Information systems frontiers: Keyword analysis and classification

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Abstract The current study focuses on the disciplines of ISF researches. The various analyses have employed to address research discipline of Management Information Systems (MIS). Since ISF is a forum for not only academic researchers but also industrial experts, it is worth to shed light on distinctive research features of ISF. I created a keyword classification scheme, incorporating new research topics into Barki's information systems keyword classification scheme. This research describes the disciplines of 318 papers in 14 issues published on ISF until 2012 by 796 scholars, examining word frequency and keyword co-occurrence.

Keywords Information Systems Frontiers (ISF) · Classification · Research discipline · Keywords taxonomy · Word frequency · Word co-occurrence · Catpac

1 Introduction

Since Information Systems Frontiers (ISF) published its first issue in 1999, ISF has been receiving considerable attention in IS field (Dwivedi et al. 2009). Information Systems Frontiers publishes articles on emerging research and development, such as enterprise modeling and integration, object/web technologies, information economics, IT integrated manufacturing, medical infor-matics, digital libraries, mobile computing, and electronic commerce. Typically, the articles are at the frontiers of information systems and focus on analytical, behavioral, and technological perspectives. ISF has been a common forum for both industry experts and academic researchers. The journal's discipline ranges from front-line industrial developments such as telecommunications, operations research to pioneering academic research in computer science, economics, and cognitive sciences. Seven hundred ninety six scholars have published 318 papers across 14 issues of ISF until 2012. The total citation number of ISF articles published by 2012 was 3437.

2 Domains of information system research

Based on earlier research (Vessey et al. 2002, 2005), I created three major research domains, environment, organization, and technology for analysis, and exclusively classified all the articles published in ISF into the three primary domains. I found 122 research articles in the environment domain, 87 research articles in the organization domain, and 109 researches in the technology domain.

After the classification, I extracted words from the introduction sections in articles in each category using Catpac (Woelfel 1993; J. Woelfel 1998; Woelfel and Stoyanoff 1993; J. K. Woelfel 1998). Catpac is an automated content analysis software that allows examination of the characteristics of domains. I extracted the most frequent words mentioned in the introductions. I show the top 25 words across the three domains in Table 1.

To get more details, I extracted the most frequent top 50 words in the introduction as shown in the tables in

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Table 1 Top 25 words

	Top 25 most frequently occurring words
Environment	(1) SERVICE, (2) INFORMATION, (3) SYSTEM, (4) TECHNOLOGY, (5) USER, (6) BUSINESS, (7) MOBILE, (8) DATA, (9) PROCESS, (10) WEB, (11) MODEL, (12) INTERNET, (13) SOFTWARE, (14) LEARNING, (15) KNOWLEDGE, (16) SECURITY, (17) APPLICATION, (18) ORGANIZATION, (19) MANAGEMENT, (20) TIME, (21) OUTSOURCING, (22) TRUST, (23) SOCIAL, (24) DEVELOPMENT, (25) ANALYSIS
Organization	(1) SERVICE, (2) SYSTEM, (3) PROCESS, (4) ORGANIZATION, (5) INFORMATION, (6) BUSINESS, (7) TECHNOLOGY, (8) MODEL, (9) KNOWLEDGE, (10) MANAGEMENT, (11) WEB, (12) RESOURCE, (13) DATA, (14) APPLICATION, (15) USER, (16) DEVELOPMENT, (17) CASE, (18) CLOUD, (19) DECISION, (20) GROUP, (21) SECURITY, (22) LEARNING, (23) SUPPORT, (24) TIME, (25) VALUE
Technology	(1) SERVICE, (2) SYSTEM, (3) INFORMATION, (4) PROCESS, (5) MODEL, (6) APPLICATION, (7) DATA, (8) WEB, (9) USER, (10) BUSINESS, (11) SEARCH, (12) QUERY, (13) NETWORK, (14) MANAGEMENT, (15) OBJECT, (16) METHOD, (17) TECHNOLOGY, (18) TIME, (19) KNOWLEDGE, (20) SOFTWARE, (21) TAG, (22) ENTERPRISE, (23) DEVELOPMENT, (24) DESIGN, (25) SUPPORT

the Appendix–4, 5, 6 by removing inappropriate words, such as propositions or conjunctions. In addition, because various authors have arbitrarily created their words, although the words may have the same meaning, the words can be represented differently by the authors (Levy and Ellis 2006). For example, UI and User Interface are identical but are in different forms. Another example is Mobile Bank, which also can be expressed as m-Bank. I calculated the frequency of the words, after converting various forms of words to representative words which stand for the same meaning. As seen in Tables 1, 4, 5 and 6, 'service' represents the top word among the three domains. In other words, authors of ISF mention "service" the most frequently in their introductions. Thus, I can make a tentative conclusion that many authors have implied that they pursue service as a topic in their research articles. Environment domain shows greater frequency of user, mobile, data, process, internet, security, outsourcing, and social. Words in organization domain show more organization-oriented words such as business, management, resource, decision, and group. Technology domain contains more technology-oriented words such as process, model, application, query, network, object, method, and design. The top words in the each domain show representativeness of their domains.

Subsequently, I created matrices of co-occurrence between two words. Tables 7, 8, and 9 in appendix respectively represent the total of co-occurrence of two top 25 words in the introduction section of environment, organization, and technology articles, respectively. As expected, I found 'information' to be the most frequently co-occurred word. For instance, information and data co-occurred 42 times in environment domain, information and process 43 times in organization domain, and information and process 63 times in technology domain.

I measured co-occurrences in the following way. I counted the top 25 words from the entire article and created matrices between the two words across the three domains in order to shed light on relations between top words. Tables 10, 11, and 12 respectively represent the total of word co-occurrence in entire article in the three domains environment, organization, and technology.

3 Classification keywords

Keywords are important, since they indicate the characteristics of an article, and are also used as a tool to classify the discipline of IS research. Barki et al. (1988), summarizes the taxonomy of keywords in IS research, in terms of a classification and hierarchy of keywords. Barki published another paper in 1993 and proposed a new scheme in order to update the classification of keywords (Barki et al. 1993). I complementally present a new scheme to reflect new trends in this paper following other researchers (Vessey et al. 2002, 2005) who also adapted from Barki's classification.

