"İŞ, GÜÇ" ENDÜSTRİ İLİŞKİLERİ VE İNSAN KAYNAKLARI DERGİSİ

"IS, GUC" Industrial Relations and Human Resources Journal

2019 Cilt/Vol: 21/Num:3 Sayfa/Page: 39-64

ISGUC.ORG

İŞ, GÜÇ ISSN 2148-9874
Endüstri İlişkileri ve İnsan Kaynakları Dergisi

Editörler Kurulu / Executive Editorial Group
Aşkın Keser (Uludağ University)
K. Ahmet Sevimli (Uludağ University)
Şenol Baştürk (Uludağ University)

Editör / Editor in Chief
Şenol Baştürk (Uludağ University)

Yardımcı Editör / Managing Editor
Ulviye Tüfekçi Yaman

Yayın Kurulu / Editorial Board
Doç. Dr. Erdem Cam (Ankara University)
Doç. Dr. Zerrin Fırat (Uludağ University)
Prof. Dr. Aşkın Keser (Uludağ University)
Prof. Dr. Ahmet Selamoğlu (Kocaeli University)
Dr. Öğr. Üyesi Ahmet Sevimli (Uludağ University)
Prof. Dr. Abdulkadir Şenkal (İstanbul Ayvansaray University)
Doç. Dr. Gözde Yılmaz (Marmara University)
Dr. Öğr. Üyesi Memet Zencirkıran (Uludağ University)

Uluslararası Danışma Kurulu / International Advisory Board
Prof. Dr. Ronald Burke (York University-Kanada)
Assoc. Prof. Dr. Glenn Dawes (James Cook University-Avustralya)
Prof. Dr. Jan Dul (Erasmus University-Hollanda)
Prof. Dr. Alev Efendioğlu (University of San Francisco-ABD)
Prof. Dr. Adrian Furnham (University College London-İngiltere)
Prof. Dr. Alan Geare (University of Otago- Yeni Zellanda)
Prof. Dr. Ricky Griffin (TAMU-Texas A&M University-ABD)
Assoc. Prof. Dr. Diana Lipinskiene (Kaunos University-Litvanya)
Prof. Dr. George Manning (Northern Kentucky University-ABD)
Prof. Dr. William (L.) Murray (University of San Francisco-ABD)
Prof. Dr. Mustafa Özbilgin (Brunel University-UK)
Assoc. Prof. Owen Stanley (James Cook University-Avustralya)
Prof. Dr. Işık Urla Zeytinoğlu (McMaster University-Kanada)

Ulusal Danışma Kurulu / National Advisory Board
Prof. Dr. Yusuf Alper (Uludağ University)
Prof. Dr. Veysel Bozkurt (İstanbul University)
Prof. Dr. Toker Dereli (Işık University)
Prof. Dr. Nihat Erdoğmuş (İstanbul Şehir University)
Prof. Dr. Ahmet Makal (Ankara University)
Prof. Dr. Ahmet Selamoğlu (Kocaeli University)
Prof. Dr. Nadir Suğur (Anadolu University)
Prof. Dr. Nursel Telman (Maltepe University)
Prof. Dr. Cavide Uyargil (İstanbul University)
Prof. Dr. Engin Yıldırım (Anayasa Mahkemesi)
Prof. Dr. Arzu Wasti (Sabancı University)

İş,Güç, Endüstri İlişkileri ve İnsan Kaynakları Dergisi, yılda dört kez yayınlanan hakemli, bilimsel elektronik dergidir. Çalışma hayatına ilişkin makalelere yer verilen derginin temel amacı, belirlenen alanda akademik gelişime ve paylaşıma katkıda bulunmaktadır. "İş, Güç," Endüstri İlişkileri ve İnsan Kaynakları Dergisi, 'Türkçe' ve 'İngilizce' olarak iki dilde makale yayınlanmaktadır.

"Is,Guc" The Journal of Industrial Relations and Human Resources is peer-reviewed, quarterly and electronic open sources journal. "Is, Guc" covers all aspects of working life and aims sharing new developments in industrial relations and human resources also adding values on related disciplines. "Is,Guc" The Journal of Industrial Relations and Human Resources is published Turkish or English language.

TARANDIĞIMIZ INDEXLER

Dergide yayınlanan yazılardaki görüşler ve bu konudaki sorumluluk yazarlarına aittir.
Yayınlanan eserlerde yer alan tüm içerik kaynak gösterilmeden kullanılamaz.

All the opinions written in articles are under responsibilities of the authors.
The published contents in the articles cannot be used without being cited

"İş, Güç" Endüstri İlişkileri ve İnsan Kaynakları Dergisi - © 2000-2019

"Is, Guc" The Journal of Industrial Relations and Human Resources - © 2000-2019

ABSTRACT

Industrial Relations and Labor is a comprehensive research field where the dynamics and drivers related to the working life are determined and the related working conditions and the relations between the parties are regulated. In order to reveal the status of the current literature in this field, this paper presents particular findings obtained from the research articles within Industrial Relations and Labor category of Web of Science via the methodologies of scientometrics and bibliometrics. These methodologies combine metrics, statistics, and text and network analytics to visualize the characteristics of the literature. In this scope, this paper investigates the networks regarding journals, authors, citations, and keyword distributions; and extracted the potential topics in the field as well as the descriptive statistics and metrics to reveal the trends Web of Science over a large-scale dataset. In a professional manner, relevant findings of the study do not only highlight the dynamics and characteristics with a holistic view but also reflect the insights and inspirations to prospective studies.

Keywords: *labor, industrial relations, literature analysis, scientometrics, topics, web of science.*

1. INTRODUCTİON

Industrial relations are confronted as a research topic that has evolved according to the socio-economic and technological dynamics of different terms, and therefore has never lost its importance for many years. The concept of Industrial relations or labor relations are described in different detail levels by several resources and parties (Britannica, 2018; ILO, 2018; Katz, Kochan, and Colvin, 2008). The rich and in-depth content of these definitions emphasize the importance of the subject.

The first use of the term "industrial relations" was attributed to a commission established by the federal government in 1912 in the United States. The commission on Industrial Relations was established to solve the growing labor problems like employee-employer and institutional disputes. For this reason, industrial relations referred to the relationship between workers and employers in the industry (Kauffman, 1993).

The field of industrial relations has emerged 1920s as an independent field of work and employment in the United States, and after World War II in England and other Anglo-Saxon countries where the industrial revolutions have primarily emerged. Although the field was originally led by US institutional economists, it has been seen as an interdisciplinary field in which labor economists, social psychologists, personnel management experts, industrial sociologists, labor lawyers and political scientists are working on labor affairs (Frege, 2008). Various research papers have been published in this field by the researchers from these disciplines and its intensive background, evolutions, and thus raising research potentials have been reflected as scientific contributions with many studies to the research field.

In such rich areas of research, researches are presented that summarize the dynamics and demographic characteristics of the existing literature and guide future studies. These studies can be classified methodically as reviews, systematic reviews, scientometrics, and bibliometric studies. In this context, this study aims to provide a holistic framework to the researchers working in this field by examining the existing literature in the field of labor and industrial relations with the methodologies of bibliometrics and scientometrics with the help of advanced analysis methods covering basic statistics, text analytics, and network visualizations. Therefore, the paper attempts to reveal the development of the literature on labor economics and industrial relations over the years.

The study focuses on the research articles, which were published in the related journals indexed by Web of Science (WoS). WoS is one of the largest online scientific database, which covers the high quality journals and books in the scope of Arts & Humanities Citation Index (AHCI), Social Sciences Citation Index (SSCI), Emerging Sources Citation Index (ESCI), Science Citation Index (SCI). Therefore, this database contains researches that are respectively regarded as by the whole scientific world and are considered as a priority in academic performance criteria (Clarivate Analytics, 2018). Scientific papers in the WoS database are often indexed by other databases, but vice versa is not always true. Therefore, it can be said that the quality and the richness of the dataset provided by WoS database for scientific studies have a great effect. In this sense, this study investigates the "Industrial Relations and Labor" category of WoS as a data source because it is the one of the primary resources in the literature covering the most reputed journals, and presents the structure of this particular literature section comprehensively. The scope of the dataset limited to 28776 articles, which were published from the early 70's to 2018 to reveal the demographics and dynamics of this field. In this framework, the research scope was developed on the areas such as articles, cited articles, authors, countries, cited authors, journals, publishing organizations, research topics, and keywords.

