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Hybrid gatekeeping framework for value-added information services☆

Suhyeon Yoo[a], Ji-Hong Park[b,*]

[a] Korea Institute of Science and Technology Information, 66, Hoegi-ro, Dongdaemun-gu, Seoul 02456, Republic of Korea
[b] Department of Library and Information Science, Yonsei University, 50 Yonsei-ro Seodaemun-gu, Seoul 03722, Republic of Korea

ABSTRACT

Information control processes designed to prioritize the most relevant information are important for enhancing the service experience of users. Gatekeeping is the process of filtering and disseminating information in online information services. This study investigates the effects of gatekeeping activities on information services and the resulting impact on the value of such services from a user's perspective in an information service environment characterized by online and offline transactions. Various hybrid gatekeeping activities are derived through focus group interviews with information services planners. A survey of information service users reveals values that could be obtained from the information services. The results of these two data gathering tools suggest an information service framework for hybrid environments. The findings enable the development of value-added information services for users through efficient information control in hybrid online and offline environments.

1. Introduction

According to the guidelines of the Reference and User Service Association (1990), information services in libraries take a variety of forms that include "direct personal assistance, directories, signs, exchange of information culled from reference sources, reader's advisory service, dissemination of information in anticipation of user needs or interests, and access to electronic information".

The selection of appropriate information is essential for effective information services. Information services entail culling information from a wide array of resources and using various editing processes to develop more useful information. The term "gatekeeping" is used to describe the various information-filtering processes that occur throughout the entire process of transmitting information from the sender to the receiver. Barzilai-Nahon (2008) defined gatekeeping as the process of "controlling information as it moves through a gate (p. 1496)."

For the purposes of this research, online communication is defined as information flow and control online and offline communication is defined as information flow and control exercised in scenarios where the Internet is not connected; it includes mass communication and face-to-face communication. With the development of information and communications technologies (ICT), current information services frequently link online and offline transactions. For example, an article posted on an online community is often introduced to traditional mass media, such as TV or newspapers, after becoming an issue among netizens. A person can obtain information about a book, such as information about the author, an abstract or contents summary, or information about related books, by scanning the quick response (QR) code on the physical book with a mobile phone.

2. Problem statement

Although extensive literature has been published on information control in information services, there are no models that describe information services where online and offline connections are integrated. An appropriate model of these systems would enable information service planners to plan and evaluate information services connecting online and offline environments. Information control strategies that consider such a hybrid environment would provide users with more relevant information services, thereby improving the customer experience.

The objective of this study is to investigate the effect of gatekeeping activities on information services, and the resulting effect on the service's value to users in an information service environment characterized by online and offline transactions.

To that end, the following research questions are posed:

RQ1. How do gatekeeping activities correspond to the specific characteristics of information service environments in which online and offline links are connected?

RQ2. What specific information service items add value for their users?

The findings will enable the development of information services

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* Corresponding author.
E-mail addresses: yoosu@kisti.re.kr (S. Yoo), jihongpark@yonsei.ac.kr (J.-H. Park).

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that add value for users through efficient information controls in hybrid online and offline environments.

3. Literature review

3.1. Gatekeeping in information science

Much scholarly work has been devoted to the topic of gatekeeping in information science. According to Shoemaker and Vos (2009), gatekeeping is "the process of culling and crafting countless bits of information into the limited number of messages that reach people each day"(p. 1). Donohue, Tichenor, and Olien (1972) provide a broader definition of gatekeeping as all processes involved in information control, extending the definition to include the processes of withholding, transmission, shaping, manipulation, display, repetition, and timing.

Some studies have regarded editorial and reviewing processes as gatekeeping activities (Braun & Dióspatonyi, 2005; Cabanac, 2012; Glogoff, 1988). These studies refer to referees as editorial gatekeepers because the referees decide what is allowed in and what is kept out of their fields, controlling the flow of new ideas or knowledge within the academic discourse. Other studies have investigated the roles of information technology (IT) professionals as technological gatekeepers in controlling information flow (Cronin, 1982; Klobas & McGill, 1995). Technological gatekeeper here refers to the role these individuals play as boundary spanners, in which they engage in processes that filter and channel external technology and information into their respective organizations (Katz & Tushman, 1979). IT professionals are involved in planning for, designing, implementing, and developing information systems and IT projects; they are considered as facilitators of communication in the production and use of information.

Information intermediaries have been studied as gatekeepers (Agada, 1999; Sturges, 2001). Libraries and librarians provide access to information and knowledge, and thus, they play the role of information intermediaries. Oyelude and Bamigbola (2012) suggest that libraries and librarians should be considered as gateways to the knowledge environment.

Barzilai-Nahon (2004) advocated for a new network gatekeeping model in the information and network context. She differentiated the gatekeeping concept into 13 activities: selection, addition, withholding, display, channeling, shaping, manipulation, repetition, timing, localization, integration, disregard, and deletion. She argued that the definition of gatekeeping should not be confined to the processes of choice, distribution, and intermediation of information; rather, she adopted a more comprehensive concept of information control, as it is affected by the network.

Studies on gatekeeping with respect to news suggest that the function of gatekeeping has now moved out from the newsroom with the emergence of new technologies. Bro and Wallberg (2015) maintained that the function of gatekeeping is now performed by people outside newsrooms. Lazaroiu (2011) focused on citizens as news producers. Pearson and Kosicki (2017) specified five key areas of change to support the transition from the traditional gatekeeping model to a wayfinding model via search engines or social media: the increased capacity for storing and publishing news, new tools for news creation, the rise of aggregators and gatewatchers, competition on a story-by-story basis, and immediate audience feedback.

3.2. Value-added model

Information services provide value to users through various gatekeeping activities. These services can be executed through offline face-to-face communication as well as online. Taylor (1986) presented one of the best-known value-added models for information services. His model consists of basic elements such as the user, interface, and system. The user is defined as an agent who actively searches for information in the information system to achieve a certain goal. The user chooses a system based on six criteria: ease of use, noise reduction, quality, adaptability, time-saving, and cost-saving. The interface provides values added by the system to help the user's selection processes, thus serving as a negotiation space between the system and the user. Taylor presented 23 values, which include those that can be physically observed such as index terms and classification systems, and those that cannot physically be observed, such as accuracy and reliability. For example, the processes of quality control, editing, updating, and analysis add value to the accuracy, comprehensiveness, currency, reliability, and validity of the service, all of which enhance the quality of the service to the user, who may use these criteria to select the most useful service. This model provides a framework focused on the users' needs and preferences to design and evaluate the information system with the objective of satisfying the users' needs.

Twenty years after Taylor's model was first presented, Eisenberg and Dirks (2008) confirmed that this model remained applicable and valuable as a research tool, but suggested some improvements based on the intervening years of information system development. They renamed the basic element terms—user, interface, and system— to user criteria, value added, and system process, thereby clarifying the relationships among the elements. Further, they added more specific elements to the user selection criteria, values that completely satisfy the user selection criteria, and they also added system processes necessary to deliver such values. For example, Taylor presented time-saving and cost-saving as user criteria, whereas Eisenberg and Dirks integrated these two criteria into the single criterion of performance. Eisenberg and Dirks also added a new user criterion called pleasing, and listed aesthetics, entertaining, reward, and engaging as values that satisfy this criterion.

