Analysis of Reference Inquiries in the Field of Social Science in the Collaborative Reference Service Using the Co-Word Technique

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Contents

ABSTRACT

This study grasped the true nature of the inquiry domain by analysing the requests for collaborative reference service in the social science field using the co-word technique, and schematized the intellectual structure. First, this study extracted 748 uncontrolled keywords from inquiries for reference in the field of social science. Second, calculated similarity indices between the words on the basis of co-occurrence frequency, and performed not only clustering but also MDS mapping. Third, to grasp the difference in inquiries for reference by period, dividing the period into two parts, and performed comparative analysis. As a result, there formed 5 clusters and “Korea Education” showed an overwhelming size with 40.3% among those clusters. The result of the analysis through the period division showed there were many questions about “Education” during the first half, while a lot of inquiries with focus on “welfare and business information” during the second half.

Keywords: Reference Inquiries, Ask a Librarian, Co-word Analysis, Cluster, Multi-dimensional Analysis

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1. Introduction

The National Library of Korea has been managing the Collaborative Digital Reference Service (hereinafter, “CDRS”), which is called ‘Ask a Librarian’, in an effort to share limited human and material resources with local public libraries and make a collaborated response to the difficulties conducting reference service since 2008. Under the CDRS system, the inquiries are automatically received by the corresponding area local library where a questioner lives, and in the case of ‘cannot process’, the inquiry is transmitted to the area representative library and the National Library. Through this system, all resources required by the reference service are collected and constructed in a knowledge DB for recycling. Through system expansion starting in 2009, the gigantic library network in Korea, in which 340 public libraries accounting for almost 50% of the public libraries across the country participate, came to be established.

There is no limit on the subject areas of inquiries for reference, but it is confirmed that a large number of inquiries were made in the field of social science. However, it is not possible to develop the proper bibliographies or pathfinder, or cultivate the subject specialists unless an empirical analysis is conducted to determine what subject areas receive lots of inquiries and what relationship exists between subject areas even within the far-reaching social science area.

The co-word analysis technique is a method of discovering the domain of knowledge quantitatively and analysing the relationship between domains. It can be explained as a method of presenting the intellectual structure of the relevant area in the form of a conceptual space map by measuring the intensity between the representative terminologies of the literature (Lee et al. 2006). This analysis technique has been used mainly for inquiring into the intellectual structure of an academic field by analysing the abstracts and keywords, etc. extracted from academic research papers. More recently, this technique has been widely used for structuralizing the intellectual domains using diverse sources, such as news or reported articles (Kang 2000), Twitter (Kim 2011; Jin et al. 2013) and quotations from a specific person, etc.

This study intends to grasp the true nature of the inquiries’ range and schematize their connectivity by analysing the DB of inquiries for reference in the field of social science through the use of the co-word analysis technique. Through analysing the research and survey level inquires which were accumulated on reference database, this study also intends to make provisions for future reference service by exploring the areas in need of subject specialist librarians and securing the specialized bibliographies.

2. Theoretical background

2.1 Collaborative Reference DB

Generally, the collaborative reference service is defined as a service that solves reference service requests from a user of an individual library through mutual cooperation with other libraries. This service is also referred to as the process of fulfilling a user's reference service request by entrusting it to another library based on a formally or informally constructed cooperation network, or means the method of sharing the resources and manpower of a reference service (Cha 2006).

'Ask a Librarian' began to be offered through system expansion from 2009 after the completion of the gigantic network. The simple inquires such as checking whether a library holds certain material or not, has been almost completed by local libraries, while the difficult inquiries which is needed to research and survey for answering were transferred to the NLK (National Library of Korea).

Bae (2011), in the research on the availability of the collaborative reference service, summed up the results as follows: First, the main users' age range comprises young adults and middle-aged people including college students, showing the level of users surpassing 82 percent, while junior and senior high school student users showed low availability of less than 1 percent. Second, the purpose of making inquiries was found to be "interest or hobbies", and "job performance", etc. and more than 40% of users were found to be satisfied with reply handling. Lastly, there were not many inquiry subjects related to the scientific technology, philosophy or religion fields, which require professionalism; instead, inquiry subjects were distributed mainly in the generalities and social science field.

