

110 Years of Training Transfer Research: A Bibliometric Analysis of Global Research Trends, and Patterns on Training Transfer using the Scopus Database

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Abstract:

The rising demands of gauging training transfer and the abundant wastes of training investment has become a severe concern among the organizations and have stimulated practical research efforts around the globe. The concept of training transfer (TT), as an emerging notion, has received substantial attention due to its sensitivity, scope, and applications in wider fields of studies. Therefore, it becomes necessary to understanding the topics of TT and widening collaborative networks to enhance research development towards integrated efforts. Therefore, the aim of this bibliometric study is to shed light on the global research trend in (TT) area based on the outputs of published research articles between 1909 and 2018. To do so, the present study used the Scopus database to examine the global research trend in TT, leading countries with highest research contribution, the prolific authors, the year in which research on training transfer began, co-authorship among authors and co-occurrence of author's keywords, highly productive journals and the most relevant authors with publication on training transfer. A total of 10,905 research articles was published between 1909-2018 were retrieved. The findings of the study revealed that only 36 % of publication was made in the last hundred years between (1909- 2008) and 64 % of research publications were made between (2009-2018). In conclusion, further studies are highly needed to highlight the importance of training transfer in developing countries, particularly in Asia and Africa.

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1. Introduction

In today's age of globalization and rapid technological advancement, organizations are facing numerous challenges like rival competition, technology change, radical shifts in customer demands and climate changes (Hurt, 2016). These challenges have enormously affected the organization's performance and employees' productivity. Employee training is considered as one of the central and strategic elements of human resource management in an organization to mitigate the effect of these challenges (Bhatti, Mohamed Battour, Pandiyan Kaliani Sundram, & Aini Othman, 2013; Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012). Employees' training is considered a key investment to grab business opportunities (Bell, Tannenbaum, Ford, Noe, & Kraiger, 2017). Employee's training refers to planned and organized effort by the organization in a systematic way to facilitate the employees in job-related competencies so that they can easily perform their job in an efficient manner (Kraiger, 2014).

Keeping in mind the importance of employee training, globally organizations are investing a huge amount in developing their human resources (Crook, Todd, Combs, Woehr, & Ketchen Jr, 2011; Schindler & Burkholder, 2016). For example, in 2013, Canadian organizations have invested an average of \$750 per and U.S. corporations have invested roughly \$ 1248 per employee's training and development (Miller, 2014). Similarly, European Countries organizations have spent an average of 1.6 % of their labor costs on employee training (Eurostat, 2010). Furthermore, the Association for Talent Development annual report 2015 also highlighted that globally organizations have invested \$200 billion on employee training (Association for Talent Development, .2015). Moreover, in an important study by Baldwin, Kevin Ford, and Blume (2017), also confirmed that a sum of approximately \$356 billion was invested in 2015

by the global organizations on the education and training of their employees. This represents the concern that Organizations across the globe have shown a keen interest in the training and development of their employees. Thus, employee training is the most effective and reliable strategy for an organization to improve the employee's skills, knowledge, performance, and productivity (Blume, Ford, Baldwin, & Huang, 2010).

However, given the importance of training, there is a great debate among training stakeholders regarding training effectiveness (Alvelos, Ferreira, & Bates, 2015; Ritzmann, Hagemann, & Kluge, 2014). In training philosophy, researchers generally used the term training effectiveness and training evaluation in the same context and in the same meaning (Ostroff, 1991). But, Kraiger, Ford, and Salas (1993) distinguish the prominent difference between these two important concepts. He stated that training evaluation generally focuses at the micro-level and more concerned on the measurement of what was learned at different level in a training program and provide bases for determining training effectiveness, whereas, training effectiveness deals at macro level and is more concerned about training results and training success, which generally relies on training transfer. It is now well established from a variety of studies the key role of training transfer in the overall effectiveness of training programs (Aguinis & Kraiger, 2009; Bhatti et al., 2013).