Based on this work, the later TEDS framework (Scholl, Eisenberg, Dirks, & Carlson, 2011) for assessing information systems encompassed the TEDS model and a 13-step procedure which extended the original Taylor model from the 1980s. The improved model can evaluate highly interactive and networked information system and information technology (IS/IT) artifacts. The values were amended and clarified, and new values were introduced to cover major aspects and characteristics of modern IS/IT artifacts. For example, values such as transaction, trust, feedback, community and social networking, and individualization were introduced in the adaptability criteria. These new values pertain to the characteristics of interactive and networked IS/IT artifacts. The TEDS model introduced new dimensions of scenarios and personae into the overall framework. Scholl and Carlson (2012) conducted an empirical study using the TEDS framework. They evaluated the websites of sports teams and found the TEDS framework to be an effective tool for systematically analyzing, evaluating, and comparing information artifacts.

Scholl, Ehrlich, Wiesner-Steiner, and Edich (2014) integrated the TEDS framework into the Moodle learning management platform, called TEDS*MOODLE. They adjusted the sub-categories of TEDS and offered clear specifications for making them both self-explanatory and flexible in the context of the Moodle learning platform. The TEDS*-MOODLE system allows individual target groups to assess learning scenarios and course rooms. It has significance in that it is a flexibly designed evaluation system that can be used in a wide range of other contexts and for all kinds of other information artifacts. An empirical study of TEDS*MOODLE to evaluate the Moodle course rooms was conducted (Scholl, 2015). This study demonstrated the functionality and limitations of the application for different types of information artifacts.

Studies on the evaluation of information services have focused on online information services such as web sites. Little attention has been paid to planning and evaluating hybrid information services.

4. Framework

Gatekeeping in hybrid communications is schematized in Fig. 1. In

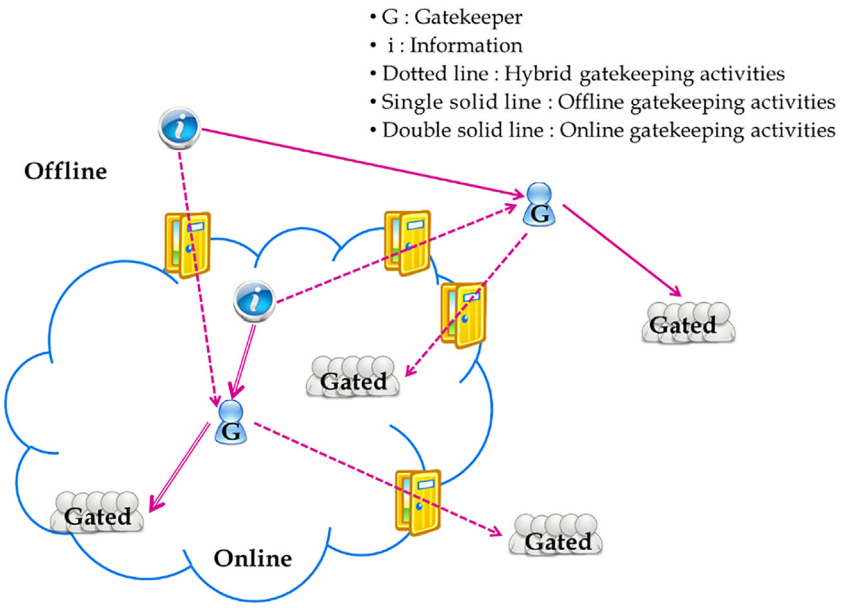

Fig. 1. Gatekeeping in hybrid communications.

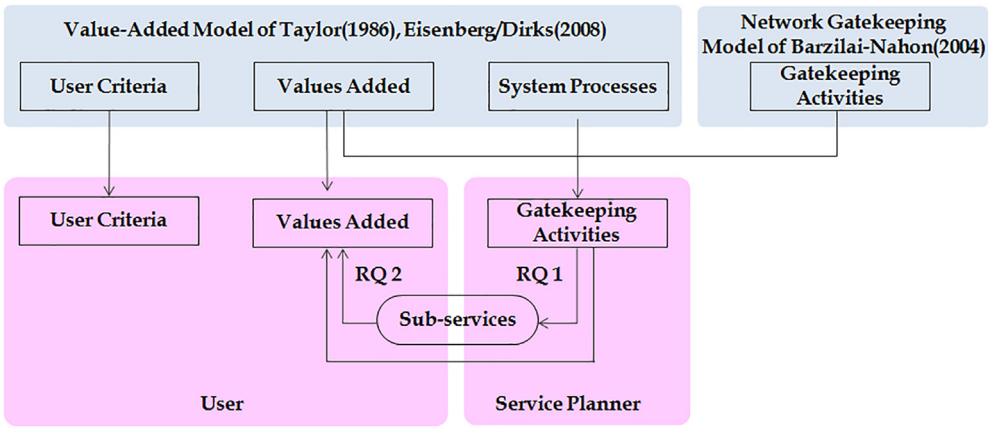

Fig. 2. Analytical framework.

this model the gatekeeper is the information services planner and practitioner that collects, selects, filters, and provides online and offline information. “Gated” refers to the recipients of information sent from the gatekeeper, that is, the users, both online and offline, of the information services. The dotted line, hybrid gatekeeping, refers to the flow and control of information, using both offline and online sources to reach out to the users.

A subject guide service, which is a representative service of academic information management institutions, is a typical type of on and offline information service. For example, the technical information agent service provided by the Agency for Defense Development (ADD) mediates information upon user request via information search and counseling or by directly offering information (Korea Special Library Association, 2012). If a member of ADD files a request for a technical information agent service, the content of the request is reviewed subject to a basic information search stage and a direct interview for closer examination of the information requirements. Once the investigation begins, all related data are provided in the system. The information requestor checks the results provided and files a second information request, commencing a new cycle of topic search services. Such topic search services involve various gatekeeping activities such as categorization, filtering, translation, localization, personalization, and customization.

The analytical framework for this study (Fig. 2) is based on Taylor's value-added model (1986), Eisenberg and Dirks' modified model (2008),[1] and Barzilai-Nahon's network gatekeeping model (2004). The analytical categories are user criteria, values added, gatekeeping activities, and detailed information services. Maintaining Taylor's and Eisenberg and Dirks' definitions, user criteria are defined as those items users evaluate to select information services. Values added are those values that are offered to users through online and offline information services. Gatekeeping activities incorporate system processes of the value-added model with the gatekeeping activities identified by Barzilai-Nahon (2004) in the network gatekeeping model. Several values are added from the value-added model, such as browsing, formatting, and ordering. For example, browsing is both a value that provides the user with the ability to search for and discover unknown information, and a gatekeeping activity that allows the user to gain serendipitous access to previously categorized information.

As a final category of analysis, the analytical framework includes details on the information services provided in online and offline environments, called “sub-service”. This category is intended to verify

[1] The TEDS model was not used for the analytical framework for this study as Taylor's model was the original and comprehensive model.

Table 1
Profiles of FGI participants.

Group	Interviewee code	Work experience (years)	Degree year	Research area	Gender	FGI duration
Group 1 Pilot FGI	A	4	Doctoral student	Open access	M	01:51:03
	B	3	MLS	Big data	F	
	C	2	MA in records management	ICT trends	F	
	D	4	MLS	HCI, User interface	F	
	E	2	Bachelor in LIS	Document delivery	F	
Group 2 Main FGI	F	15	PhD in LIS	Information planning	F	01:43:15
	G	10	Doctoral student	User log analysis	F	
	H	9	MLS	Data sharing	F	
	I	15	MA in computer science	Information retrieval	M	
	J	12	MA in chemical science	Document delivery	F	

Scenario for Discussion

Planning Value-added Information Services Integrating On-offline

Our institute, as the national information service organization, is preparing the guide for the young researcher. The various information services have to be provided for the successful research of the young researcher. Staff can utilize all kinds of resources (information, community, human resources, and etc.) in online and offline. The guide should be not one off information but value added services to the young researchers supporting their successful research. The final form of the guide would be the web site (including the mobile site, pad, and etc.). The aim and features of this guide is to design the hybrid information services, which is information and resources are connected to the utmost in online and offline, so as to give values to the young researchers.

