	1	2	2	2	2	0	1	2	2	1	1	1
P15	1	1	2	2	1	2	1	1	2	1	1	2	1	1	0	2	2	2	1	1
P16	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	0	3	2	1	2
P17	1	1	2	1	1	1	2	1	2	1	1	2	2	1	2	2	0	1	1	1
P18	1	1	1	2	1	1	1	1	1	1	1	2	1	2	2	1	2	0	1	2
P19	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	3	1	0	2
P20	1	2	1	2	1	1	2	1	1	1	1	1	2	2	2	2	2	1	1	0

Japanet

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
P1	0	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	2
P2	1	0	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	2	2
P3	1	1	0	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2
P4	1	2	1	0	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1

P5	1	2	2	1	0	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
P6	1	2	1	1	1	0	2	1	1	2	2	1	2	2	2	2	2	1	2	1
P7	1	2	1	1	1	1	0	1	2	1	1	1	2	2	2	2	1	1	1	1
P8	1	2	1	1	1	1	2	0	1	1	1	2	1	2	1	1	1	1	1	1
P9	1	2	1	1	1	1	2	1	0	1	1	1	1	1	1	1	1	1	1	1
P10	1	2	1	1	1	2	1	2	1	0	1	1	1	2	1	1	1	2	1	1
P11	1	1	1	2	1	1	1	1	2	1	0	1	2	2	1	1	1	2	1	1
P12	1	2	1	1	1	1	1	1	1	1	1	0	2	2	2	2	1	1	1	1
P13	1	1	2	1	2	1	1	2	2	2	2	2	0	1	1	2	1	1	1	2
P14	1	1	2	1	1	2	2	1	1	2	2	1	2	0	1	1	2	1	1	1
P15	1	1	1	2	1	2	1	1	2	1	1	2	1	1	0	1	2	2	1	1
P16	1	2	1	2	2	2	2	2	2	2	2	2	1	1	1	0	2	2	1	2
P17	1	1	1	1	1	1	2	1	1	1	1	1	2	1	2	2	0	1	2	1
P18	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	0	1	2
P19	1	2	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	0	2
P20	1	2	1	2	1	1	2	2	1	2	1	1	1	1	1	2	2	1	2	0
Takasimaya																				
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
P1	0	1	1	1	2	1	1	1	1	1	2	1	1	2	2	1	1	1	1	2
P2	1	0	2	2	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	2
P3	1	1	0	1	1	1	1	2	2	1	2	2	1	1	1	1	2	2	1	2
P4	1	2	1	0	1	1	1	2	2	2	1	1	1	1	1	1	2	2	2	1
P5	1	2	2	1	0	2	2	1	1	1	1	1	1	1	1	2	2	2	1	1
P6	1	2	1	1	1	0	2	1	1	2	2	1	2	2	1	2	2	2	2	1
P7	1	1	1	1	1	1	0	1	2	1	1	1	2	2	2	1	1	1	2	1

P8	1	1	1	1	1	1	2	0	1	1	1	2	1	2	1	1	1	1	2	1
P9	1	1	2	2	1	1	2	1	0	1	1	1	2	1	2	1	2	2	2	1
P10	1	1	2	2	2	2	1	2	1	0	1	1	2	2	2	1	1	1	2	1
P11	1	1	1	1	2	1	1	1	2	1	0	1	2	2	2	1	1	1	1	1
P12	1	1	2	2	2	1	1	1	1	1	1	0	2	2	2	1	1	1	1	1
P13	1	1	2	2	1	1	1	2	2	2	2	2	0	1	1	1	1	2	2	1
P14	1	1	1	1	1	2	2	1	1	2	2	1	2	0	1	1	1	2	2	2
P15	1	1	1	1	1	2	1	1	1	1	1	1	1	1	0	1	2	2	1	1
P16	1	2	1	2	2	2	1	1	1	2	1	1	1	1	1	0	2	2	1	2
P17	1	1	1	2	2	1	1	2	2	1	1	2	2	1	2	2	0	1	2	1
P18	1	1	1	2	1	1	1	2	2	1	1	1	1	2	2	1	1	0	2	2
P19	1	2	2	2	2	2	2	2	2	1	2	2	1	1	2	1	1	1	0	2
P20	1	2	1	2	1	1	1	1	1	1	2	2	1	1	1	1	2	1	2	0
Abzby																				
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
P1	0	1	2	1	2	1	1	1	1	1	2	1	1	2	2	2	1	1	1	2
P2	1	0	2	2	2	1	1	1	1	1	2	2	1	1	1	2	1	1	2	2
P3	1	1	0	1	1	2	1	2	1	2	2	2	1	1	1	1	2	1	1	2
P4	1	2	1	0	1	1	1	2	1	2	1	1	2	1	2	1	1	2	1	1
P5	1	2	2	1	0	2	2	1	1	1	1	1	2	1	1	2	1	2	1	1
P6	1	2	1	1	1	0	2	1	1	2	2	1	2	1	1	2	1	1	2	1
P7	1	2	1	1	1	1	0	1	2	1	1	2	1	2	1	1	2	1	2	1
P8	1	1	2	1	1	1	2	0	1	1	1	2	1	1	2	1	1	1	2	1
P9	1	2	1	1	1	1	2	1	0	1	1	1	2	1	2	1	1	1	2	1
P10	1	2	1	1	1	2	1	2	1	0	1	1	2	1	1	2	1	1	2	1

