Attributes and Factors Affecting the Organization of Knowledge Resources: A Case Study of the Library and Information Service Industry in Taiwan

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ABSTRACT: Using a qualitative research method, in this study we investigated the attributes and factors that might affect the organization of knowledge resources in the library and information service industry. The findings from this study suggest that, in addition to "document/content" attributes (i.e., author, title, subject, etc.) traditionally emphasized by the library and information science field, the library and information service industry may also take "disposition," "situation," and "order/scheme" attributes as additional standards for organizing knowledge resources.

1. Introduction

Organization is a process of putting cluttered objects in order as an articulated aggregation. Classification is not only part of human nature, but also the most utilized method of organizing information. Satija (1998, 2000) considered classification to consist of the following activities: naming, defining, analyzing, generalizing, discriminating, distinguishing, pattern-making, sorting, filtering, demarcating, separating, individualizing, identifying, categorizing, grouping, matching, selecting, sampling, arranging, ordering, grading, ranking, correlating, tabulating, mapping, designing, structuring, coordinating, organizing, and controlling. Classification pertains to the discipline of logic and pervades every activity of life. Generally, classification serves to divide objects (both abstract and concrete) on the basis of their differences, or to group objects on the basis of their similarities.

Findings of previous research indicate that individuals tends to use different attributes to organize personal information objects. The author's doctoral dissertation (Chiu 2002) was an exploratory investigation of this topic. The purpose of that research was to explore the practice of managing knowledge and the strategies of organizing knowledge resources in the library and information service industry in Taiwan. That paper focused on the objective of explaining how the attributes affecting the practitioners who are organizing knowledge resources in the library and information service industry are not limited to the document content attribute, which has traditionally been emphasized by the field of library

and information science. The most-used attributes and factors may vary when organizing different types of information resources.

2. Literature review

The field of Library and Information Science has utilized many kinds of knowledge organization tools (e.g. classification schemes, subject headings, thesauri, and cataloging rules) to organize resources in libraries. Traditionally, only such document attributes as author, title, and topic were considered major factors. But standards used to organize personal information might be different. Research results of previous studies, such as Kwasnik (1991), Mackenzie (2000), Gottlieb and Dilevko (2001), and Bergman et al. (2003) all supported this supposition. Because Kwasnik proposed the most complete structure, it was chosen as the foundation for coding rules.

Kwasnik (1991) investigated how eight college professors organized and classified their personal documents, and found that their decisions for classifying documents were affected by 34 factors, which were further categorized into 7 attributes:

Situation attributes: access, circumstance, need/requirement, ownership of the document, relations to me ("related to me"), room/space, source, and use/purpose.
Document attributes: author, form, topic, title, and physical attributes.
Disposition attributes: change, abandonment (discard), retention (keep), location, and postponement.
Order/scheme attributes: accumulation, arrangement, grouping, separation, and unfinished order.
Time attributes.
Value attributes: importance, interest, need for improvement, lack of value (not valuable), unspecified value, secrecy/confidentiality, and personal utility ("works for me").
Cognitive state attributes: don't know, the desire to remember, and "just know."

The numbers of times that participants mentioned the factors was tabulated. The study found that situation attributes comprised the highest percentage (33.3%), followed by document attributes (29.4%). With respect to individual factors, form; use/purpose; topic; location; circumstance; and time were the most important standards that participants used to classify their personal documents.

In an attempt to determine how managers organized their email, Mackenzie (2000) used a questionnaire to survey fifteen managers. Two of the fifteen were then selected to participate in further interviews. After analyzing the questionnaires, Mackenzie found the following three basic grouping patterns:

Using project name, topic, state, or sender as the grouping standard.
Using no classification rules, which meant keeping messages in the time order in which they were received.
Using a simple hierarchical structure, which meant starting with broad topics, and then adding nested file folders as subjects became narrower.

After further interviews, the research results showed that the classification schemes were based on managers' needs. As more email messages came in, managers adjusted their classification rules according to an internal priority system and the stage of the project. The resulting scheme was usually flat, so that managers were able to see all the headings during the classification process. In addition, the headings were vaguely labeled and possessed meaning only for the individual manager, usually describing some aspect of each manager's knowledge base (such as a vendor, event, or project).

Gottlieb and Dilevko (2001) provided a list of the URLs of sixty web sites to fifteen participants selected into a convenience sample. Participants were asked to classify the web sites based on principles of their own making. The researchers found the following three categories of attributes that had influenced the participants' decisions:

Context attributes: access/retrieval, space, use, and knowledge/interest.
Content attributes: author, form, title, topic, source, and visual attributes.
Other attributes: unsure (lack of certainty), can't remember (inability to remember), and vagueness.