- **Service users**: young researchers (from master course students to researchers less than 7 years of research experience)

- **Service provider**: dept. of information management for the public

- **Service features**: information services where the online and offline is connected

- **Example**:

1) recording the offline scholarly events such as special lectures or conferences and providing services at online

2) writing visiting report after participating offline conference and posting at online

Fig. 3. Scenario.

values offered to users through gatekeeping activities applied to information control in connected online and offline transactions. Adding this category to the framework allows information services planners to determine gatekeeping activities needed in hybrid online and offline environments, and values offered to users through specific characteristics of information services.

The analytical framework allows for the identification of how gatekeeping activities correspond to specific information service items (RQ 1) and of the values each information service item offers to users (RQ 2). This makes it possible to identify how gatekeeping activities conducted by each different information service offer values to users.

5. Methodology

5.1. Focus group interview

5.1.1. Conducting the focus group interview

A focus group interview (FGI) was conducted with people who plan and

implement information services in practice. They were considered appropriate as subjects because they had experience with the types of gatekeeping activities that can provide values to users. Moreover, as graduates of library and information science or computer science programs, they had extensive theoretical and practical knowledge about information services. Among the researchers who plan and implement information services, those who were willing to participate were targeted for the FGI, and 10 researchers were ultimately recruited. They were members of the Department of Information Service in the Korea Institute of Science and Technology Information, which is a national science and technology information center as well as a research institute. The groups were classified according to work experience because it was deemed likely that the scope and depth of the content derived from the FGI would vary according to position, and participants might not have felt free to express their opinions if there were significant gaps in experience among members (Richardson & Rabiee, 2001). Therefore, the participants were divided into two groups of five members: Group 1 for junior researchers, and Group 2 for senior researchers. Participants in each group had already worked together for at least two years. Group 1 was assigned to the pilot FGI, and Group 2 was assigned to the main FGI. The interviews were conducted on May 24 and 27, 2013, in a soundproofed eight-person meeting room. The profiles of the FGI participants are presented in Table 1.

A guide was developed for the conduct of the FGIs. Both groups were presented with a scenario in which they were to plan information services for young researchers, and the participants were asked to plan for value-added information services using all online and offline information elements. When a specific information service was selected, the following were discussed in sequence: why users need the service; what value/usefulness users gain from the service; and what information service items are needed to provide that value/usefulness. Next, the group discussed what filtering processes (i.e., gatekeeping activities) were required to offer the desired information service items. The participants were asked to assess the value of three information services and their gatekeeping activities within two hours. The pilot FGI served as moderator training for the researcher and also led to further refinement of the scenario (Fig. 3).

5.1.2. Content analysis

The relationship between gatekeeping activities and information services was investigated by analyzing the content produced by the FGI, particularly with regard to specific information service items. The data analysis software NVivo10 was used for coding. Twenty-eight definitions of gatekeeping activities were coded in the initial coding scheme, following the analytical framework discussed above. To investigate specific information services, the themes extracted in the initial coding process were added to the coding scheme. The initial coding yielded 26 additional codes for information service items, which resulted in a total of 54 codes. The analysis also captured 195 references. Upon completing the initial coding, codes with similar meanings were grouped into a single code, and a more intuitive and representative name was given to each cluster of codes. Finally, each of the 14 gatekeeping activities and 26 information service items was given a unique code.

The most frequently referenced gatekeeping activity was shaping (19 references). Shaping refers to the gatekeeping activity whereby information is manipulated in some way, such as summary, analysis, and integration. By contrast, the gatekeeping activity of authentication attracted only one reference. This may be explained by the relatively few discussions regarding service limitations, such as access control; most of the discussions concerned user-interface dimensions. Fig. 4 shows the individual coding rates for all 14 gatekeeping activities.

The information services were largely divided into three groups: funding information services (10 codes, 25 references); trend information services[2] (10 codes, 40 references); and video information services (6 codes, 14 references). The most frequently referenced information services within the three groups were funding02_analysis (12 references, 30%), trend02_customization (14 references, 18.9%), and video03_search (8 references, 42.1%). These results are considered by the planners to indicate that these information service items form the core function of the services.

Among the 26 information services, trend02_formatting was found to have the highest number of gatekeeping activities (8 of 14: add-on, browsing, filtering, formatting, internationalization, linking, quality control, and shaping). Trend02_formatting refers to the type of trend information service by which information is presented according to standardized forms; this service, which requires various gatekeeping activities, was considered by the participants to be the basic trend information service.

The FGI content analysis yielded 26 information service items covering sub-specialized functions for certain services, such as funding08_visualization and video02_script. However, diverse values were difficult to derive for all these items. Therefore, the 26 service items extracted from the FGI content analysis were re-grouped into 15 items—five each from the three groups of funding, trend, and video information services—by clustering service items via word similarity, and redefining the service name (Table 2). The degree of similarity was measured with the Pearson correlation coefficient.

5.1.3. Inter-coder reliability

A second coder was hired to test inter-coder reliability. This was a specialist with 10 years of experience in information service planning, including experience in content analysis using NVivo 10. The final coding was performed on the entire FGI interview script by the second coder, yielding 201 references with 40 codes. Using Holsti's formula (Holsti, 1969), the coding agreement between the researcher and the second coder was calculated, and the Holsti coefficient was found to be 0.89 (range: 0.67 to 1.00). This value exceeds the permissible threshold (0.80) presented by Krippendorff (2004) and confirms the clarity and reliability of the coding scheme.

5.2. Survey

5.2.1. Construction of questionnaire

Once the FGIs were concluded, a screenshot and a statement introducing an information service item was presented to the 10 pretest participants, who were asked to rank degrees of 25 perceived values for each information service item, on a Likert scale of 1 to 5. Participants were provided with text describing each value to clarify each value's definition. The descriptive texts were reviewed by FGI participants and faculty in the Department of Information Service. The texts were also revised to reflect the opinions of the pretest respondents (see below). The final descriptive texts presented with the questionnaire are shown in Table 3.

5.2.2. Pretest

The pretest revealed whether the questionnaire was written clearly and could be easily understood. The pretest was also used to measure the reliability and validity of the questionnaire. The pretest sample consisted of researchers who were part of the target population of the study; following the recommendation of Boyd, Westfall, and Stasch (1977), these individuals were considered to be “best interviewees,” favorable to surveys. Backstrom and Hursch (1963) likewise suggested including approximately three groups of people with different capabilities in a pretest. For the pretest, 33 people were divided into three groups: 10 professors and researchers in the physical sciences and technology (Group A); 10 professors and researchers in the social sciences (Group B); and 13 information service planners and developers (Group C). Group A was the most suitable sample because it was part of the target population that would comprise the sample in the survey (i.e., information service users), and the items tested were familiar to

[2] Services that provide trend reports, e.g., reports on trends in science and technology, open access, and information services.

