

# Data mining considering curation

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In this paper data mining considering the effect of curation in the marketing situation is discussed. Recently in the marketing or business situation, curation has been frequently considered and important. In addition, holistic communication is sometimes considered to deliver or promote products or solutions. In the holistic communication, usually a target “hub” is selected for additional communications. Actually, such strategy is usually conducted in a secret mode, so in the case of data mining, such a strategy might be ignored and the result will be lack of effects of holistic communication. It will be necessary to discover such hidden communication and relationships during data mining.

## 1. Introduction

Recently, marketing situation has been changed. Perhaps behaviours of consumer are analyzed quite differently from the previous researches (For instance, [9, 10, 19]). After the proposal of behavioral economics, an analysis of consumer has been changed. Accordingly, recent marketing strategy have been rather different from previous ones. In [9, 19] several unique strategies are illustrated. Of course they involve advertisement strategies. However, for advertisement, more radical change has occurred. For instance, previously in the advertisement, posters and commercial films on TV were frequently used. However, after the age of internet, the internet system, for instance web, blog, and facebook, is additionally used for ecological and effective advertisement. Actually this is not a major difference. In fact, only the media of advertisement has been changed. The advertisement strategy is the same as the previous strategies. However a rather different strategy is conducted in the age of internet.

Recently in the marketing or business situation, for the promotion or the advertisement *curation*<sup>\*1</sup> has frequently been considered and regarded as an important strategy [12, 21, 22]. In addition, as a curation, holistic communication is sometimes considered to deliver or promote products or solutions. In the holistic communication, usually a target “hub” is selected for additional communications. Such additional communications can produce more confidence to general consumers. The concept of holistic communication was proposed more than 10 years ago. Therefore, the communication assumed human-to-human (oral) communication. This type of communication style can be applied to the internetwork-based communication. In addition, in the digital-age, in order to move into the Marketing 3.0 stage, it is pointed out that R3 communication is important [15]. R3 communication consists of Relevance, Reputation, and Relationship. Relevance is a communication between a business and consumers. Reputation is a communication between

supporters and consumers. Relationship is a communication between a business and supporters. Previously only communication between a business and consumers (B to C) is considered. However, recently communication among B, C, and S is very important. In R3 communication, a “hub” can be a supporter. Actually, such a “hub”-based strategy is usually conducted in a secret mode, so in the case of data mining, such a strategy might be ignored and the result will be lack of effects of holistic communication. It will be necessary to discover such hidden communication and relationships during data mining.

In this paper I review curation and holistic communication, then propose data mining considering the effect of curation and holistic communication in the marketing situation.

## 2. Chance discovery

Chance Discovery is a discovery of chance, rather than discovery by chance. Ohsawa defined chance (risk) as “*a novel or rare event/situation that can be conceived as either an opportunity or a risk in the future [17]*”. It is naturally understood that a chance, which is either known or unknown, includes possibilities to cause unfamiliar observations. It can also be said that a chance is an alarm like an inflation of money supply or a big difference between future (estimated, reserved) and current stock prices that will change the middle or long term economic situation (Japan, in 1990). We sometimes ignore such critical factors, because we cannot understand that they are important factors. This is because the results or the factors are exceptions, and rare or novel events.

Chance discovery is also characterized as an explanatory reasoning, however since “chance” is defined as unknown hypotheses, some techniques to deal with an empty or an imperfect hypotheses base are required. If so, such an inference mechanism as usual abduction (hypothetical reasoning etc.) is not sufficient to achieve chance discovery. Chance discovery needs an explanatory reasoning that can deal with an empty or imperfect hypotheses base.

Therefore, I have previously characterized chance discovery as an explanatory reasoning for the unknown or unfamiliar observations, then defined “chance” as follow:

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\*1 The definition is shown in the next section.

**Definition 1** 1. **Chance** is a set of unknown hypotheses. Therefore, explanation of an observation is not influenced by it. Accordingly, a possible observation that should be explained cannot be explained. In this case, a hypotheses base or a knowledge base lacks necessary hypotheses. Therefore, it is necessary to generate missing hypotheses. Missing hypotheses are characterized as chance.

2. **Chance** itself is a set of known facts, but it is unknown how to use them to explain an observation. That is, a certain set of rules is missing. Accordingly, an observation cannot be explained by the facts. Since rules are usually generated by inductive ways, rules that are different from the trend cannot be generated. In this case, rules are generated by abductive methods, so trends are not considered. Abductively generated rules are characterized as chance.