Similar studies in the field, as indicated in the next section, have generally focused on the limited part of Industrial Relations and Labor concepts, and used basic statistics to make a summary reports about the related literature. Comparatively, this study handles a quite larger dataset and provides a holistic view for the characteristics of the research articles in this field with the help of topic modelling as well as other text analytics and network visualizations. To the best of authors' knowledge, this paper presents the first study in open literature up to now in this field.

The paper is organized as follows: Section two, related work, summarizes the basics of scientometrics and also reviews the previous research concerning bibliometrics and bibliographies in field of industrial relations and labor. Section three, materials and methods, describes the objectives and methodology considered within the study along with the tools and application platforms. Section four, results and discussion, explains the quantitative findings and visualizations in comparison with the sample studies from the related literature. Section five concludes the paper.

2. Related Literature

In the relevant literature, there is an assessment that the discipline of industrial relations, which includes all dimensions of the employment relation, is broadly composed of two main areas. These basic areas are management of labor and collective bargaining, and methods of workforce governance. In the context of these two main areas, the literature has developed primarily in the management field of workers since the mid-1920s, and many authors have adopted the concept of personnel management or personnel administration as a concept covering this field. Between 1960 and 2000, in the management field of the workers, instead of the concept of personnel management, the concept and approach of human resources management started to be adopted. The debate over the disintegration between the disciplines of Human Resources Management and Industrial Relations, which broke or weakened in the 1970s and 1980s, came to the fore in the 1990s (Kaufman, 2002). It is not surprising that the scientific researches carried out in this area are very intensive due to constant changes in organizations according to socioeconomic conditions and technological developments.

With the rise of the methodologies such as bibliometrics and scientometrics, which analyze bibliometric data, investigating the hidden patterns and characteristics have become possible in order to

reveal the characteristics of the literature and the social networks in a research field. Co-occurrence, co-authorship, and co-citation analyses and related network visualizations can be performed to obtain the research topics and to understand the patterns of citations (Boyack, 2004; Gurzki & Woisetschlaeger, 2017; Hosseini et al. 2018) as well as the metrics to compare or evaluate the performance of journals, authors, or other parties (Patience, Blais, and Bertrand, 2017). Garfield (2009) presented the historical evolution of scientometrics in a time line.

Scientometric and similarly bibliometric studies concerning Industrial Relations and Labor have been conducted from different perspectives in the last decade. Casey and McMillan (2008) investigated citation patterns in The Industrial and Labor Relations Review, the one of the foremost industrial relations journals, by constructing co-citation maps for three different time periods that are 1974-1984, 1985-1995, and 1996-2006, respectively. Salmerón-Manzano and Manzano-Agugliaro (2017) discussed the worldwide contributions to the literature in Labor relations in the period of 1970–2016 and within Scopus Elsevier database through bibliometrics regarding type of documents and main sources.

Fernandez-Alles and Ramos-Rodríguez (2009) analyzed and visualized the networks of relationships between the most-cited studies in Human Resource Management journal in addition to the main areas in the discipline that were identified via factor analysis. McMillan and Casey (2010) examined the top industrial relations journals over the past 40 years to reveal the citation and co-citation patterns at the journal level and the article level in order to reveal the movement from traditional view of industrial relations to a broader "employment relations" view. Lee, Felps, and Baruch (2014a, 2014b) analyzed the articles about career studies between 1990 and 2012 by using bibliometric mapping techniques in order to obtain a global map of the literature of career. Clusters about career were also constructed in these complementary studies and the top terms were extracted by considering the 50 most highly cited publications from each cluster. Markoulli, Lee, and Felps (2015) reviewed the articles about human resource management published between 1992 and 2013 by using bibliometric mapping and clustering techniques and constructed a scientometric term map for classifying the research area.

Beside studies based the bibliometric and scientometric methods, this research area also involves bibliographic studies where a particular literature section on a certain area within a certain time interval are grouped over different dimensions and the characteristics of these groups are revealed. Especially, the journal *Labor History* appears to have included such bibliographies periodically. Filardo (2001, 2005, 2006, 2007) can be given as examples for these studies. Filardo (2001) categorized the labor studies according to particular titles, e.g. labor movements, family and gender, labor and political action, periods of development, cross-period studies; Filardo (2005) and Filardo (2006) organized the studies according to document types such as dissertations, fictions, histories, monographs, and biographies; and Filardo (2007) grouped the studies regarding different characteristics like geographical, topical, and meta-historical studies. Bibliographic studies just list the selected papers for the particular time intervals by grouping them regarding their subjects.

Similar to the abovementioned studies about scientometrics and bibliometrics in labor and industrial relations, we also aimed at revealing the main research areas and dynamics in the field over the years. Moreover, different from the existing studies, we summarized and visualized those characteristics and demographics in more details by utilizing advanced network visualizations and text analytics and also through broader dataset including more than 28776 articles grouped under the related category of WoS.

3. Methodology

3.1. Scope of the Research

This study focused on investigating the characteristics of the literature about labor and industrial relations comprehensively with the help of scientometrics, and therefore, examined the articles that were published in the literature since the early 1970's to reveal the demographics and dynamics of this field. Through the analyses and visualizations conducted of the articles with the bibliometric dataset, this study aims at revealing the followings:

- The number of publications and average citations per item over the years,
- Academics and journals with high ranking regarding the number of publications and number of citations,
- Demographics related to the countries, institutions, and research areas,
- Network representations that were built regarding co-authorships, co-citations, or other bibliographic relationships, keywords, and clusters on each network,
- Keyword changes over time, topic structure and trends in the abstracts.

The abovementioned outputs also indicate the research questions behind the scope of this research.

3.2. Data Source

This paper reviews the Industrial Relations and Labor category within WoS to obtain the findings listed before. Web of Science (WoS) was handled as a data source because it is one of the primary resources in the literature covering the most reputed journals. WoS Database hosts journals, which were ranked according to particular indexes such as Arts & Humanities Citation Index (A&HCI), Science Citation Index (SCI) Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Emerging Sources Citation Index (ESCI). As of August 30, 2018, Industrial Relations and Labor category of WoS covers 68 journals and 28776 articles in the related field, which can be considered as a representative data source to identify the dynamics in the field.

3.3. Dataset Description

We conducted the article search in August 2018, within the core collection of the Web of Science (WoS) and in the Industrial Relations and Labor Category, between January 1, 1975, and August 30, 2018. The resulting record content included the full records and cited references in plain text and tab-delimited (for windows) file format.

As a result of the search in WoS "Industrial Relations & Labor" category, we reached 58056 documents in different types, i.e. Articles (29784, 51.30%), Book Reviews (17787, 30.63 %), Proceeding Papers (6134, 10.56%), Editorial Materials (2698,4.64%), Reviews (886,1.52%), Notes (796, 1.37%), Letters (172, 0.29%), News Items (125, 0.21%), Biographical Items (123, 0.21%), Correction Additions (91, 0.15%), Corrections (90, 0.15%), Poetry (84, 0.14%), Discussions (70, 0.12%), Reprints (59, 0.10%), Items about an Individual (52, 0.09%), Bibliographies (40, 0.06%), Meeting Abstracts (21, 0.03%), Book Chapters (17, 0.02%), Chronologies (12, 0.02%), Software Reviews (11, 0.01%), Film Reviews (10, 0.01%), Record Reviews (2, 0.01%), Art Exhibit Reviews (1, 0.01%), and Excerpts (1,0.01%), respectively.