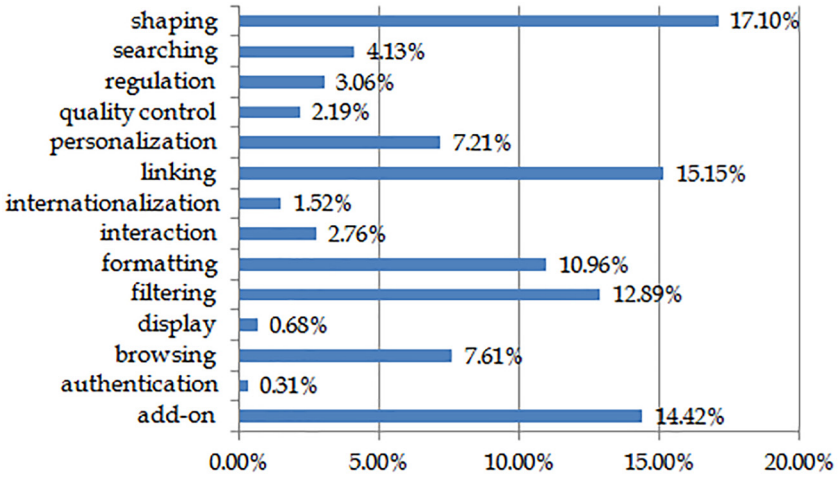

Fig. 4. Coding comparison among gatekeeping activities.

Table 2
Final 15 information service items drawn from FGIs.

	Funding information services	Trend information services	Video information services
Information service items	funding11_visualization	trend11_formatting	video11_script
	funding12_customization	trend12_customization	video12_search
	funding13_mediating	trend13_trend by field	video13_review
	funding14_linking	trend14_classification	video14_export
	funding15_analysis	trend15_summarization	video15_security

Table 3
Final value list after pretest.

Code	Value name	User criterion	Question number and question in questionnaire
EU01	Browsability	Ease of use	1. It provides not only the information I want but also an opportunity to accidently discover information I did not know about.
EU02	Formatting	Ease of use	2. The information of interest is easily understood through graphics, visual emphasis, and format.
EU03	Interfacing	Ease of use	3. The method for using this service is easy to learn.
EU04	Ordering	Ease of use	4. Because content is divided by field, letter, date of issue, and institution, it is convenient to use.
EU05	Accessibility	Ease of use	5. The information can be easily obtained through a simple path.
NR01	Item identification	Noise reduction	6. Because a systematic description and the origin of the information are provided, I can easily understand and identify the information.
NR02	Subject description	Noise reduction	7. I can easily find the desired topic because features such as indexes and keywords are provided.
NR03	Summarization	Noise reduction	8. Information is shown concisely through summaries, abstracts, and graphs.
NR04	Linkage or referral	Noise reduction	9. It broadens information choices by connecting to external links.
NR05	Precision	Noise reduction	10. I can accurately find the information I want through various subjects and keywords.
NR06	Selectivity	Noise reduction	11. The information I need is facilitated by appropriate sorting.
QL01	Accuracy	Quality	12. This service has no typos or errors and is helpful for getting data with accurate sources.
QL02	Comprehen-siveness	Quality	13. This service offers a wide variety of information.
QL03	Currency	Quality	14. Date information, such as the date of issue, is helpful for information selection.
QL04	Reliability/authority	Quality	15. I expect that the search methods for content not presented on the screen will be the same as the presented method.
QL05	Validity	Quality	16. Content obtained through the service will be useful for me.
AD01	Contextuality	Adaptability	17. This service provides personalized options that suit my needs.
AD02	Flexibility	Adaptability	18. This service displays content using various formats and methods.
AD03	Simplicity	Adaptability	19. The presentation of content is simple and clear.
AD04	Stimulatory	Adaptability	20. This service helps one become familiar with the service by providing a community space.
AD05	Privacy	Adaptability	21. Information I search for can be saved and managed on my page, etc.
PF01	Time saving	Performance	22. I think information search time can be saved by using this service.
PF02	Cost saving	Performance	23. I think the cost of acquiring information can be reduced by using this service.
PF03	Security & safety	Performance	24. This service considers security and stability.
PL01	Pleasing	Pleasing	25. It provides an opportunity to directly participate, and it stimulates my interest.

the group. Group A's responses were expected to be very similar to those of the final survey participants. This group's results and opinions—including the identification of items deemed impossible to answer—were considered especially useful for designing the survey. Group B was expected to be unfamiliar with the information service items because the items tested were not the same as those used by this sample, although these individuals were also part of the target population. This group was expected to have the most difficulty answering the questionnaire. Based on the items that posed challenges for Group B, the questionnaire was revised so that the questions could be more easily understood. Group C was comprised of people who plan information services by studying users' perspectives. Therefore, this group was expected to verify the content of the questionnaire from the perspectives of both planners and users, and provide advice for survey implementation.

The images and explanations of the information service items were

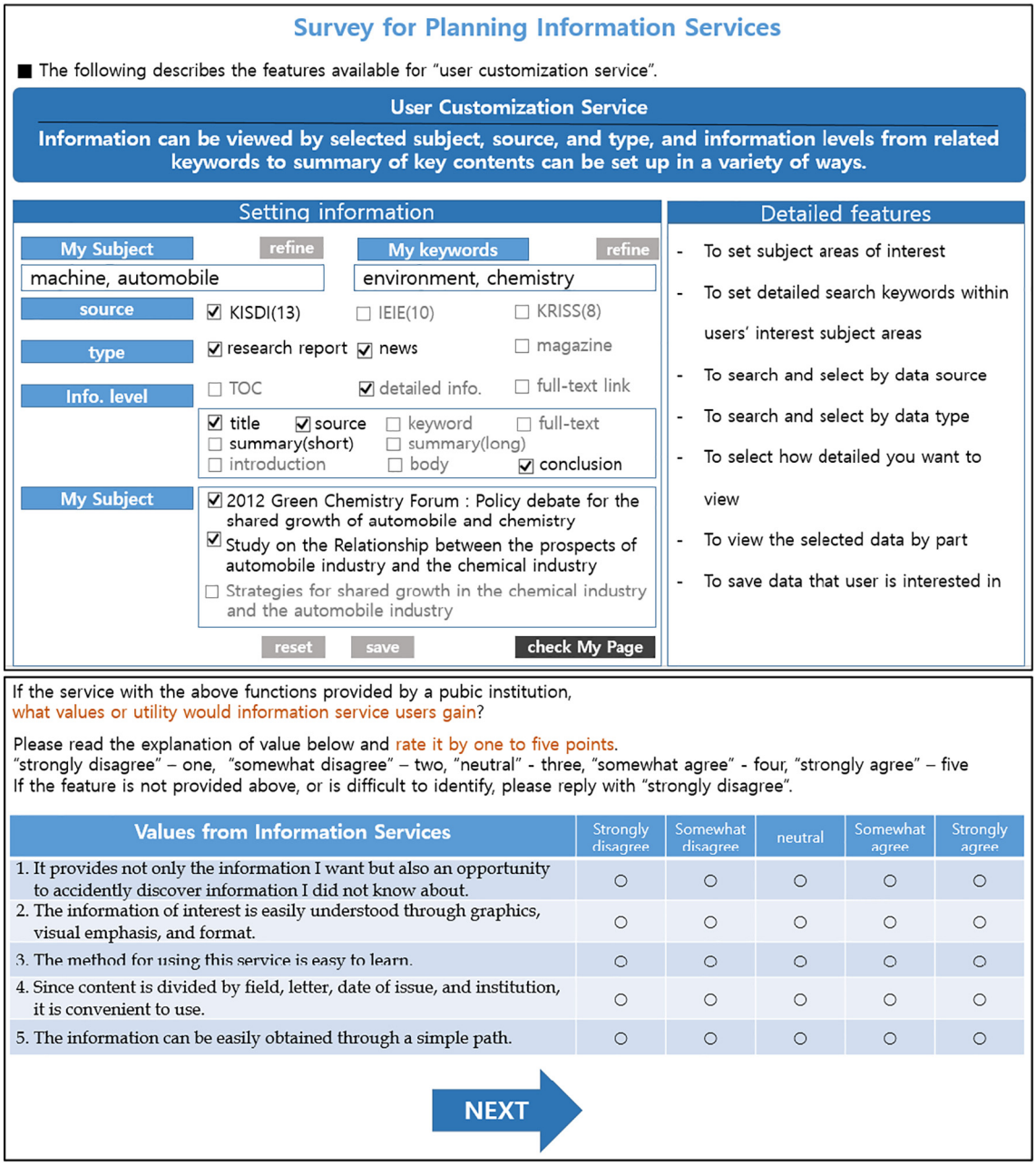

Fig. 5. Sample screenshot of main survey.