In fact, chance has a flavour of probabilistic reasoning, however, this definition does not represent a chance in an explicit probabilistic form. Instead, this definition treats chance in a logical way. This is because a logical inference, especially abduction, seems to be a powerful weapon to perform a chance discovery that is an explanatory reasoning.

### 3. Curation

I introduced in my previous papers, but I review the original curation in art galleries and museums and e-Science Data Curation are reviewed. In addition, as a recent trend, I introduce several curation concepts in the business area. Finally I illustrate curation in chance discovery which I proposed in the previous papers.

#### 3.1 Curation in (art) museums

There is at least a person who is responsible as “curator” in (special) exhibitions, galleries, archive, or (art) museums. Their main task is a curatorial task, which is multifaceted. Curator comes from a Latin word “cura” which means cure. Then originally it used for a person who take care of a cultural heritage.

In the report by American Association of Museums Curators Committee (AAMCC) [8], they pointed out “curators are highly knowledgeable, experienced, or educated in a discipline relevant to the museum’s purpose or mission. Curatorial roles and responsibilities vary widely within the museum community and within the museum itself, and may also be fulfilled by staff members with other titles.” Then they showed the definition of curator as follows;

- Remain current in the scholarly developments within their field(s); conduct original research and develop new scholarship that contributes to the advancement of the body of knowledge within their field(s) and within the museum profession as a whole.
- Make recommendations for acquiring and deaccessioning objects in the museum collection.
- Assume responsibility for the overall care and development of the collection, which may include artifacts,

fine art, specimens, historic structures, and intellectual property.

- Advocate for and participate in the formulation of institutional policies and procedures for the care of the collection that are based on accepted professional standards and best practices as defined by AAM, CurCom, and other relevant professional organizations.
- Perform research to identify materials in the collection and to document their history.
- Interpret the objects belonging or loaned to the museum.
- Develop and organize exhibitions.
- Contribute to programs and educational materials.
- Advocate and provide for public use of the collection.
- Develop or contribute to monographs, essays, research papers, and other products of original thought.
- Represent their institution in the media, at public gatherings, and at professional conferences and seminars.
- Remain current on all state, national, and international laws as they pertain to objects in the museum collection.

In addition, AAMCC showed curatorial responsibilities as follows;

- A:** Research, Scholarship, and Integrity
- B:** Interpretation
- C:** Acquisition, Care, and Disposal
- D:** Collection Access and Use
- E:** Replication of Objects in the Collection

Thus curators have responsibilities for various aspects of exhibition activities. However, the most important activity will be a plan of exhibition. For that the above activities such as research, interpretation and acquisition are necessary. They should properly exhibit a truth which is result of their researches and interpretations.

#### 3.2 e-Science Data Curation

The above curation is for actual museums. That is, curation is conducted mainly for actual art works. However, curation in this section is for digital data. There are several differences between digital curation and analogue curation.

JISC pointed out an importance of curation as “promoting good curation and an information infrastructure to capitalise upon and preserve expensively gathered data means bringing together varied technical and managerial resources, and managing these over time. This activity needs to be supported by clear strategies for resourcing and support [11].” They compare curation with archiving and preservation.

- Curation: The activity of managing and promoting the use of data from its point of creation, to ensure it is fit for contemporary purpose, and available for

discovery and re-use. For dynamic datasets this may mean continuous enrichment or updating to keep it fit for purpose.

- Archiving: A curation activity which ensures that data is properly selected, stored, can be accessed and that its logical and physical integrity is maintained over time, including security and authenticity.
- Preservation: An archiving activity in which specific items of data are maintained over time so that they can still be accessed and understood through successive change and obsolescence of technologies.

That is, they pointed out that curation is more creative task. Then they showed aspects of curation as follows:

- Trust: Trust can be enhanced by the existence of qualified domain specialists who curate the data.
- Utility: Certain information about the data —where it came from, how it was generated, for example— is necessary to enable future users to gauge the utility and reliability of the data, and indeed any annotation of the data. Data utility also depends on the ability of users to manage and analyse it; data mining tools and algorithms, visualisation tools, user interfaces and portals will play a crucial role in accelerating research.
- Discoverability: How will future users find data, in particular data they do not know exists, in other domains, or archived according to terminology which has fallen out of use? Data access is often organised through portals; how will those portals be organised? What tools will users need to read or use the data, and who will provide these tools?
- Access management: A significant proportion of data involves confidentiality issues. Ownership and rights management also need to be taken into account.
- Heterogeneity: Not only is this data revolution creating a deluge of data, the data itself comes in very many different and often specialist formats, some created by the researchers themselves.
- Complexity: The data can be composite in nature, with links to external objects and external dependencies (such as calibration information), and be highly complex in structure. This complexity represents a significant challenge for the preservation of data.