Since the scope of the research is limited to the articles in the list above, we considered 29784 articles as a raw dataset. Due to the fact that a paper can be classified under multiple document types, this raw dataset was examined again to find out other types. As a result, 993 proceeding papers and 15 book chapters were found in the article list, and then discarded them from the dataset in order to focus on the research articles published in journals.

3.4. Techniques and Tools Used in the Analyses

The dataset was exported as a plaintext file and stored a relational database designed on Oracle platform by using the Hypertext Preprocessor Programming (PHP) coding in order to perform customized analyses on particular subsets obtained over queries. The returned values in queries were also saved as spreadsheets or in the form of comma-separated variables (CSV).

Bibliometric mapping was used which is a quantitative approach to visualize various bibliometric aspects of the papers performed in the form of different networks. In this case, these attempts resulted in scientific landscapes, used for macro-level analysis, and bibliometric networks to present co-occurrences of keywords, co-authorships and co-citations. For implementing the bibliometric mapping, VOSviewer software package (Van Eck and Waltman 2013; VOSviewer 2018) was used, i.e. an application software platform for analyzing and visualizing large bibliographic datasets. Besides VOSviewer, one can use various different software packages to analyze bibliometric data especially for revealing social networks (Al, Sezen, and Soydal, 2012).

Further analysis to find out the content characteristics of the papers, this paper presents a topic model. A topic is a distribution over a set of words, and topic modeling techniques evaluate each document as a combination of topics. In this sense, topics constitute the semantic structure in the text. We used this structure to emphasize the basic concepts in the papers as well as the paper categories regarding the common topic structures in the literature. In this context, we used Python codes including Tethne, NLTK, and Mallet libraries for developing a topic model via Latent Dirichlet Allocation (LDA) that is a popular topic modelling approach in text mining (Blei, Ng, and Jordan 2003; Blei and Lafferty 2009; Tethne 2018; Mallet 2018). The selected python libraries also produced the topic statistics by years, thus, LDA results provided insights from the content of the articles by highlighting the main topics that appeared in the related studies as well as the topic trends by time.

4. Results

4.1. Trends in the Number of Articles by Years and Research Intensity

As one can see from Figure 1 that the number of articles follows an increasing trend. Even if there is a decreasing trend in 2018, this situation is due to not completing the year yet. The total 28776 articles cited 238964 sources in their reference list, and 11068 articles in the data set were cited for more than five times.

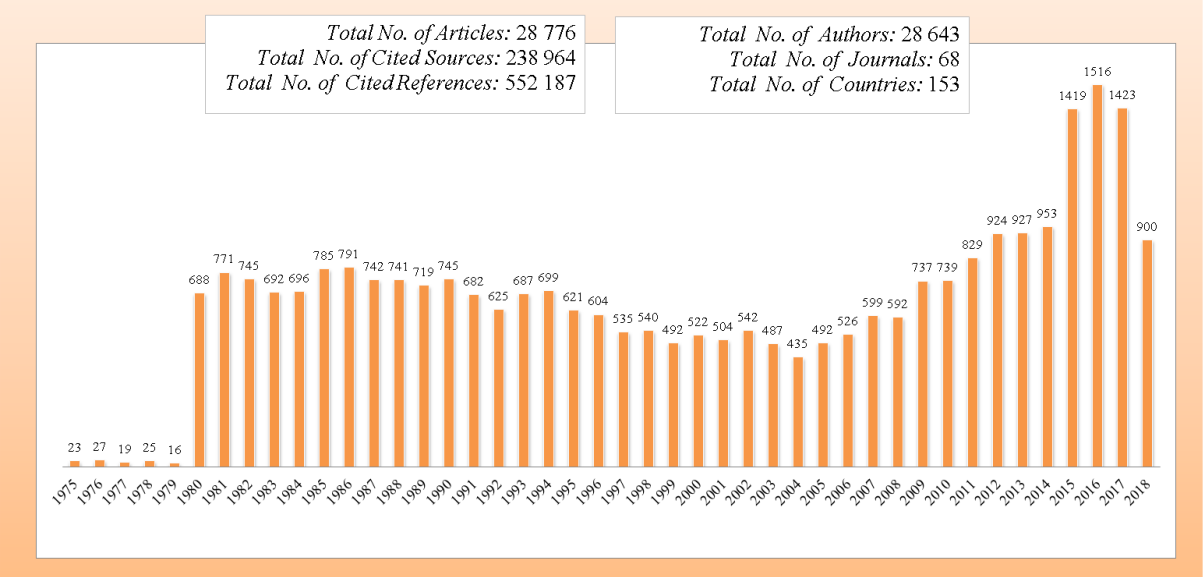


Fig 1. Article Counts by Years

4.2. Authors, Journal Patterns, and the Most Cited Articles in the Field

According to the most cited 15 articles that are listed in Table 1, top two articles were published in Industrial and Labor Relations Review written by MacDuffie (1995) and Osterman (1994) and there are also two more articles from this journal in the list covering 27% of the citations of the most cited twenty articles for the studied years. Table 2 also lists the top 20 authors that have contributed to the field. Besides, Journal of Labor Economics received 37% of the total number of citations, and The Journal of Human Resources received 36% of the citations in the list, respectively. The most cited article, "Human-Resource Bundles and Manufacturing Performance - Organizational Logic and Flexible Production Systems in The World Auto Industry" (MacDuffie, 1995), takes place in the journal, Manufacturing Industrial Labor Relations Review, in the ninth place in the list of journals published in the field.

Table 3 lists the top 15 journals having the highest publication rate from 28776 articles published in 68 journals classified under Industrıal Relations and Labor category.

DOI:10.4026/isguc.634391

2019 Cilt/Vol: 21/Num:3 Sayfa/Page: 39-64

Table 1. The Top-15 Most Cited Articles in the Related Field

Rank	Cited Reference	Journal	5 Year Impact Factor	Year	Authors	No. of Citations
1	Human-Resource Bundles and Manufacturing Performance - Organizational Logic and Flexible Production Systems in The World Auto Industry	Industrial & Labor Relations Review	1.559	1995	MacDuffie, JP	1434
2	What Makes An Entrepreneur?	Journal of Labor Economics	4.358	1998	Blanchflower, DG; Oswald, AJ	774
3	How Common is Workplace Transformation and Who Adopts It	Industrial & Labor Relations Review	1.559	1994	Osterman, P	756
4	Human-Capital and The Rise And Fall of Families	Journal of Labor Economics	4.358	1986	Becker, GS; Tomes, N	607
5	Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants	Journal of Labor Economics	4.358	1985	Borjas, GJ	606
6	Intrahousehold Resource-Allocation - An Inferential Approach	Journal of Human Resources	4.921	1990	Thomas, D	542
7	An Overview of The Health and Retirement Study	Journal of Human Resources	4.921	1995	Juster, FT; Suzman, R	518
8	Human-Capital, Effort, and The Sexual Division of Labor	Journal of Labor Economics	4.358	1985	Becker, GS	499
9	Recent Advances in Quantile Regression Models - A Practical Guideline for Empirical Research	Journal of Human Resources	4.921	1998	Buchinsky, M	496
10	Immigrant Inflows, Native Outflows, and The Local Labor Market Impacts of Higher Immigration	Journal of Labor Economics	4.358	2001	Card, D	462
11	Employers Discriminatory Behavior and The Estimation of Wage Discrimination	Journal of Human Resources	4.921	1988	Neumark, D	456
12	The Impact of Obesity on Wages	Journal of Human Resources	4.921	2004	Cawley, J	450
13	Cities and Skills	Journal of Labor Economics	4.358	2001	Glaeser, EL; Mare, DC	446
14	The Impact of The Mariel Boatlift on the Miami Labor-Market	Industrial & Labor Relations Review	1.559	1990	Card, D	421
15	Wealthier is Healthier	Journal of Human Resources	4.921	1996	Pritchett, L; Summers, LH	416

