

In-depth Understanding of STEM Information Needs using FGI

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Abstract

In the rapidly changing science and technology environment, an in-depth understanding of users of STEM information is an essential factor in designing a user-centered information system. The purpose of this study is to investigate and analyze in-depth the behaviors and needs of users who use STEM information. In this study, the needs of users for STEM information and STEM information sites are dealt with in depth using the FGI qualitative method. In addition, it includes the analysis results of grouping of similar sites according to various aspects of use of STEM information sites. As a result of grouping similar sites based on awareness and level of use, they were grouped by domestic-international, paid-free, integrated-specific fields. As a result of grouping similar sites according to the purpose of use, they were grouped by domestic and international papers, research reports, and patents. As a result of grouping similar sites according to usage attributes, they were grouped by diversity, reliability, and specialization. As for the positions of similar sites perceived by users, Science Direct and PubMed showed high specialization and high quality, Google Scholar showed integration and popularity, and RISS showed four attributes evenly. Suggestions for information system design are discussed.

Keywords: Information Needs, STEM, Focus Group Interview, Qualitative Method

1. Introduction

The field of STEM (Science, Technology, Engineering, and Medicine) changes rapidly. The life cycle of STEM literature is shorter than that of humanities and social science literature. The information service system that distributes STEM contents needs to be designed and operated by reflecting the characteristics of these academic fields and contents well. In the rapidly changing science and technology environment, an in-depth understanding of users of STEM information is an essential factor in designing a user-centered information system.

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2. Related Studies

The earliest research on the use of information can be traced back to the 1900s [1]. Research on human behavior related to information can be considered to have begun in earnest in the mid-20th century, which

occurred more frequently in the rapidly changing science and technology fields. In the 1980s, as the research focused on the information itself faced a limit, systems-centered research turned to human-centered research. More recently, multidisciplinary studies on the interaction between humans and information (including human-information systems) have emerged [2-4].

The information service system needs to be designed from the perspective of users who use the system, not from the perspective of developers/providers [5-7]. To this end, there are various quantitative or qualitative research methods. In order to compensate for each limitation, a quantitative method and a qualitative method are applied together to conduct research [8-9]. For example, in order to grasp the improvement of the information service system, research can be conducted using a combination of usability evaluation, log analysis, observation, survey, and in-depth interview.

Log analysis is a useful research method that can observe human behavior unobtrusively [10-11]. If it is an information system designed based on web, it is possible to analyze and understand the interaction between users and systems from various perspectives through transaction log analysis. Research on human behavior on the web began to appear in the late 1990s when the web appeared, and in the 2000s, research was actively conducted in various academic fields. With the development of information and communication technology (for example, the emergence of a smartphone, which is a PC in the hand), data has been increasing rapidly from the late 2000s until now. By deriving from user analysis using big data, various services are being redesigned or newly created. To understand human behavior in-depth, qualitative methods are still widely used in diverse fields.

3. Research Design and Results

The qualitative method of Focus Group Interview(FGI) was used to investigate and analyze the needs of users of science and technology information in-depth. A total of 30 STEM information users participated in this study. The study was conducted from June to July. In-depth interviews, commonly known as interviews, refer to a conversation between a researcher with a purpose and a subject. Since the data obtained through interviews are often the subject's actual experience, the researcher can experience the sense of reality indirectly. A semi-structured interview was designed for this study. A semi-structured interview means an interview in which the format of the question is decided as a frame, and the follow-up question is left to the discretion of the researcher. Follow-up questions can be asked differently depending on the subject's answer, so it is a flexible interview method. Through this, researchers can obtain various interview results. Focus group studies are conducted in small groups of 6 to 8 people for discussion on a specific topic. The purpose of the focus group study is for participants to draw as many opinions as possible on the subject.

The user needs of the main science and technology information sites such as the National Assembly Library, RISS, KIPRIS, Science Direct, PubMed, Springer Link, Google Scholar, and etc. were compared and analyzed. When looking at the images of each site used mainly, the amount of information in Science Direct and PubMed is vast, but too much information makes it uncomfortable to use. KIPRIS and Springer Link provide systematic and well-organized information. Google Scholar provides a variety of information along with the accuracy of the search. The National Assembly Library provides useful information, but it has an old image, and RISS is easy to access, but offers limited subject areas.

