## **Citation Analysis on South Korea S&T Journals in** 2014

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#### Abstract

**Objectives:** Korea Institute of Science and Technology Information (KISTI) has produced Korea Science Citation Index (KSCI) and has published Korea Journal Citation Reports (KJCR) since 2002. This study was aimed to explore various citation indicators between journals by employing network analysis based Korea Science Citation Database (KSCD). **Methods/Statistical Analysis:** This study used KSCD (KJCR 2014 coverage) for citation analysis on Korean S&T Journals in 2014. KJCR followed the same model like JCR and is calculated, based on articles in recent 3 years and references in recent one year. Specifically, there are 700 titles of journals for KJCR 2014. **Findings:** This study analyzes the most recently published KJCR in 2015 and 2014 and suggests the reference's composition of data type as well as the high rank journals with the yearly trend of main citation index and each fields of citation network analysis. Through this study, various citation trends of Korea ST journals was revealed, Specifically each journal's and classified subject's citation relation through network analysis and composition of citation map. **Improvements/Applications:** Inter Citation Network Map were produced based on journals in KJCR 2014.

**Keywords:** Citation Analysis, Citation Network Map, Korea Journal Citation Reports (KJCR), Korea Science Citation Database (KSCD), Korea Science Citation Index (KSCI)

#### 1. Introduction

The position of South Korea's publications in Web Of Science (WoS) Science Citation Index Extended (SCIE) database is 11th place, in 2014. In addition, South Korea's the number of journals is 1,160, based on investigation in 2015, and a considerable number of the journals are registered in SCIE and SCOPUS respectably. Comparing Korean researcher's international and Korean journals output, there is a big difference in journal output of classified subject, as a result of comparing JCR and KJCR in detail<sup>1</sup>. Therefore, citation analysis in journals published by Korea is needed, to understand the influence based on Korea's science and technology research paper. KISTI (Korea Institute of Science and Technology) developed KSCD (Korea Science Citation Database) and KSCI (Korea Science Citation Index) and has published KJCR (Korea Journal of Citation Reports) from 2002. The number of journals in KSCD is 875, journals and

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citations ranging from 2002 to 2014, and through KSCI website citation index service and KJCR reports by year, is provided<sup>2.3</sup>. This study analyzes the most recent KJCR's citation index, suggesting the reference's composition of data type as well as high rank journals with the yearly trend of the main citation index and each fields of citation index. In addition, through much attempted citation network analysis in recent citation analysis study, the citation map and citation map of classified subject in the whole journals are written and suggested.

Many researchers of Korea have conducted related study based on KSCD. Table 1 shows the research paper list of published journals so far, using KSCD. There are 16 research papers so far and the research subjects are citation structure analysis<sup>4-7</sup>, intellectual structure analysis<sup>8-12</sup>, journal citation impact measurement index development<sup>13-15</sup>, automatic subject classification, and other studies<sup>16-18</sup>. Specifically, not only general citation statistics in a largely scaled analysis of references cited was identified but also the various Citing behavior (1. foreign journals rate of cited references, 2. citing age of cited references, 3. citation statistics by author and organizations). In addition, intellectual structure of academic field through various bibliometric methods like Bibliographic Coupling Analysis and Co-Citation Analysis in KSCD's relevant journals was revealed the related research.

### 2. Data Collection and Method

This study used KSCD (KJCR 2014 coverage) for citation analysis on Korean S&T Journals in 2014. Table 2 shows the composition of data set (KSCD for KJCR 2014). KJCR followed the same model like JCR and is calculated, based on articles in recent 3 years and references in recent one year<sup>19</sup>. Specifically, there are 700 titles of journals for KJCR 2014. The major citation indicator of JCR is IF (Impact Factor). Below table shows citation indicators that KJCR 2014 and it is explained in KSCI service web site.

## 3. Result

#### 3.1 Basic analysis of KJCR 2014

Basic analysis was conducted regarding article, reference DB and citation index forming KJCR 2014. First it is the analysis result of article and reference DB.