ISSN: 2148-9874

Table 2. The First 20 Authors Referenced by the Researchers

Rank	Authors	Country	The Most Frequent Collaborations	No. of Citations	No. of Articles	Average No. of Citations	28776%
1	Addison JT	USA	Germany (21) -Portugal (21)	1061	63	16.84	0.21
2	Neumark D	USA	Germany (3)	3019	47	64.23	0.16
3	Dilts DA	USA	-	76	46	1.65	0.16
4	Shultz PT	USA	-	1	45	0.02	0.15
5	Gunderson M	Canada	USA (5)	386	44	8.77	0.15
6	Kandel WL	USA	-	31	43	0.72	0.14
7	Kaufman BE	USA	Australia (21)	622	42	14.81	0.14
8	Heywood JS	USA	England (11)	622	39	15.95	0.13
9	Fiorito J	USA	England (5)	637	35	18.20	0.12
10	Masters MF	USA	Canada (1)	253	35	7.23	0.12
11	Hirsch BT	USA	Germany (5)	1563	34	45.97	0.11
12	Sand RH	USA	-	5	33	0.15	0.11
13	Beaumont PB	Scotland	England (6)	106	32	3.31	0.11
14	Green F	England	Galler (10)	805	32	25.16	0.11
15	Gauvin M	Canada	-	1	31	0.03	0.10
16	Heery E	Galler	England (16)	384	31	12.39	0.10
17	Kahn LM	USA	Germany (2)	1377	31	44.42	0.10
18	Delaney JT	USA	Canada (1)	1383	30	415	0.10
19	Wiatrowski WJ	USA	-	117	30	3.9	0.10
20	Wilkinson A	Australia	England (14)	562	30	18.73	0.10

DOI:10.4026/isguc.634391

Table 3. Top 15 Journals in the Field

Rank	Source Titles	Country	5 Year Impact Factor	Research Domain	No. of Articles	28776 %
1	Monthly Labor Review	USA	0.59	Business & Economics	2228	7.74
2	Public Personnel Management	USA	1.215	Business & Economics ; Public Administration	1313	4.56
3	Personnel Review	ENGLAND	1.942	Business & Economics; Psychology	1294	4.49
4	Labor Law Journal	USA	-	Business & Economics; Government & Law	1287	4.47
5	Relations Industrielles Industrial Relations	CANADA	0.528	Business & Economics	1168	4.05
6	Journal of Human Resources	USA	4.921	Business & Economics	1141	3.96
7	Journal of Labor Research	USA	0.595	Business & Economics	1092	3.79
8	International Labour Review	USA	1.151	Business & Economics	1086	3.77
9	Industrial Labor Relations Review	USA	1.559	Business & Economics	1054	3.66
10	Journal of Labor Economics	USA	4.358	Business & Economics	1034	3.59
11	Work Employment And Society	ENGLAND	2.799	Business & Economics; Sociology	991	3.44
12	Industrial Relations	USA	1.629	Business & Economics	984	3.41
13	British Journal of Industrial Relations	USA	2.285	Business & Economics	957	3.32
14	International Journal of Manpower	ENGLAND	1.085	Business & Economics	910	3.16
15	Personnel	USA	-	Business & Economics; Psychology	901	3.13

The citation connections as networks among the journals and authors were extracted as exhibited according to overlay visualization in Figure 2.

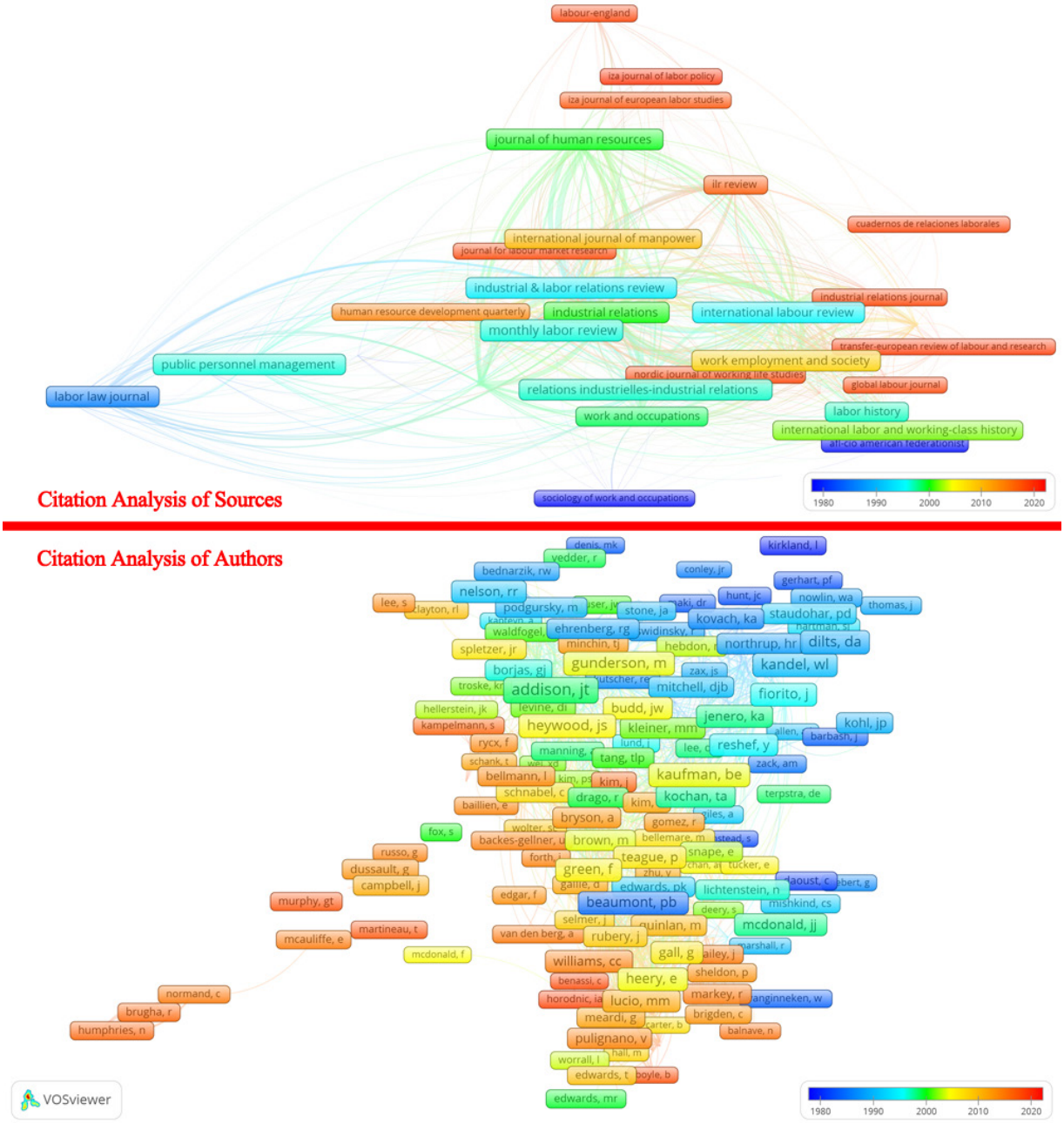


Fig 2. Citation Analysis Overlay Visualization by Years

4.3. Countries/ Territories

The articles in the dataset contain records from 153 countries, however, 1852 records (6.436%) do not contain a data in the country field. The country rankings are given in Table 4.