Training transfer is the process in which trainees successfully applied newly learned skills and knowledge at the workplace and used these skills continuously at the workplace (Baldwin & Ford, 1988). But, in a seminal study by Hurt (2016) and Baldwin et al. (2017), it was found that training transfer is low as most employees are failing to transfer their newly learned knowledge and skills at workplaces. Moreover, earlier work of Lim and Morris (2006) and Devos, Dumay, Bonami, Bates, and Holton III (2007) also highlighted that only 10 to 20 percent of training is transferred to

the workplace and Sookhai and Budworth (2010) also stated that estimated skills lost 66 to 90 percent due to poor training transfer. Similarly, Cromwell and Kolb (2004) also underlined that approximately 85 percent of training contents are not transferred to the workplace and these lower training transfer and wastage of skills lost problems are also highlighted in earlier studies (Devos et al., 2007; Georgenson, 1982; Merriam & Leahy, 2005).

More interestingly, in the previous studies, it has been observed that lower training transfer also resulted in wastage of training investment. In this regard, a study by Dhaka, Vatta, and Chayal (2018), stated that a major portion of training investment is wasted due to poor training transfer and study by Laker and Powell (2011) also reported that approximately \$50 billion to \$200 billion annual loss due to poor training transfer. Surprisingly, Lim and Nowell (2014) highlighted that globally only 21 percent of organizations measure the level of training transfer. Therefore, this lower training transfer and wastage of training investment has become a severe problem and justified practical efforts to systematically explore these issues and shed light on a global perspective.

The past three decades have seen rapid advances in the field of training transfer and earlier reviews (Baldwin & Ford, 1988; Baldwin, Ford, & Blume, 2009; Baldwin et al., 2017; Burke & Hutchins, 2008; Cheng & Hampson, 2008; Cheng & Ho, 2001; Grossman & Salas, 2011; Salas & Cannon-Bowers, 2001) and meta-analysis by Colquitt, LePine, and Noe (2000) and Blume et al. (2010) has made a valuable contribution and make training transfer one of the most vital and leading areas of training research. Since these initial reviews and meta-analysis are mostly restricted to limited comparison, shorter time span, fewer databases as a source of data mining. Moreover, these efforts are also restricted in scope and limited to local surveys. Thus these detailed

reviews of the studies on TT in current status in all areas of human endeavor which are very important to understand its wider application feasibility and future research application are still unclear.

We believe that training transfer research will be progressed by better understanding the research trend over a period of time (Sitzmann & Weinhardt, 2017) including how and when the research interest changes or evolve in this field. In our opinion, lower training transfer and lesser return on training investment due to poor training transfer is an evolving phenomenon and a widespread matter. Therefore, a systematic bibliometric study is highly needed that holds the view that our ultimate objective is to expand the research on training transfer understand the training transfer phenomena and global interests in a systematic manner over a period of 110 years from 1909 to 2018.

An abundance of databases is available for data searching. Among them, Scopus database holds a broader coverage in multi-discipline subject area (Bartol, Budimir, Dekleva-Smrekar, Pusnik, & Juznic, 2014; Granda-Orive et al., 2013; Jacso, 2005) and also maintained a wider range of citation and largest abstract database in a wider field of subjects areas (Khudzari, Kurian, Tartakovsky, & Raghavan, 2018). Therefore, by using the Scopus database, researchers in the present study have made an attempt to broaden the research area and include all the research fields and topic which may not available in other databases and have not been yet so far.

The aim of the study is to increase our understanding and knowledge of training transfer by providing a comprehensive overview of the published TT literature in a wider perspective from 1908 to 2018. The focus of such a study is to examine the global research patterns and trends in a detailed manner and provides new insights for researchers, training stakeholders, human

resources professionals, and policymakers in this broader field. The first section of this paper introduces and describes bibliometric methods being used in this study. Then we discuss the key analysis which is being performed based on the data obtained from the Scopus database. Based on the findings of the current study, we recommend future research that can enhance our knowledge and understanding in the field of training transfer.

2. Methods

The current study employed Bibliometric analysis procedures to address the research objectives. It is a quantitative technique for the analysis of published research work and a scientific method that is based on the outputs of the academic literature database to examine the research trends on a specific area or a particular keyword (Khudzari et al., 2018). Moreover, this type of inquiry provides valuable knowledge and evidence for professionals pursuing to evaluate scientific activity (De Bakker, Groenewegen, & Den Hond, 2005).

