Trend Analysis of Subject Areas in Knowledge Management Researches

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Abstract: In recent years, Knowledge Management (KM) has attracted considerable interests from academic community, and abundant of researches are emerging every year. The emergence of knowledge economy has brought new changes to organizations, managers and workers. The main concern of knowledge management researches are closely associated with the challenges brought by the emergence of knowledge economy and society. This paper is concentrated on word frequency statistics analysis to survey KM researches overseas from 1981 to 2009, to clarify the development of KM researches based on the survey on subject areas, and to analyze trends of KM researches.

Introduction

Knowledge Management (KM) has existed as an activity since the beginnings of consciousness about knowledge itself. Knowledge Management originated during the late 1980's and became famous with the rise of Internet (Joseph M. Firestone, 2003). In recent years, knowledge management has attracted considerable interests from academic community, and abundant of researches are emerging every year.

Recent years, knowledge management researches are mainly developed from three main lines. The first line focuses on information management. Since information is taken as a carrier of knowledge, researchers achieve knowledge management through the management of information content and information tools. Researchers who pursue on this aspect almost have the background of information technology and majored in computer science, moreover, they are engaged in information system and artificial intelligence researches. The second research line is the management of human, researchers' sharing the background of social science and humanities who emphasize on human's behaviors, skills and modes of thinking. The third line emphasize on knowledge asset management, knowledge is an essential productive factors and as a intangible asset, how to make a good utilization and how to produce new value are the main topics of knowledge management on the perspective on economics. (Wang, 2009) In this paper, knowledge management researches are analyzed from the perspective of subject areas to get the KM research trends.

Survey Design

This survey begins at 1980, from the very beginning of the knowledge management-related researches, and lasts to 2009, to examine paper numbers of every year from various subject areas. All the data is from ***ISI Web of Knowledge***, KM-related papers are categorized by the subject areas by frequency statistics.

Items survey on ***ISI Web of Knowledge***

ISI Web of Knowledge is an online academic database provided by Thomson Scientifics' Institute for Scientific Information. It provides access to many databases and other resources: Web of Science, which covers about 8,700 leading journals in science, technology, social sciences, arts, and humanities; ISI Proceedings; Current Contents Connect; Medline; ISI Essential Science Indicators, Journal Citation Reports (two editions: Science and Social Sciences), in-cites, Science Watch, ISI HighlyCited.com, Index to Organism Names, and BiologyBrowser is licensed to institutions such as universities and the research departments of large corporations.

Based on *ISI Web of Knowledge* database, if you input the keywords in item blank, for example: Title= (knowledge management) AND Year Published= (1997) to all database, the number of papers about knowledge management research of every year is showed as in Figure 1.

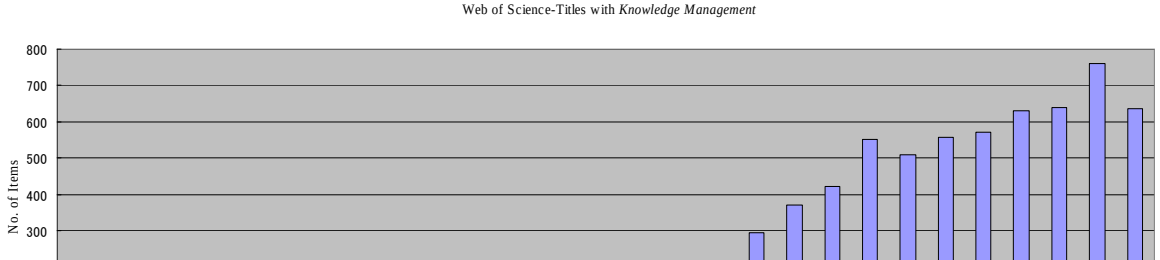

Figure 1: Paper volume distribution

It is obviously that from 1980th to early 1990th, there are only a few research papers of each year, however, the paper's volume got a distinctive increase from late 1990th.

Subject areas analysis

According to the paper's volume, the analysis process is divided into two periods, which are early period from 1981 to 1994 and the recent period from 1995 to 2009.