Table 4. Top 25 Countries in the Related Subject

Rank	Country	The Most Frequent Collaborations	No. of Articles	28776%
1	USA	Canada (246)	14229	49.44
2	England	USA (223)	3277	11.38
3	Canada	USA (246)	2233	7.76
4	Australia	England (130)	1696	5.89
5	Germany	USA (162)	1137	3.95
6	France	England (61)	638	2.21
7	Switzerland	USA (39)	568	1.97
8	Netherlands	England (46)	537	1.86
9	Spain	England (43)	448	1.55
10	Scotland	England (106)	422	1.46
11	Sweden	USA (26)	410	1.42
12	China	USA (68)	328	1.14
13	Italy	England (30)	312	1.08
14	Belgium	Hollanda (34)	286	0.99
15	Galler	England (116)	275	0.95
16	Israel	USA (64)	263	0.91
17	Ireland	England (46)	252	0.87
18	Denmark	Germany (20)	233	0.81
19	Norway	USA (23)	219	0.76
20	New Zealand	England (26)	212	0.73
21	South Korea	USA (75)	204	0.70
22	India	USA (23)	177	0.61
23	Brasil	USA (16)	176	0.61
24	South Africa	USA (21)	174	0.60
25	Finland	USA (14)	151	0.52

The first five countries contributing to this area are the USA, UK, Canada, Australia, and Germany (Table 4). USA produced approximately 50% of the articles in the field. United Kingdom and Canada are followers of USA with 11.4% and with 7.8%. By the way, compared to its population, the 300 academic articles written are a very small figure for China, the production base of the world.

Naturally, many authors from different countries work together to conduct such research attempts. In this regard, Figure 3 presents the position of 88 countries on a network emphasizing the collaborations among them, which published more than five articles having at least one citations.

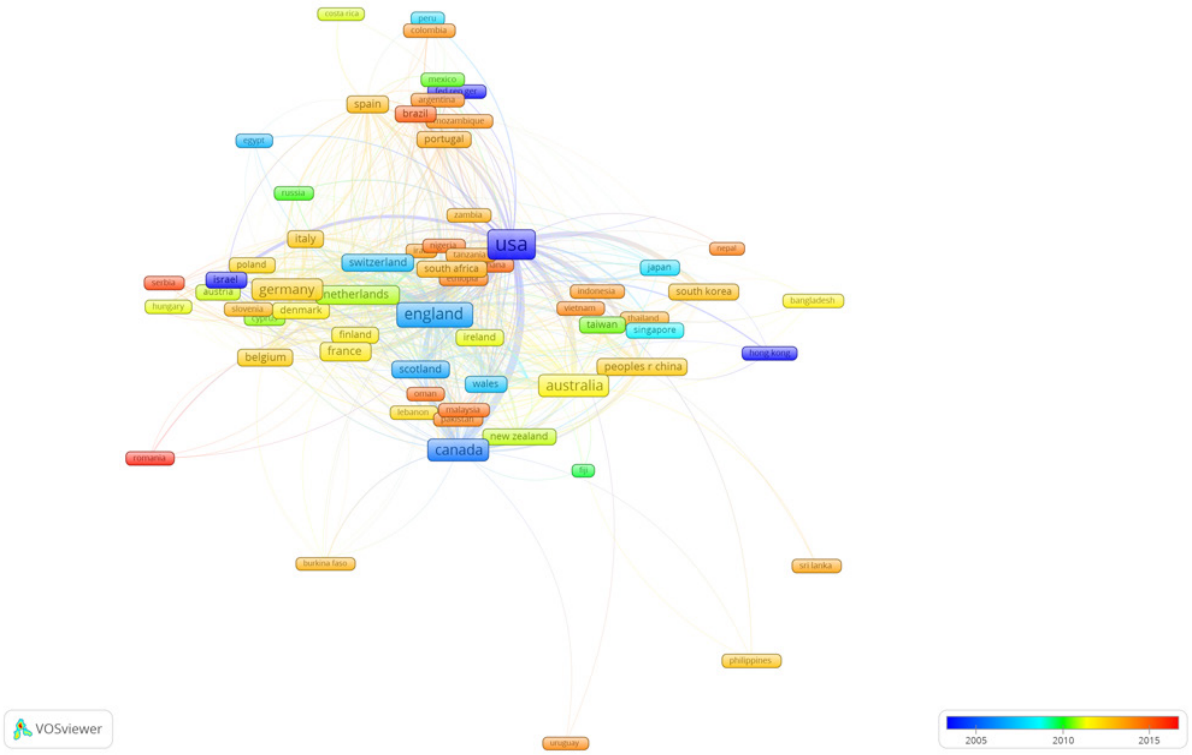


Fig 3. Co-Authorship Country Analysis Overlay Visualizations

4.4. Institutions

Among the most contributing organizations, the Bureau of Labor Statistics, Cornell University, National Bureau of Economic Research, International Labor of Organization are at the forefront as listed in Table 5.

Table 5. The Most Productive Institutions in This Field

Rank	Organizations	No. of Articles	28776%
1	US Bur Labor Stat	1426	4.95
2	Natl Bur Econ Res	340	1.18
3	Cornell Univ	339	1.17
4	Univ Wisconsin	261	0.90
5	Univ Warwick	250	0.86
6	Univ Sydney	247	0.85
7	Univ Illinois	246	0.85
8	Univ Toronto	225	0.78
9	Harvard Univ	214	0.74
10	Univ Calif Berkeley	214	0.74
11	Rutgers State Univ	209	0.72
12	Int Labour Off	207	0.71
13	Univ Michigan	200	0.69
14	Univ Montreal	198	0.68
15	Columbia Univ	195	0.67

Rank	Organizations	No. of Articles	28776%
16	Univ Manchester	189	0.65
17	Univ Minnesota	188	0.65
18	Univ Laval	174	0.60
19	Michigan State Univ	173	0.60
20	Univ Penn	173	0.60
21	Univ Calif Los Angeles	169	0.58
22	Univ N Carolina	169	0.58
23	Penn State Univ	165	0.57
24	MIT	161	0.55
25	Univ Massachusetts	158	0.54

28776 records were published in 10.96% American, 2.12% in the UK, 2.08% in Canadian and 0.84% in Australian universities. This is not surprising because the United States and England are the countries where industrialization is the most advanced and the countries of industrial revolution was started. Canada and Australia are the countries, which have migrant workers. These are significant subjects, which contributes to the number of articles.

4.5. Research Areas

Table 6 indicates the most frequent terms selected as the research area field in the database. These terms highlights the major subjects and areas of the labor and Industrial Relations studies.

Table 6. The Distribution of the Articles in Web of Science Categories

Rank	Web of Science Categories	No. of Articles	28776%
1	Industrial Relations Labor	28776	100.00
2	Economics	4493	15.61
3	Management	3355	11.65
4	History	3037	10.55
5	Law	2552	8.86
6	Public Administration	1823	6.33
7	History of Social Sciences	1662	5.77
8	Sociology	1605	5.57
9	Psychology Applied	1489	5.17
10	Psychology	901	3.13
11	Social Sciences Interdisciplinary	784	2.72
12	Health Policy Services	584	2.02
13	Political Science	144	0.50
14	Geriatrics Gerontology	111	0.38
15	Gerontology	111	0.38
16	Education Educational Research	104	0.36

After having undergone many changes and transformations, today, Industrial Relations's current subjects of the field include labor relations, collective bargaining, employee relations, employment relations, union-management relations, labor economics, industrial psychology, industrial sociology, labor law, labor history, industrial relations theory, labor organizations, industrial relations management, collective bargaining and negotiations, industrial conflict (strikes); grievance procedures, arbitration and mediation. Moreover, industrial relations and labor includes human resources field as a subgroup with the terms of training and development, workforce diversity, compensation, selection and staffing, pensions, safety, minimum wages, gender discrimination on work. As a result, Industrial Relations study areas are changing from economics to sociology to law. This situation is quite natural and is caused by Industrial Relations's being a multidisciplinary area.

4.6. Keyword Distributions and Topic Trends

Co-occurrence networks of author keywords were both constructed based on years and subject clusters in Figure 4. The words in this network were the keywords repeated at least ten times within the dataset.

The network based upon time-scale (Figure 4a) exhibits the most frequent keywords by years via colors and this network can be considered as the heat map of the field regarding the related keywords.