2.1. Data source and search strategy

The search process was carried out within September 15 and 22, 2019 using the Scopus database. All research articles were included which had been published between 1909 and 2018. The study core theme was research articles containing the keyword “training transfer” or “transfer of training” or “learning transfer” or “transfer of learning” in the title, abstract and keywords. These terms are being used interchangeably in training transfer literature. The first query string produced a total of 12,488 research articles. In order to confirm that retrieved data comprised only empirical research articles with no review articles and meta-analysis, additional phrases were added, which resulted in 1862 review articles and meta-analysis. For further verification, abstracts and full-texts of these 1862 articles were examined and after the

final screening, a total of 1583 review articles and meta-analysis were identified. Lastly, an electronic identifier (EID), a Scopus unique article identifier, of these 1583 articles was noted and added in the final search string (so that they would not appear in the next search results). The final string produced 10,905 research articles relevant to our study and exclude all the irrelevant research articles. Moreover, additional information of relevant articles was retrieved, including publication country, author affiliation, year of publications, h-index, cite score, citation, journal name, prolific authors and their research contribution, institutional information, co-authorship, research sponsor and research subject.

2.2. Data processing and tools

In order to achieve the purposes of the present study, the analysis of data generated from the Scopus database was exported in CSV format. All these files and data were Save as in Microsoft Excel 2016 for the creation of tables and graphs. The highly productive authors, leading journals, research contributions from each country, funding agencies, etc. were ranked according to the publication rates and citations. Furthermore, for co-authorship analysis, author keywords co-occurrence and researcher collaboration analysis, all the citation, bibliographical, and keywords details of all 10,905 research articles were exported in VOSviewer software (1.6.7), which is highly suitable for analyzing and visualizing large bibliometric databases, and complex networks for graphical presentation (Van Eck & Waltman, 2009; VOSviewer, 2017). Lastly, a Java application for HLTA was used to obtain topical hierarchies by using progressive expectation-maximization in HLTA codes (Chen, Zhang, Poon, & Chen, 2016).

2.3. Analysis of co-authorship and co-occurrence

For the purpose of this analysis, all authors leading to 119 countries across the globe with

total research publication 10,905 research articles were included in the VOSviewer. Furthermore, for the co-occurrence of the author's keywords analysis, 17,371 keywords from only 7143 research articles were included and the remaining 3762 articles were excluded because these articles having no keywords information. Moreover, irrelevant information and synonymic of the author's keywords were analyzed manually and adjusted before importing these keywords into VOSviewer. Furthermore, for keywords analysis, a threshold value of the minimum occurrence of a keyword was set 10. Lastly, in order to view the average publication year, the number of occurrences and link strength of the keywords, a network visualization, and overlay visualization mode were selected and the color of a keyword shows the average publication year of the research article in which a keyword occurs.

3. Results and discussion

3.1. Publication growth and research interest from 1909 to 2018

As shown in Fig.1, a total of 10,905 research articles were published between 1909 and 2018. Surprisingly, it was found that the concept of training transfer has received very little intentions in the earlier ear, and just only 150 research articles were published in the first fifty years from a period of 1909-1959. This low interest and publications may be caused by global wars (e.g. 1st world war and 2nd world war) and some other troublesome. After that, there was a rise in research universities across the globe and a steady trend was observed in this research area. Although the first study was conducted in 1909, But, Edwin Fleishman elaborates this concept in an eminent study in 1953, in which he discussed the training transfer concept in a detailed way (Fleishman, 1953). The field of training transfer gained researcher interest from a period of 1960-1980

and 573 publication was recorded in this period. This substantial increase was due to the industrial revolution and the growing application of Human Resource Management at the workplace.

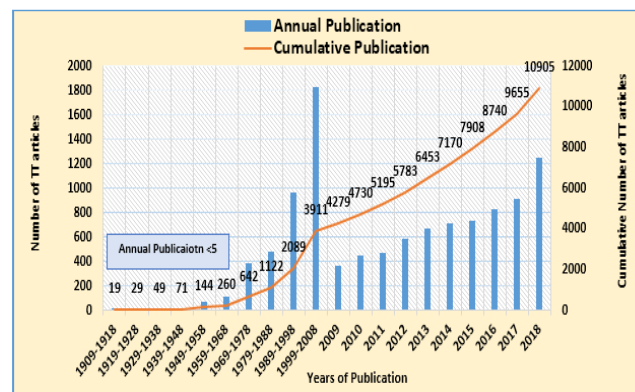


Figure 1: A total of 10905 research articles were published on training transfer from 1909 to 2018. See the online article for the color version of this figure. Source: Scopus.