Totally there are 311 papers titled with "Knowledge Management" in the early period, according to the subject areas, which can be categorized as in Table 1:

Table 1: subject areas distribution of KM papers from 1981-1994

Ranking	Subject Area	Record Count	% of 311
1	Computer Science	24	7.7170%
2	Engineering	18	5.7878 %
3	Business & Economics	14	4.5016 %
4	Pharmacology & Pharmacy	13	4.1801 %
5	Biochemistry & Molecular Biology	12	3.8585 %
6	Information Science & Library Science	12	3.2154 %
7	Operations Research & Management science	10	3.2154 %
8	Geriatrics & Gerontology	9	2.8939 %
9	Immunology	8	2.5723 %
10	Neurosciences & Neurology	7	2.2508 %
11	Infectious Diseases	6	1.9293 %
12	Behavioral Sciences	5	1.6077 %
13	Cell Biology	5	1.6077 %
14	Microbiology	5	1.6077 %
15	Pediatrics	5	1.6077 %
16	Psychology	5	1.6077 %
17	Respiratory System	5	1.6077 %
18	Anatomy & Morphology	4	1.2862 %
19	Gastroenterology & Hepatology	4	1.2862 %
20	Genetics & Heredity	4	1.2862 %
21	Oncology	4	1.2862 %
22	Ophthalmology	4	1.2862 %
23	Pathology	4	1.2862 %
24	Cardiovascular System & Cardiology	3	0.9646 %
25	Health Care Sciences & Services	3	0.9646 %
26	Mathematics	3	0.9646 %
27	Nursing	3	0.9646 %
28	Obstetrics & Gynecology	3	0.9646 %
29	Physiology	3	0.9646 %
30	Radiology, Nuclear Medicine & Medical Imaging	3	0.9646 %

If we combine some subjects, we can find that there are 16 subjects (Geriatrics & Gerontology, Immunology, Neurosciences & Neurology, Infectious Diseases, Pediatrics, Respiratory System, Anatomy & Morphology, Gastroenterology & Hepatology, Oncology, Ophthalmology, Pathology, Cardiovascular

System & Cardiology, Nursing, Obstetrics & Gynecology, Physiology, Radiology, Nuclear Medicine & Medical Imaging) belong to medical science, and 5 subjects (Pharmacology & Pharmacy, Biochemistry & Molecular Biology, Cell Biology, Microbiology, Genetics & Heredity) belong to biology science, so it can be transferred into Table 2:

Table 2: Refined subject areas distribution

Ranking	Subject Area	Record Count	% of 311
1	Medical Science	73	24.1158%
2	Biology	39	12.5402%
3	Computer Science	24	7.7170%
4	Engineering	18	5.7878 %
5	Business & Economics	14	4.5016 %
6	Information Science & Library Science	12	3.2154 %
7	Operations Research & Management science	10	3.2154 %
8	Behavioral Sciences	5	1.6077 %
9	Psychology	5	1.6077 %
10	Health Care Sciences & Services	3	0.9646 %
11	Mathematics	3	0.9646 %

Through the subject areas statistic in the early period of KM researches, three main trends are indicated here:

① Medical science and biology are the main subject areas, plenty of medical data, biological data and chemical data were taken as subjects of researches.

② The majority of papers are focused on the keywords such as “database”, “knowledge-based” etc.

③ Knowledge was taken as encoded structures in physical systems that allow those objects to adapt to an environment.

KM research analysis from 1994-2009

Due to there is a big volume of KM articles and papers from this period, they are analyzed by general categories which are Science and Technology (3694 items), Social Science (1847 items) and Arts and Humanities (37 items). Since there are a few papers in Arts and Humanities area, they are ignored in this study.

First, we prepared the subject areas statistics from the perspective of Sciences and Technology (1994-2009)

as shown in Table 3:

Table 3: subject areas statistics from perspectives of Sciences and Technology (1994-2009)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Computer Science	15	6	14	20	23	35	59	109	117	99	98	116	150	367	391	348
Business & Economics	—	3	—	—	9	20	25	21	21	22	22	27	44	204	250	225
Psychology	5	4	—	7	—	10	10	10	10	13	12	34	46	26	—	—
Behavioral Sciences	—	—	—	7	7	—	8	11	—	7	11	28	39	—	—	—
Engineering	8	5	10	11	13	25	49	30	26	35	29	36	47	108	121	105
Health Care & Service	—	—	—	—	7	—	—	—	—	—	—	34	42	24	22	—
Information Science & Library Science	9		5	12	10	24	25	53	42	21	27	55	47	35	33	58
Operations Research & Management Science	—	—	—	8	—	13	17	23	8	25	15	16	21	—	—	—
Environmental Science	—	—	—	—	7	7	15		10	6	10	13	17	27	—	20
Education & Educational Research	—	—	—	—	—	—	—	—	—	—	—	—	—	40	50	30
Communication	—	—	—	—	—	—	—	—	—	—	8	—	—	—	—	18
Mathematics	—	—	—	—	—	—	—	—	—	—	—	—	—	29	39	53
Biology & Chemistry	7	5	12	15	8	13	—	6	14	—	—	—	—	—	—	18
Medical Sciences	22	23	12	12	14	9		13	8	7	6	14	19	—	—	—

Telecommunications	—	—	—	—	—	—	—	—	—	—	—	—	—	22	22	18
Energy & Fuels	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	—
Agriculture	—	3	—	—	—	—	7	—	—	6	—	—	—	—	—	—

This table shows subject area distribution of the period from 1994-2009, and the numbers indicate paper numbers, for example, 6 represents that there are 6 articles of computer science subject in 1995, — represents that there are no record/out of top 10 of that year.