Figure 4b presents the same group of keywords but in this graph the colors refer to the clusters, which were mined based on the similarities and associations among the keywords of the articles. In total, we obtained nine clusters through the keywords, which were repeated at least ten times in the dataset. The most visible clusters in the network can be seen as the studies based upon employee behaviors in organizations (red); historical and socio-economic studies investigating migration (yellow); workforce and the status of worker class (green); health sector and health workforce (blue), labor legislation and dispute (light brown), human resource development and related studies (red). These clusters followed by the others related to the policy development, councils, and economic issues.

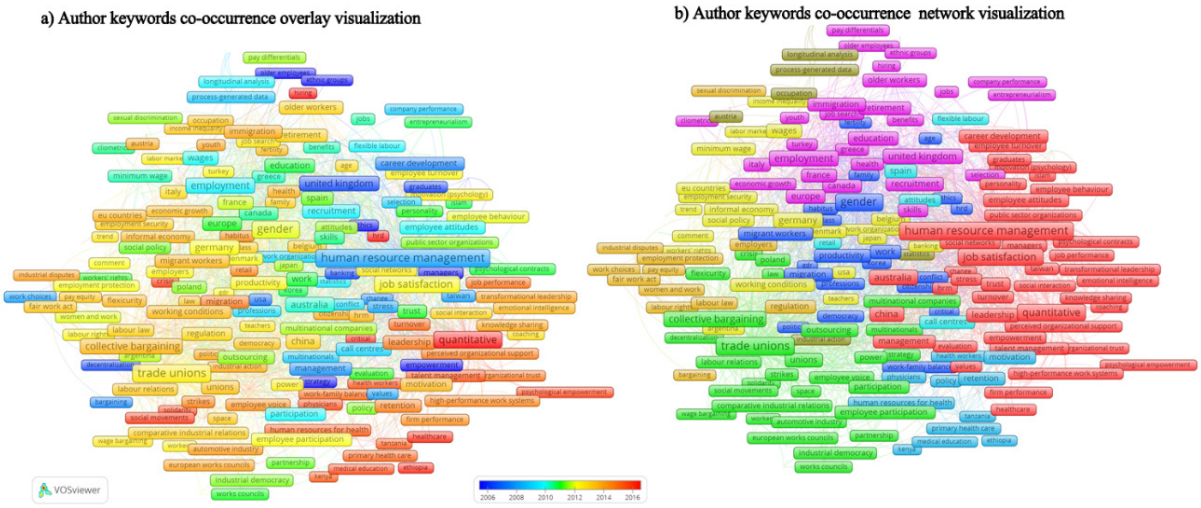


Fig. 4 Author Keywords Analysis

We developed a topic model (10 topics) based upon LDA by considering the abstracts and titles. The topic model produced mainstream subjects in parallel to the clusters in Figure 4. Through this model, we could also obtain the popularity of the topics by years when calculations of LDA are performed dynamically with respect to years via the Tethne library of Python (Figure 5). Figure 5 describes

the topic contents in more details than the explanations for the co-occurrence network given in Figure 4 due to availability of comprehensive title and abstract sentences concerning the content of the research.

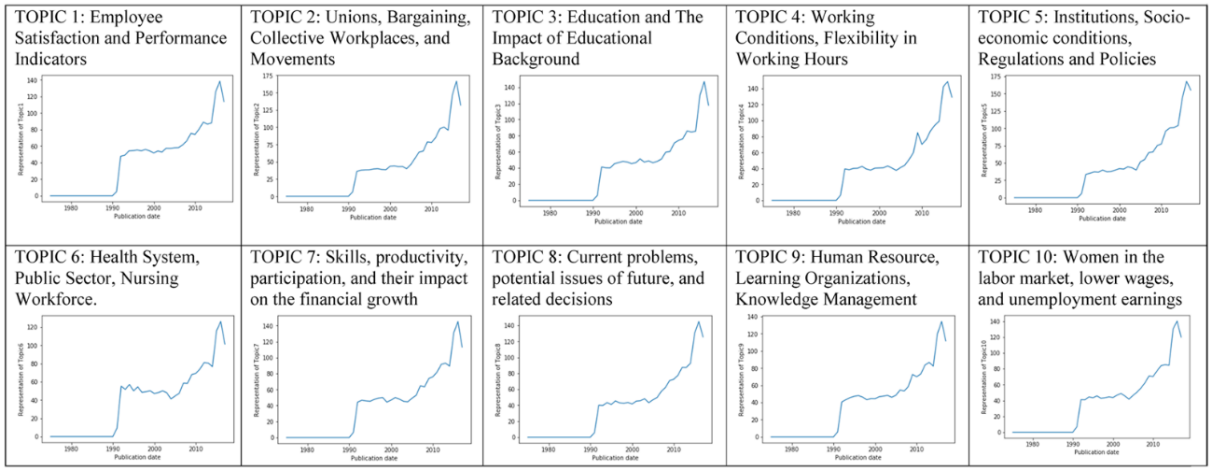


Fig. 5 Topics and Topic Popularities by Years

These topics are also consistent with the basic theoretical background of the field.

5. Conclusion and Discussion

Industrial relations and Labor, as a whole, is a matter of considerable importance in the literature where hundreds of papers are published every year. This is an intensive area, which the studies such as review, systematic review, bibliographic and bibliometric studies can facilitate the follow-up of publications, helping to organize the researches of academics, and thus keep on highlighting future directions in this field. In this regard, this paper presented such a research and particular findings from the related literature covered by the Industrial Relations and Labor category of Web of Science. Findings were obtained through the method of scientometrics and bibliometrics, the methodology combining statistics, text analytics, and network analysis to visualize the characteristics of a literature section through bibliometric data. The analyses in the scope of these methodologies induced scientific landscapes, journal statistics, demographics, and bibliometric networks to present co-occurrences of keywords, co-authorships and co-citations.

In recent years, while there have been comments that "industrial relations is in the trouble" (Piore, 2011) or " has arrived at a cul-de-sac" (Arthurs, 2014); some authors (Kaufman and Gall, 2015) have advocated the opposite. Although the number of research articles has declined in 2003 and 2004, these numbers have been climbing again since 2006, moreover, after 2014, the slope is rising further (Figure 1). The reason for the decrease in 2018 is that the data set does not include all articles in 2018. This situation is in the opposite direction to Piore's thought.

The most cited article in the field (1434 citations) was found to be "Human-Resource Bundles and Manufacturing Performance - Organizational Logic and Flexible Production Systems in The World Auto Industry" published in the Industrial & Labor Relations Review in 1995. JT Addison is the most cited author with 1061 citations. The journal with the highest number of publications (2228) in the field was the Monthly Labor Review published in the USA. 49.44% of the articles were published in USA, 11% in England and 7.76% in Canada. Turkey could not enter in the first 25 countries regarding the number of papers, and this finding indicated that the WoS directory does not have a large number of

studies from Turkey. However, when we looked at the co-authorship relations of Figure 3 regarding countries, it showed that Turkey has acquired orange colour, which means that Turkish writers have started to become more active in this field after 2010.

Summary statistics in the tables and the relationships in the networks indicated particular countries such as US and England and the leading institutions of these countries. The reasons behind these findings rely on the historical developments in these countries. The industrial revolutions that emerged in the 19th and 20th centuries created a space with the participation of specialists from different fields to organize "work" with new and changing labor / employer relations. Commons in the US and Webb in England can be considered as pioneers in the field (Hyman, 1995) that have been creating inspirations for the researchers of the field in the recent years such as Kauffman and Gregor (2015).