After a seminal study of Baldwin and Ford (1988) on training transfer, an incremental interest was observed and a total of 1674 articles were published in a period of 1981-2000. Then in the 21st century, there was seen greater research interest and growth in the field of training transfer. Strong interest was observed at the start of 2001 and rapid growth was found in this period. A record of 2333 (21%) was published in the period 2001-2010. To be sure, a series of review articles and Baldwin and Ford training transfer model extensions (e.g. (Baldwin et al., 2009; Burke & Hutchins, 2008; Ford & Weissbein, 1997), an important meta-analysis study by Blume et al. (2010) on training transfer has made training transfer one of the most significant and leading areas of training research. A dramatic increase was noticed from 2011 to 2018, an average annual publication increased by 500 times and a total of 6175 (57%) research articles were published in this time period. More interestingly, highest annual publications 1250 were seen in 2018. Thus, it is expected that the research interest and publication growth will remain to continue in the field of training transfer. However, it is also noticed that a major portion (n = 9324, 86 %) are paid articles and only (n= 1581, 14 %) are open

access research articles. It seems that a wider range of research articles are paid one, users have no access to the information and therefore, we assumed that citation of an article will be increased if it is to be published through an open-access journal type.

Existing research recognized the importance of training transfer in the overall effectiveness of a training program (Bhatti et al., 2013; Blume, Ford, Surface, & Olenick, 2017). A rapid advance in the field of training transfer has been observed in the span of 2010 to 2018, and a series of research groups and scholars across the globe are working actively in various subject areas (Schindler & Burkholder, 2016; Sookhai & Budworth, 2010). This is evidence that top ten subject areas under which major publications were made are as follow: Social sciences (4204 articles), Psychology (3243 articles), Medicine (2030 articles), Business Management and Accounting (1785 articles), Neurosciences (1597), Computer science (1244 articles), Arts and Humanities (1209 articles), Engineering (688 articles), Biochemistry, Genetics and Molecular Biology (632 articles) and Health Professional (558). Indeed, training transfer has received considerable attention and scholars from multidiscipline subjects' fields and made it a multidisciplinary research fields.

The funding of the study also showed that a small fraction of only 21 % (2256/10905) articles have funding while 79 % (8649/10905) a major portion have no research fundings. Moreover, the bibliometric analysis of the retrieved article in TT in terms of languages of publication in which the articles were written indicated that these research articles were written in 24 different languages. It is interested that English was the most dominant language with total numbers of publications $n=10559$ and cover 97% of the publications followed by Spanish ($n=91$; 1%), German ($n=80$; 1%), Chinese ($n=36$, 0.33%), French ($n=36$; 0.33%), Portuguese ($n=25$; 0.23%), Turkish ($n=17$; 0.16%), Japanese ($n=12$; 0.11%) and

Russian ($n=12$; 0.11%). The rest 15 languages just only contributed (36; 0.31%) in the total publication of TT research. Although it is compulsory for a publisher to submit an article whose title and abstract must be in the English language, it is also noted that the majority of the researchers in the TT field belong to the USA and Western Europe where they have greater research collaboration. Furthermore, English is the most commonly used language in the global academic community (Rey-Martí, Ribeiro-Soriano, & Palacios-Marqués, 2016).

3.2. Preferred journals

It is observed that the most productive journals in the field of training transfer are owned by 8 different publisher/research organizations as can be seen from the data in Table 1. The most interesting aspects of the table show that the 7 major publishers belong to American research institutes and research organizations. The rest 3 journals were held by Springer Nature (Germany), Frontiers Media S.A (Switzerland) and Elsevier (Netherlands). The most productive journal was Plos One falling in Biochemistry subject area with a total of 122 research articles was published and holds 1.1% of the total publications in the field of training transfer, followed by Journal of Experimental Brain Research ($n=119$, 1.3%) categorized in Neuroscience subject area, Frontiers in Psychology ($n=103$, 1%) falls in Psychology and Human Resource Development Quarterly ($n=96$, 1%) categorized in Business Management and Accounting. Results also showed that 70 % of journals are categorized in subject areas like Social Sciences, Management Science and Psychology and rest 30 % of journals are categorized in Medicine, Computer Science and Engineering subject areas.