They use “data curation” because they think data have value. Not only for keeping data but also usability of data for the public, they use the word “curation.” Actually, most of data are neither art works nor archaeological artifacts. However, it is important to view data from the aspect of what should be preserved. The main difference between data and art works or archaeological artifacts is that data do not have a shape and cannot exist alone. It is necessary to prepare a container such as a cdrom and a hard disc drive system. Therefore for data curation, “Discoverability” plays a significant role.

### 3.3 Curation in business and information market

In 2011, several books on curation were published. In Japan we had at least two publications which I noticed by Katsumi [12] and Sasaki [22]. In addition, Rosenbaum published “Curation Nation” [21] in the same year. They discuss a “curation” in “business” and information market field. I do not know why in 2011 such publications on (information) curation appear simultaneously.

#### 3.3.1 Sasaki

Sasaki defined curation in [22] as follows:

**Curation:** From huge amount of information source, according to the curator’s sense of value and world view, picking up information, giving a new meaning to it and sharing it with many persons.

Sasaki used a metaphor of biotope\*<sup>2</sup> to illustrate the promotion of a unknown or less known but a good artist. His main point to successful promotion is to recognize:

- Where those who need a certain information live?
- How to offer the information to those who need the information?
- How to make them impressed by the information?

He gave a metaphor the place where those who need a certain information live as a biotope\*<sup>3</sup>. Actually strategies he illustrated are very intentional because they are business that should be successful and that were succeeded. In addition, he pointed out the importance of a human as a media. That is in order to generate sympathies, there should be a certain context and the context will be generated (aware) not only by a viewpoint such as search keyword, place and program but also by the specialized person’s sense of value and world view. His viewpoint is based on Social Network System (SNS), then his curation can be regarded as a generation of explicit, multi-core circle type, and indefinite relationship supported by social media.

#### 3.3.2 Katsumi

Katsumi seems to extend a task of curation in museums. He uses a framework of a curator’s task. He illustrates a curator’s task is as follows [12]:

1. Reconsider meanings of existing works etc.
2. Select contents and add relationships to them.
3. Offer a new meaning and value to customers.

\*2 Biotope is an area of uniform environmental conditions providing a living place for a specific assemblage of plants and animals. Biotope is almost synonymous with the term habitat, but while the subject of a habitat is a species or a population, the subject of a biotope is a biological community. (from Wikipedia)

\*3 Biotope is an area of uniform environmental conditions providing a living place for a specific assemblage of plants and animals. Biotope is almost synonymous with the term habitat, but while the subject of a habitat is a species or a population, the subject of a biotope is a biological community. (from Wikipedia)

He compares a river model with a well model in recognition of customer's needs in business world. In a river model customers are on the opposite side of a river. (information) providers, based on their previous experience, existing concepts, and various sorts of surveyed data, expect customers' position and throw a ball. In a well model, if providers dig their own well, they will discover a new underground stream and it might be connected to customers' underground stream. In this underground stream potential needs which customers are not aware exist.

Katsumi illustrates a new curation model in business based on innovators' successful examples such as the strategy of Seven-Eleven.

### 3.3.3 Rosenbaum

Rosenbaum gave features to curation as follows [21]: Curation comes in many shapes and sizes. It is critically important to understand two things. First, curation is about adding value from humans who add their qualitative judgment to whatever is being gathered and organized. And second, there is both amateur and professional curation, and the emergence of amateur or prosumer curation isn't in any way a threat to professionals. He continued that "Curation is very much the core shift in commerce, editorial, and communities that require highly qualified humans." Accordingly he mainly discuss curation in the field of magazine and networks. He characterizes curation as the future of consumer conversation. He mentions that "as curated customer conversation take hold, there will not be a brand, a service, or a company that will emerge to give feedback and filter customer reaction to goods and services. [...] Indeed, reasonable and balanced communities curated to be about honest feedback and customer solutions will emerge as a new and powerful force in consumer-and-brand interaction." In addition, he seems to extend curation tasks to quite different type of jobs, for instance DJ. His definition of curation seems to cover quite a large field.