After World War II, by the means of changing labor management relations and production styles, there was a high demand for labor. Industrialization, along with demand for better conditions, has also brought issues of unionization and collective bargaining. After the 1980s, covering large portion of the timespan handled in this study, profitability and efficiency began to gain importance. The computer-aided industrial revolution, changes in the production structure and production relations have brought about changes in working patterns (flexible working hours). With these changes, more social issues such as social exclusion, equal pay for equal work, decent work, education and employment relations, have gained importance. In those years, Dunlop and his work *Industrial Relations Systems* (Dunlop 1958), Kochan and his book *Collective Bargaining and Industrial Relations* (Kochan, 1980) and Kauffman with many important studies have been the pioneers and the milestones of the Industrial Relations field. After 2010, the area gained an important concept, which is about the emerging industrial revolution and knowledge management and other dynamics in the organizations have reflected to the studies in the field.

USA can be regarded as the cradle of industrial relations and labor. USA holds the pulse of labor market with Bureau of Labor Statistics (BLS) since 1945. After the First World War, USA, having to plan the best manpower in its hand, had begun to work to regulate the labor market by using economic data. United Kingdom and Canada are followers of USA. Fundamental rights and freedoms, including freedom of labor, are the forefront of these countries since the 1700s. From a different perspective, these countries are the countries in which industrial revolutions originated. By the way, compared to its population, the 300 academic articles written are a very small figure for China, the production base of the world. Despite the activity of the working life, it is thought that the number of articles written about Industrial Relations can be caused by the lack of management style and language constraint.

BLS is the leading organization producing and publishing research in this field. The BLS of the U.S. Department of Labor is the principal federal agency responsible for measuring labor market activity, working conditions, and price changes in the economy and its mission is to collect, analyze, and disseminate essential economic information to support public and private decision making. BLS is an institution that guides the American labor market, tracks economic developments numerically, surveys and predictions with the help of national accounts. The Institute's work is preparing reports that guide policymakers, strategists who prepare action plans, universities, schools and career choices, publish articles (BLS, 2018).

Cornell University, the second-ranked, was founded in 1865 and School of Industrial and Labor Relations (ILR) was founded in 1945. ILR studies include human resource management; labor-management relations; labor economics; organizational behavior; international and comparative labor; labor relations, labor law and history; conflict resolution; management development; diversity management;

employment and disability; and social statistics. It has many faculties, institutes and research centers such as Center for Advanced Human Resource Studies, Cornell Higher Education Research Institute, K. Lisa Yang and Hock E. Tan Institute on Employment and Disability Institute for Compensation Studies, Institute for Workplace Studies, Labor Dynamics Institute. All these institutions produce scientific articles in the field of Industrial and Labor Relations (Cornell University, 2018).

National Bureau of Economic Research (NBER), the third-ranked, founded in 1920, is a non-profit, non- partisan organization that leads USA citizens about economic research that is focus areas include developing new statistical measurements, estimating quantitative models of economic behavior, and analyzing the effects of public policies. (NBER, 2018).

International Labor of Organization (ILO) is an organization that develops standards, conducts researches and regulations on work and labor issues in the world (Standing, 2008: 355). As the world's leading organization, ILO is at 12th ranked and the first ranked institution is BLS. This shows that BLS, as a local institution, is more successful in producing academic publications than ILO, as an international institution. The first institution that contributed to the relevant literature is the American Bureau of Labor Statistics, which produced almost 5% of publications. In fact, this institution has so many publications that the ILO, which is the leading institution in the world in terms of labor force, is in the 12th place. BLS, NVER and ILO are organizations that leads work and labor relations. They are within the first 25 institutions, and these organizations have realized 6.9% of the publications.

At the 4th place is for the University of Wisconsin where the first Industrial Relations course was created in the US in 1920 led by John R. Commons (Kaufman, 1998).

In the field of industrial relations education, there are two main methods in the USA and Canada. These approaches are called sovereign and dependent field models. The sovereign discipline model is the graduate school that has completed its own education unit structuring and that gives the graduate degree. Industrial relations institutes and research centers that do not offer a bachelor's degree but work as specialist at the graduate level are called dependent disciplines. In the US, the universities pursuing the sovereign model are Cornell University, which placed in the second rank in the institutions list. Similarly, Illinois University (6th) and Michigan University (13th) appeared in the tables. MIT (22nd) and Los Angeles California University (18th) have applied dependent model. In Canada, sovereign discipline model has been used by the context of school, department, program, and center in the universities. For example, University of Toronto (8th), University of Montreal (14th), and the Laval University (22nd) were observed in the findings (Chaykowski and Weber, 1993, p. 89-91).

The most visible clusters in the co-occurrence network of keywords indicated that the studies based upon employee behaviors in organizations; historical and socio-economic studies investigating migration; workforce and the status of worker class; health sector and health workforce, labor legislation and dispute, human resource development and related studies; these clusters followed by the others related to the policy development, councils, and economic issues. The topics obtained via LDA are also consistent with the basic theoretical background of the field and the keyword clusters in the keyword co-occurrences. When we look at the distribution of the concept of labor economics and labor throughout the years, after the 1850s, there are many notions like industrial revolution, mass migration, changing working conditions, mass production, more workers, more employees and surplus of labor.

Co-occurrences of keywords in Figure 4a also highlighted the recent keywords with hot colors, which reveals the current topics in the related literature. The keywords such as *economics*, *corporate culture*, *retailing*, *management development*, *non-union employee representation* were more common before 2005 whereas the keywords, *management techniques, career development, human resource management,*

labor market, organizational change, organizational restructuring, employment were observed within the articles in the range of 2005-2010. As of 2010, the concepts, *human resource development, employee involvement, atypical employment, entrepreneuralism, denazification, inflation, employee attitudes, employment protection, flexibility, effectiveness,* have started to be more frequent in addition to the case studies of many countries. Coming to the last decade, the subjects comprising the keywords, *job insecurity, migration, economic crisis, wage inequality, task performance, productivity, job quality, health policy, occupational health, talent management, leadership style, unionism, cold war, neoliberalism, public service motivation* were obtained as the hot topics observed in the selected literature.

As mentioned in the related work section, it is possible to come across bibliometric and bibliographic studies in this area. For example, Casey and McMillan' s study (2008) divided into three 11-year periods from 1974-2016, with quoted author, journal and co-citation analysis being carried out using bibliometric technique, only in the journal of Industrial & Labor Relations Review. This journal have still had the most cited articles in the field, which can be seen from our summary tables. Comparatively, our study handled all related journals in WoS, which can be considered as a representative data of the field. Salmerón-Manzano and Manzano-Agugliaro (2017) reported similar findings for the countries, thus USA, England and Canada have kept the same order since 2017. In their study, the types of document, languages, countries and institutions, subject categories, author and index keywords were given as only percentages and graphs. In the institutions category, that study handled only the universities where as our study also revealed the other most productive institutions in the literature such as ILO and BLS. Besides, we utilized advanced techniques to highlight the co-authorships and co-occurrences of keywords, and corresponding network visualizations.

Consecutively, we handled a broader dataset covering all research articles in the related research category of WoS as a whole, and revealed the characteristics and demographics of the field in more details by utilizing advanced network visualizations and text analytics in the scope of the methodology of scientometrics and bibliometrics. Furthermore, we investigated topic structures in the abstracts with the help of advanced text analytics, i.e. topic modelling with LDA, to emphasize the basic concepts in the papers as well as the paper categories regarding the common topic structures in the related literature. The tools we used also produced the popularity of each topic by the years in the selected time span. In addition, we have interpreted the subject in line with the historical development process and general information in the field.

As a result, this study shed light on the main research areas and dynamics in the field regarding years and also various dimensions including authors, journals, citation metrics, papers, institutions, countries, keywords, and topics by using quantitative techniques. It is not only about with numerical data but also with the information of dynamics of Industrial Relations. Such analytical findings would support the researchers in this field and shed light on the future studies.

REFERENCES

Al, U., Sezen, U., & Soydal, İ. (2012). Türkiye'nin Bilimsel Yayınlarının Sosyal Ağ Analizi Yöntemiyle Değerlendirilmesi. Accessed at http://www.bby.hacettepe.edu.tr/bilgibelge/file/SOBAG-110K044.pdf (July 23, 2018).