For example, since IT based services, such as e-Commerce, e-Learning or SNS, have made their debut since 1993, the services cannot be classified by Barki's scheme (Cohen 1999). In addition, because ISF arguably covers the latest information more than the other journals in the IS area in general, the classification by Barki needs to be modified. The modified classification scheme and keywords in ISF are shown in the Table 2. As the table shows, I discovered that the keywords are not concentrated in a specific classification but that are evenly distributed in general. Therefore, research articles on ISF are not biased in particular fields but seize balance in most areas of IS / IT researches.

Table 2 Keyword taxonomy of ISF

Classification	Count	Classification	Count
Reference theories		IS Development & Operations	
Artificial intelligence	16	IS life cycle activities	31
Organizational theory	11	Development methods and tools	14
Behavioral science	10	IS development strategies	8
Research	9	IS operations	3
Economic theory	8		56
Management theory	7	IS usage	
Social science	7	Users	11
Decision theory	6	Organizational use of IS	8
Computers science	5	Type of processing	5
Information theory	5		24
Management science	5	Information systems	
Language theories	2	Types of information systems	34
Systems theory	2	IS applications areas	28
	93	IS characteristics	4
IS Education & Research		Components of IS	2
IS research	16	Platform	2
IS professional societies	2		70
	18	IT based services	
Information technology		SNS (Blog)	14
Software	67	e-Learning	9
Internet	38	Web service	8
P2P	25	e-Business	6
Computer systems	17	e-Commerce	6
Cloud computing	10	Game	6
Wireless	6	Online communities	3
Grid	3	News	2
	166	m-Commerce	1
IS management			55
IS security	43	Organizational environment	
IS management issues	24	Organizational dynamics	47
IS planning	15	Organizational characteristics	6
IS project management	13	Organizational functions	4
Data resource management	12		57
IS evaluation	8	External environment	
Software resource management	4	Economic environment	16
IS staffing	3	Social environment	16
Organizing IS	3	Legal environment	7
IS control	2	Political environment	3
Hardware resource management	1		42
Ubiquitous	1		
	129		

4 Keyword domain matrix

In order to examine relations between keywords and research discipline of the three domains, I distinguished the keywords according to the domains where individual research belongs. The results are shown in Table 3.

Keywords such as Reference Disciplines, External Environment, IS Education and Research and IT Based Services exclusively belong to articles of environment

Table 3 Keywords in three domains

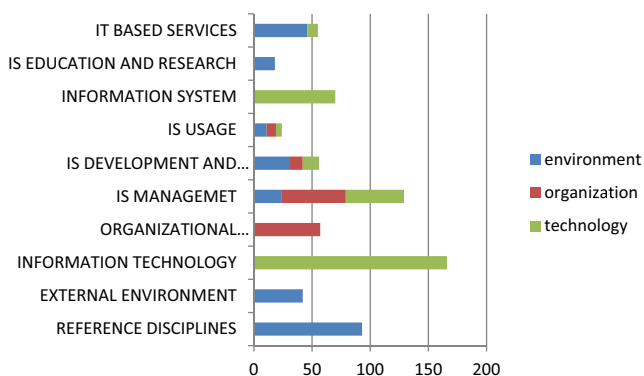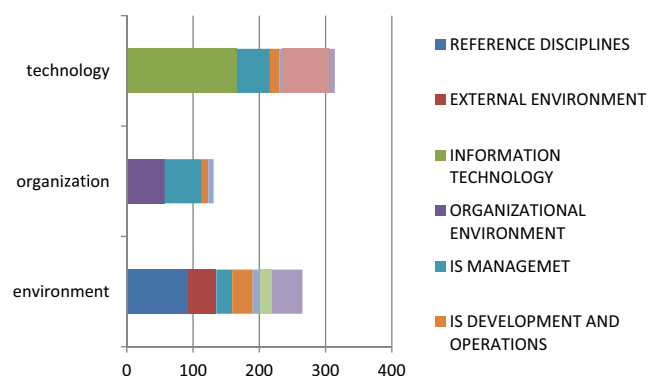|	Environment	Organization	Technology	Grand total
Reference disciplines	93	0	0	*93*
External environment	42	0	0	*42*
Information technology	0	0	166	*166*
Organizational environment	0	57	0	*57*
IS management	24	55	50	*129*
IS development and operations	31	11	14	*56*
IS usage	11	8	5	*24*
Information system	0	0	70	*70*
IS education and research	18	0	0	*18*
IT based services	46	0	9	*55*
Grand total	*265*	*131*	*314*	*710*

domain. Keywords of Organizational Environment also exclusively belong to organization domain. Articles of technology domain exclusively contain keywords of Information Technology and Information Systems. Keywords in IS Management, IS Development and Operations, and IS Usage exist across the three domains (Figs. 1 and 2).

Articles in environment and organization do not contain any keywords categorized into information technology. In other words, authors of the articles do not tend to be specialized in technology. Although Reference Disciplines is one of the most frequent keyword taxonomy in the domain, articles in environment domain consist of equally distributed keywords, compared with the other domains. Thus, articles in the domain treat various topics differently. The majority of keywords of articles belong to organization domain are categorized into organizational environment or IS management. Thus, keywords categorized into 'information technology' are the most frequent keywords in the technology domain. It implies that articles in organization and

technology domains tend to be more specific to particular topic.

5 Conclusion

As mentioned above, I have examined the characteristics of the articles in ISF. First, I established three research domains and then I classified all articles that had been published until 2012. I examined the frequency of words that are embraced in the introductions of articles. I found that service is a word most frequently mentioned. With the words, I also examined co-occurrence. From the results, I found that information is the most often mentioned simultaneously with other words. Referring the classification of Barki, I classified keywords defined by the authors to update Barki's taxonomy. It was found that environment articles study the various areas of the surrounding IS/IT and articles of organization or technology are more specialized. In summary, this article has been a historical exploration of the areas of interest of articles published in ISF over the past decade.