The National Library supports other libraries in their sharing of the management know-how for maintaining high-quality service throughout the process of approval, review and preliminary quality control of the reply materials. In addition, the National Library is arranging a course of study for reference librarians, addressing areas such as flow of Q&A service and reply data preparation, preparation of reference information sources and their utilization, and preparation of book information and its utilization, etc. The operating system comprises the interface for a user's inquiries and module for librarians. A user makes inquiries by accessing the integrated Web-based Q &A system, while the librarians of the relevant area where a user lives carry out responses through a Librarian's private module. The librarian's module includes a function to manage the responses of inquiries, various sorts of statistics modules, and knowledge DB, etc.

2.2 Outline of Co-word Methodology

The co-word analysis is the method of finding interword relations and mapping the subdomain using diverse quotients after calculating the co-appearance frequency of individual word pairs by extracting words from the literature in the relevant subject area. In other words, the co-word analysis is the method of showing a the visualized pattern and structure of words by analyzing the connectivity degree of the words coming under a specific subject on the assumption that the keywords represents the literature contents connotatively. Co-word analysis is one of applied methodology derived from social network analysis. Because word tends to do form a specific semantic frame by combining other words. Co-word analysis perform semantic network matrix between words and then analyse the matrix from the perspective of social network analysis. The 'concept' in the co-word analysis is a synthesis of one or more words like the node of social network, and is like edge or link for connections between concepts. That is, that two or more concepts are discussed in one sentence means that they have a close relationship, and the union of such relationships forms semantic map which is the same as the network map in social network analysis (Cho 2013). Hence, for the co-word analysis, the word matrix that contains the information about the frequency of the words within difference texts, i.e., co-occurrence matrix between words has to be deducted, and this matrix is analysed like the adjacency matrix of social network analysis (Sim 2010).

The procedures of the co-word analysis are described as follows:

The first procedure is word gathering. There are roughly two methods of gathering words; one is to directly extract words from the text using software like NPtools and KrKwic (Park and Leydesdorff 2004) and the other is to extract words from the data using the analysis code, such as keywords and tags, etc. The latter could bring about distorted results, the so-called 'Index Effect' (Courtial et al. 1984), because a subjective view can be reflected in the process of going through an index under the specialist's control. However, there is an argument that this method is not so invalid in that the word control is an unavoidable process using the co-word analysis technique, and adoption of such a method can solve the problems of synonyms or homonyms (Lee 2003).

The next step is to calculate the co-occurrence frequency of words targeting the refined word list. The co-occurrence matrix is a method of presenting whether two words emerge simultaneously in one literature, meaning that the higher the numerical value is, the higher the co-occurrence

frequency number. Usually, similarity indices are used to measure the similarity between words (Lim 2006), which can standardize the difference between words with low appearance frequency and words with high appearance frequency by normalizing the scope of the co-occurrence frequency (Lee et al. 2006). Generally, Cosine, Jaccard, and Pearson's correlation coefficients are used as similarity coefficients in the co-word analysis.

Once the similarity coefficient is calculated, clustering is conducted for classifying words. In the co-word analysis, mostly clustering is performed because in the case the data volume for processing gets larger, it becomes difficult to interpret output (Peter and van Raan 1993). In order to cluster, the hierarchical clustering technique is mostly used in the co-word analysis. It belongs to the method in which the already-generated clusters repeat their phased combination according to a certain distance value in order to generate a lot bigger clusters, and it is possible to represent this pattern in a dendrogram.

In addition, MDS is largely used in co-word analysis in order to visualize the complicated relationship between objects in multi-dimensional space by structuralizing it (Green, Camone and smith 1989). Similarity appears among data in the MDS map as spatial distance, and it can be said that the individuals located in close proximity to each other are relatively high in similarity, while individuals located far from each other are relatively not similar(Lee et al. 2006).

3. Literature Review

Park (2004) did an analysis of the supply chain management field, using co-word analysis for the objective understanding of the management information system research domain. Kwon et al. (2010) and Kim (2011) analysed the research domain for the enterprise architecture and digital finance fields, respectively, using the co-word analysis technique.

In recent years, the co-word analysis technique has been much used even in the field of Library and Information Science. Ding, Chowdhury and Foo (2001) drew up an area map using clustering and multi-dimensional scaling targeting the research in the field of information retrieval, while Seo and Chung (2013) analysed the intellectual structure of the research papers in the field of Open Access, which was constructed between 1998 and 2012 by the Web of Science. Liu and Wang (2013) identified the intellectual structure of the research on digital libraries, which was performed in China from 2002 until 2011, while Zong et al. (2013) identified the intellectual structure of the doctoral theses in Library and Information Science in China.