As a result of grouping similar sites based on awareness and level of use (Table 1), they were grouped by domestic-international, paid-free, integrated-specific fields. Web of Science, Google Scholar, and Science Direct were grouped into 'sites that mainly provide foreign materials', 'high awareness but low use'. PubMed and WIPS were grouped into 'sites that provide foreign materials in specific fields', 'mainly providing paid services', 'user group is limited to a specific field'. The National Assembly Library, RISS, KIPRIS, KISS, and DBpia were grouped into 'sites that mainly provide domestic data', 'high awareness and high usage', 'mainly providing free services'.

Table 1. Grouping of similar sites according to recognition and usage level

	Group A	Group B	Group C
Similar sites	National Assembly Library, RISS, KIPRIS, KISS, DBpia	Web of Science, Google Scholar, Science Direct	PubMed, WIPS
Grouping reason	Know and use often	Know and use occasionally	Know but rarely use
Characteristics between groups	<ul style="list-style-type: none"> · Sites that mainly provide domestic data · High awareness and high usage · Mainly providing free services 	<ul style="list-style-type: none"> · Mainly foreign data providing sites · High awareness but low use 	<ul style="list-style-type: none"> · Provision of foreign materials in specific fields · Mainly providing paid services · User group is limited to a specific field

As a result of grouping similar sites according to the purpose of use (Table 2), they were grouped by domestic and international papers, research reports, and patents. Google Scholar and the National Assembly Library were grouped together as 'sites that can grasp comprehensive research trends' and 'sites that provide free original fulltext services'. Science Direct, PubMed, Web of Science, RISS, and KISS were grouped into 'sites that provide original full texts for domestic and foreign papers,' and KIPRIS and WIPS belong to Group C as 'sites that provide free/paid information on domestic and foreign patents'.

Table 2. Grouping of similar sites according to the purpose of use

	Group A	Group B	Group C
Similar sites	Science Direct, PubMed, Web of Science, RISS, KISS	Google Scholar, National Assembly Library	KIPRIS, WIPS
Grouping reason	Domestic and foreign papers	Research Report	Patent
Characteristics between groups	<ul style="list-style-type: none"> · Free/paid · Sites that provide full-texts of domestic and foreign paper 	<ul style="list-style-type: none"> · A site to understand comprehensive research trends · Sites that mainly provide free full-text services 	<ul style="list-style-type: none"> · Free/paid · Domestic and foreign patent information provision site

As a result of grouping similar sites according to usage attributes (Table 3), they were grouped by diversity, reliability, and specialization. The National Assembly Library and Google Scholar were grouped together, and diversity was found to be the strength rather than specialization and reliability. Web of Science and Science Direct were grouped by reliability, and PubMed, RISS, and DBpia were grouped by specialization.

Table 3. Grouping of similar sites according to usage attributes

	Group A	Group B	Group C
Similar sites	National Assembly Library, Google Scholar	Web of Science, Science Direct	PubMed, RISS, DBpia
Grouping reason	Diversity	Reliability	Specialization
Characteristics between groups	· Online/offline service provision and rich content provision site	· Foreign site and highly reliable site	· Site that provides only specific fields and contents

As for the positions of similar sites perceived by users (Figure 1), Science Direct and PubMed showed high specialization and high quality, Google Scholar showed integration and popularity, and RISS showed four attributes evenly.