Fig. 1 Keywords in three domains

Fig. 2 Domains with keywords

Appendix

Table 4   Fifty frequency of words in the data set from environment discipline

50 frequency of words in the data set from Environment Discipline

TOTAL WORDS	6656	THRESHOLD		0
TOTAL UNIQUE WORDS	50	RESTORING FORCE		0.1
TOTAL EPISODES	6622	CYCLES		1
TOTAL LINES	4796	FUNCTION	Sigmoid (-1 - +1)	
		CLAMPING	Yes	

DESCENDING FREQUENCY LIST					ALPHABETICALLY SORTED LIST				
WORD	FREQ	PCNT	CASE FREQ	CASE PCNT	WORD	FREQ	PCNT	CASE FREQ	CASE PCNT
SERVICE	473	7.1	1910	28.8	ACCESS	81	1.2	396	6
INFORMATION	394	5.9	1894	28.6	ACTIVITY	85	1.3	474	7.2
SYSTEM	367	5.5	1758	26.5	ADOPTION	96	1.4	482	7.3
TECHNOLOGY	262	3.9	1307	19.7	ANALYSIS	104	1.6	595	9
USER	241	3.6	1091	16.5	APPLICATION	128	1.9	755	11.4
BUSINESS	233	3.5	1075	16.2	BEHAVIOR	94	1.4	512	7.7
MOBILE	232	3.5	886	13.4	BUSINESS	233	3.5	1075	16.2
DATA	183	2.7	923	13.9	COMMUNICATION	61	0.9	398	6
PROCESS	178	2.7	910	13.7	COMPUTER	62	0.9	374	5.6
WEB	172	2.6	758	11.4	CONSUMER	95	1.4	465	7
MODEL	168	2.5	852	12.9	DATA	183	2.7	923	13.9
INTERNET	166	2.5	773	11.7	DECISION	67	1	388	5.9
SOFTWARE	148	2.2	698	10.5	DESIGN	71	1.1	370	5.6
LEARNING	146	2.2	509	7.7	DEVELOPMENT	110	1.7	625	9.4
KNOWLEDGE	143	2.1	660	10	FACTOR	93	1.4	513	7.7
SECURITY	138	2.1	554	8.4	FRAMEWORK	98	1.5	431	6.5
APPLICATION	128	1.9	755	11.4	GOVERNMENT	80	1.2	307	4.6
ORGANIZATION	128	1.9	661	10	HEALTH	62	0.9	248	3.7
MANAGEMENT	123	1.8	689	10.4	INFORMATION	394	5.9	1894	28.6
TIME	122	1.8	690	10.4	INTERACTION	67	1	287	4.3
OUTSOURCING	121	1.8	405	6.1	INTERNET	166	2.5	773	11.7
TRUST	120	1.8	388	5.9	KNOWLEDGE	143	2.1	660	10
SOCIAL	119	1.8	587	8.9	LEARNING	146	2.2	509	7.7
DEVELOPMENT	110	1.7	625	9.4	LITERATURE	82	1.2	468	7.1
ANALYSIS	104	1.6	595	9	MANAGEMENT	123	1.8	689	10.4
FRAMEWORK	98	1.5	431	6.5	MARKET	66	1	307	4.6
ADOPTION	96	1.4	482	7.3	MEDIA	68	1	304	4.6
CONSUMER	95	1.4	465	7	MOBILE	232	3.5	886	13.4
BEHAVIOR	94	1.4	512	7.7	MODEL	168	2.5	852	12.9
FACTOR	93	1.4	513	7.7	NETWORK	81	1.2	431	6.5
RISK	91	1.4	363	5.5	ORGANIZATION	128	1.9	661	10
ACTIVITY	85	1.3	474	7.2	OUTSOURCING	121	1.8	405	6.1
LITERATURE	82	1.2	468	7.1	PEOPLE	74	1.1	414	6.3
ACCESS	81	1.2	396	6	PROCESS	178	2.7	910	13.7
NETWORK	81	1.2	431	6.5	QUALITY	76	1.1	405	6.1
GOVERNMENT	80	1.2	307	4.6	RESOURCE	73	1.1	377	5.7
QUALITY	76	1.1	405	6.1	RISK	91	1.4	363	5.5
PEOPLE	74	1.1	414	6.3	SECURITY	138	2.1	554	8.4
SUPPORT	74	1.1	476	7.2	SERVICE	473	7.1	1910	28.8
RESOURCE	73	1.1	377	5.7	SOCIAL	119	1.8	587	8.9
DESIGN	71	1.1	370	5.6	SOFTWARE	148	2.2	698	10.5
THEORY	71	1.1	357	5.4	SUPPORT	74	1.1	476	7.2
VALUE	69	1	391	5.9	SYSTEM	367	5.5	1758	26.5
MEDIA	68	1	304	4.6	TECHNOLOGY	262	3.9	1307	19.7
DECISION	67	1	388	5.9	THEORY	71	1.1	357	5.4
INTERACTION	67	1	287	4.3	TIME	122	1.8	690	10.4
MARKET	66	1	307	4.6	TRUST	120	1.8	388	5.9
COMPUTER	62	0.9	374	5.6	USER	241	3.6	1091	16.5
HEALTH	62	0.9	248	3.7	VALUE	69	1	391	5.9
COMMUNICATION	61	0.9	398	6	WEB	172	2.6	758	11.4

Table 5 Fifty frequency of words in the data set from organization discipline

50 frequency of words in the data set from Organization Discipline

TOTAL WORDS	5354	THRESHOLD	0	
TOTAL UNIQUE WORDS	50	RESTORING FORCE	0.1	
TOTAL EPISODES	5339	CYCLES	1	
TOTAL LINES	3647	FUNCTION	Sigmoid (-1 - +1)	
		CLAMPING	Yes	