Besides the studies that analysed intellectual structure targeting scientific research results, another study identified and structuralized subjects on the basis of the relationship between the words existing in the reported news articles, blogs and Twitter. Kang (2000) analysed the structural network of policy and power in Korea shown in newspaper articles, Cho, Choi and Park (2012) analysed the conflict the over U.S beef imports and the process of negotiation shown in nine Korean TV debates and Jin et al. (2013) analysed and structuralized the changes in topics by conducting co-word analysis on the basis of Twitter.

4. Research Method

This study calculated similarity indices on the basis of co-occurrence frequency between the words, and performed not only clustering but also MDS mapping. After clustering, the secondary analysis was done in order to grasp the interaction between the clusters. In addition, in an effort to look into the differences in inquiries for reference by period, the same analysis was done again by dividing the period into a first half (2008-2009) and second half (2010-2013). This study used KrKwic software (Park and Leydesdorff 2004) for the purpose of drawing up a co-occurrence matrix, and also used the SPSS program for correlation analysis, cluster analysis and MDS mapping. The research method is described in detail as follows:

First, at the end of June 2013, this study extracted about 261 cases of data constructed in the field of social science from the Ask a Librarian knowledge DB of the National Library of Korea. This study regarded inquiries classified in the No. 300 band as those for the social science field because the ‘Ask a Librarian’ knowledge DB classified the inquiries based on the Korean Decimal Classification (KDC) system. This study extracted 728 cases of uncontrolled keywords, which were given in the process of a librarian’s presenting a reply to inquiries. In addition, this study selected 30 words, which appeared more than 3 times after being refined as shown in (Table 1) below, as final analysis objects. There were 88 total keywords that appeared more than twice (2times - 13times), but among these keywords, 58 keywords that occurred twice were not judged as important keywords for drawing research results. On the other hand, the keywords which occurred more than 3 times (3times-12keywords, 4times-8keywors, 5times-2keywors, 6times-2keywors, 7times-2keywors, 8times-3keywors, 13times-1keywors), were considered valid and meaningful. Therefore this study selected 30 keywords which occurred more than 3 times.

Second, this study carried out refinement work, such as by synonym, analogous word, broader

term/narrower term, and abbreviated word, etc., and excluded the terms that overlapped in the word matrix in a case of inquiry or whose concept was similar to the others with the exception of one word. For refining analogous, broader/narrower term, and abbreviated word, eye-check had been performed. Through eye-checking, words clusters have been formed with similar words. Among the each word in the clusters, representative word is selected and then remaining words were changed to representative words. Here, this study makes it clear that there might be a difference in terms of appearance frequency according to a researcher's subjectivity because the process of unifying the similar words and eradicating stop words appearing in the term extraction process is swayed by a researcher's subjectivity.

〈Table 1〉 Term Refinement Example

Classification	Example	
Analogous Word	lifelong education	lifelong study
	tale	myth, legend
Broader / Narrower Term	welfare	social welfare, child welfare, welfare for the aged
	disability	disabled person, blind people
	international organization	international nongovernmental organization, international governmental organization

Third, with the refined word list as an object, the study prepared the co-occurrence matrix through KrKwic and KrTitle software. KrKwic (Korean Key words in context) is full-text analysing software for Korean language. In addition, this study used the Pearson correlation coefficient, which was used in the research by Ding, Chowdhury and Foo (2001) and Lee et al. (2006), as a similarity index.

Forth, this study implemented clustering in order to classify terms on the basis of similarity indices. For this purpose, this study used Ward's technique (Lee et al. 2006), which generates clusters by minimizing the Euclidian distance between central values among hierarchical clustering methods. Meanwhile, this study conducted a secondary analysis in order to grasp the similarity or dissimilarity between the generated clusters, for which this study adopted the method of adding up the co-occurrence frequency value of the words included in clusters (Park 2004). In addition, this study calculated the relationship between clusters using the Pearson correlation coefficient.

Fifth, in an effort to visualize the relationship between words in multi-dimensional space, this

study standardized the Pearson correlation coefficient matrix using a z score and calculated the Euclidian distance, and then visualized the relationship between words in two-dimensional space by applying a PROXISCAL algorithm. Additionally, this study calculated the similarity indices even between clusters in order to grasp the relationship between subject areas through their visualization, based on which, this study prepared the secondary map in the same way. The size of the clusters is marked by calculating the proportion of the sum of co-occurrence frequency of the words belonging to a cluster.