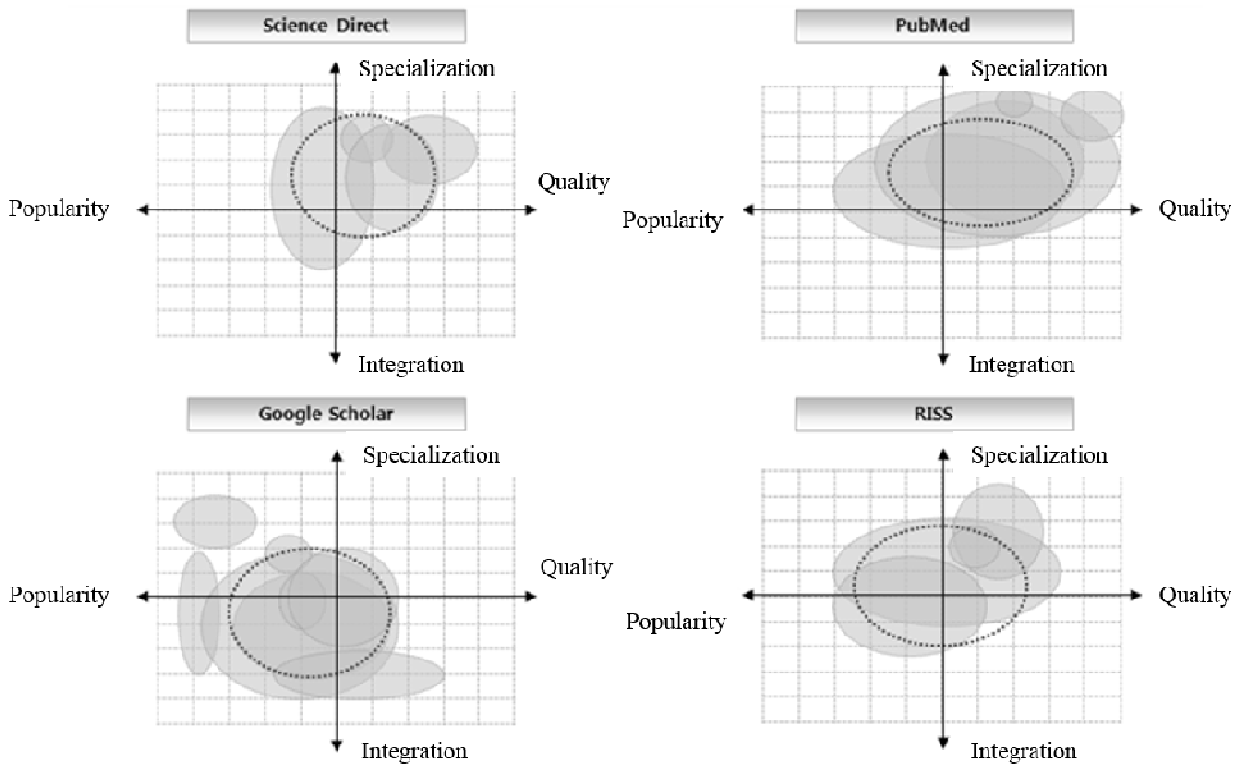


Figure 1. Similar site positioning

4. Discussion and Conclusion

There are various users who use science and technology information. In order to meet the needs of various users, periodic evaluation of the information service system should be conducted from various perspectives targeting actual users.

Whether the service is paid or free, the characteristics of the site operating organization (national or private, commercial or non-commercial), the characteristics of the content providing organization (national or private), the content provision coverage (domestic or foreign, general or special), search function, user Interface, etc. appeared as factors that influence the use of sites and contents.

It is not easy to meet the needs of all users. Most information service sites basically design and provide content and services for target user groups. For example, in the case of Google Scholar, which has the widest user base, the diversity of search results as well as the powerful search function is a great advantage. While the reliability of the content provided by the sites operated by commercial publishers (eg, PubMed, Science Direct) is high, there are limitations in terms of accessing and using the content as most are paid services. A site with a wide user base, such as Google/Google Scholar, is the National Assembly Library operated by a national institution. One of the main functions of this site is the diffusion and use of knowledge information in the STEM field. The national site is still not a place where users can visit anytime and use the content they want without burden, like Google/Google Scholar. The national site is operated by a government institution. Even though it has a vast amount of high-quality contents, the recognition (popularity) and satisfaction (perceived experience) level are still not high enough. Although the site is highly trusted, Google/Google Scholar is still highly publicly known and widely used. In the rapidly changing information technology environment, it is necessary to periodically improve existing services or develop new services by in-depth reflecting the needs and characteristics of users.

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