P11	1	2	1	2	1	1	1	1	2	1	0	1	2	1	1	1	1	2	2	1
P12	1	1	2	2	1	1	1	1	1	1	1	0	1	2	1	1	1	1	1	1
P13	1	1	2	1	2	1	1	2	2	2	2	2	0	1	1	2	1	1	1	2
P14	1	1	2	2	1	1	2	2	1	1	2	1	2	0	1	1	1	2	1	1
P15	1	1	2	1	2	1	1	2	1	1	1	2	1	1	0	1	2	2	1	1
P16	1	2	2	2	2	2	2	1	2	1	2	2	1	1	1	0	2	2	1	2
P17	1	2	1	1	2	1	1	1	1	1	1	1	2	1	2	2	0	1	2	1
P18	1	2	1	1	2	1	1	1	2	1	1	1	1	2	1	1	1	0	2	2
P19	1	1	2	1	1	2	1	2	2	1	1	2	2	2	1	1	1	1	0	2
P20	1	2	1	2	1	1	1	1	1	2	1	1	2	1	2	1	2	1	2	0

Table C-4 Theoretical Value

Table c-4-1 Daiei

HW=Hub Weight		A*At																			
AW=Authority Weight		At*A																			
	Hw	1.06	1.36	1.09	0.72	0.83	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.21	1.21	1.21	1.21	1.02	1.00	1.21	1.00
	Aw	0.68	1.24	0.99	0.69	1.01	0.99	1.03	1.00	1.00	1.00	1.00	1.00	1.05	1.05	1.05	1.05	1.23	1.00	1.05	1.00
4.77	Hw^2	1.13	1.84	1.18	0.52	0.69	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.47	1.47	1.47	1.47	1.04	1.00	1.47	1.00
4.53	Aw^2	0.46	1.53	0.97	0.47	1.01	0.98	1.07	1.00	1.00	1.00	1.00	1.00	1.11	1.11	1.11	1.11	1.51	1.00	1.11	1.00
	HwNormal	0.22	0.28	0.23	0.15	0.17	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.25	0.25	0.25	0.25	0.21	0.21	0.25	0.21
	AwNormal	0.15	0.27	0.22	0.15	0.22	0.22	0.23	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.27	0.22	0.23	0.22