DESCENDING FREQUENCY LIST				ALPHABETICALLY SORTED LIST				
WORD	FREQ	PCNT	CASE FREQ	CASE PCNT	WORD	FREQ	PCNT	CASE FREQ	CASE PCNT
SERVICE	351	6.6	1389	26	ACCESS	53	1	308	5.8
SYSTEM	330	6.2	1533	28.7	ADOPTION	65	1.2	257	4.8
PROCESS	313	5.8	1311	24.6	AGENTS	52	1	239	4.5
ORGANIZATION	279	5.2	1359	25.5	ANALYSIS	54	1	331	6.2
INFORMATION	275	5.1	1322	24.8	APPLICATION	107	2	555	10.4
BUSINESS	229	4.3	1107	20.7	ARCHITECTURE	51	1	266	5
TECHNOLOGY	208	3.9	1021	19.1	BUSINESS	229	4.3	1107	20.7
MODEL	194	3.6	935	17.5	CASE	91	1.7	486	9.1
KNOWLEDGE	173	3.2	791	14.8	CLOUD	87	1.6	282	5.3
MANAGEMENT	155	2.9	893	16.7	COMMUNICATION	50	0.9	303	5.7
WEB	141	2.6	619	11.6	COMMUNITY	49	0.9	221	4.1
RESOURCE	137	2.6	581	10.9	CONSUMER	59	1.1	290	5.4
DATA	126	2.4	596	11.2	COST	58	1.1	321	6
APPLICATION	107	2	555	10.4	CUSTOMER	49	0.9	219	4.1
USER	105	2	539	10.1	DATA	126	2.4	596	11.2
DEVELOPMENT	95	1.8	547	10.2	DECISION	86	1.6	427	8
CASE	91	1.7	486	9.1	DESIGN	68	1.3	396	7.4
CLOUD	87	1.6	282	5.3	DEVELOPMENT	95	1.8	547	10.2
DECISION	86	1.6	427	8	ENTERPRISE	58	1.1	282	5.3
GROUP	79	1.5	310	5.8	ENVIRONMENT	58	1.1	378	7.1
SECURITY	78	1.5	341	6.4	FRAMEWORK	54	1	308	5.8
LEARNING	77	1.4	325	6.1	GROUP	79	1.5	310	5.8
SUPPORT	77	1.4	457	8.6	INFORMATION	275	5.1	1322	24.8
TIME	77	1.4	477	8.9	INTERNET	52	1	269	5
VALUE	77	1.4	401	7.5	KNOWLEDGE	173	3.2	791	14.8
DESIGN	68	1.3	396	7.4	LEARNING	77	1.4	325	6.1
ADOPTION	65	1.2	257	4.8	MANAGEMENT	155	2.9	893	16.7
SOCIAL	65	1.2	322	6	MOBILE	51	1	244	4.6
SOFTWARE	64	1.2	352	6.6	MODEL	194	3.6	935	17.5
PROJECT	62	1.2	279	5.2	MULTI	49	0.9	259	4.9
STUDENT	61	1.1	256	4.8	NETWORK	56	1	330	6.2
PERFORMANCE	60	1.1	327	6.1	ORGANIZATION	279	5.2	1359	25.5
CONSUMER	59	1.1	290	5.4	OUTSOURCING	54	1	173	3.2
COST	58	1.1	321	6	PERFORMANCE	60	1.1	327	6.1
ENTERPRISE	58	1.1	282	5.3	PROCESS	313	5.8	1311	24.6
ENVIRONMENT	58	1.1	378	7.1	PROJECT	62	1.2	279	5.2
NETWORK	56	1	330	6.2	RESOURCE	137	2.6	581	10.9
SHARING	55	1	285	5.3	SECURITY	78	1.5	341	6.4
ANALYSIS	54	1	331	6.2	SERVICE	351	6.6	1389	26
FRAMEWORK	54	1	308	5.8	SHARING	55	1	285	5.3
OUTSOURCING	54	1	173	3.2	SOCIAL	65	1.2	322	6
ACCESS	53	1	308	5.8	SOFTWARE	64	1.2	352	6.6
AGENTS	52	1	239	4.5	STUDENT	61	1.1	256	4.8
INTERNET	52	1	269	5	SUPPORT	77	1.4	457	8.6
ARCHITECTURE	51	1	266	5	SYSTEM	330	6.2	1533	28.7
MOBILE	51	1	244	4.6	TECHNOLOGY	208	3.9	1021	19.1
COMMUNICATION	50	0.9	303	5.7	TIME	77	1.4	477	8.9
COMMUNITY	49	0.9	221	4.1	USER	105	2	539	10.1
CUSTOMER	49	0.9	219	4.1	VALUE	77	1.4	401	7.5
MULTI	49	0.9	259	4.9	WEB	141	2.6	619	11.6

Table 6   Fifty frequency of words in the data set from technology discipline

50 frequency of words in the data set from Technology Discipline

TOTAL WORDS	8027	THRESHOLD	0
TOTAL UNIQUE WORDS	50	RESTORING FORCE	0.1
TOTAL EPISODES	8006	CYCLES	1
TOTAL LINES	4740	FUNCTION	Sigmoid (-1 -
		CLAMPING	Yes

DESCENDING FREQUENCY LIST					ALPHABETICALLY SORTED LIST				
WORD	FREQ	PCNT	CASE FREQ	CASE PCNT	WORD	FREQ	PCNT	CASE FREQ	CASE PCNT
SERVICE	579	7.2	2246	28.1	ACCESS	107	1.3	555	6.9
SYSTEM	570	7.1	2636	32.9	ACTIVITY	69	0.9	409	5.1
INFORMATION	495	6.2	2139	26.7	ANALYSIS	61	0.8	363	4.5
PROCESS	416	5.2	2043	25.5	APPLICATION	314	3.9	1547	19.3
MODEL	393	4.9	1711	21.4	ARCHITECTURE	111	1.4	595	7.4
APPLICATION	314	3.9	1547	19.3	BUSINESS	198	2.5	1015	12.7
DATA	309	3.8	1399	17.5	CODE	72	0.9	347	4.3
WEB	296	3.7	1364	17	COMMUNICATION	71	0.9	411	5.1
USER	211	2.6	1001	12.5	COMPUTING	83	1	457	5.7
BUSINESS	198	2.5	1015	12.7	CONSUMER	61	0.8	283	3.5
RFID	194	2.4	829	10.4	CONTROL	112	1.4	602	7.5
QUERY	177	2.2	607	7.6	DATA	309	3.8	1399	17.5
NETWORK	170	2.1	819	10.2	DATABASE	60	0.7	283	3.5
MANAGEMENT	158	2	927	11.6	DECISION	60	0.7	335	4.2
OBJECT	153	1.9	572	7.1	DESIGN	123	1.5	677	8.5
METHOD	150	1.9	765	9.6	DEVELOPMENT	128	1.6	782	9.8
TECHNOLOGY	148	1.8	896	11.2	ENTERPRISE	129	1.6	643	8
TIME	146	1.8	807	10.1	ENVIRONMENT	75	0.9	467	5.8
KNOWLEDGE	131	1.6	584	7.3	FRAMEWORK	88	1.1	485	6.1
SOFTWARE	131	1.6	655	8.2	IMPLEMENTATION	61	0.8	368	4.6
TAG	131	1.6	429	5.4	INFORMATION	495	6.2	2139	26.7
ENTERPRISE	129	1.6	643	8	INTERNET	66	0.8	373	4.7
DEVELOPMENT	128	1.6	782	9.8	KNOWLEDGE	131	1.6	584	7.3
DESIGN	123	1.5	677	8.5	MANAGEMENT	158	2	927	11.6
SUPPORT	119	1.5	748	9.3	METHOD	150	1.9	765	9.6
PRIVACY	116	1.4	547	6.8	MOBILE	99	1.2	437	5.5
CONTROL	112	1.4	602	7.5	MODEL	393	4.9	1711	21.4
ARCHITECTURE	111	1.4	595	7.4	NETWORK	170	2.1	819	10.2
TECHNIQUE	110	1.4	639	8	OBJECT	153	1.9	572	7.1
ACCESS	107	1.3	555	6.9	ORGANIZATION	75	0.9	461	5.8
REQUIREMENT	107	1.3	583	7.3	PERFORMANCE	78	1	484	6
MOBILE	99	1.2	437	5.5	PRIVACY	116	1.4	547	6.8
RESOURCE	96	1.2	477	6	PROCESS	416	5.2	2043	25.5
FRAMEWORK	88	1.1	485	6.1	QUALITY	76	0.9	390	4.9
COMPUTING	83	1	457	5.7	QUERY	177	2.2	607	7.6
PERFORMANCE	78	1	484	6	REQUIREMENT	107	1.3	583	7.3
QUALITY	76	0.9	390	4.9	RESOURCE	96	1.2	477	6
ENVIRONMENT	75	0.9	467	5.8	RFID	194	2.4	829	10.4
ORGANIZATION	75	0.9	461	5.8	SEARCH	70	0.9	316	3.9
SECURITY	74	0.9	414	5.2	SECURITY	74	0.9	414	5.2
CODE	72	0.9	347	4.3	SERVICE	579	7.2	2246	28.1
COMMUNICATION	71	0.9	411	5.1	SOFTWARE	131	1.6	655	8.2
SEARCH	70	0.9	316	3.9	SUPPORT	119	1.5	748	9.3
ACTIVITY	69	0.9	409	5.1	SYSTEM	570	7.1	2636	32.9
INTERNET	66	0.8	373	4.7	TAG	131	1.6	429	5.4
ANALYSIS	61	0.8	363	4.5	TECHNIQUE	110	1.4	639	8
CONSUMER	61	0.8	283	3.5	TECHNOLOGY	148	1.8	896	11.2
IMPLEMENTATION	61	0.8	368	4.6	TIME	146	1.8	807	10.1
DATABASE	60	0.7	283	3.5	USER	211	2.6	1001	12.5
DECISION	60	0.7	335	4.2	WEB	296	3.7	1364	17