Sixth, this study conducted the same analysis once again with only the words generated during individual periods as objects by dividing the period into the first half (2008-2009) and the second half (2010-June, 2013). During the 5 and a half years of service period, the first 2 years were designated as the first half period and the remainder were designated as the second half. In 2008 and 2009, when the reference service was open to the public, average 80 cases of inquiries were asked. However, from 2010 the number of inquiries decreased to 30 or so cases, entering a state of sharp stagnancy. Therefore this study divided the period into two different sections, and looked into the difference by period by conducting co-occurrence frequency analysis, correlation analysis and cluster analysis of the words generated during individual periods. This study also carried out the correlation analysis between clusters to see if there exists any cluster having a correlation with other clusters generated by individual periods.

5. Analysis Results

5.1 Co-Occurrence Matrix and Correlation Analysis Results

This study extracted 748 cases of indices constructed in 261 cases of inquiries for reference, which are classified as the field of social science from the ‘Ask a librarian’ inquiries for a reference DB constructed at the National Library of Korea. In an effort to calculate the co-occurrence frequency of the filtered word list, this study prepared the co-occurrence matrix through KrKwic and KrTitle software. A part of the (Table 2) targeting the 30 words, which appeared more than 3 times, is presented as follows:

〈Table 2〉 Part of Co-Occurrence Matrix

Keyword	Korea	Welfare	Japan	Statistics	Educatio	Busines	Curriculu	Teen	Manage	Informati
Korea	195	49	21	19	20	13	15	10	8	5
Welfare	49	46	10	2	5	5	2	4	6	1
Japan	21	10	22	1	2	4	1	2	3	1
Statistics	19	2	1	22	2	0	5	0	0	5
Educatio	20	5	2	2	21	2	1	2	3	0
Business	13	5	4	0	2	15	0	0	1	0
Curriculu	15	2	1	5	1	0	14	0	0	1
Teen	10	4	2	0	2	0	0	10	1	0
Manage	8	6	3	0	3	1	0	1	9	0
Informati	5	1	1	5	0	0	1	0	0	5

As a result of analysing the occurrence frequency of words while preparing the co-occurrence matrix, it was found that “Korea” (13), “welfare” (8), “Japan” (8), “statistics” (8), and “education” (7) showed a high frequency. Besides, “curriculum” and “teen” occurred 6 times; “management” and “information” emerged 5 times, and though not presented in the table above, “economy”, “textbook”, and “college” appeared 4 times while “America”, “China” and “Germany” appeared 3 times.

Frequently requested inquiries included those about various statistics and current conditions in Korea like “Statistical Information on Korean Students Studying Abroad on a Yearly Basis” and “Korean Gas Station Statistics”, and the inquiries for references related to education like “Education for the Disabled”, and “Vocational Education”, etc. were frequently requested. Among the nations, “Japan”, “America”, “Germany”, and “China”, etc. were frequently handled; particularly, in the case of “Japan”, many inquiries for references were requested related to social issues, such as problems about comfort women.

Meanwhile, the results of the Pearson correlation analysis for measuring the similarities targeting the co-occurrence matrix present the word pairs showing more than 0.6 similarities in (Table 3) below. The word pairs showing a high correlation coefficient means that the inquiries for reference, which were made by combination of these concepts, are frequently requested. For example, if the word pair “welfare-disability (0.648)” shows a high correlation coefficient, this means that the inquires for reference that combine the concepts of “welfare” and “disability”, as shown in “Disability and Welfare Group Status” and “Welfare of Disabled Persons Act”, are frequently requested. The word pairs showing the highest correlation coefficient include “education-curriculum” (0.758), “education-history of education” (0.738), “information-law” (0.707). The terms of the educational subordinate concepts were frequently combined to form a complicated inquiry, and