Content attributes had the highest overall rate of occurrence (61.6%), with context attributes accounting for 21.2% and other attributes for 17.3%. Topic was most often cited (32.6% of the time), followed distantly by unsure (11.6%) and title (9.4%).

When designing a personal information management system, Bergman, Beyth-Marom, and Nachmias (2003) suggested that most users organized personal information items according to subjective

attributes. Therefore, they articulated the following principles:

Subjective classification principle: The same information item may be related to different topics for different users. Therefore, classification is a behavior of the subjective judgment of individual users.

Subjective importance principle: The importance of an information item is determined by the user relative to the importance of other information items. Therefore, subjective importance does not rest in the information itself.

Subjective context principle: Research has shown that information is better recalled when it is stored in the context in which it takes place. Therefore, context should be captured and added to information items when saved for an individual's future use.

The findings from the research cited above correspond to Wilson's 1979assertion that information content accounted for the primary use of a document, but primary use should not be the only factor considered. In addition to primary uses, further uses of a document might include: the projects in which it can be used, the decisions it can facilitate, the arguments it can support, and the predictions it can warrant. Thus, the organization of information should not be limited solely to its content, but should also be expanded to include its functions.

3. Methodology

Because a qualitative research method was used, the philosophical basis of this research is quite different from that of a quantitative study. Qualitative research aims at understanding the processes of constructing social reality, namely the experience and interpretation interpretation of an individual in different cultures and social contexts. Generally speaking, once research becomes human-centered, situation-focused, integrated and progressive, qualitative method is appropriate. In order to identify the attributes and factors used in organizing knowledge resources, the author employed the method of a semi-structured interview eight managers of a leading knowledge management company in the library and information service industry in Taiwan.

Data were collected through a semi-structured interview. That is, interviews were carried out based on pre-prepared outlines. From July 24 to August 9, 2002, the author interviewed the eight] managers selected from within the subject company (see Table 1 for the profile). Each participant was asked to conduct a guided tour of his physical work space (i.e., desk, drawers, and file cabinets) and visual space (i.e., the file manager in his PC or the space in a Unix system, and his email system) using a think-out-loud method. Thus, the thought process could be recorded and transcribed, then attributes and factors affecting the way participants categorized and organized their knowledge resources could be analyzed.

Interviewee	Department	Date of interview
A	Financial & Administration Center	2002/07/24 (3:20-4:40 PM)
B	Financial & Administration Center	2002/07/27 (4:45-5:45 PM)
C	Markets & Sales Group	2002/07/25 (3:20-4:15 PM)
D	R & D Center	2002/07/25 (3:35-5:50 PM)
E	R & D Center	2002/07/26 (3:30-4:40 PM)
F	Markets & Sales Group	2002/07/31 (4:45-5:30 PM)
G	Knowledge Resource Center	2002/08/09 (3:50-4:55 PM)
H	R& D Center	2002/08/09 (5:10-6:35 PM)

Table 1. Profile of interviewees

Type of knowledge resources	Kwasnik's study	Mackenzie's study	Gottlieb, Dilevko's study	Bergman, Beyth-Marom, Nachmias' study	Current Study
Personal documents	X				X
Emails	X	X			X
Websites			X		
Electronic files				X	X

Table 2. Profile of knowledge resources

Knowledge resources examined in this study include personal documents (e.g. books, documents, vertical files, letters, manuals, personal stuffs, etc.) in interviewees' desks, drawers, and file cabinets as well as electronic files and emails in their virtual space. (see Table 2 for the profile)

With the permission of participants, interviews were tape-recorded. Non-verbal information that could not be captured on tape was hand-recorded. The content of the interviews was transcribed soon after the interviews were conducted. To facilitate the subsequent processes of coding and analysis, the author deleted meaningless platitudes, and annotated other parts with parentheses after close reading. The major patterns of the interview transcripts were then confirmed, coded, and classified using the technique of content analysis. This technique was used to identify factors affecting the way in which interviewees organized their knowledge resources, and to categorize these factors into attributes.

The coding rules for this study were based on Kwasnik's structure (see Appendix 1). The rules of coding included 32 factors in 6 categories: situation attributes, document attributes, disposition attributes, order/scheme attributes, value attributes, and time/space attributes. The responses were considered from the viewpoint of differing types of resources – specifically, physical space, electronic files, and e-mail. The author first examined the number of times each factor appeared in each participant's transcript and recorded the outcomes in a table. Later, a second coder followed the same rules. Finally, analytical differences between the two coders were compared and revised after discussion. Then, the analyzed results from the eight participants were integrated and the proportion of occurrence of each factor was calculated. Thus, the main attributes and factors affecting the way in which interviewees organized their knowledge resources were identified.

4. Research findings

Content analysis was used to identify the factors that affected how the interviewees in the subject company organized their knowledge resources. The factors were further categorized into attributes in 6 categories. Table 3 shows the overall picture of the research findings. Each factor's frequency and percentage of appearance indicates its relative importance viewed from the perspective of physical space, electronic file, or e-mail. The percentage of each cumulated attribute was also calculated.