Table 7 Top 25 word co-occurrence in introduction of 'environment' researches

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	Total
(1) ANALYSIS		1	6	25	7	18	0	9	6	9	1	30	7	8	9	6	10	13	8	15	5	7	5	8	6	366
(2) APPLICATION	1		9	12	12	17	0	4	1	8	7	9	4	4	14	3	14	2	11	9	10	6	4	10	8	284
(3) BUSINESS	6	9		20	11	42	4	14	7	16	12	28	19	9	35	15	31	9	19	13	22	24	8	8	12	620
(4) DATA	25	12	20		12	42	2	13	10	8	18	25	6	4	14	10	25	8	19	21	15	22	3	13	11	606
(5) DEVELOPMENT	7	12	11	12		23	0	10	11	9	5	15	11	7	15	4	15	11	24	15	16	18	3	7	11	442
(6) INFORMATION	18	17	42	42	23		4	22	8	24	22	22	26	11	31	33	41	20	32	26	44	41	13	25	20	1032
(7) INTERNET	0	0	4	2	0	4		0	0	0	2	1	0	0	0	2	4	2	1	2	2	2	0	1	1	66
(8) KNOWLEDGE	9	4	14	13	10	22	0		17	14	8	17	14	9	21	9	9	7	18	13	8	17	6	11	5	403
(9) LEARNING	6	1	7	10	11	8	0	17		4	3	13	6	2	5	0	5	10	4	11	17	11	0	3	1	278
(10) MANAGEMENT	9	8	16	8	9	24	0	14	4		1	18	13	8	18	10	12	4	13	15	12	14	5	3	3	384
(11) MOBILE	1	7	12	18	5	22	2	8	3	1		9	1	0	3	2	18	3	6	9	18	22	0	6	6	367
(12) MODEL	30	9	28	25	11	22	1	17	13	18	9		16	8	23	17	22	14	9	27	13	20	12	11	3	648
(13) ORGANIZATION	7	4	19	6	11	26	0	14	6	13	1	16		9	15	3	8	10	13	11	11	11	3	8	3	355
(14) OUTSOURCING	8	4	7	3	6	7	0	9	2	8	1	7	8		6	2	7	4	4	8	7	4	1	3	1	187
(15) PROCESS	9	14	35	14	15	31	0	21	5	18	3	23	15	9		13	24	11	13	20	12	27	5	16	14	573
(16) SECURITY	6	3	15	10	4	33	2	9	0	10	2	17	3	2	13		4	3	8	9	5	12	7	7	2	285
(17) SERVICE	10	14	31	25	15	41	4	9	5	12	18	22	8	9	24	4		11	13	19	19	23	5	11	15	635
(18) SOCIAL	13	2	9	8	11	20	2	7	10	4	3	14	10	3	11	3	11		7	15	15	6	7	7	11	400
(19) SOFTWARE	8	11	19	19	24	32	1	18	4	13	6	9	13	6	13	8	13	7		12	13	20	7	16	10	469
(20) SYSTEM	15	9	13	21	15	26	2	13	11	15	9	27	11	6	20	9	19	15	12		12	22	12	14	5	557
(21) TECHNOLOGY	5	10	22	15	16	44	2	8	17	12	18	13	11	7	12	5	19	15	13	12		19	0	11	8	543
(22) TIME	7	6	24	22	18	41	2	17	11	14	22	20	11	4	27	12	23	6	20	22	19		6	14	10	649
(23) TRUST	5	4	8	3	3	13	0	6	0	5	0	3	3	4	5	7	5	7	7	12	0	6		5	0	190
(24) USER	8	10	8	13	7	25	1	11	3	3	11	11	8	2	16	7	11	7	16	14	11	14	5		7	398
(25) WEB	6	8	12	11	7	20	1	5	1	3	6	3	3	1	14	2	15	11	10	5	8	10	0	7		283