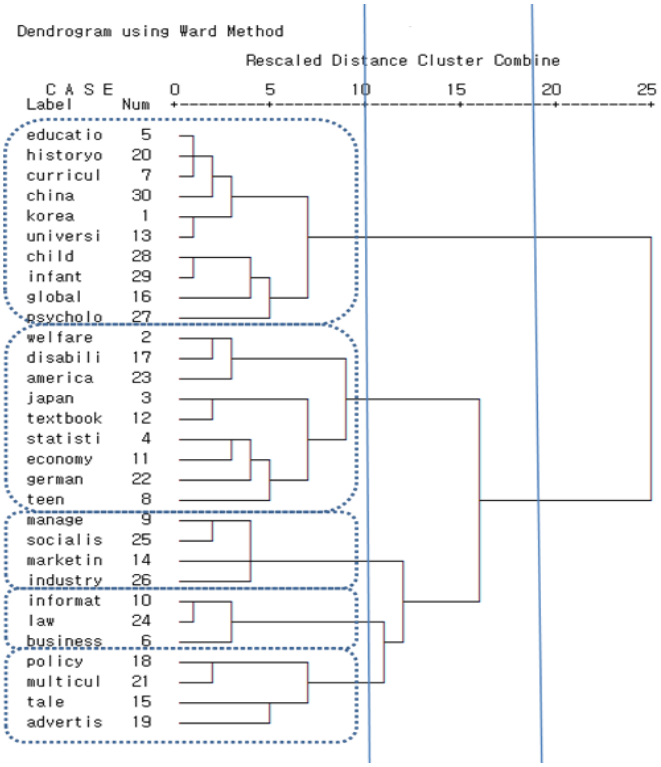
“information” and “law” were combined as requested inquiries about the resources on law or the legal profession.

〈Table 3〉 Word Pairs Showing High Correlations

Pearson Coefficient	Word Pair
More than 0.7	education-curricular .758 education-history of education .738 information-law .707
0.6 - 0.7	welfare-disability .648 curricular-infant .691 education-infant .640 university-history of education .621

5.2 Cluster Analysis Results

This study conducted a hierarchical cluster analysis using the correlation coefficients on 30 words. As a result of carrying out clustering by using Ward’s technique and standardizing with a Z score, the dendrogram was output as below (Fig. 1).



〈Figure 1〉 Dendrogram

The X axis of the dendrogram represents the relative distance between words while the Y axis represents the word name and number. When the dendrogram is cut off between 15 and 20, it is confirmed that it is roughly divided into the education-related area and social science area. This is because most of the inquiries for the references are scattered across the social science area, but the sub-domains in the “education” area show a high connectivity with each other. However, when the dendrogram is cut off around 10, once again for subdividing the cluster a little more, it is confirmed that 5 clusters is formed as show in (Table 4).

〈Table 4〉 Cluster and Proportion

Cluster	Words	Representative Keyword	Sum of Similarity	Share (%)
CL1	advertisement tale multicultural family policy	Other Social Science	14	4.1
CL2	information business law	Business Law & Information	32	9.4
CL3	manage marketing industry social issue	Management	30	8.8
CL4	social issue Japan statistic teen economy textbook disability German America	Welfare & Disability	112	33
CL5	Korea education curricular university global history of education psychology child infant China	Korea Education	154	45.5

This study marked the proportion of the 5 segmented clusters by adding up their frequency and explained their characteristics by showing a high co-occurrence frequency in each cluster. The “Korean education” area accounting for 45.5% represents almost half of the group of clusters; the “Welfare and Disability” area represents a 33% proportion; the “Business and Law Information” area represents a 9.4% proportion, and the remaining 2 clusters represent an 8.8% and 4.1% proportion, respectively.

Meanwhile, this study carried out the correlation analysis by adding up the similarity values of the words belonging to individual clusters to explore the correlation between the 5 segmented clusters. As a result, the correlation coefficient values were drawn as in (Table 5). However, this study could not identify a cluster pair showing significant similarity in (Table 5). Accordingly, the organization shows that each of the 5 clusters formed independent areas, but did not form meaningful relationships among them.