revised based on the results of the pretest. The pretest was conducted for five information service items in the trend information service category. However, among the 25 values investigated, "stimulatory" and "pleasing" were difficult to measure, resulting in a high rate of unresponsiveness in these categories. Therefore, three more information service items that were not from the trend information services were added to the final survey. Owing to the commonly expressed opinion that the survey took too long in the pretest, two information service items were evaluated per respondent in the final survey, as opposed to the five information service items that were evaluated per respondent in the pretest. Fig. 5 shows part of the survey screen. The original language of the survey is Korean.

5.2.3. Final survey

Information service users were the target population; therefore, the questionnaire was distributed to selected users of National Digital Science Library (NDSL), the online science and technology information service site of Korea. A total of 43,680 Korean e-mail addresses were extracted from users who had accessed the site at least once and used its services within one year (January 1, 2013, to December 31, 2013). These users reflected all characteristics of the target population and therefore comprised an effective sample as actual service users.

The survey was distributed on August 11, 2014, using a mass e-mail system and was conducted for five days from August 11 to August 15, 2014. A total of 1265 people responded, yielding a response rate of 2.9% compared to the number of e-mails sent and 45% compared to the number of clicks (2811). Because 1265 survey participants each responded to two information service items, 2530 cases were collected. The data for respondents who provided the same response to all 25 questions on the Likert scale and who took < 2 min were deleted (56 respondents, 112 cases). Thus, the analysis was conducted on 2418 cases from 1209 respondents.

5.2.4. Reliability and validity

Cronbach's alpha in the pretest and in the final survey was used to verify the inter-item consistency of the questionnaire. In addition, factor analysis was used to verify the validity of the questionnaire. The results were analyzed using SPSS 18.0.

For reliability measurements of the pretest and the final survey, alpha was > 0.9. Because this level corresponds to excellent, according to George and Mallery (2003), the survey can be considered to be very reliable.

The Kaiser–Meyer–Olkin (KMO) value, which indicates the suitability of factor analysis, was 0.86 for the pretest and 0.962 for the final survey; these values are meritorious, according to Kaiser (1974). Because the significance probability of Bartlett's sphericity test value was $p < 0.001$ for the pretest and final survey, the use of factor analysis was deemed appropriate. The analysis of the main components was used to extract factors, and the factors were rotated using the varimax method to prevent the problem of multicollinearity among factors. For the pretest, factors were collected through 12 repeated calculations, and six factors were extracted. The eigenvalues of the six extracted factors were all > 1, describing 72.301% of the population. Factor loading ranged from 0.438 (item identification) to 0.887 (stimulatory), indicating significant levels. For the final survey, factors were collected by six repeated calculations, and three factors were extracted. The eigenvalues of the three extracted factors were all > 1, describing 51.554% of the population. The factor loadings of the items applicable to the extracted factors were all found to be > 0.4, and were therefore considered significant.

6. Results

To determine more generalized relationships among information service items and values, eight information services were clustered to identify the main information services with specific attributes. At the same time, the 25 values were re-grouped according to their attributes to identify the main values and generalize their associations with the main information services. These groupings were accomplished by performing a correlation analysis to determine the main information services, and a factor analysis to determine the main values.

6.1. Identifying main information services

The eight information service items were hierarchically clustered based on the response averages of the 25 values as variables. In order to find the optimal number of clusters, horizontal lines were drawn in a dendrogram, applying the five-step graphical option from the agglomeration schedule. Five was found to be the optimal number of clusters (Fig. 6).

In the final clustering, three trend information services were clustered into one, and funding15_analysis and video20_all were clustered together. The remaining information service items were classified as independent clusters. Table 4 shows the names of the main information services that were finally identified, as well as the primary attributes of these main services.

6.2. Identifying main values

To derive the main values, a factor analysis was performed on the 25 values. First, to determine the optimal factors, factor analyses were performed repeatedly, varying the number of factors to be derived. If a value that did not originally belong to the derived factor showed a high degree of correlation with the derived factor, the factor analysis was repeated after removing the derived factor. After determining five value factors, a varimax rotation was applied to the 25 values using the principal component analysis method. After nine iterations of the factor convergence procedure, three of the five factors were found to demonstrate eigenvalues of 1.0 or higher. The values that were closely correlated with individual factors but did not pertain to them were eliminated in order to derive factors with high commonalities. Four values with factor loadings that exceeded 0.4 were eliminated: privacy, ordering, cost saving, and validity. After removing these four items, a different set of five factors was determined and it underwent the same procedure of factor analysis. Factors converged after eight iterations. Of the five factors selected, two demonstrated eigenvalues that exceeded 1.0, with the first and second factors accounting for 41.825% and 6.762%, respectively, thus indicating an explanatory power of 61.614% for all five factors. The KMO value measuring the degree of correlation between the variable pairs against other variables was found to be very high, at 0.956. In addition, Bartlett's test of sphericity provided an acceptable value of $p < 0.001$, thus validating the adequacy of the factor analysis. Four value items were loaded to the first factor and five value

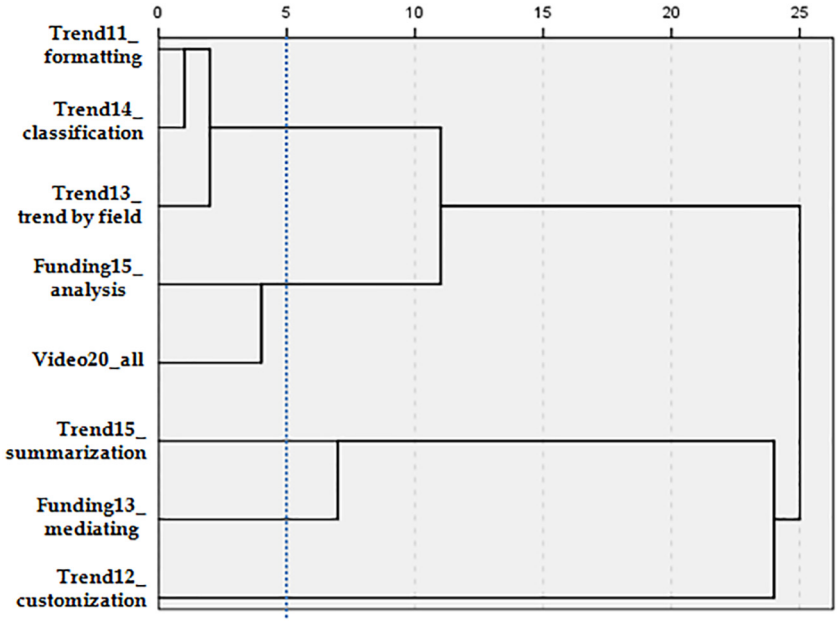

Fig. 6. Cluster dendrogram of information service items.