Table 8 Top 25 word co-occurrence in Introduction of 'organization' researches

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	Total
(1) APPLICATION		4	2	0	5	1	2	0	3	5	0	4	2	0	4	0	2	1	2	3	1	0	2	2	3	77
(2) BUSINESS	4		10	0	7	17	9	4	36	26	3	26	27	13	43	2	1	26	23	22	20	14	9	16	15	614
(3) CASE	2	10		2	14	11	9	3	15	9	4	12	23	5	18	1	5	9	9	22	7	7	2	7	1	328
(4) CLOUD	1	0	1		1	0	0	0	1	1	0	1	1	1	0	1	0	1	0	1	0	1	1	0	0	23
(5) DATA	5	7	14	4		9	7	2	24	11	3	12	14	9	23	5	5	8	16	15	9	17	4	13	4	392
(6) DECISION	1	17	11	0	9		5	8	25	18	5	17	14	10	19	4	3	2	18	12	11	8	3	18	3	346
(7) DEVELOPMENT	2	9	9	0	7	5		5	21	14	8	16	12	3	14	1	7	10	14	12	14	17	2	6	9	365
(8) GROUP	0	4	3	0	2	8	5		13	7	8	8	3	0	2	1	1	3	9	7	6	7	2	2	7	191
(9) INFORMATION	3	36	15	1	24	25	21	13		30	4	35	23	15	34	3	16	17	23	35	34	30	8	10	14	760
(10) KNOWLEDGE	5	26	9	1	11	18	14	7	30		6	27	20	13	20	2	14	5	16	11	14	14	5	7	3	456
(11) LEARNING	0	3	4	0	3	5	8	8	4	6		2	5	4	3	0	0	1	12	6	8	2	3	2	0	144
(12) MANAGEMENT	4	26	12	1	12	17	16	8	35	27	2		20	6	27	7	6	11	20	19	14	20	2	7	8	496
(13) MODEL	2	27	23	1	14	14	12	3	23	20	5	20		6	29	3	1	17	18	21	10	7	6	10	9	483
(14) ORGANIZATION	0	13	5	2	9	10	3	0	15	13	4	6	6		11	4	5	5	9	8	9	3	5	10	1	234
(15) PROCESS	4	43	18	0	23	19	14	2	34	20	3	27	29	11		5	1	18	21	30	9	25	6	11	8	578
(16) RESOURCE	0	2	1	2	5	4	1	1	3	2	0	7	3	4	5		0	4	6	3	0	8	0	5	0	104
(17) SECURITY	2	1	5	0	5	3	7	1	16	14	0	6	1	5	1	0		4	6	12	5	10	5	4	3	179
(18) SERVICE	1	26	9	3	8	2	10	3	17	5	1	11	17	5	18	4	4		15	18	13	20	11	6	14	445
(19) SUPPORT	2	23	9	0	16	18	14	9	23	16	12	20	18	9	21	6	6	15		18	13	15	8	7	10	479
(20) SYSTEM	3	22	22	0	15	12	12	7	35	11	6	19	21	8	30	3	12	18	18		14	20	12	6	8	528
(21) TECHNOLOGY	1	20	7	2	9	11	14	6	34	14	8	14	10	9	9	0	5	13	13	14		11	5	13	4	399
(22) TIME	0	14	7	1	17	8	17	7	30	14	2	20	7	3	25	8	10	20	15	20	11		7	11	7	479
(23) USER	2	9	2	1	4	3	2	2	8	5	3	2	6	5	6	0	5	11	8	12	5	7		1	4	180
(24) VALUE	2	16	7	0	13	18	6	2	10	7	2	7	10	10	11	5	4	6	7	6	13	11	1		4	288
(25) WEB	3	15	1	0	4	3	9	7	14	3	0	8	9	1	8	0	3	14	10	8	4	7	4	4		244

Table 9 Word co-occurrence in introduction of 'technology' researches

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	Total
(1)	APPLICATION		13	24	21	17	9	21	8	7	15	18	19	1	27	4	13	16	13	16	17	4	12	15	13	13	475
(2)	BUSINESS	13		34	17	20	23	41	10	19	9	24	11	3	40	3	17	23	13	24	20	6	22	18	6	12	593
(3)	DATA	24	34		21	16	16	61	18	31	20	28	23	9	51	17	33	22	15	33	38	20	17	34	20	13	923
(4)	DESIGN	21	17	21		24	3	26	9	18	17	32	14	7	38	7	18	24	12	21	23	5	11	17	12	10	601
(5)	DEVELOPMENT	17	20	16	24		7	24	14	11	16	34	6	5	28	3	25	18	25	14	19	7	21	15	8	8	540
(6)	ENTERPRISE	9	23	16	3	7		26	3	8	7	19	5	3	19	2	8	12	13	11	20	2	3	9	2	4	347
(7)	INFORMATION	21	41	61	26	24	26		29	38	20	34	22	15	63	19	46	30	20	46	60	16	30	42	34	22	1168
(8)	KNOWLEDGE	8	10	18	9	14	3	29		15	7	15	1	2	25	3	10	11	6	15	13	4	6	9	10	9	348
(9)	MANAGEMENT	7	19	31	18	11	8	38	15		9	29	7	8	35	4	16	19	12	33	30	12	16	20	8	13	613
(10)	METHOD	15	9	20	17	16	7	20	7	9		29	5	8	29	8	25	9	11	17	20	11	6	17	9	8	440
(11)	MODEL	18	24	28	32	34	19	34	15	29	29		12	14	49	13	38	24	25	41	35	10	13	26	14	18	835
(12)	NETWORK	19	11	23	14	6	5	22	1	7	5	12		4	15	3	11	26	6	14	21	8	8	21	14	6	446
(13)	OBJECT	1	3	9	7	5	3	15	2	8	8	14	4		12	10	17	8	2	11	14	11	7	12	6	3	262
(14)	PROCESS	27	40	51	38	28	19	63	25	35	29	49	15	12		15	39	29	24	35	43	8	24	47	13	17	1013
(15)	QUERY	4	3	17	7	3	2	19	3	4	8	13	3	10	15		12	13	1	11	9	8	3	13	3	9	289
(16)	SEARCH	13	17	33	18	25	8	46	10	16	25	38	11	17	39	12		11	15	24	37	12	16	25	14	23	717
(17)	SERVICE	16	23	22	24	18	12	30	11	19	9	24	26	8	29	13	11		15	22	29	6	20	22	11	27	670
(18)	SOFTWARE	13	13	15	12	25	13	20	6	12	11	25	6	2	24	1	15	15		15	18	6	10	8	3	7	416
(19)	SUPPORT	16	24	33	21	14	11	46	15	33	17	41	14	11	35	11	24	22	15		29	9	19	30	9	16	747
(20)	SYSTEM	17	20	38	23	19	20	60	13	30	20	35	21	14	43	9	37	29	18	29		21	24	34	16	12	906
(21)	TAG	4	6	20	5	7	2	16	4	12	11	10	8	11	8	8	12	6	6	9	21		10	18	3	1	316
(22)	TECHNOLOGY	12	22	17	11	21	3	30	6	16	6	13	8	7	24	3	16	20	10	19	24	10		12	5	8	459
(23)	TIME	15	18	34	17	15	9	42	9	20	17	26	12	12	47	13	25	22	8	30	34	18	12		18	5	703
(24)	USER	13	6	20	12	8	2	34	10	8	9	14	6	6	13	3	14	11	3	9	16	3	5	18		12	399
(25)	WEB	13	12	13	10	8	4	22	9	13	8	18	6	3	17	9	23	27	7	16	12	1	8	5	12		377