Average	STD	Skew	Kurt
0.22	0.03	-0.09	0.62
0.22	0.03	-1.15	3.19

Table c-4-2　Izutsuya

HW=Hub Weight
AW=Authority Weight

	Hw	1.05	1.70	0.97	0.77	0.84	1.04	1.00	0.99	0.97	1.07	1.03	0.97	1.01	0.95	0.93	1.19	0.95	0.88	1.16	1.00
	Aw	0.67	1.02	0.97	0.94	0.94	0.94	1.13	1.01	0.98	0.94	1.04	0.94	1.07	1.06	1.20	1.12	1.24	0.94	1.06	1.00
4.64	Hw^2	1.10	2.89	0.95	0.59	0.70	1.09	0.99	0.99	0.94	1.15	1.06	0.94	1.02	0.90	0.86	1.41	0.90	0.77	1.34	1.00
4.55	Aw^2	0.44	1.04	0.94	0.88	0.89	0.88	1.28	1.01	0.96	0.89	1.08	0.89	1.15	1.13	1.43	1.26	1.54	0.89	1.13	1.00
	HwNormal	0.23	0.37	0.21	0.17	0.18	0.22	0.21	0.21	0.21	0.23	0.22	0.21	0.22	0.20	0.20	0.26	0.20	0.19	0.25	0.22
	AwNormal	0.15	0.22	0.21	0.21	0.21	0.21	0.25	0.22	0.21	0.21	0.23	0.21	0.24	0.23	0.26	0.25	0.27	0.21	0.23	0.22

Average	STD	Skew	Kurt
0.22	0.04	2.63	9.56
0.22	0.03	-0.69	2.83

Table c-4-3　Tokyu

HW=Hub Weight
AW=Authority Weight

	Hw	0.97	1.41	0.98	0.76	0.91	1.00	0.96	0.93	0.96	1.15	1.06	1.06	0.98	1.08	0.99	1.25	0.95	0.92	1.31	1.00
	Aw	0.72	0.97	1.12	1.05	0.93	1.05	1.24	1.01	1.15	1.03	1.09	1.18	1.15	1.01	1.21	1.11	1.48	1.07	0.87	1.00
4.66	Hw^2	0.94	2.00	0.96	0.58	0.83	0.99	0.92	0.86	0.92	1.31	1.13	1.13	0.97	1.16	0.99	1.57	0.90	0.85	1.70	1.00
4.84	Aw^2	0.51	0.94	1.25	1.11	0.87	1.10	1.55	1.02	1.32	1.07	1.19	1.40	1.32	1.01	1.46	1.23	2.20	1.15	0.75	1.00

	HwNormal	0.21	0.30	0.21	0.16	0.20	0.21	0.21	0.20	0.21	0.25	0.23	0.23	0.21	0.23	0.21	0.27	0.20	0.20	0.28	0.21
	AwNormal	0.15	0.20	0.23	0.22	0.19	0.22	0.26	0.21	0.24	0.21	0.23	0.24	0.24	0.21	0.25	0.23	0.31	0.22	0.18	0.21

Average	STD	Skew	Kurt
0.22	0.03	1.09	1.50
0.22	0.03	0.31	2.45

Table c-4-4　Japanet

HW=Hub Weight
AW=Authority Weight

	Hw	0.86	0.88	0.97	0.78	0.85	1.08	0.92	0.85	0.78	0.88	0.88	0.89	1.02	0.95	0.91	1.18	0.88	0.85	0.93	1.00
	Aw	0.73	1.15	0.84	0.93	0.82	0.92	1.12	1.01	1.01	1.02	1.02	0.93	0.95	1.02	0.99	0.95	0.98	0.89	0.88	1.00
4.12	Hw^2	0.73	0.77	0.94	0.60	0.73	1.17	0.85	0.73	0.61	0.78	0.77	0.79	1.05	0.91	0.83	1.40	0.78	0.72	0.87	1.00
4.31	Aw^2	0.53	1.32	0.71	0.87	0.67	0.84	1.25	1.03	1.03	1.05	1.04	0.87	0.91	1.05	0.97	0.91	0.95	0.79	0.78	1.00
	HwNormal	0.21	0.21	0.24	0.19	0.21	0.26	0.22	0.21	0.19	0.21	0.21	0.22	0.25	0.23	0.22	0.29	0.21	0.21	0.23	0.24
	AwNormal	0.17	0.27	0.20	0.22	0.19	0.21	0.26	0.24	0.24	0.24	0.24	0.22	0.22	0.24	0.23	0.22	0.23	0.21	0.21	0.23