Table 4
Final five main information services.

Main information services	Detailed information services	Description
Classification	trend11_formatting trend13_trend by field trend14_classification	Service or function of providing information in a preset format according to preset classification criteria, such as theme, issue, or keyword
Summarization	trend15_summarization	Service or function of providing summaries and reports of raw data
Mediating	funding13_mediating	Community function connecting information provider and consumer
Analysis	funding15_analysis video20_all	Prediction and analysis function through integration and convergence with related information
Customization	trend12_customization	Function that uses an information service tailored to individual needs via customized configuration of information type and presentation

Table 5
Factor analysis results from final survey.

Item		Factor				
Code	Name	1	2	3	4	5
AD04	Stimulatory	**0.747**	0.187	0.188	0.179	−0.014
PL01	Pleasing	**0.725**	0.165	0.311	0.078	0.134
PF03	Security & safety	**0.689**	0.072	0.061	0.267	0.207
AD02	Flexibility	**0.554**	0.218	0.327	0.215	0.208
EU03	Interfacing	0.072	**0.783**	0.128	0.065	0.174
EU05	Accessibility	0.108	**0.661**	0.309	0.222	0.201
EU01	Browsability	0.144	**0.600**	0.248	0.169	0.161
AD03	Simplicity	0.271	**0.581**	0.241	0.125	0.185
EU02	Formatting	0.282	**0.573**	−0.017	0.489	0.080
NR05	Precision	0.200	0.212	**0.691**	0.337	0.114
NR06	Selectivity	0.256	0.269	**0.680**	0.230	0.137
AD01	Contextuality	0.441	0.139	**0.597**	0.068	0.241
PF01	Time saving	0.249	0.343	**0.542**	0.173	0.258
NR03	Summarization	0.360	0.158	0.106	**0.716**	0.121
NR04	Linkage	0.285	0.106	0.320	**0.633**	0.178
NR02	Subject description	0.094	0.266	0.440	**0.569**	0.163
NR01	Item identification	0.011	0.308	0.349	**0.547**	0.292
QL03	Currency	−0.079	0.226	0.273	0.090	**0.736**
QL01	Accuracy	0.294	0.121	0.124	0.294	**0.613**
QL04	Reliability/authority	0.337	0.351	0.001	0.116	**0.551**
QL02	Comprehensiveness	0.375	0.219	0.286	0.168	**0.510**
Eigenvalue		8.783	1.420	0.979	0.913	0.844
% of Variance		41.825	6.762	4.660	4.347	4.018
Cumulative %		41.825	48.588	53.248	57.595	61.614

Table 6
Five main values in hybrid communication.

Main values	**Value**	**Description**
Supportive value	Stimulatory Pleasing Safety & security Flexibility	Values supporting usefulness by familiarizing users with information services
Constructive value	Interfacing Accessibility Browsability Simplicity Formatting	Values enhancing the usefulness of services by organizing them meaningfully for easier use of information
Noise reduction value	Precision Selectivity Contextuality Time saving	Values contributing to preventing users' unnecessary search efforts by prescreening information items useful for users
Intellectual access value	Summarization Linkage Subject description Item identification	Values procuring intellectual access for users by providing systematic methods for approaching required information
Content usefulness	Currency Accuracy Reliability, authority Comprehensiveness	Values providing the usefulness of information content

items to the second factor, with all of them showing factor loadings exceeding 0.5 and the first factor showing the highest eigenvalues. Table 5 presents the results of the final factor analysis of the 21 value items left after eliminating four items.

These five factors, or main values that users can obtain from information services, were labeled supportive value, constructive value, noise reduction, intellectual access, and content usefulness. They are presented in Table 6, along with their component values and explanations.

The first factor was called supportive value because the values contained in this category are not necessarily required for all services; rather, these values help users become accustomed to information services. The values pertaining to the second factor, constructive value, are characterized by strong formal traits that provide help at the level of system design or at the interface of an information service frame, rather than at the level of the quality or content of the information provided. The third factor was called noise reduction because it concerns services that prescreen information items required by users, thus reducing unnecessary effort. The fourth factor, intellectual access, covers values that provide users with systematic methods for approaching the required information and thus facilitate their intellectual access to the information. Taylor's value-added model (1986) considered the third and fourth factors to be noise reduction and called the values pertaining to the fourth factor “values improving intellectual access to information (p. 58).” The fifth factor, content usefulness, represents values that provide users with useful information content.

6.3. Integrating the results

The five main information services were used as an interface to connect gatekeeping activities and main values, and a map was drawn to represent the relationships between gatekeeping activities and main information services (Fig. 7). This map gives an overview of the correlations among gatekeeping activities, main information services, and the values endowed by each main information service.

Both gatekeeping activities and main values were normalized in five steps. Specifically, respondents were asked to rate the usefulness of 25 values on the 8 information service items. Five main information services were drawn from eight information service items through the clustering method while five main values were drawn from 25 values through factor analysis. Response averages from the survey to the corresponding main information services were calculated in order to determine the relationship between main information services and main values. For the five main values, the main value with the highest response average was ranked first, and the main value with the lowest was ranked fifth. In Fig. 7, the highest main value of the ranks is colored in five cells and the lowest ranked main value in one cell. Thus, Fig. 7 illustrates the gatekeeping activities that constitute the main information services, with those activities arranged at the bottom end of the X-axis. The top end of the X-axis displays the main values according to the ranking of the five main values prioritized by individual main

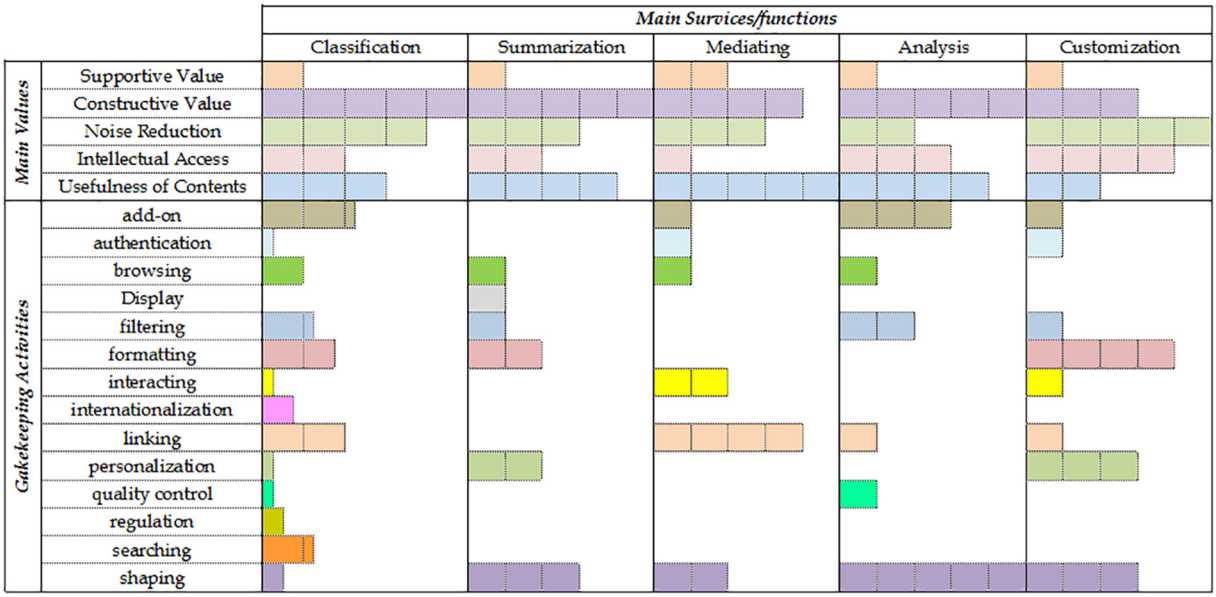

Fig. 7. Map of relationships among gatekeeping, information services, and values.