At the end of [21], he states "We are all curators. We all will be sharing into the ecosystem of our friend and families. For some, it will become part of who we are. And for a few of us, curation will become our livelihood. It's exciting for me to see that we're turning a corner. The network is built. The data center are in place. The next step will involve the human piece of the equation—humans are more-valuable machines."

### 3.3.4 Curation in business?

A "curation" for business in the internet age seems an interaction between customer (user) and goods. There will not be a system to insist trends from big companies, but trends will be constructed or selected according to customers' interaction on (inter)networks. In addition, a (small) company or community can use this system to give rare goods a certain trend. Thus the strategy of information delivery in business has changed in recent year and they call this type of information delivery as "curation." Curation in business means not only an information display system but also an information delivery strategy.

## 3.4 Curation in chance discovery

In [3], [4], [5], and [6], I proposed a concept of curation in chance discovery. The curation in chance discovery is rather different from those illustrated in the above. In the above applications, a curation is a strategy to explicitly arrange things or matters to show. On the other hand, in the curation in chance discovery, such strategies should be implicitly conducted. Because a chance is defined as rare, hidden, potential or novel event(s) / situation(s) that can be conceived either as a future opportunity or risk [17].

Accordingly, in [6], I proposed the definition of curation in chance discovery.

[Definition of curation in chance discovery]

- Curation is a task to offer users opportunities to discover chances.
- Curation should be conducted with considering to offer implicit and potential possibilities.
- Chances should not be explicitly displayed to users.
- However, such chances should rather easily be discovered and arranged according to the user's interests and situations. This can be achieved for instance by affordance.
- There can be a certain holistic communication environment. This type of *holistic communication* might function as media to discover chance for novice users.
- There should be a certain freedom for user to interpret a key person, matter, thing or event, which should only stimulate or assist users' thinking procedure.
- There should be a certain freedom for user to arrange chances.

An effect and an assistance of a (holistic) communication and affordance are added to the new definition of curation in chance discovery. By the addition of (holistic) communication, during chance discovery users will be able to have the other (perhaps better) opportunity compared with a solo chance discovery.

Perhaps new task for curator is how to determine an implicit "hub" in holistic communication which will assist chance discovery.

## 4. Effects of holistic communication and data mining

In the previous section, I pointed out the importance of a holistic communication in curation. In this section, I review several examples of a holistic communication in advertisement or marketing situation.

### 4.1 Holistic communication

Recently, no curation has been directly performed by a "system manager." Instead a "system manager" tries to use a certain community effectively. A "system manager" provides a certain information to those who will be interested

in it. The information will be shared in the community and sometimes it will be delivered to other communities having the same or similar interests. There exist a certain intention, but the feature of curation is rather vague and changeable. Perhaps the task as a curation is to offer a certain environment for communication among customers. Thus generation of customers communication is important in this type of curation.

For instance, Martínez-Ruiz illustrates the holistic communication tool in film festivals [14]. Their holistic communication tool blends advertising, personal selling, sales promotion, publicity, and virtual marketing tools. They pointed out that “Especially with the proliferation of the Internet, *viral marketing* provides a valuable method to encourage people to pass on messages related to film festival to others, which creates the potential for exponential growth in exposure and influence.” Actually, they did not specify a “hub” person, but a certain people who will pass on messages to others can become a “hub” person.

Akiyama and Sugiyama discussed a holistic communication in advertising [7]. In a holistic communication, an advertiser seeks active consumers and makes them a sort of hub from which a lot of information will be delivered and exchanged to other consumers (B to C to C model\*4). Such an active consumer usually offers good opinion or information which is believed as a better news source by many other customers and is sometimes a charismatic consumer. This model is similar to the above curation strategy (by Sasaki).

In [13], Lorenzon pointed out the importance of an *ecological* holistic communication. Lorenzon did not use the keyword “hub” but showed the similar strategy. Lorenzon pointed out that “in this ecological perspective marketers and companies have to use the interactive tools (web, mobile devices, blogs, etc.) as strategic solutions to gain feedbacks from the growing customer power. . . . a more interactive communication model based on trust and advocacy could re-distribute communication budget focusing more on entertainment or engagement solution instead of only invasive infotainment.” This strategy is conducted to use the growing customer power and by the interactive communication expects re-distribution of communication for the better advertisement. In this case, a “hub” will be unclear.

Thus the recent marketing situation regards the holistic communication as an important system to advertise a brand image or products. Accordingly, if we would like to conduct data mining in such situation, it will be necessary to consider the influence of a holistic communication which is sometimes unclear or potential.