In addition, results also showed a strong relationship between highly productive journals and prolific subject areas. In this regard, Plos One

is the highly productive journals with the highest no of publications (122) but also publish the highest numbers of articles in the subject area Biochemistry, Generics and Molecular Biology which rank number 9 in leading subject areas. Similarly, Experimental Brain Research falls at number 2nd but also ranks in number 1st leading journals in the subject area Neuroscience which falls at number 5 in leading subject areas. Furthermore, Frontiers in Psychology, number 3 productive journals but holds a leading journal in subject area Psychology which falls at 2nd number in leading subject areas in the domain of TT. Moreover, an important journal “Human Resource Development Quarterly” is the most leading journal that holds a key role in two prolific subject areas: one in Business Management and Accounting (ranked at no & Arts and Humanities which falls at no 4 & 7 subsequently in the leading subject areas. Lastly, but not least is the Journal of Education Psychology falls at no 5, but a leading journal in the subject area Social Science which holds no 1st position in the highly interesting subject area.

Furthermore, CiteScore evaluation criteria of an academic journal is an alternative metrics to the generally used JCR impact factors (I_fs), which is also an important metric to measure the strength and position of a journal (Khudzari et al., 2018). What can be clearly seen in Table .1, that three journals having a CiteScore of 5 and above. Journals having the highest CiteScore belonged to Computers in Human Behavior (6.14) which falls level (8) in the list of highly productive journals and lowest CiteScore belonged to Experimental Brain Research (1.95) but ranked 2nd in the journal productive list. Organization Science ranked 8th with 58 articles in Scopus but ranked 1st with the highest number of 7536 citations. Surprisingly, it is also noted that the language of all highly productive journals is English which makes it easy for readers and plays a pivotal role in journal ranking and CiteScore. But in our view, journal strength cannot only be evaluated only on the basis of CiteScore. Besides CiteScore, researchers should also consider whether the journal publishes the novel research work, and that knowledge easily accessible and contribute to the enhancement of the research field.

3.3. Leading research countries, top institutions, and international collaboration

Figure 2 presents an overview of the 15 leading countries having maximum research publications in the field of training transfer and the most productive research institutes of these leading countries. The most interesting information about the data in this table is that the United States of America (USA) and the United Kingdom (UK) are the leading countries having about 46 % and 10 % research contribution in the overall publication of training transfer. A total of 4990 research articles were contributed by the researchers of the USA, whereas, UK is the highly productive country among the European Union (EU) countries having the highest research publication 1094 in the field of training transfer. While China which is the world's highly populated country (UNstats, 2019) and only 4% research publication was contributed by the Chinese researchers in the field of training transfer.

Table 1: The top 10 most productive journals on TT research with their most cited article. Source: Scopus

Rank	Journal	TP (%)	TC	Cite Score 2018	The most cited article(reference)	Time cited	Publisher
1	Esq One	122 (1.1)	1624	3.02	Brain training game improves executive functions and processing speed in the elderly: A randomized controlled trial	140	Public library of science
2	Experimental Brain Research	119 (1.09)	3746	1.95	Evidence for a dynamic-dominance hypothesis of handedness	336	Springer nature
3	Frontiers In Psychology	103 (1)	861	2.40	Do action video games improve perception and cognition?	211	Frontiers Media S.A
4	Human Resource Development Quarterly	96 (1)	3982	2.51	The flawed four-level evaluation model	363	Wiley-Blackwell
5	Journal Of Educational Psychology	94 (1)	3018	5.81	The double-deficit hypothesis for the developmental dyslexias	976	APA
6	International Journal Of Training And Development	66 (1)	967	2.13	The transfer of training: What really matters	198	Wiley-Blackwell
7	Journal Of Neuroscience	60 (1)	2425	5.83	Functional mapping of human learning: A positron emission tomography activation study of eyeblink conditioning	142	Society for Neuroscience
8	Computers In Human Behavior	58 (1)	1192	6.14	How can one amplify the effect of e-learning? An examination of high-tech employees' computer attitude and flow experience	87	Elsevier
9	Journal Of Neurophysiology	58 (1)	1715	2.66	Learned dynamics of reaching movements generalize from dominant to nondominant arm	222	APA
10	Organization Science	58 (1)	7536	4.76	Deliberate learning and the evolution of dynamic capabilities	2602	Institute for Operations Research and the Management Sciences