Arthurs, H. (2014). From theory and research to policy and practice in work and employment- and beyond? *Relations Industrielles/Industrial Relations,* 69(2), 423-446.

Sociologie des Organisations (SciencesPo. and CNRS). 19 rue Amélie 75 007, Paris – France.

Bellemare, G. (2000). End users: Actors in the ındustrial relations system? *British Journal of Industrial Relations,* 38(3), 383-405.

Blei, D. M., & Lafferty, J.D. (2009). Topic models. *Text Mining: Classification, Clustering, and Applications*. Ashok Srivastava, Mehran Sahami (Eds.): 101-124. CRC Press. Taylor & Francis Group: Boca Raton. ISBN 978-1-4200-5940-3.

Blei, D. M., Andrew Y. N., & Jordan, M.I. (2003). Latent Dirichlet Allocation. *Journal of Machine Learning Research,* 3, 993–1022.

BLS. 2018. About the U.S. Bureau of Labor Statistics. *BLS Information*. Accessed at https://www.bls.gov/bls/infohome.htm (February 16, 2018).

Boyack, K.W. (2004). Mapping knowledge domains: characterizing PNAS. *Proceedings of the National Academy of Sciences, 101*(*suppl 1*), 5192-5199.

Casey, D.L., & McMillan, G.S. (2008). Identifying the "Invisible Colleges" of the Industrial & Labor Relations Review: A bibliometric approach. *Industrial and Labor Relations Review,* 62 (1), 126 – 132. DOI. 10.1177/001979390806200107.

Chaykowski, R., & Weber, C. (1993). Alternative models of industrial relations graduate programs in Canadian and U.S. universities. *Relations Industrielles,* 48(1), 86-100.

Cornell University. 2018. *Cornell University*. Accessed at https://www.cornell.edu/about/ (January 05, 2018).

Dunlop, J. (1958). *Industrial Relations Systems*. New York: Holt, Rinehart and Winston.

Encylopedia of Brittanica. (2018). Industrial relations. *Encylopedia of Brittanica*. Accessed at https://www.britannica.com/topic/industrial-relations (January 15, 2018).

Fernandez-Alles, M., & Ramos-Rodríguez, A. (2009). Intellectual structure of human resources management research: A bibliometric analysis of the journal Human Resource Management, 1985–2005. *Journal of the Association for Information Science and Technology,* 60(1), 161–175. DOI:10.1002/asi.20947.

Filardo, P. M. (2001). Labor History bibliography, 2000. *Labor History, 42*(4), 397-425.

Filardo, P. M. (2005). Labor History bibliography 2004. *Labor History, 46*(3), 329-345.

Filardo, P. M. (2007). Labor History bibliography 2006. *Labor History,* 48(4), 429-456.

Filardo, P. M. (2006). Labor History bibliography 2005. *Labor History,* 47(3), 361-395.

Frege, C. (2008). The history of industrial relations as a field of study. P. Blyton, N. Bacon, F. Jack, & H. Edmund (eds). *The SAGE Handbook of Industrial Relations*: 35. SAGE.

Garfield, E. (2009). From the science of science to scientometrics visualizing the history of science with HistCite software. *Journal of Informetrics,* 3(3), 173-179. DOI: https://doi.org/10.1016/j.joi.2009.03.009.

Gurzki, H., & Woisetschlaeger, D. M. (2017). Mapping the luxury research landscape: A bibliometric citation analysis. *Journal of Business Research*, *7*, 147-166.

Hirsch, J.E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National academy of Sciences,* 102(46), 16569-16572.

Hosseini, M. R., Martek, I., Zavadskas, E. K., Aibinu, A. A., Arashpour, M., & Chileshe, N. (2018). Critical evaluation of off-site construction research: A Scientometric analysis. *Automation in Construction, 87,* 235-247. DOI: https://doi.org/10.1016/j.autcon.2017.12.002.

Hyman, R. (1995). Industrial Relations in Europe: theory and practice. *European Journal of Industrial Relations,* 1(1), 17-46.

ILO. (2018). *ILO Thesaurus*. International Labour Organization. Accessed at http://ilo.multites.net/default-ten.asp (January 12, 2018).

Katz, H. C., Kochan, T.A., & Colvin, A.J. (2017). *An Introduction to Collective Bargaining and Industrial Relations*. Singapore: McGraw Hill International Edition.

Kaufman, B. E. (1993). *The Origins and Evolution of the Field of Industrial Relations in the United States*. Ithaca: ILR Press.

Kaufman, B. E. (1998). Regulation of the employment relationship: The old institutional perspective. *Journal of Economic Behavior & Organization,* 34(3), 349-385.

Kaufman, B. E. (2002). The role of economics and industrial relations in the development of the field of personnel/human resource management. *Management Decision,* 40(10), 962-979.

Kaufman, B. E. (2004). *The Global Evolution of Industrial Relations: Events, Ideas and the IIRA*. Geneva: ILO.

Kaufman, B., & Gall, G. (2015). Advancing industrial relations theory: an analytical synthesis of British-American and pluralist-radical ideas. *Relations industrielles,* 70(3), 407–431.

Kochan, T. A. (1980). *Collective Bargaining and Industrial Relations: From Theory to Policy and Practice*. RD Irwin.

Lee, C.I.S., Felps, W., & Baruch, Y. (2014b). Mapping career studies: a bibliometric analysis. *Academy of Management Proceedings,* 2014(1), DOI: 10.5465/AMBPP.2014.284.

Lee, C.I.S., Felps, W., & Baruch, Y. (2014a). Toward a taxonomy of career studies through bibliometric visualization. *Journal of Vocational Behavior,* 85(3), 339-351. DOI: 10.1016/j.jvb.2014.08.008.

MacDuffie, J. P. (1995). Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *ILR Review,* 48(2), 197-221.

Mallet. (2018). Mallet Tutorial: Generating and visualizing topic models with Tethne and MALLET. Accessed at https://pythonhosted.org/tethne/tutorial.mallet.html (January 10, 2018).

Markoulli, M.P., Lee, C.I.S., & Felps, W. (2017). Mapping HRM: A structural analysis of the HRM field. *Academy of Management Proceedings,* 2017(1), Briarcliff Manor, NY 10510: Academy of Management, 2017. DOI: 10.5465/AMBPP.2015.70.

NBER. (2018). About The NBER. *The National Bureau of Economic Research*. Accessed at http://admin.nber.org/info.html (January 10, 2018).

Osterman, P. (1994). How common is workplace transformation and who adopts it? *ILR Review,* 47(2), 173-188.

Patience, G.S., Patience, C.A., Blais, B., & Bertrand, F. (2017). Citation analysis of scientific categories. *Heliyon,* 3(5), e00300. DOI: 10.1016/j.heliyon.2017.e00300.

Piore, M. J. (2011). Whither industrial relations: Does It have a future in post-industrial society? *British Journal of Industrial Relations,* 49(4), 792-801.

Salmerón-Manzano, E., & Manzano-Agugliaro, F. (2017). Worldwide scientific production indexed by scopus on labour relations. *Publications,* 5(4), 25. doi:10.3390/publications5040025.

Standing, G. (2008). The ILO: an agency for globalization? *Development and Change,* 39(3), 355-384.

Steven McMillan G., & Casey, D.L. (2010). Paradigm shifts in industrial relations: A bibliometric and social network approach, in David Lewin, Bruce E. Kaufman, Paul J. Gollan (ed.) *Advances in Industrial and Labor Relations (Advances in Industrial and Labor Relations, 17*) Emerald Group Publishing Limited: 207-255.

Tethne. (2018). Tethne: bibliographic network analysis in Python. Accessed at https://pythonhosted.org/tethne (January 10, 2018).

Van Eck, N., & Waltman, L. (2013). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics,* 84(2), 523-538. DOI:10.1007/s11192-009-0146.

VOSviewer, (2018). VOSviewer Website. Accessed at http://www.vosviewer.com (July 23, 2018).

View publication stats