## 4.2 Data mining considering holistic communication

As shown in several books such as [22], the successful promotion will be achieved by a proper curatorial strategy. For instance, for the promotion of the concert of Egberto Gismonti in Japan, the promotion staff tried to hide the information of promoters and by using a metaphor of biotope

\*4 B: business, C: customer

gradually send a part of information to the mixi\*5’s gaiter community. They did not clarify the “hub” person, but provided a link to another information. Thus they could catch persons who will be interested in Egberto Gismonti’s concert. Because in such a special community, there should be several users who will be interested in Egberto Gismonti. In addition, the SNS system might have functioned as a holistic communication system. In addition, by the partial information they could emphasize the users’ interests.

If we analyze the user data of mixi, a certain result will be obtained. However, it is rather doubtful we could obtain the effect of the holistic communication in the community.

## 4.3 How to determine holistic communication?

In the above, I pointed out that a holistic communication pattern is usually hidden, erased, or ignored in the data to be analyzed. Therefore, it will be rather difficult to determine the effect of a holistic communication during data mining. A “hub” seems a person. Actually in the case of marketing or advertisement, it is true. But we can extend “hub” to anything in the world. It may sometimes called “catalyst” in the chemical situation. Thus we will deal with anything in the world as “hub.” For instance, Ohsawa frequently use the example: When he went to buy a beer he usually bought additional food. He checked a fish which was very expensive, therefore he bought an unexpensive alternatives, which was a potato-chips. According to his explanation, the expensive fish functioned as a hub (chance) to buy not-expensive food for the beer. Even if the store introduces a POS system, they cannot collect data which consumers do not buy. Thus the effect of a holistic communication is rather difficult to determine. However, the effect of a holistic communication will appear as a gap in the data mined result. The problem is to determine the place of a gap. In general, a gap is not easy to determine. For a gap determination, I proposed scenario violation determination strategy by abduction [1, 2]. In the proposal, if a scenario has a certain gap, it can be abductively determined. However, if the scenario is perfect in a sense, it is difficult to determine the gap. Therefore, in [2], I proposed the strategy to determine the reason of communication error by discovering a gap in a pattern of nurse’s activity. For that I introduced Kamishibai KeyGraph [18]. If we compare the reference (perfect) pattern with the suspicious pattern, it is rather easy to determine a gap. In Figure 1, a gap in nurse’s activity could be determined by Kamishibai-KeyGraph.

Actually, in the above proposal, a reference pattern is necessary for the comparison. Of course, an abductive gap determination determination needs a model. Actually the model dealing with a holistic communication can be constructed by referring to the previous examples on a holistic communication. Thus by the combination of the general data mining (e.g. classification) and abduction, data mining considering a holistic communication can be achieved. That is, to the data a classification tool such as C4.5 [20] can be applied to generate a model without a holistic communication. Then abduction is applied to generate a pattern

\*5 Japan’s SNS cite

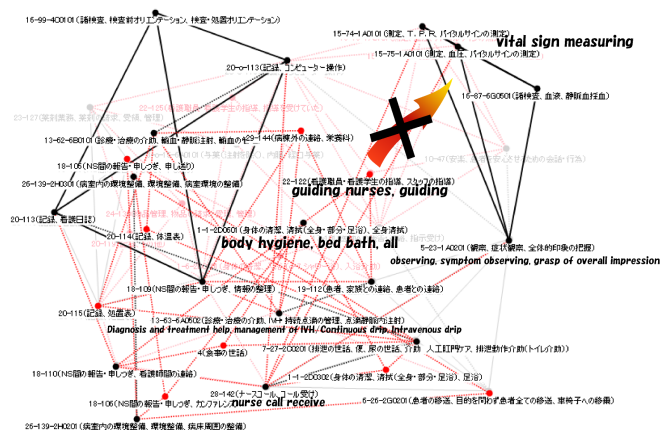


Figure 1: Analysis of nursing activities by Kamishibai-KeyGraph

of holistic communication. We can combine both results to obtain more proper result.

If we can not construct a holistic communication model, a single KeyGraph<sup>®</sup> [16] can be applied. By the analysis by KeyGraph<sup>®</sup>, several islands without bridge will be generated. A place where a holistic communication exists, a hidden island or bridge will exist. By referring to the result from KeyGraph<sup>®</sup>, the hidden island is added as a place of a holistic communication and the hidden bridges are added between islands which are related to the holistic communication.