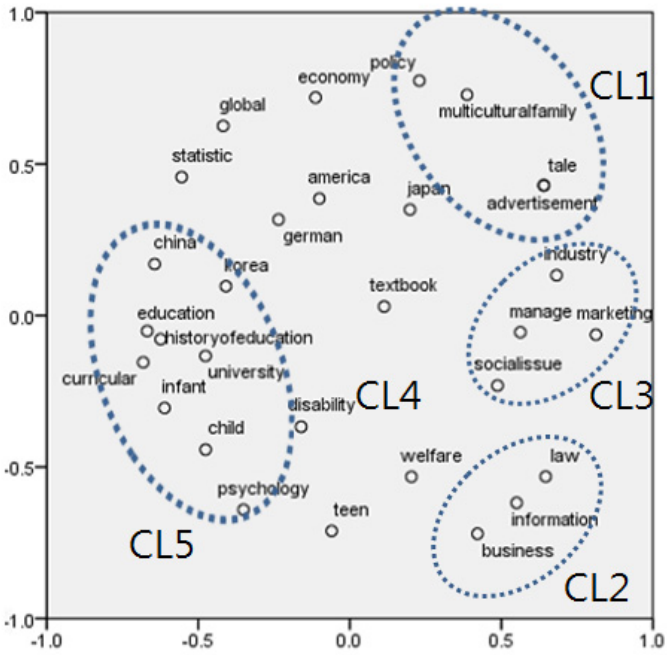
〈Table 5〉 Coefficients Between Clusters

Group	CL1	CL2	CL3	CL4	CL5
CL1	1.000	-0.161	-0.366	-0.372	-0.335
CL2	-0.161	1.000	-0.221	-0.219	-0.338
CL3	-0.366	-0.221	1.000	-0.290	-0.258
CL4	-0.372	-0.219	-0.290	1.000	0.116
CL5	-0.335	-0.338	-0.258	0.116	1.000

5.3 MDS Mapping

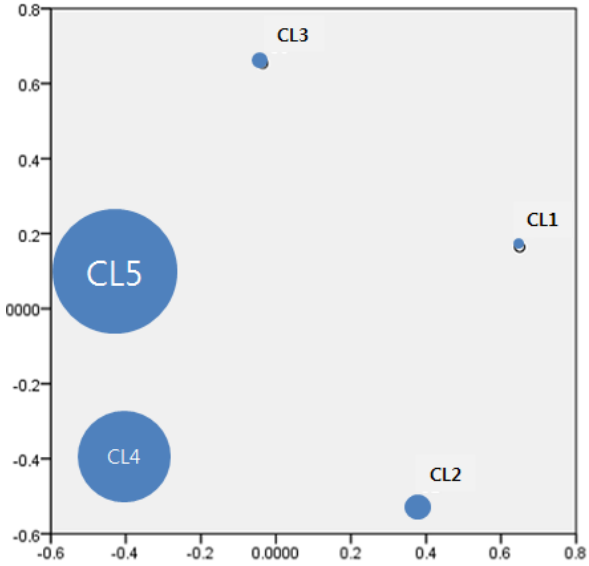
For the purpose of visualizing the relationship between words in the two-dimensional space, this study applied a PROXSCAL algorithm to the calculated Pearson correlation coefficient between words. In multi-dimensional scaling, a repeated calculation is usually conducted until the optimum result is obtained in order to enhance the goodness of fit of the relative distance of objects, and the goodness of fit can be ascertained through the stress value (Byun 2011). The stress value means an error between actual distance and estimated distance, having the value between 0 and 1. When the actual distance and estimated distance completely coincide with each other, its value counts zero, and here, the S stress index was represented as 0.2272. Looking at the calculated MDS map in (Fig. 2), it can be confirmed that the CL5 “Korean Education” area is located on the left side; CL2 “Business and Law Information” is located in the lower right-hand corner; CL3 “Management” is located just above CL2; “Social Science other areas” comprising CL1

is located in the upper right-hand corner, and CL4 is arranged over a wide dispersion in the middle part.



〈Figure 2〉 MDS Map on the Basis of the Correlation Coefficient Between Words

(Fig.2) shows the conceptual similarity between the 30 words in a spatial map, but it is difficult to clearly explain the proportion and relations of a cluster. Accordingly, for a much easier explanation, this study drew up an MDS map as shown in (Fig.3) using the correlation coefficient between the 5 clusters calculated from (Table 5). The S stress index showed 0.07, and it is possible to confirm that CL5 “Korean Education” exists on the left, below which a CL4 “Welfare and Disability” area is located. The CL2 “Business and Law Information” area is located in the lower right-hand corner, and the remainder of the clusters are scattered on the map. The correlation analysis revealed that no pair has a significant relation, so the internode line does not exist. As a result of marking the size of a node by reflecting the proportion of a cluster calculated in (Table 4), it was found that the CL5 “Korean Education” area overwhelmingly stood out, followed by the CL4 “Welfare and Disability” area, and the remainder of the clusters lay scattered meaninglessly.

