Analysis of S&T information seeking behaviors and policy directions for national S&T information service center in Korea

Eun Jin Kim[1], Yong Ho Lee[1]

[1] Department of Policy research, Korea Institute of Science and Technology Information,
245 Daehangno, Yuseong, Daejeon, 305-806, Korea
{kimej, stylee, pwlee}@kisti.re.kr

Abstract. This study aims to increase our understanding about information seeking behavior via a field study which tries to identify characteristics of users in Korea and how they are differentiated with others. A survey was made online over 4 weeks and 921 usable responses were left and used. We suggested five hypotheses in research framework and examine these statistically. In conclusion, we derived some insights for national S&T information service strategies from three perspectives - information service, information brokerage and negotiator perspective against worldwide publishing companies.

Keywords:information seeking behavior, information service, S&T information, information management, information policy

1   Introduction

As research knowledge information is moving from the offline to online, the boundary between the information source and channel is growing less strict, and the user has started assuming the role of the information provider as well. With the development of communication tools and social media, users who were considered passive consumers within the provider-oriented market have started generating and sharing information to become information provider ([1], [6]).

Significant causes of change in information seeking behavior of researchers are as follows; information digitalization ([7]), ubiquity of information, information explosion ([4]), and sophistication of analysis tools.

This paper identifies such environmental change as well as trends in information seeking behavior of domestic researchers, and draws insights for knowledge information service. Basic assumptions and hypothesis are formed to explain the information seeking behavior of researchers, and a field survey on domestic researchers in Korea is carried out. Through the empirical analysis, the researchers' demand on information and behaviorsare investigated and analyzed. Especially, we examinethe difference in information seeking behavior depending on the research capabilities. Policy directions from national information center perspective

areproposed for increasing the research productivity and strengthening the research competency on a national level.

2   Research framework

In conventional systems ease of use and self-efficacy were the major decisive factors of the information channels, but commoditization of information emphasizes more on the differentiation of information service from user perspective.

Table 1. Research questions - Hypotheses

Hypotheses	
Hypothesis①	Is there a difference among information type depending on information seeking purpose?
Hypothesis ②	Do researchers use different information channels depending on information type?
Hypothesis ③	Does value offering of information change with information type?
Hypothesis ④	Does value offering of information change with the information channel in use?
Hypothesis ⑤	Is there a difference in information seeking behavior by the level of research capabilities? - Does purpose of information seeking differ by the level of research capabilities? - Does type of information used by the researcher differ by the level of research capabilities? - Does the preference of certain information channel depend on the level of research capabilities?

Hypotheses ①, ②, and ③ aim to see if information type and value offering of channels differ by purpose.

The relation between information seeking purpose and information type strongly correlate with the service design. The statistically significant difference in hypothesis ② would mean that specialized information service providers exist in market. This can be inferred as that the channels can be ranked by service offerings.

Test results of hypothesis ③ informs us the value which users consider important by information type. If the value offering of information differs from channels in use (hypothesis ④), it would mean that users select their information channel based on value offering by information type. Therefore the information service provider can differentiate its own service by user groups.

The hypothesis ⑤ tests the difference of information seeking behavior by user groups. More specifically the question can be divided into the difference of information seeking purpose, information type and information channel per user group. We use the level of research capabilities to divide the user groups.

Table 2. Operational definitions of research variables

Variable	Definition
Information type	The type of information needed to solve the research problem
Value offering of Information	Considered value offering when researchers use information service
Information channel	Information portal (gate) to get necessary information
Level of research capabilities	The level of R&D competence of researcher group

A survey was carried out researchers from universities, public research institutes, and companies to test the hypotheses on information seeking behaviorin Korea. 921 of the responses were analyzed. Chi-square test was used to validate hypotheses.

3   Results

The largest researcher demands on knowledge information came from the "studies on technological trends", and the most actively used information channels were large web portals such as NAVER (web portalof Korea) and Google. Users access a web portal at first and they use "specialized research service site" as a supplementary source. The information seeking purposes were ranked by "studies on technological trends", "project developments", and "R&D project" in order.

Validating hypothesis ①, the required information significantly differ by the information seeking purpose (p-value=0.00). For example "technological trends" for studies on technological trends and "academic literature" for paper writing and R&D projects are each used the most.

Test of hypothesis ② shows that the preferred information channel differ by type of information because the effective path of acquiring information depend on the information attributes required by the researcher Difference of information channels by the information type was statistically significant(p-value=0.00). For example, the domestic portal service, NAVER is most often used for "studies on technological trends" while Google and other academic information services (Web of Science, Scopus, etc.) are used for 'academic literature studies'.