The results showed that the top 3 attributes affecting physical spaces were disposition attributes (28.57%), document attributes (21.15%), and situation attributes (17.58%). In the organization of electronic files, the biggest influence came from document attributes (42.94%), disposition attributes (18.64%), and situation attributes (11.86%). In the organization of e-mail, disposition attributes (25.70%), document attributes (20.67%), and order/scheme attributes (15.64%) were predominant. These findings can be interpreted as follows: in general, document attributes, which are utilized by the LIS field, are also a major standard used by individuals for organizing knowledge resources. Yet, in this study it was found that disposition attributes, situation attributes and order/scheme attributes might also be important bases for individuals organizing knowledge resources.

The 6 attributes categorized by this study consisted of 32 factors; therefore, the author chose to further investigate the influence of each factor on how the interviewees organized their knowledge resources. Table 4 presents the factors whose appearance frequency was higher than 5% for physical space, electronic files, and e-mail. Location and time were both major factors. Form, use/purpose, name of the customer, and abandonment were also leading factors in two of the three aspects. The research findings indicate that in addition to document attributes (such as author, title, and subject) location, time, form, use/purpose, name of the customer, and abandonment are things we should pay attention to in further planning.

5. Conclusions

Kwasnik found that when college professors organized personal documents, situation attributes were the most important attributes. These attributes were followed in importance by document attributes. Research from Gottlieb and Dilevko found that content attributes (equivalent to document attributes in Kwasnik's research) had the highest rate of occurrence, followed by context attributes. Findings from this study showed that the top 3 attributes affecting physical space listed in order of importance, were: disposition attributes, document attributes, and situation attributes; while, when organizing electronic files, the attributes with the greatest influence, listed in order of importance were: document attributes, disposition attributes, and situation attributes. In addition, as each factor was concerned, Kwasnik

Attributes/ Factors	Physical space		Electronic files		e-mail	
	No. of times	Percentage	No. of times	Percentage	No. of times	Percentage
Situation attributes						
Access	20	5.49%	4	1.13%	2	1.12%
Relation to me	1	0.27%	3	0.85%	3	1.68%
Space	8	2.20%	3	0.85%	0	0.00%
Source	14	3.85%	3	0.85%	12	6.70%
Use/Purpose	20	5.49%	27	7.63%	4	2.23%
Organizational chart	1	0.27%	2	0.56%	1	0.56%
Subtotal	**64**	**17.58%**	**42**	**11.86%**	**22**	**12.29%**
Document attributes						
Author (name)	1	0.27%	7	1.98%	7	3.91%
Form	44	12.09%	21	5.93%	4	2.23%
Topic	15	4.12%	11	3.11%	3	1.68%
Physical factor	3	0.82%	42	11.86%	0	0.00%
Name of the customer	11	3.02%	31	8.76%	17	9.50%
Name of the product	3	0.82%	36	10.17%	4	2.23%
Name of the activity/ conference	0	0.00%	0	0.00%	2	1.12%
Sequential number	0	0.00%	4	1.13%	0	0.00%
Subtotal	**77**	**21.15%**	**152**	**42.94%**	**37**	**20.67%**
Disposition attributes						
Change	0	0.00%	4	1.13%	1	0.56%
Abandonment	2	0.55%	20	5.65%	18	10.06%
Retention	12	3.30%	6	1.69%	11	6.15%
Location	84	23.08%	36	10.17%	14	7.82%
Postponement	6	1.65%	0	0.00%	2	1.12%
Subtotal	**104**	**28.57%**	**66**	**18.64%**	**46**	**25.70%**
Order/Scheme attributes						
Accumulation	2	0.55%	1	0.28%	2	1.12%
Sorting/ Filing	23	6.32%	4	1.13%	7	3.91%
Classification	11	3.02%	17	4.80%	5	2.79%
Separation	7	1.92%	9	2.54%	8	4.47%
Unfinished order	8	2.20%	3	0.85%	6	3.35%
Subtotal	**51**	**14.01%**	**34**	**9.60%**	**28**	**15.64%**
Value attributes						
Importance	3	0.82%	6	1.69%	13	7.26%
Interest	0	0.00%	0	0.00%	1	0.56%
Need for improvement	0	0.00%	4	1.13%	0	0.00%
Lack of value/ Lack of importance	2	0.55%	11	3.11%	5	2.79%
Unspecified value	7	1.92%	8	2.26%	1	0.56%
Personal utility	0	0.00%	0	0.00%	2	1.12%
Subtotal	**12**	**3.30%**	**29**	**8.19%**	**22**	**12.29%**
Time/Space attributes						
Time	53	14.56%	30	8.47%	18	10.06%
Region	3	0.82%	1	0.28%	6	3.35%
Subtotal	**56**	**15.38%**	**31**	**8.76%**	**24**	**13.41%**
Total	364		354		179	