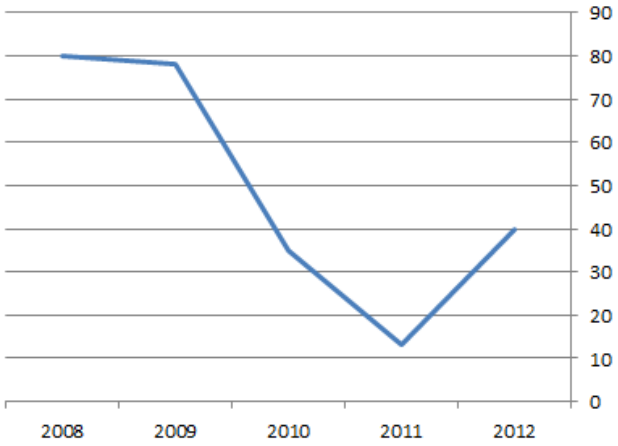


〈Figure 3〉 MDS Map on the Basis of the Correlation Coefficients Between Clusters

The organization of the intellectual structure of inquiries for reference in the field of social science viewed through (Fig. 3) can be explained as follows: First, inquiries for reference are scattered across the social science area, which can be divided into 5 subject areas. Second, no significant correlation exists between subject areas, so it might be possible to interpret that the inquiries of an interdisciplinary character, which transcend areas, are not frequently requested. Third, the “Korean Education” area takes up the biggest proportion, and next social issues like “Welfare, Disability” are often handled. The handling volume of other subjects in the Social Science domain is insignificant.

5.4 Comparative Analysis by Period

This study carried out co-occurrence frequency analysis, correlation analysis, cluster analysis and correlation analysis between clusters once again by dividing the period into a first half (2008-2009) and second half (2010-June 2013), in order to look into the temporal difference between the inquires for reference. First, the distribution by year is shown as follows in (Fig. 4).



〈Figure 4〉 Number of Cases by Year

Starting from the year 2008, there has been a downward trend in general. About 80 cases of inquiries in 2008 and 2009, decreased to 30 or so cases of inquiries in 2010, 2011, and 2012, respectively. In 2013, due to the absence of the data for the second half, this study exempted it from the graph specified in (Fig. 4), but only 15 cases were handled during the first half; thus, if such trends continue, it is estimated that about 30~40 cases will be aggregated just like in the year 2011 and 2012, even if the number of cases accumulates until the second half. It might be interpreted that the inquiries for reference were revitalized until 2008 and 2009 when the reference service was open to the public, and since then, the inquiries for reference have entered a state of sharp stagnancy.

This study carried out co-occurrence frequency analysis, correlation analysis, cluster analysis, and correlation analysis between clusters once again targeting 158 cases for 2008 and 2009 in a bundle, and 103 cases from 2010 until June 2013 in another bundle for the analysis by period. The analysis results are shown in (Table 6).

First, the frequency analysis found that “Korea” (10), “Japan” (8) and “Education” (7) appeared as high frequency words between 2008 and 2009, while “Information” (4), “Management” (4), “Teen” (4), “Welfare” (3) and “Business” (3) emerged as high frequency words between 2010 and 2013. Second, the correlation analysis results revealed that “Education” and “History of Education” showed the highest correlation of 0.830 in 2008 and 2009, and other sub-domains related to education also showed a high correlation. However, in the case of the years from 2010 until 2013, only “Welfare” and “Information” showed correlations, of about 0.748. Third, the cluster analysis

results indicated that 3 clusters formed during the first half, and the education-related concepts including “university” and “statistics”, etc. formed one cluster, showing the biggest proportion accounting for 56%. On the contrary, in the case of the second half, 3 clusters formed, but the educational field failed to form a cluster unlike in the first half; instead, a cluster formed having a high proportion of inquiries, accounting for 50%, around “Teen” and “Welfare”, and a cluster accounting for a 27% proportion formed around “Business Information” as well. Fourth, as a result of looking into the correlation between clusters, a cluster showing a significant correlation in both periods was not discovered.

To sum up, in the case of the first half, it is understood that there were many inquiries for references related to the concept of “education” and education-related subject concepts were combined to form complicated inquires for reference. In contrast, in the case of the years from 2010 until 2013, the proportion of inquiries in the “education” area shrank during a stagnant period. However, it is interpreted that there were lots of inquiries for references about the information source of a specific area, such as “Business Information” or “Welfare Information”, and other inquiries in diverse social science areas, such as “Teen” and “Multicultural family”, were also made.