information services. Colored cells indicate the extent to which the colored cell is related. This makes it easy to identify the main value most preferred for each main information service. On the other hand, to determine the relationship between main information services and gatekeeping activities, the number of times an information service items was identified was used from the content analysis of FGIs. Fourteen gatekeeping activities were coded by information service item. The number of times an item was identified for a gatekeeping activity was recalculated based on the clustered main information services. Then, the recalculated number of coding to the gatekeeping activities was normalized in five steps. For example, the gatekeeping activity shaping" was recalculated into 0.5 cells in the main information service "classification" and five cells in the main information service "analysis." This suggests that shaping is more useful in analysis than in classification. The gatekeeping activity "add-on" occupies 3.25 cells, which means it is the most useful gatekeeping activity in the main information service "classification."

6.3.1. Classification service

In particular, classification is a service in which information is categorized, for example by particular criteria such as themes, issues, and keywords. This service involves gatekeeping activities which include add-on, linking, formatting, filtering, and searching. The classification service implemented through these gatekeeping activities prioritizes constructive value over other values. In other words, the classification service is implemented by gatekeeping activities such as linking, formatting, filtering, and searching, and the services consisting of these activities enhance the efficacy of information use.

6.3.2. Summarization service

Raw data are summarized and reported in the summarization service, which is accompanied by gatekeeping activities that summarize, analyze, and integrate information, such as shaping, formatting, and personalization. The summarization service can provide users with constructive values, as can classification. Both services focus on the specific format rather than the value of content in the services. The summarization service needs only 5 of the 14 gatekeeping activities. For the summarization service plan and evaluation, these activities must function properly.

6.3.3. Mediating service

Mediating is a community-type service that connects providers and consumers of information. This service inevitably requires that gatekeeping activities link to connect related information, sites, and services. The gatekeeping activities linking, interacting, and shaping are useful, and add-on, authentication, and browsing are also needed. For this service, unlike classification or summarization, content usefulness was found to be prioritized over all other values. Intellectual access was the last among the five main values. Thus the mediating service focuses on the content, using linking, interacting, and shaping activities rather than providing systematic methods such as subject description and item identification.

6.3.4. Analysis service

Analysis, which is a predicting and analyzing service that links and integrates related information, inevitably requires the shaping function that summarizes, analyzes, and integrates information. It also requires add-ons for integrating related information or services and information filtering as additional gatekeeping activities. Analysis implemented through these gatekeeping activities provides users with constructive value.

6.3.5. Customization service

Finally, customization, a personalization service, involves formatting, personalization that puts personal profiles into context, and shaping for the summary, analysis, and integration of information. Customization prioritizes noise reduction over all other main values by aiming to offer prescreened information tailored to individual needs, thus reducing users' unnecessary search efforts.

6.4. Completing the framework

Table 7 lists all sub-components pertaining to the three main components of the gatekeeping framework proposed. These sub-components constitute components of information services that can occur within hybrid communications. The list is not exhaustive, and other sub-components may be added.

Finally, hybrid gatekeeping comprises various information services, and these provide five types of main values to the users. This hybrid gatekeeping framework is illustrated in Fig. 8. This proposed framework describes the various information services that could be formed

Table 7
Components of hybrid gatekeeping framework.

Gatekeeping	Main information services	Values	
		Main	Sub
Add-on	Classification	Supportive value	Stimulatory
Authentication	Summarization		Pleasing
Browsing	Mediating		Security & safety
Filtering	Analysis		Flexibility
Display	Customization		
Formatting		Constructive value	Interfacing
Interacting			Accessibility
Internationalization			Browsability
Linking			Simplicity formatting
Personalization			
Quality control			
Regulation			
Searching		Noise reduction	Precision
Shaping			Selectivity
			Contextuality
			Time saving
		Intellectual access	Summarization
			Linkage
			Subject description
			Item identification
		Contents usefulness	Currency
			Accuracy
			Reliability, authority
			Comprehensiveness

through hybrid gatekeeping activities in connected online and offline environments, and these information services would differentiate their priorities within the five main values to provide added values to the users.

7. Discussion

This study identifies five main information services and the added values provided to users according to the services. Further, the study explores the connection among gatekeeping activities, information services, and values. One immediately interesting point is that gatekeeping activities are not easily distinguished as either online or offline activities; they can only be dichotomized into activities implemented online or offline. Distinguishing information services according to on–offline distinction is not useful—online and offline gatekeeping activities are better understood in the context of integrated communication rather than an online–offline dichotomization.

The benefits of this research to service planners can be illustrated with several examples. When the service planners attempt to design a new classification service, they should use gatekeeping activities including add-on, linking, formatting, and searching, which are the most useful activities for this service. When service planners try to make an analysis service, they should use functions as shaping, add-on, filtering, and so on. The analysis service comprising these functions provides users constructive value, usefulness of contents, intellectual access, noise reduction, and supportive value.

Another implication of this study is that it is possible to add new information sources or new users using the proposed hybrid gatekeeping framework. For instance, Seoul National University's academic event website is a typical example of hybrid communications in that offline academic events at the university are videotaped and then uploaded to the site for online use. However, within the hybrid gatekeeping framework, services for offline users can be considered as well. In other words, besides merely providing video-on-demand (VOD) information to online users, new offline users can be acquired if a format conversion service—such as one that extracts audio information from a video for the user to keep in a storage device—is included. This enables service provision to those who cannot view a website because they are on the move or are not connected to the Internet. Here, a new group of users can be acquired by applying the current service to the hybrid gatekeeping framework and compensating for the deficiency that normally attaches to being offline.

7.1. Limitations

First, because each gatekeeping activity was deduced from the FGIs with the practitioners, activities that were not mentioned were not included. Other kinds of services could be identified if different planners were interviewed. Similarly, there could be various components that come into play other than the gatekeeping activities and detailed information services discussed in this study. Also, although a survey was conducted to understand various values that users gain from information services, the survey alone might not be sufficient to measure the usefulness of some values. Intangible values such as accuracy, currency, or reliability are obtained through time and reputation and did not form part of the survey.

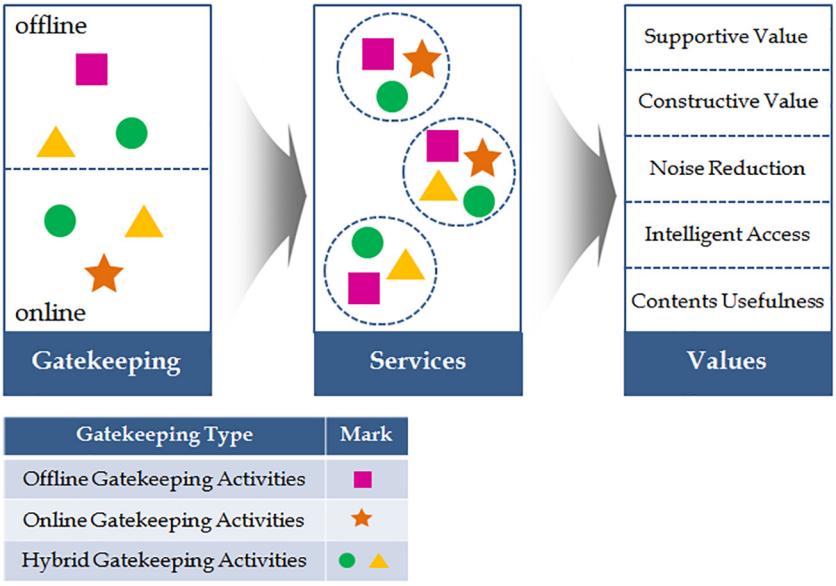

Fig. 8. Hybrid gatekeeping framework for value-added information services.