Average	STD	Skew	Kurt
0.22	0.02	1.14	1.73
0.22	0.02	-0.33	0.75

Table c-4-5　akasimaya

HW=Hub Weight
AW=Authority Weight

	Hw	0.97	1.17	1.03	1.03	1.02	1.15	0.97	0.92	1.09	1.13	0.96	1.01	1.12	1.07	0.87	1.08	1.12	1.04	1.23	1.00
	Aw	0.73	0.95	1.00	1.12	1.04	0.99	0.96	1.01	1.03	0.92	1.04	1.00	1.07	1.06	1.12	0.84	1.02	1.07	1.14	1.00

4.71	Hw^2	0.94	1.36	1.07	1.06	1.04	1.32	0.94	0.84	1.18	1.28	0.92	1.01	1.25	1.15	0.76	1.16	1.26	1.09	1.51	1.00
4.52	Aw^2	0.53	0.91	1.01	1.26	1.08	0.99	0.92	1.01	1.06	0.84	1.09	1.00	1.15	1.12	1.25	0.71	1.04	1.14	1.30	1.00
	HwNormal	0.21	0.25	0.22	0.22	0.22	0.24	0.21	0.19	0.23	0.24	0.20	0.21	0.24	0.23	0.18	0.23	0.24	0.22	0.26	0.21
	AwNormal	0.16	0.21	0.22	0.25	0.23	0.22	0.21	0.22	0.23	0.20	0.23	0.22	0.24	0.23	0.25	0.19	0.23	0.24	0.25	0.22

Average	STD	Skew	Kurt
0.22	0.02	0.00	-0.20
0.22	0.02	-1.39	2.91

Table c-4-6 Abzby

HW=Hub Weight
AW=Authority Weight

	Hw	1.01	1.04	0.99	0.96	1.00	1.01	0.96	0.93	0.93	0.97	0.97	0.84	1.07	1.00	0.96	1.19	0.97	0.96	1.03	1.00
	Aw	0.72	1.14	1.11	0.95	1.00	0.92	0.95	0.99	0.96	0.91	1.00	1.04	1.10	0.90	0.94	0.98	0.92	0.96	1.09	1.00
4.44	Hw^2	1.01	1.08	0.97	0.93	1.01	1.02	0.93	0.86	0.87	0.94	0.93	0.70	1.15	1.01	0.92	1.42	0.94	0.93	1.07	1.00
4.40	Aw^2	0.52	1.30	1.23	0.91	0.99	0.84	0.91	0.98	0.92	0.84	1.00	1.08	1.20	0.82	0.89	0.97	0.84	0.91	1.19	1.00
	HwNormal	0.23	0.23	0.22	0.22	0.23	0.23	0.22	0.21	0.21	0.22	0.22	0.19	0.24	0.23	0.22	0.27	0.22	0.22	0.23	0.23
	AwNormal	0.16	0.26	0.25	0.22	0.23	0.21	0.22	0.23	0.22	0.21	0.23	0.24	0.25	0.21	0.21	0.22	0.21	0.22	0.25	0.23

Average	STD	Skew	Kurt
0.22	0.02	0.92	4.15
0.22	0.02	-0.70	2.36

Table c-4-7 Aggregation of Theoretical Value

Hw=Hub Weight Aw=Authority Weight Tb=Term-based Similarity between pages Pi and Pj

	Hw_average	Hw_std	Hw_skew	Hw_kurt	Aw_average	Aw_std	Aw_skew	Aw_kurt	Tb_average	Tb_std	Tb_skew	Tb_kurt
EC1	0.222	0.031	-0.091	0.617	0.222	0.029	-1.151	3.187	0.295	0.418	0.813	-1.193
EC2	0.220	0.040	2.627	9.558	0.222	0.026	-0.692	2.830	0.325	0.425	0.718	-1.351
EC3	0.221	0.032	1.086	1.498	0.221	0.032	0.314	2.450	0.283	0.409	1.012	-0.819
EC4	0.222	0.024	1.140	1.734	0.223	0.023	-0.334	0.753	0.530	0.393	-0.187	-1.503
EC5	0.223	0.019	0.004	-0.202	0.223	0.021	-1.395	2.907	0.263	0.403	1.067	-0.680
EC6	0.223	0.015	0.922	4.146	0.223	0.021	-0.703	2.363	0.348	0.464	0.673	-1.525

D: Chapter 5

(1) Table D-1 Information value of S1 (2014)