〈Table 6〉 Difference in Analysis Results by Period

Classicication	2008-2009	2010-2013.6
Number of Object data	158	103
Frequency Analysis Results	Korea (10), Japan (8), education (7), curricular (5), welfare (5), statistic (5)	information (4), manage (4), teen (4), business (3), multicultural family (3), welfare (3), tale (3), statistic (3)
Correlation Analysis Results	education/history of education (0.838), welfare/disability (0.796), university/history of education (0.649), curricular/history of education (0.770)	information/welfare (0.748)
Clustering Results	• cluster1 (56%): Korea, education, education, statistic, university • cluster2 (19%): welfare, disability, America • cluster3 (23%): Japan, economy, business, industry, policy	• cluster1 (22%): manage, Korea • cluster2 (50%): teen, welfare, statistics, multicultural family, tale, • cluster3 (27%): business, information

6. Summary and Discussion

As a result of conducting co-word analysis, it was found that the inquiries for references in the field of social science were divided into 5 areas: “Korean Education”, “Welfare and Disability”, “Management”, “Business and Law Information” and “Other general fields of Social Science.” “Korean Education” formed a cluster representing an overwhelming proportion of inquiries at 40.3%, but this study did not identify a significant relationship between the 5 clusters. Accordingly, it is interpreted that the trend seems to be mostly in favor of simple inquiries limited to specific detailed subject areas rather than complicated inquiries for references transcending the targeted subject area. On the basis of the analysis results of the inquiries for reference by period, it is interpreted that in the case of the years between 2008 and 2009, there were overwhelmingly many inquiries for references related to educational concepts, while in the case of the years between 2010 and 2013, a large number of inquiries for reference were made around “welfare” and “business information” instead of the field of “education”.

This study conducted an empirical analysis of the inquiries in the social science field of the Collaborative Reference Service DB, and the results suggest the necessity of enhancing professionalism in services by securing diverse reference bibliographies and subject specialists related to “education”, “welfare”, “business”, and “law”. Particularly, increased focus on the “education” field, which showed a high correlation between sub-domains in the correlation analysis and also a big share even in the MDS map, is necessary to thoroughly prepare for a reference service. There will be a need for specialized data and subject specialists that can play a role as a reference resource when survey or research-type inquiries are requested. In addition, considering this study analysis showed that there were frequent requests for inquiries for references related to “business information” and “law information”, it is necessary to take into account the adequate line-up of the reference information sources of the relevant field and cultivation of specialists as well.

The significance of this research can be summarized like below. Still now, generally reference service of public libraries in Korea has been based on simple directional information or factual questions such as checking whether a library holds certain material or not. But CDRS has been serviced with the research and survey level inquiries which local libraries felt difficulty and transferred to NLK, so the congregated data in CDRS is rare and valuable to understand the subject coverage of research and survey level reference service. Therefore, the result of this study could give clues about what subject and kind of research and survey level inquiries were asked to the public

libraries of Korea. The analysis about subject of research and survey level inquiries could be utilized as basic data for deciding what subject of reference resource should be prepared and what subject of specialists should be raised. Overseas libraries offering matured reference service have already responded to the research and survey level inquiries with assigning by diverse subject specialists such as education, law, art, business and so on. At this point of time, the necessity of educating reference special librarians have increased in Korea, so it is very important to understand what subject of research and survey level inquiries were asked to the library reference service.

But this study has limitation like below. First, these research results were produced based on the reference service that is collaboratively shared between 340 public libraries in Korea, so the reference service users who requested inquiries for references are mainly young and middle-aged adults among the general public, and their purpose for making inquiries is primarily in the areas of solving job performance issues, hobbies or related matters of concern. Therefore, results that differ from this study might be drawn from the reference service of a university library, which is normally used for doing research or assignments. Second, these research results were based on research and survey level inquires which local libraries had transferred to NLK. Therefore this study didn't cover all type of reference inquiry, including simple directional information or factual questions. Third, since the analysed data based on certain time of period, the result of this study might be changed as times goes by and if a lot more data will be accumulated through the revitalization of this reference service, it is judged that it would be possible to conduct more in-depth analysis and more significant results could be drawn.

7. Conclusion

This study was able to identify matters of concern in the social science field to library users through the analysis of the Korean Collaborative Reference Service, which is managed by the National Library in cooperation with about 340 public libraries around the country. This study identified what detailed reference inquiry areas are combined with other areas to form a complex inquiry through co-word analysis, and also identified the subject domain of library reference service in the field of social science through its visualization by clustering key words. Users' inquiries were scattered throughout social science, showing the largest proportion of inquiries in the field of educational studies. The inquiries in the field of social science could be divided into 5 detailed subject areas, but due to the unclear correlation between sub-domains, this study could figure

out that there were not many inquiries having interdisciplinary characteristics for reference. This study hopes that these research results could be used for understanding for what areas in the field of social science subject specialists should be secured, and also what reference information sources should be equipped in preparation for the reference service.

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