Table 3. Integrated table of analytical results

Physical space	Electronic files	e-mail
Location	Physical factor	Time
Time	Name of the product	Abandonment
Form	Location	Name of the customer
Sorting/Filing	Name of the customer	Location
Access	Time	Importance
Use/Purpose	Use/purpose	Source
	Form	Retention
	Abandonment	

Table 4. Factors affecting the organization of knowledge resources

found that form, use/purpose, topic, location, and time were the most important factors. Gottlieb and Dilevko found that topic, unsure, and title were most important ones; whereas location and time were the major factors in this study. Moreover, Mackenzie pointed out that when managers organized email, need was the major concern of the classification scheme. When more email came in, managers adjusted their classification rules according to the priorities in their minds and the stage of the project. However, this study found that the most important attributes in sequence were disposition attributes, document attributes, and order/scheme attributes when interviewees organized their email. Generally speaking, the results from these four studies are comparable even though the subjects differed. All four studies emphasize that document attributes are not the only attributes to be considered in organizing knowledge resources.

From this exploratory research, the author found that in addition to document attributes (i.e., author, title, subject, format, etc.) that are traditionally emphasized by the LIS field, practitioners in the library and information service industry might also use disposition attributes, situation attributes, and order/scheme attributes as standards for organizing knowledge resources depending on the context or type of resource. The most important factors were location, time, form, use/purpose, name of the customer, and abandonment.

The purpose of organizing resources is to facilitate retrieval and usage. We explored the "real" knowledge organization behavior of "real" persons in their own working space. These preliminary conclusions could serve as a reference for information professionals when designing systems for organizing knowledge resources. Considered from the perspective of user habit, it seems clear that information professionals should take into account more than just document attributes.

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Appendix 1: Coding Rules

Category	Influential factor	Description and examples
Situation attributes	Access	For example: ongoing investigation, data acquisition, access to information, the search for information.
	Relation to me	Personal materials, documents, or digital files.
	Room/Space	For example: insufficient space, the most spacious place, and no place to keep something.
	Source	Where the information is from: place, source, and department.
	Use/purpose	What is this for? Including: job duty and function. For example: human resources, financial, probation, and ongoing cases.
	Organizational chart	Direct mention of certain departments in the company.
Document attributes	Author	Name of a person. For example: Name of a colleague, name of an email author, all kinds of contact persons, and so on.
	Form	Types of information. For example: reference, memoir, propaganda, manual, contract, announcement, and application.
	Topic	The topic of the document.
	Physical factor	Including: color, type of files, and different version of an operating system (i.e., txt, PDF, doc, gif, tiff, picture files, and Sun version.
	Name of the customer	The company or its clients. Including: name of a library, name of a project, and name of an institution. For example: National Central Library, Taipei Public Library, and National Taiwan University.
	Name of the product	Including: name of the product, system, database, agency and publishing companies. For example: OVID, OCLC, ERL, and Medline.
	Name of the activity/ conference	Name of an activity or a conference held by the company.
	Sequential number	Numbers in sequence such as 001, 002, 003.
Disposition attributes	Change	For example: changed document, re-edited document, rearrange document.
	Abandonment	For example: deletion, filtration, killed document.
	Retention	For example: retention and inability to throw out.
	Location	For example: desktop, basket or drawer, hard drive, C drive, D drive, this box, a closer place.
	Postponement	For example: in the tray, lack of hurry, need to wait for a response, need to wait for an answer.
Order/scheme attributes	Accumulation	For example: arrangement.
	Sorting/filing	For example: order, file, replacement.
	Classification	For example: classification to related folders, classification like this, the sorting into certain types, the sorting into details, the dividing into 3 pieces.
	Separation	Space divisions for centralizing materials with the same function, for example: isolation, direct pull out, and removal.
	Unfinished order	For example: incompleteness, insufficient time to finish.
Value attributes	Importance	For example: large size, more-important case, something which must be handled, something ongoing, needs.
	Interest	For example: something I feel nice about.
	Need for improvement	For example: good example, improper method.
	Lack of value/ lack of importance	For example: junk mail, out-of-date item, no need, not worth naming it.
	Unspecified value	Something not related to work or without a specific function; for example: no use for it, uncertainty over whether it should be thrown out, bits and pieces, sundries, meaningless material.
	Personal utility	For example: still checking it, I feel ok.
Time/space attributes	Time	Including: regular schedule, everyday activity, tomorrow. And the appearance of seldom, just, little, chronicle, before, temporary, nature, or often.
	Region	For example: overseas, Taiwan, northern area, mainland China.