	Vp1	Vp2	Vp3	Vp4	Vp5	Vp6	Vp7		
h1	12.42	108.44	218.31	7411.79	259.23	37.04	818.47	159582.40	Vh1
h2	10.64	61.04	250.70		188.94		1435.33	1946.65	Vh2
h3	10.64	61.04	250.70		188.94		1435.33	1946.65	Vh3
h4	9.31	203.47	208.92		354.27		897.08	1673.04	Vh4
h5	9.80		199.64		769.94		806.79	1786.17	Vh5
h6	10.34	305.20	698.73	239.09	384.97		889.22	2527.55	Vh6
h7	10.18	244.16	277.46		384.97		844.76	1761.53	Vh7
h8	12.82	406.93	677.09		481.21		592.81	2170.87	Vh8
h9	14.79	203.47	1354.19		549.96		563.17	2685.58	Vh9
h10	18.94						363.55	382.49	Vh10
h11	12.82	152.60	338.55		481.21		675.81	1660.99	Vh11
h12	10.99	122.08	270.84		384.97		844.76	1633.64	Vh12
h13	12.80	61.04	156.69		229.39		1211.93	1671.85	Vh13
h14	13.72	64.25	208.92		229.39		1038.80	1555.07	Vh14
h15	9.60	122.08	250.70		183.51		1211.93	1777.82	Vh15
h16	14.89	81.39	156.69		236.18		897.08	1386.23	Vh16
h17	14.89	81.39	156.69		236.18		897.08	1386.23	Vh17
h18	19.23	81.39	150.47		349.97		750.90	1351.95	Vh18
h19	19.23	81.39	150.47		349.97		750.90	1351.95	Vh19
h20	12.82	48.83	270.84		384.97		1126.35	1843.81	Vh20
h21	17.59	101.73	147.96		280.20		663.88	1211.36	Vh21
h22	19.54	135.64	147.96		280.20		603.53	1186.87	Vh22
h23	8.79	122.08	394.55		400.29		829.85	1755.56	Vh23
h24	19.54	122.08	169.09		280.20		603.53	1194.45	Vh24
h25	7.82	135.64	295.91		233.50		1106.47	1779.35	Vh25
h26	16.92	81.39	139.28		218.01		875.20	1330.80	Vh26
h27	16.75	101.73	147.96		280.20		677.43	1224.07	Vh27
h28	16.75	122.08	147.96		254.73		663.88	1205.40	Vh28
h29	8.79	122.08	394.55		400.29		829.85	1755.56	Vh29
h30	17.59	110.98	169.09		280.20		638.35	1216.21	Vh30
h31	7.82	122.08	295.91		233.50		1144.63	1803.94	Vh31
h32	16.92	81.39	139.28		218.01		875.20	1330.80	Vh32
								209076.87	
								209.08	Vs

(2) Table D-2 Information value of S2 (2014)

	Vp1	Vp2	Vp3	Vp4	Vp5	Vp6	Vp7		
h1	28.93	159.28	683.90	342.64	1210.25	1483.89	683.72	82666.76	Vh1
h2	25.32	162.23	604.35	252.81	1029.49	1594.41	815.18	4483.79	Vh2
h3	25.32	162.23	604.35	252.81	1029.49	1594.41	815.18	4483.79	Vh3
h4	25.32	162.23	604.35		1029.49	1594.41	724.61	4140.41	Vh4
h5	25.32	162.23	604.35	252.81	1029.49	1594.41	815.18	4483.79	Vh5
h6	18.57	149.75	1208.71		1544.23	1993.01	931.64	5845.91	Vh6
h7	18.57	149.75	1208.71		1544.23	1993.01	931.64	5845.91	Vh7
h8	27.85	129.78	604.35		772.12	1328.68	758.31	3621.09	Vh8
h9	21.60	158.24	454.07		549.29	1113.27	1119.02	3415.49	Vh9
h10	34.55	138.46	681.10		823.94	1298.82	714.27	3691.14	Vh10
h11	28.79	147.69	681.10		823.94	1298.82	780.71	3761.06	Vh11
h12	34.55	170.41	681.10		823.94	1298.82	671.41	3680.24	Vh12
h13	27.85	129.78	604.35		772.12	1328.68	758.31	3621.09	Vh13
h14	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh14
h15	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh15
h16	29.79	184.61	681.10		823.94	338.82	1119.02	3177.29	Vh16
h17	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh17
h18	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh18
h19	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh19
h20	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh20
h21	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh21
h22	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh22
h23	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh23
h24	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh24
h25	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh25
h26	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh26
h27	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh27
h28	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh28
h29	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh29
h30	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh30
h31	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh31
h32	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh32
h33	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh33
h34	30.85	184.61	681.10		1098.59	1558.58	671.41	4225.15	Vh34
h35	19.89	149.75	604.35		772.12	1328.68	988.10	3862.89	Vh35
h36	20.57	170.41	681.10		823.94	1298.82	1017.29	4012.13	Vh36
h37	19.89	149.75	604.35		772.12	1328.68	988.10	3862.89	Vh37
h38	21.07	170.41	681.10		823.94	1298.82	987.37	3982.71	Vh38
h39	21.07	170.41	681.10		823.94	1298.82	987.37	3982.71	Vh39
h40	27.85	194.67	1208.71		1544.23	1594.41	627.07	5196.94	Vh40