Rank: Rankin of the journal; TP: Total publication of the journal; TC: Total citation in the given period



Figure 2: The top 15 most productive countries and academic institutions in TT publications; TPC: total publication of a given country, TPI: total publications from a given academic institute; SCP: single-country publication. Source: Scopus

In the total publications of a given institute (TPI), the University of Illinois at Urban-Champion from the USA is the most productive academic institute with publication (n=113) and National Taiwan University of Science and Technology having the least contribution (n=14) in the TT research field. Furthermore, among these fifteen highly productive research universities, eight universities are listed in the top 100 best universities (QS World University Rankings, 2019). These universities are as follow: University College London (ranking 7th), University of Tokyo (23rd), University of Toronto (28th), Peking University (30th), University of Queensland (48th), Ludwig - Maximilians - Universitat Munchen (62nd), and University of Queensland (65th), the University of Illinois at Urban-Champion (69th) and Katholieke Universiteit Leuven ranked at (81th). These findings show that the field training transfer has received remarkable attention from the researchers of the world-leading universities.

In addition, these top 15 countries contributed 98% in total TT research, and single-country publications (SCP) are noted as 69 %, whereas, 31% contributed by collaboration among various countries. Among these 15 countries, the highest SCP came from the USA (81%), followed by Taiwan (78%), Japan (70%), Spain (67) are leading countries having higher intra-country research liaison. The SCP trends show that these countries have rich intra-country research collaboration and support. On the contrary, Belgium, a small country, ranking at level 15 in the highly productive country list, but having less single country publication and 58 % (92 articles) are published with the

collaboration of 31 countries. Thus international research collaboration opens new research avenue, increased research citations, broaden the knowledge and create novelty, but also an effective tactic for creating more impact and ranking up (Thelwall & Sud, 2016).

Figure 3 shows the research liaison and collaboration among the researchers of various countries. In VOSviewer, the closeness of the two countries indicates that scholars of these countries have research collaboration and thickness of line shows strengthening of the relationship that authors of these countries have strong inter-country research collaboration and liaison. Results of co-authorship analysis revealed that USA has strong research liaison with 58 countries with 1181 times of co-authorship, followed by UK (45 links, 543 co-authorships), Canada (41 links, 426 co-authorships), Germany (40 links, 348 co-authorships), Netherlands (39 links, 271 co-authorships), Australia (39 links, 322 co-authorship), China (36 links, 297 co-authorships), and others. It was also shown that 2/3 of the listed countries had international collaborative publications with less than 5 countries. Numerous, possible factors like government policies, research grants, domestic research capacity, economic condition, a ratio of foreign postgraduates and foreign faculty, intra-country research trends may contribute to the international research collaboration. In addition, a flexible and stable research policy also important to ensure the sustainability of international collaboration.

Table 2 provides an overview of the 15 most leading authors in the field of training transfer which are affiliated to seven different countries. What is striking about the figure in this table is that 7 leading authors belong to the USA, followed by 2 authors from Canada, 2 from Sweden and 1 author from each China, France, UK, and Switzerland. The most interesting aspect of this analysis is that these 15 prolific authors having multi-disciplinary research expertise and research interests varying from 4 to 23 research fields. Surprisingly, it was noted that their 7% research publication related to the field of TT and a major portion of 93% lies in other research areas. Interestingly, it is also noted that these authors have strong liaison with world-leading scholars and their 6% publications are single-author publications SAP, 19% two authors publication TAP, and 76% publications having more than two authors. Moreover, these 15 leading authors belong to the world's top 300 leading universities (QS World University Rankings, 2019) and their origin from the USA, Western Europe and only one from Asia. In addition, findings of the study also showed that the majority of the researchers are in the field of research for the last 50 years, having multidisciplinary research expertise,

but the field training transfer has grabbed their interest and intention at the start of 21st century. Moreover, it is also found that the majority of the researcher's work on TT is also ranked in most productive journals.