Table 10 Top 25 word co-occurrence in article of 'environment' researches

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	Total
(1)	ANALYSIS		22	26	28	23	39	3	23	8	19	12	37	22	8	29	10	28	21	20	42	26	32	6	22	13	916
(2)	APPLICATION	22		30	32	26	38	2	19	7	19	14	35	25	4	29	7	32	14	20	42	26	36	6	27	12	951
(3)	BUSINESS	26	30		31	24	41	6	26	7	21	9	34	28	7	32	10	34	15	18	43	28	35	6	20	12	942
(4)	DATA	28	32	31		29	43	4	24	8	16	11	34	23	3	23	11	31	19	21	41	26	39	6	23	12	966
(5)	DEVELOPMENT	23	26	24	29		38	2	19	9	16	7	29	25	6	26	8	27	20	21	36	26	34	5	17	12	869
(6)	INFORMATION	39	38	41	43	38		4	33	11	27	15	54	41	7	40	17	42	32	27	57	42	47	11	33	19	1348
(7)	INTERNET	3	2	6	4	2	4		1	0	2	2	3	1	0	2	2	4	2	1	4	3	6	0	4	1	114
(8)	KNOWLEDGE	23	19	26	24	19	33	1		11	20	11	29	22	9	25	8	27	13	15	34	22	30	5	19	8	797
(9)	LEARNING	8	7	7	8	9	11	0	11		5	4	12	7	2	9	1	6	8	4	11	9	13	0	5	3	294
(10)	MANAGEMENT	19	19	21	16	16	27	2	20	5		6	24	21	6	18	11	20	12	17	33	18	22	6	15	7	650
(11)	MOBILE	12	14	9	11	7	15	2	11	4	6		15	3	1	9	2	17	4	5	18	12	15	0	10	6	396
(12)	MODEL	37	35	34	34	29	54	3	29	12	24	15		34	7	33	15	36	24	24	52	29	37	8	30	13	1123
(13)	ORGANIZATION	22	25	28	23	25	41	1	22	7	21	3	34		8	26	9	26	19	22	41	27	30	6	22	10	852
(14)	OUTSOURCING	8	4	9	4	7	11	0	9	2	8	0	8	9		9	2	9	3	6	6	5	3	4	2	1	202
(15)	PROCESS	29	29	32	23	26	40	2	25	9	18	9	33	26	6		9	28	18	17	41	25	36	5	23	12	896
(16)	SECURITY	10	7	10	11	8	17	2	8	1	11	2	15	9	2	9		9	6	8	15	5	13	4	9	4	322
(17)	SERVICE	28	32	34	31	27	42	4	27	6	20	17	36	26	7	28	9		18	20	44	26	38	8	25	17	1005
(18)	SOCIAL	21	14	15	19	20	32	2	13	8	12	4	24	19	4	18	6	18		12	25	18	22	7	17	8	635
(19)	SOFTWARE	20	20	18	21	21	27	1	15	4	17	5	24	22	4	17	8	20	12		27	16	21	5	13	8	614
(20)	SYSTEM	42	42	43	41	36	57	4	34	11	33	18	52	41	8	41	15	44	25	27		40	50	10	35	13	1346
(21)	TECHNOLOGY	26	26	28	26	26	42	3	22	9	18	12	29	27	7	25	5	26	18	16	40		31	3	17	13	913
(22)	TIME	32	36	35	39	34	47	6	30	13	22	15	37	30	4	36	13	38	22	21	50	31		8	27	14	1161
(23)	TRUST	6	6	6	6	5	11	0	5	0	6	0	8	6	1	5	4	8	7	5	10	3	8		6	3	206
(24)	USER	22	27	20	23	17	33	4	19	5	15	10	30	22	3	23	9	25	17	13	35	17	27	6		8	765
(25)	WEB	13	12	12	12	12	19	1	8	3	7	6	13	10	1	12	4	17	8	8	13	13	14	3	8		403