We can get three categories according to the article numbers, escalated and stable subjects (Computer Science, Business & Economics, Engineering, Information Science & Library Science, Operations Research & Management Science, and Environmental Science), newly increasing subjects (Education & Educational Research, Telecommunications, Mathematics and Medical Information) and declining subjects (Agriculture, Behavioral Sciences, Medical Science, Health Care & Service and Psychology).

The same way, we prepared statistic subject areas from the perspective of social sciences (1994-2009) as shown in Table 4:

Table 4: subject areas statistics from the perspective of Social Sciences (1994-2009)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Computer Science	—	6	—	20	—	8	—	10	—	4	8	14	43	235	356	238
Business & Economics	7	6	8	14	32	29	34	42	32	52	51	51	71	241	352	282
Psychology	5	6	4	7	9	10	11	11	15	16	17	39	46	32	25	14
Behavioral Sciences	3	—	2	7	7	—	7	10	4	7	11	28	39	24	—	—
Engineering	—	5	2	11	—	14	22	7	4	7	11	9	16	58	90	69
Health Care & Service	—	—	2	—	—	—	—	—	6	7	7	—	—	18	20	14
Information Science & Library Science	—	—	—	12	—	5	—	11	8	—	—	16		22	22	36
Operations Research & Management Science	—	—	—	8	3	7	14	6	—	15	11	—	14	—	—	—
Environmental Science	—	—	2	—	—	4	14	—	8	5	7	—	—	16	—	—
Education & Educational Research	—	—	—	—	—	—	—	—	4	—	—	12	14	51	67	39
Communication	—	—	—	—	—	—	—	—	—	—	—	—	13	—	20	20
Mathematics	—	—	—	—	—	—	—	—	—	—	—	—	—	19	42	44
Biology & Chemistry	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13
Medical Sciences	2	3	—	—	—	2	—	2	5	5	4	—	—	—	—	—
Telecommunications	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy & Fuels	—	6	—	—	—	—	5	3	—	—	—	—	—	—	—	—
Agriculture	—	7	—	—	3	—	—	—	—	—	—	—	—	—	—	—

Also there are three categories: escalated and stable subjects (Computer Science, Business & Economics, Engineering, Public Administrations, Information Science & Library Science, Psychology, Operations Research & Management Science and Environmental Science), newly increasing subjects (Education & Educational Research, Communication, Mathematics and Social Issues), as well as declining subjects (Agriculture, Demography, Neurosciences & Neurology, Pharmacology & Pharmacy, Gastroenterology & Hematology, Pediatrics, Sociology, Cell Biology, Oncology, Biodiversity & Conservation, Psychiatry and Nursing).

If we compare subject area distribution between Science and Technology and Social Science, they share something in common as shown in Table 5.

Table 5: Subject areas compare between two perspectives

Escalated and Stable Subjects	Newly Increasing Subjects	Declining Subjects

1. Computer Science 2. Business & Economics 3. Engineering 4. Information Science & Library Science 5. Operations Research & Management Science 6. Environmental Science	1. Education & Educational Research 2. Telecommunications 3. Mathematics	1. Agriculture 2. Medical Sciences 3. Biology

According to the subject area statistics, we can get two conclusions here:

1. Communities of practice such as the KM Network and the development of standards and best practices are in a mature stage of development.
2. Data/text/document mining and statistics on medical sciences, biological sciences are ending. New KM technologies arise to involve on these subjects.

Meanwhile, there are some distinctions:

1. Psychology and Behavioral Science get rising tendency on social sciences researches and declining on science and technology researches perspectives.
2. Both Biology and Medical Science are declining on these two perspectives.

Conclusions and Further Studies: With the quick development of computer science, knowledge management has become as a mature science gradually in many subject areas, such as computer science, business & economics, medical science, biology, information science and so on. At first, knowledge management focused on dealing with kinds of data, text and document management from the subject area analysis and the titles of papers at the early period. Through the subject areas statistics and analysis from two perspectives from Sciences & Technology and Social Science in recent 15 years, we found that data/text/document mining and statistics on medical sciences, biological sciences are ending. Communities of practice such as the KM Network and the development of standards and best practices are in a mature stage of development. Psychology and Behavioral Science get rising tendency on social sciences researches and declining on science and technology researches perspectives.

However, we can only get a rough conclusion of the trend of knowledge management researches' development. In order to make this study more detailed, this study should be extend to paper's keywords analysis, famous KM researchers' dynamic analysis and KM technologies analysis, to examine KM researcher's trend, which is also further work to fulfill this study.

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