Table 3. Preferred information channel by the information type

Channel Type	Web portal	Specialized information service	Information service of its own	Public service	Journal, academic society web	Etc.	Total	
							Responses	Ratio %)
Academic literatures	196	112	53	28	25	0	414	45.0

Manufacturing technologies	20	6	3	2	0	0	31	3.4
Patents	39	14	6	4	1	0	64	6.9
Marketing	52	19	4	10	1	0	86	9.4
Technological trends	132	56	32	20	4	0	244	26.5
Policies	24	10	3	9	0	1	47	5.2
Researcher information	3	0	1	0	0	0	4	0.4
Etc.	2	1	2	2	1	23	31	3.4
Total	468	218	104	75	32	24	921	100.0

Validating hypothesis ③ showed that value offering of information significantly different depending on the information type were determined to be the amount of information, uniqueness of information, and information reliability.

The value offering of information from researcher perspective should be distinguished from generally accepted value offerings. For example the "recency of information" (1st choice), "information accessibility" (2nd choice), and "accuracy of information" (3rd choice) are value offerings considered important in general information service.

In case of hypothesis ④, There are no statistical significance, that is, researchers regards the values of provided information equal regardless of the information channel. To test hypothesis ⑤, the respondents were grouped by universities, public research institutes, company and top 25% and bottom 25% at each. Analysis results showed that information seeking behavior by the level of research capabilities differed by each group.

The information channel used by university researchers differed by the research capability levels. The top group tends to use its own information service while the bottom group tends to use large portal service along with specialized information services. This is probably because the information accessibility range of electronic library becomes wider as you move toward the upper group.

For researchers of public research institutes, the information seeking purpose and preferred channel of information tended to be different by the research capability levels. The leading group seeks information for the organization R&D activities on specialized information service web sites while the following group seeks information for the studies on technological trends on portal sites.

For corporate researchers, the information seeking purpose and information type tended to be different by the research capability levels. The leading group seeks information for the purpose of R&D while the following group seeks information for non-R&D activities such as marketing investigation.

Table 4. Preferred information channel by the level of research capability

	Top group		Bottom group	
	1st choice	Portal (google, etc.)	1st choice	Portal (google, etc.)
University	2nd choice	Organization's information service	2nd choice	National information service

| Public research institute | 1st choice | National information service | 1st choice | Portal service |
| | | Portal (google, etc.) | 2nd choice | National information service |

4   Conclusions

This study performs broad analysis on the information seeking behavior of researchers. The most used information channel for the research activities is web "portals". For technological trends, NAVER is used most often, and Google is the first to go for academic literature. Researchers need information for the purpose of studying technological trends, carrying out R&D projects, and commercializing a project and use technological trend information, academic literature, and marketing information to fulfill such purposes. It was expected that information type and value offerings of information were considered important in selecting information channel, but only the information type is significant criteria in selecting information channel. Last, the information seeking behavior by the level of research capability is different by factors such as organization type.

Table 5. test results of hypotheses

Hypothesis ①	The necessary information type differs by the information seeking purpose.		
Hypothesis ②	The used information channel differs by the necessary information type.		
Hypothesis ③	There is a difference in the value of information attributes (information amount, uniqueness, and credibility) by the necessary information type.		
Hypothesis ④	It cannot be said that there is a difference in the used information channel by the information attribute considered importantly by the user.		
Hypothesis ⑤		Information seeking purpose	Information type	Information channel
	University	x	x	o
	Public research institute	o	x	o
	Corporate	o	o	x

The reason why portals are so dominant is that it has abundant user experiences, sousers can search information with less effort through web portals. In general, researchers use NAVER and Google to start search information, and domestic corporate researchers tend to favor NAVERover Google.

Second, researchers of the same field and in the same organization tend to be different in information seeking behavior depending on their research capabilities. Leading universities depend on their own information system while the following universities depend on information channels outside.

Based on these implications, a policy direction for national information service center is proposed from the perspective of functions of such information center. The center needs to rather focus on strengthening their role in acting as information mediator and negotiators. It should focus on the completeness of domestic academic literature on behalf of information service provider. Foreign academic literature can be reached by globalweb portal with high accessibility. Therefore the differentiation could be made to focus on domestic information.

From information mediator perspective, the service center should focus on open service. Portals have an immovableposition as an information channel, so it would be inefficient for national information center to attempt to take back that positioning. Rather it should focus on acting as aninformation mediator to provide academic information. More specifically it should provide open service of meta-information.

It should also focus on acting as a national negotiator for accessing foreign academic information. As a journal market becomes dominated by a small number of publishing companies, national information center should develop and propose different academic subscription models to these publishers and negotiate on a national level for any excessive requirement from such publishers. This will cut down costs of acquiring academic knowledge on a national level and contribute to increasing the national R&D productivity in the long run.

Lastly, as to strengthen its role as information mediator and negotiator it should assume the dominant role in promoting open access. The ultimate goal of a national information center should be maximizing the accessibility and utilization of knowledge information for domestic researchers. It should strongly support open access and weaken dominance of large publishers and gradually decrease the cost of subscriptions.

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