8. Conclusion

This study explores the relationship among gatekeeping activities, information services, and values added for users. Five main information services were drawn and this study identified their connection to gatekeeping activities and values. In light of the difficulty in defining a distinction between online and offline environments, the gatekeeping framework in hybrid communication has been proposed. This framework is significant because it considers the perspective of the practitioners who design information services and the users of these services. This study also provides a basic framework for planning new information services or evaluating existing information services for improvement.

References

Agada, J. (1999). Inner-city gatekeepers: An exploratory survey of their information use environment. *Journal of the American Society for Information Science and Technology, 50*, 74–85.

Backstrom, C. H., & Hursch, G. D. (1963). *Survey research.* Evanston, IL: Northwestern University Press.

Barzilai-Nahon, K. (2004). *Gatekeepers and gatekeeping mechanisms in network.* Unpublished doctoral dissertation. Israel: Tel-Aviv University Tel-Aviv.

Barzilai-Nahon, K. (2008). Toward a theory of network gatekeeping: A framework for exploring information control. *Journal of the American Society for Information Science and Technology, 59*, 1493–1512.

Boyd, H. W., Westfall, R., & Stasch, S. F. (1977). *Marketing research-text and cases.* Homewood, IL: Richard D. Irwin, Inc.

Braun, T., & Dióspatonyi, I. (2005). Gatekeeping indicators exemplified by the main players in the international gatekeeping orchestration of analytical chemistry journals. *Journal of the American Society for Information Science and Technology, 56*, 854–860.

Bro, P., & Wallberg, F. (2015). Gatekeeping in a digital era. *Journalism Practice, 9*(1), 92–105.

Cabanac, G. (2012). Shaping the landscape of research in information systems from the perspective of editorial boards: A scientometric study of 77 leading journals. *Journal of the American Society for Information Science and Technology, 63*, 977–996.

Cronin, B. (1982). Progress in documentation: Invisible colleges and information transfer. *Journal of Documentation, 38*(3), 212–236.

Donohue, G. A., Tichenor, P. K., & Olien, C. N. (1972). Gatekeeping: Mass media systems and information control. In F. G. Kline, & P. J. Tichenor (Eds.). *Current perspectives in mass communication research* (pp. 41–69). Beverly Hills, CA: Sage Publications.

Eisenberg, M., & Dirks, L. (2008). Taylor's value-added model: Still relevant after all these years. *Proceeding of the Annual iConference, 3*, 309–321. Retrieved from http://hdl.handle.net/2142/14906.

George, D., & Mallery, P. (2003). *SPSS for windows step by step: A simple guide and reference, 11.0 update* (4th ed.). Boston, MA: Allyn & Bacon.

Glogoff, S. (1988). Reviewing the gatekeepers: A survey of referees of library journals. *Journal of the American Society for Information Science, 39*, 400–407.

Holsti, O. R. (1969). *Content analysis for the social sciences and humanities.* Reading, MA: Addison-Wesley.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31–36.

Katz, R., & Tushman, M. (1979). Communication patterns, project performance, and task characteristics: An empirical evaluation and integration in an R&D setting. *Organizational Behavior and Human Performance, 23*(2), 139–172.

Klobas, J. E., & McGill, T. (1995). Identification of technological gatekeepers in the information technology profession. *Journal of the American Society for Information Science, 46*, 581–589.

Korea Special Library Association (2012). *Library and information service.* Daejeon, Korea: KSLA.

Krippendorff, K. (2004). *Content analysis: An introduction to its methodology.* Thousand Oaks, CA: Sage Publications.

Lazaroiu, G. (2011). Conceptualizing gatekeeping in the digital era. *Contemporary Readings in Law and Social Justice, 3*(1), 52–159.

Oyelude, A. A., & Bamigbola, A. A. (2012). Libraries as the gate: "Ways" and "keepers" in the knowledge environment. *Library Hi Tech News, 29*(8), 7–10.

Pearson, G. D. H., & Kosicki, G. M. (2017). How way-finding is challenging gatekeeping in the digital age. *Journalism Studies, 18*(9), 1087–1105.

Reference and User Service Association (1990). Information services for information consumers: Guidelines for providers. *RQ, 30*, 262–265. Retrieved from http://www.jstor.org/stable/25828755.

Richardson, C. A., & Rabiee, F. (2001). A question of access: An exploration of the factors influencing the health of young males aged 15–19 living in Corby and their use of health care services. *Health Education Journal, 60*(1), 3–16.

Scholl, H. J., & Carlson, T. S. (2012). Professional sports teams on the web: A comparative study employing the information management perspective. *European Sport Management Quarterly, 12*(2), 137–160.

Scholl, H. J., Eisenberg, M. B., Dirks, L., & Carlson, T. S. (2011). The TEDS framework for assessing information systems from a human actor's perspective: Extending and repurposing Taylor's value-added model. *Journal of the American Society for Information Science and Technology, 62*, 789–804.

Scholl, M. (2015). An implementation of user-experience-based evaluation to achieve transparency in the usage and design of information artifacts. *Hawaii International Conference on System Science, 45*, 21–32.

Scholl, M., Ehrlich, P., Wiesner-Steiner, A., & Edich, D. (2014). The Project TEDS@wildau: TEDS framework integration into the Moodle platform for user-specific quality assurance of learning scenarios. *Hawaii International Conference on System Science, 45*, 1935–1945.

Shoemaker, P. J., & Vos, T. P. (2009). *Gatekeeping theory.* New York, NY: Routledge.

Sturges, P. (2001). Gatekeepers and other intermediaries. *ASLIB Proceedings, 53*(2), 62–67.

Taylor, R. S. (1986). *Value-added processes in information systems.* Norwood, NJ: Ablex.

Suhyeon Yoo is a senior researcher working for the Department of Information Service at Korea Institute of Science and Technology Information, Daejeon, South Korea. She is responsible for operating library consortia for electronic resources. Her particular areas of interest are electronic resource sharing, copyright issues in information services, and scholarly communication. She holds an MA and a PhD in library and information science from Yonsei University, Seoul, South Korea. She has published articles in *Asia-Pacific Journal of Multimedia Services Convergent with Art, Humanities, and Sociology, Cluster Computing*, *Indian Journal of Science & Technology*, *Interlending and Document Supply*, and *Journal of Advanced Research in Dynamical and Control Systems*. She received an outstanding research award in 2014 from the Korea Institute of Science and Technology Information.

Ji-Hong Park is an associate professor at the Department of Library and Information Science of Yonsei University, Seoul, South Korea. His areas of research interest include social networks and media, bibliometrics, and scholarly communication. He holds a PhD in information science and technology and an MS in information management from Syracuse University, New York. He has published in *The Electronic Library*, *Information Processing & Management*, *Journal of Documentation*, *Journal of Information Management*, *Journal of Scholarly Publishing*, *Journal of the Association for Information Science and Technology*, *Journal of the Korean Society for Information Management*, *Journal of the Korean Society for Library and Information Science*, and *Libri*. He received the outstanding research award in 2010 and 2017 from Yonsei University.