h41	27.86	221.53	1362.21		1647.88	1558.58	658.25	5476.31	Vh41
h42	27.86	221.53	1362.21		1647.88	1558.58	658.25	5476.31	Vh42
h43	27.86	221.53	1362.21		1647.88	1558.58	658.25	5476.31	Vh43
h44	33.42	139.05	604.35		772.12	1594.41	652.15	3795.50	Vh44
h45	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh45
h46	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh46
h47	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh47
h48	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh48
h49	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh49
h50	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh50
h51	34.55	158.24	681.10		823.94	1558.58	671.41	3927.83	Vh51
h52	20.89	108.15	1208.71		1029.49	1993.01	959.04	5319.29	Vh52
h53	21.60	123.07	1362.21		1098.59	1948.22	987.37	5541.06	Vh53
h54	21.60	123.07	1362.21		1098.59	1948.22	987.37	5541.06	Vh54
h55	55.70	194.67	604.35	42.13	1029.49	1594.41	931.64	4452.40	Vh55
h56	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh56
h57	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh57
h58	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh58
h59	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh59
h60	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh60
h61	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh61
h62	57.59	221.53	681.10	42.13	1098.59	1558.58	959.16	4618.69	Vh62
h63	29.84	139.05	1208.71		1029.49	1993.01	652.15	5052.25	Vh63
h64	30.85	158.24	1362.21		1098.59	1948.22	671.41	5269.52	Vh64
								357546.57	
								357.55	Vs

(3) Table D-3 Information value of S3 (2014)

	Vp1	Vp2	Vp3	Vp4	Vp5	Vp6	Vp7		
h1	45.26	191.24	850.06	980.13	297.61		531.83	52130.39	Vh1
h2	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh2
h3	57.03	198.33	1051.63	270.29	708.73		423.05	2709.07	Vh3
h4	38.16	288.08	1153.57		241.84		828.52	2550.18	Vh4
h5	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh5
h6	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh6
h7	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh7
h8	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh8
h9	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh9
h10	57.03	198.33	1051.63	270.29	708.73		423.05	2709.07	Vh10
h11	59.63	230.47	1153.57	248.00	886.74		497.11	3075.52	Vh11
h12	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh12
h13	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh13
h14	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh14