Index	Author	DOI	Journal (Abbrev.)	Year
1	Lee J-Y, Lee J-Y	10.1633/jim.2010.41.1.043	J Inf Ma	2010
2	Kim P-J, Lee J-Y.	10.3743/KOSIM.2010.27.1.269	J Kor Soc Inf Ma	2010
3	Ryoo J-D, Choi E-J.	10.3743/KOSIM.2011.28.1.123	J Kor Soc Inf Ma	2011
4	Lee J-Y.	10.4275/KSLIS.2011.45.2.119	J Kor Soc Libr Inf Sci	2011
5	Choi S-H.	10.3743/KOSIM.2011.28.2.065	J Kor Soc Inf Ma	2011
6	Byun J-H, Chung E-K.	10.1633/JIM.2011.42.4.075	J Kor Soc Inf Ma	2011
7	Nam Y-J, etc.	10.3743/KOSIM.2011.28.4.201	J Kor Soc Inf Ma	2011
8	Lee J-Y.	-	J Kor Soc Libr Inf Sci	2011
9	Kim B-K, etc.	10.3743/KOSIM.2011.28.2.117	J Kor Soc Inf Ma	2011
10	Choi S-H, etc.	10.3743/KOSIM.2011.28.2.097	J Kor Soc Inf Ma	2011
11	Jo S-R, Lee J-Y.	10.1633/JIM.2012.43.1.159	J Info Ma	2012
12	Cho H-Y.	10.1633/JIM.2012.43.2.043	J Info Ma	2012
13	Lee J-W, etc.	10.1633/JIM.2012.43.3.023	J Info Ma	2012
14	Choi H, etc.	10.1080/09737766.2013.802625	Collnet J Sci Inf Ma	2012
15	Park J-H, etc.	10.1633/JIM.2012.43.4.191	J Inf Ma	2012
16	Kang M, etc.	10.17485/ ijst%2F2015%2Fv8iS1%2F59413	Indi J Sci Tech	2015

Table 1. Research papers based KSCD

• Figure 1 shows the distribution of KJCR 2014 Journals (700 titles) with ESI 22 subject areas. The publications were concentrated on areas such as Computer Sciences and Engineering.





- Journal average frequency is 5 times, the average number of articles and references per journal is 74 and 1,709 respectably.
- The journal rate of Journal language is Korean journal 68% (476 titles) and English journal 32% (224 titles) respectably.
- The data type rate of references are journals 76.5%, books 9.6%, conferences materials 4.3%, etc. 9.5%.
- The rates of foreign journal articles and domestic journal articles cited by KJCR 2014 journals are 76.4% and 24.6% respectably.

The trend in years of Journal Impact Factor (JIF) of KJCR 2014 is as.

• The IF was suggested in 1955 by Garfield and this criterion for journal evaluation has become a useful tool for the inter comparison of scientific journals<sup>20</sup>. Trends of IF average values in KJCR from 2004 to 2014 are shown in Figure 2. The average IF of KJCR 2014 is 0.338 and for the last five years, there has been a gradual increase.



Figure 2. KJCR impact factor (2004 - 2014)

The trend in years of Journal Impact Factor (JIF) of KJCR 2014 is as:

• Table 3 shows a list of top 10 journals in descending order of JIF, two years, three years, and five years value. When top 5 of JIF with three years and five years is compared, JIF five years value of "Korean Food Cooking Science Transaction" is higher than two years or three years. However, there are no big differences between the journal titles in top 10 lists. KJCR 2014 based on the high quality DB offers the latest year indicators, and it can be utilized depending on research and analysis purposes.

# 3.2 Ciation Network Analysis Based on KJCR 2014

Citation analysis and network analysis are in complementary relationship. Intellectual structure of the subject field can be identified by quantitative analysis on the published journal articles in the informatics study. Not only general citation indicator, but also Inter Citation network analysis needs to be considered additionally when we service KJCR. Aim of this study is to identify the intellectual structure of the 2014 through journal and subject based Inter Citation analysis, which is the most popular method in Bibliometrics. Network analysis is used to examine the Inter Citation relationship and to identify the subject relationship by Node XL and Gephi software<sup>22.22</sup>.

First, the result of citation network analysis among journals is as.

• For producing journal Inter Citation network, 180 journals, which are cited times over 25(except self-citation) within 700 journals in 2014 KJCR were selected. The produced network is as shown in Figure 3. To highlight the weight of links, link width reflecting the citation times were controlled.