## 5. Conclusions

In this paper I introduce the importance of curation as a trend in the recent marketing. In 2011 many books on curation in marketing were published. It is actually for advertisement. Thus it is necessary to consider such influences in data mining. In addition, not only person but also anything in the world can be a hub. Then I point out the importance of data mining considering the effect of curation in the marketing situation. Especially, I point out the importance of considering the effect of a holistic communication which is adopted in various situations in advertisement or brand image promotion.

For that, I propose combination data classification and abduction for data mining. That is, to the data a classification tool such as C4.5 can be applied to generate a model without a holistic communication. Then abduction is applied to generate a pattern of holistic communication. In addition, I suggest the adoption of single KeyGraph<sup>®</sup> for the determination of hidden holistic communication.

Actually, data for data mining is sometimes incomplete, the proposed strategy can also be applied to such cases.

## References

- [1] Abe A., Ozaku H.I., Kuwahara N., and Kogure K.: Scenario Violation in Nursing Activities — Nursing Risk Management from the viewpoint of Chance Discovery, *Soft Computing Journal*, Vol. 11, No. 8, pp. 799–809 (2007)
- [2] Abe A., Ohsawa Y., Kuwahara N., Ozaku I.H., Sagara K., Kogure K.: Scenario Violation as Gaps between Activity Patterns, *New Mathematics and Natural Computation*, Vol. 6, No. 2, pp. 193–208 (2010)
- [3] Abe A.: Curation in Chance Discovery, *Proc. of ICDM2010 5th International Workshop on Chance Discovery*, pp. 793–799 (2010)
- [4] Abe A.: Curation and Communication in Chance Discovery, *Proc. of IJCAI2011 6th International Workshop on Chance Discovery*, pp. 3–8 (2011)
- [5] Abe A.: Curation in Chance Discovery, in Abe A. and Ohsawa Y. eds.: *Advances in Chance Discovery*, SCI 423, pp. 1–18, Springer Verlag (2012)
- [6] Abe A.: Curation in chance discovery again, *Proc. of EWCCDS12*, pp. 37–42 (2012) to appear
- [7] Akiyama R. and Sugiyama K.: *Holistic Communication*, Senden Kaigi (2004) in Japanese
- [8] American Association of Museums Curators Committee: A code of ethics for curators, [http://www.curcom.org/\\_pdf/code\\_ethics2009.pdf](http://www.curcom.org/_pdf/code_ethics2009.pdf) (2009)
- [9] Anderson C.: *FREE: The Future of a Radical Price*, Hyperion (2009)
- [10] Graves P.: *Consumer.ology*, Nicholas Brealey Publishing (2010)
- [11] JISC: e-Science Data Curation Report, <http://www.jisc.ac.uk/e-sciencecurationreport.pdf> (2004)
- [12] Katsumi A.: *Curation Sense*, Ushio Publication (2011) in Japanese
- [13] Lorenzon A. and Pilotti L.: Consumer receptiveness in the development of a holistic communication strategy: trust, advocacy and brand ecology, *Innovative Marketing*, Vol. 4, Issue 1, pp. 16–28 (2008)
- [14] Martínez-Ruiz M.P., Jiménez-Zarco A.I., and Álvarez-Herranz A.Á.: Film Festivals: A holistic communication tool for the film industry, *African Journal of Business Management*, Vol. 5(5), pp. 1951–1957 (2011)
- [15] Onzo N. et al.: *R3 Communication*, Sendenkaigi (2011) in Japanese
- [16] Ohsawa Y., Benson N. E. and Yachida M.: KeyGraph: Automatic Indexing by Co-occurrence Graph based on Building Construction Metaphor, *Proc. Advanced Digital Library Conference (IEEE ADL'98)*, pp. 12–18 (1998)

- [17] Ohsawa Y. and McBurney P. eds: *Chance Discovery*. Springer Verlag (2003)
- [18] Ohsawa Y., Ito T., and Kamata M.: Kamishibai Key-Graph as Scenario Map Visualizer for Detecting Transient Causes from Sequential Data, *Proc. of PAKDD 2008 Working Notes of Workshops on Data Mining for Decision Making and Risk Management*, pp. 272–283 (2008)
- [19] Poundstone W.: *Priceless: The Myth of Fair Value*, Hill and Wang (2010)
- [20] Quinlan J. R.: *C4.5: Programs for Machine Learning*, Morgan Kaufman (1993)
- [21] Rosenbaum S.: *Curation Nation*, McGraw Hill (2011)
- [22] Sasaki T.: *The age of curation*, Chikuma Shinsyo (2011) in Japanese