h15	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh15
h16	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh16
h17	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh17
h18	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh18
h19	36.50	247.92	1051.63		193.29		705.09	2234.42	Vh19
h20	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh20
h21	52.14	198.33	1051.63		236.24		470.06	2008.40	Vh21
h22	52.14	198.33	1051.63		236.24		470.06	2008.40	Vh22
h23	52.14	198.33	1051.63		236.24		470.06	2008.40	Vh23
h24	54.11	209.54	1053.28		236.24		524.22	2077.39	Vh24
h25	54.11	209.54	1053.28		236.24		524.22	2077.39	Vh25
h26	54.11	209.54	1053.28		236.24		524.22	2077.39	Vh26
h27	54.52	230.47	1153.57	198.40	665.06		552.35	2854.36	Vh27
h28	51.06	198.33	1042.89	529.95	212.62	819.36	541.25	3395.46	Vh28
h29	51.06	198.33	1042.89	353.30	212.62		492.04	2350.24	Vh29
h30	43.00	198.33	1042.89		425.24		470.65	2180.10	Vh30
h31	43.00	198.33	1042.89		425.24		470.65	2180.10	Vh31
h32	43.00	198.33	1042.89		425.24		470.65	2180.10	Vh32
h33	43.00	198.33	1042.89		425.24		470.65	2180.10	Vh33
h34	48.02	198.33	1051.63		425.24		459.84	2183.06	Vh34
h35	48.02	198.33	1051.63		425.24		459.84	2183.06	Vh35
h36	36.50	165.28	525.81		354.37		705.09	1787.04	Vh36
h37	36.50	165.28	525.81		354.37		705.09	1787.04	Vh37
h38	48.02	198.33	1051.63		425.24		459.84	2183.06	Vh38
h39	50.21	230.47	1153.57		532.05		540.34	2506.64	Vh39
h40	50.21	230.47	1153.57		532.05		540.34	2506.64	Vh40
h41	36.50	165.28	525.81		354.37		705.09	1787.04	Vh41
h42	50.21	230.47	1153.57		532.05		540.34	2506.64	Vh42
h43	48.02	198.33	1051.63		425.24		459.84	2183.06	Vh43
h44	36.50	165.28	525.81		354.37		705.09	1787.04	Vh44
h45	36.50	165.28	525.81		354.37		705.09	1787.04	Vh45
h46	48.02	198.33	1051.63		425.24		459.84	2183.06	Vh46
h47	35.09	165.28	525.81		236.24		846.10	1808.53	Vh47
h48	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh48
h49	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh49
h50	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh50
h51	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh51
h52	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh52
h53	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh53
h54	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh54
h55	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh55
h56	35.09	165.28	525.81		236.24		846.10	1808.53	Vh56
h57	45.62	198.33	1051.63		531.55		470.06	2297.19	Vh57

h58	45.62	198.33	1051.63		531.55		470.06	2297.19	Vh58
h59	45.62	198.33	1051.63		531.55		470.06	2297.19	Vh59
h60	45.62	198.33	1051.63		531.55		470.06	2297.19	Vh60
h61	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh61
h62	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh62
h63	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh63
h64	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh64
h65	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh65
h66	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh66
h67	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh67
h68	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh68
h69	40.55	152.56	525.81		212.62		705.09	1636.64	Vh69
h70	40.55	152.56	525.81		212.62		705.09	1636.64	Vh70
h71	40.55	152.56	525.81		212.62		705.09	1636.64	Vh71
h72	40.55	152.56	525.81		212.62		705.09	1636.64	Vh72
h73	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh73
h74	48.02	198.99	1107.09		267.24		530.40	2151.75	Vh74
h75	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh75
h76	43.45	152.56	525.81		212.62		640.99	1575.44	Vh76
h77	43.45	152.56	525.81		212.62		640.99	1575.44	Vh77
h78	43.45	152.56	525.81		212.62		640.99	1575.44	Vh78
h79	43.45	152.56	525.81		212.62		640.99	1575.44	Vh79
h80	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh80
h81	45.62	152.56	525.81		177.18		640.99	1542.17	Vh81
h82	45.62	152.56	525.81		177.18		640.99	1542.17	Vh82
h83	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh83
h84	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh84
h85	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh85
h86	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh86
h87	45.62	152.56	525.81		212.62		604.36	1540.98	Vh87
h88	45.62	152.56	525.81		212.62		604.36	1540.98	Vh88
h89	45.62	152.56	525.81		177.18		640.99	1542.17	Vh89
h90	45.62	152.56	525.81		177.18		640.99	1542.17	Vh90
h91	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh91
h92	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh92
h93	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh93
h94	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh94
h95	45.62	152.56	525.81		177.18		640.99	1542.17	Vh95
h96	45.62	152.56	525.81		177.18		640.99	1542.17	Vh96
h97	46.79	198.33	1051.63		354.37		480.74	2131.86	Vh97
h98	52.14	198.33	1051.63	216.24	531.55		470.06	2519.94	Vh98
								261893.31	
								261.89	Vs