Figure 3. Inter citation network map of 180 Journals in KJCR 2014

No.	JIF(2years)	JIF(3years)	JIF(5years)
1	J Kor Acad Soc Edu	J Kor Acad Soc Edu	J Kor Acad Soc Edu
2	Asia Pac J Cancer Prev	Asia Pac J Cancer Prev	J Kor Acad Nurs Adm
3	J Kor Public Health Nurs	J Kor Public Health Nurs	J Kor Soc Food Sci Nutr
4	J Kor Soc Food Sci Nutr	J Kor Soc Food Sci Nutr	Asia Pac J Cancer Prev
5	J Kor Acad Nurs Adm	J Korean Acad Nurs Adm	J Kor Soc of Food Cook Sci
6	Kor J Med Crop Sci	Kor J Community Nutr	J Kor Public Health Nurs
7	Kor J Community Nutr	Kor J Med Crop Sci	Kor J Community Nutr
8	J Ind Eng Chem	J Korean Soc of Food Cook Sci	J Kor Soc Food Sci Technol
9	J Petrol Soc Korea	J Petrol Soc Korea	J Korean Acad Nurs
10	J Kor Soc of Food Cook Sci	J Ind Eng Chem	J Kor Women Health Nurs

Table 3. List of top 10 Journals (Abbrev.) in descending order of JIF (2,3,5years)

• The result of graph metrics analyzed Inter Citation network by NodeXL is as Table 4. "NodeXL" based on open source software was employed for visualizing intellectual interchanges among journals and central analysis in the weighted networks<sup>23</sup>. This network has 180 nodes and 293 links without self-loops. Directed graph density of this network is 0.009. This network is weighted network and there are 129 units of reciprocal links and 59 units of reciprocal nodes.

Table 4. List of top 25 Journals in descending order	of
eigenvector centrality	

No.	Title of Journal (Abbrev.)	Eigenvector
		Centrality
1	J Kor Soc Food Sci Nutr	0.099
2	J Kor Soc Food Sci Nutr	0.073
3	J Kor Soc of Food Cook Sci	0.068
4	J Kor Soc Food Cult	0.063
5	J Kor Soc Food Sci Technol	0.062
6	J East Asian Soc Diet Life	0.06
7	Kor J Food Preser	0.06
8	Kor J Community Nutr	0.052
9	J Exp Biomed Sci	0.043
10	Kor J Culin Res	0.035
11	J Food Eng Prog	0.033
12	J Nutr Health	0.033
13	Kor J Food Sci Ani Resour	0.028
14	Kor J Hum Ecol	0.027
15	J Kor Diet Assoc	0.026
16	J Food Hyg Saf	0.019
17	Food Sci Biochnol	0.019
18	J Kor Soc Appl Biol Chem	0.018
19	Kor J Microbial Biotechnol	0.016
20	Kor J Med Crop Sci	0.013
21	J Ginseng Res	0.013
22	J Kor Fish Aquat Sci	0.012
23	J Agri Life Sci	0.012
24	Kor J Herbology	0.012
25	Kor J Crop Sci	0.012

• Eigenvector centrality value is also expressed by node size and maximum eigenvector centrality journal is "Korean Food Cooking Science Transaction". Table 4 is a list of top 25 journals in descending order of eigenvector centrality value. When eigenvector centrality is in relation with high score node, in basis of same connection with lower score relative score is given to all the node within a network. (It forms a concept, when in relation with high rank journal, authority and centrality increase.) Google's page Rank is modification of eigenvector centrality.

The result of citation network analysis among subjects is as:

To show subject Inter Citation network, 157 subjects based on WoS, subject classification to 157 titles of journals were applied and the network with betweenness centrality was produced. This network is weighted network and the size of node reflects the weighted degree value and betweenness centrality was expressed by color. High value is expressed in darker violet. It can detect the number of shortest paths from all subjects of journals to all the others that pass through that node subject of journal. "Gephi 0.82" was employed for visualizing of intellectual interchanges among subjects and centrality analysis in the weighted network. "Multidisciplinary Field Science" subject is a bridge journal clearly shown as in Figure 4. And we can identify feature of "Multidisciplinary Field Science" journal and know intuitively and objectively by the network map.



**Figure 4.** Inter citation network map of 157 subject in KJCR 2014

#### 4. Conclusions

This study was aimed to explore various citation indicators between journals by employing network analysis based on journal Inter Citation, which is differentiated from general citation indicator based on analysis method. Relationships and links between references can be measured, and is able to show more specific features of Inter Citation network structure than general citation indicators. This study offers impact factor of domestic journals based KSCD and seek ways to offer citation relationship by multidirectional methods like recent research trends, thus it can be meaningful research of domestic S&T field in 2014. In order to improve this study, it is necessary to understand the network analysis methods and various software in"informatics".

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