Table 11 Top 25 word co-occurrence in article of 'organization' researches

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	Total
(1) APPLICATION		18	15	1	24	8	15	9	22	16	3	16	24	16	24	14	7	22	19	26	15	19	17	11	12	606
(2) BUSINESS	18		15	0	20	17	14	9	34	23	4	21	31	31	28	13	6	29	20	29	24	21	17	20	14	718
(3) CASE	15	15		1	21	14	16	11	28	17	4	19	23	23	26	14	4	19	17	31	19	21	14	11	5	614
(4) CLOUD	0	0	2		4	0	0	0	1	1	0	1	4	2	0	2	0	3	0	0	0	2	1	0	0	43
(5) DATA	24	20	21	4		15	18	12	36	23	4	21	29	24	31	16	8	26	23	38	21	26	17	18	12	787
(6) DECISION	8	17	14	0	15		11	8	25	15	4	17	19	24	25	14	4	12	13	21	16	21	8	15	6	498
(7) DEVELOPMENT	15	14	16	0	18	11		12	27	15	8	16	22	23	22	14	7	20	19	32	23	21	16	14	8	653
(8) GROUP	9	9	11	0	12	8	12		14	11	4	9	10	10	14	9	2	11	11	15	13	12	6	5	6	364
(9) INFORMATION	22	34	28	1	36	25	27	14		28	7	29	41	48	45	20	13	33	25	51	35	34	26	25	15	1072
(10) KNOWLEDGE	16	23	17	1	23	15	15	11	28		6	21	23	26	28	13	4	21	20	30	17	20	11	13	5	656
(11) LEARNING	3	4	4	0	4	4	8	4	7	6		4	8	7	6	4	1	3	7	10	10	5	5	5	0	179
(12) MANAGEMENT	16	21	19	1	21	17	16	9	29	21	4		25	23	25	14	5	23	18	30	16	19	14	12	8	641
(13) MODEL	24	31	23	4	29	19	22	10	41	23	8	25		35	38	19	7	32	26	42	24	31	21	21	13	903
(14) ORGANIZATION	16	31	23	2	24	24	23	10	48	26	7	23	35		34	21	9	31	20	42	32	30	21	19	9	902
(15) PROCESS	24	28	26	0	31	25	22	14	45	28	6	25	38	34		21	9	27	24	42	25	32	20	20	15	927
(16) RESOURCE	14	13	14	2	16	14	14	9	20	13	4	14	19	21	21		6	16	15	23	14	20	11	9	6	506
(17) SECURITY	7	6	4	0	8	4	7	2	13	4	1	5	7	9	9	6		8	7	9	9	9	5	6	5	236
(18) SERVICE	22	29	19	3	26	12	20	11	33	21	3	23	32	31	27	16	8		22	34	25	26	19	18	15	828
(19) SUPPORT	19	20	17	0	23	13	19	11	25	20	7	18	26	20	24	15	7	22		28	21	23	14	15	10	669
(20) SYSTEM	26	29	31	0	38	21	32	15	51	30	10	30	42	42	42	23	9	34	28		32	35	25	22	13	1071
(21) TECHNOLOGY	15	24	19	0	21	16	23	13	35	17	10	16	24	32	25	14	9	25	21	32		27	16	19	9	737
(22) TIME	19	21	21	2	26	21	21	12	34	20	5	19	31	30	32	20	9	26	23	35	27		18	18	11	795
(23) USER	17	17	14	1	17	8	16	6	26	11	5	14	21	21	20	11	5	19	14	25	16	18		11	11	576
(24) VALUE	11	20	11	0	18	15	14	5	25	13	5	12	21	19	20	9	6	18	15	22	19	18	11		5	526
(25) WEB	12	14	5	0	12	6	8	6	15	5	0	8	13	9	15	6	5	15	10	13	9	11	11	5		347

Table 12 Top 25 word co-occurrence in article of 'technology' researches

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(1)	Total
(1)	APPLICATION		30	43	36	31	15	50	20	32	40	47	29	24	51	10	39	18	33	23	38	59	25	31	40	34	14	1240
(2)	BUSINESS	30		32	27	27	18	40	18	25	31	37	16	12	39	6	30	10	26	18	29	42	15	28	27	19	11	930
(3)	DATA	43	32		35	30	14	58	27	35	43	50	28	26	51	15	42	19	35	23	34	59	29	33	42	33	14	1319
(4)	DESIGN	36	27	35		27	13	43	16	26	36	41	19	21	47	10	36	13	31	22	34	46	18	26	29	26	14	1078
(5)	DEVELOPMENT	31	27	30	27		13	38	19	22	34	33	17	18	39	9	36	9	25	25	27	44	18	29	26	20	12	954
(6)	ENTERPRISE	15	18	14	13	13		18	8	11	14	20	8	8	18	3	14	6	14	15	15	22	8	11	14	7	5	493
(7)	INFORMATION	50	40	58	43	38	18		31	38	52	61	33	30	64	16	55	24	44	28	48	75	30	42	50	41	21	1596
(8)	KNOWLEDGE	20	18	27	16	19	8	31		15	22	26	11	8	27	7	24	6	16	10	21	31	10	15	20	17	12	651
(9)	MANAGEMENT	32	25	35	26	22	11	38	15		28	33	18	16	36	10	25	15	26	17	30	43	19	23	29	18	9	933
(10)	METHOD	40	31	43	36	34	14	52	22	28		47	23	25	55	11	46	10	31	26	39	59	24	31	40	30	13	1237
(11)	MODEL	47	37	50	41	33	20	61	26	33	47		25	25	56	13	49	17	39	28	46	64	25	31	44	33	17	1403
(12)	NETWORK	29	16	28	19	17	8	33	11	18	23	25		13	27	6	22	16	26	13	21	37	14	18	25	24	7	784
(13)	OBJECT	24	12	26	21	18	8	30	8	16	25	25	13		30	11	25	9	21	13	21	33	20	23	26	18	5	739
(14)	PROCESS	51	39	51	47	39	18	64	27	36	55	56	27	30		15	55	14	39	28	47	69	27	39	47	36	18	1502
(15)	QUERY	10	6	15	10	9	3	16	7	10	11	13	6	11	15		14	4	10	6	12	15	8	10	12	12	6	404
(16)	SEARCH	39	30	42	36	36	14	55	24	25	46	49	22	25	55	14		16	33	24	37	60	25	35	37	31	18	1259
(17)	SECURITY	18	10	19	13	9	6	24	6	15	10	17	16	9	14	4	16		14	8	13	24	10	10	15	16	6	507
(18)	SERVICE	33	26	35	31	25	14	44	16	26	31	39	26	21	39	10	33	14		20	31	46	15	26	32	27	14	1071
(19)	SOFTWARE	23	18	23	22	25	15	28	10	17	26	28	13	13	28	6	24	8	20		20	34	16	18	22	12	9	734
(20)	SUPPORT	38	29	34	34	27	15	48	21	30	39	46	21	21	47	12	37	13	31	20		56	19	26	34	27	14	1152
(21)	SYSTEM	59	42	59	46	44	22	75	31	43	59	64	37	33	69	15	60	24	46	34	56		34	44	56	42	19	1718
(22)	TAG	25	15	29	18	18	8	30	10	19	24	25	14	20	27	8	25	10	15	16	19	34		19	24	15	4	719
(23)	TECHNOLOGY	31	28	33	26	29	11	42	15	23	31	31	18	23	39	10	35	15	26	18	26	44	19		29	20	8	960
(24)	TIME	40	27	42	29	26	14	50	20	29	40	44	25	26	47	12	37	16	32	22	34	56	24	29		36	10	1192
(25)	USER	34	19	33	26	20	7	41	17	18	30	33	24	18	36	12	31	16	27	12	27	42	15	20	36		16	956
(1)	WEB	14	11	14	14	12	5	21	12	9	13	17	7	5	18	6	18	6	14	9	14	19	4	8	10	16		455

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