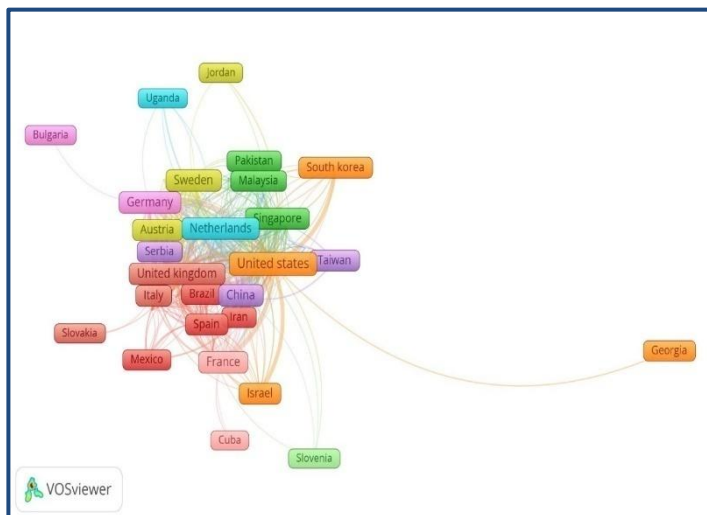


Fig. A screenshot of the bibliometric map created based on co-authorships with network visualization mode. See the online article for the color version of this figure. Source: Scopus

3.4. Leading authors

Table 2: List of the 10 most prolific authors in the training transfer (TT) research area. Source: Scopus.

R	Author	Scopus ID	Origin	Current Affiliation	TS A	ATP *	Y of 1 st P**	TC* *	h- index *	AT P	ATC *	h- index *	Y of 1 st P	P in 2018
1	Singh, Chandrabhika	7401801404	USA	Georgetown University	4	132	2000	1771	25	31	575	16	2008	4
2	Salas, Eduardo	57203103382	USA	Rice University	16	489	1983	23640	84	25	1775	17	1992	3
3	Kramer, A.F.	7401891929	USA	University of Illinois	17	487	1983	33780	96	22	900	14	2008	1
4	Bäckman, L.	7102174121	Sweden	Stockholm University	20	666	1973	30772	86	21	2121	16	2008	4
5	Endsley, G.	7006257929	UK	King's College	12	152	1955	2749	31	19	379	9	1980	0
6	Nyberg, Lars M.	7102383645	Sweden	Umea University	23	394	1970	22995	78	18	1075	14	2008	1
7	Lovett, M.W.	7101802359	Canada	Hospital for Sick Children University	8	58	1981	2164	25	17	655	13	1994	1
8	Yu, Cong	7404977928	China	Peking University	10	53	1996	1294	19	17	569	11	2008	2
9	Barr, Rachel	7401833241	USA	Georgetown University	7	69	1996	2241	27	16	355	11	2007	0
10	Jacks, Lutz	28648627600	Switzerland	University of Zurich	21	421	1985	18175	76	16	280	10	2004	1

R: Author ranking; TSA: Total subject area; ATP*: Author total publication in all fields; Y of 1st P*: Author first publication; ATC*: Author total citation in all fields; h-index*: h-index in all fields; ATP: Author total publication in training transfer field; ATC: Author total citation in TT field; h-index: h-index in TT field; Y of 1st P: Author first publication in TT subject; P in 2018: author total publication in TT field in 2018.

R: Author ranking; TSA: Total subject area; ATP*: Author total publication in all fields; Y of 1st P*: Author first publication; ATC*: Author total citation in all fields; h-index*: h-index in all fields; ATP: Author total publication in training transfer field; ATC: Author total citation in TT field; h-index: h-index in TT field; Y of 1st P: Author first publication in TT subject; P in 2018: author total publication in TT field in 2018.

3.5. Authors keywords

Co-Occurrence analysis of 17,038 keywords was carried out by using VOSviewer (Fig.4a). After analyzing the

keywords, renaming the similar words and eliminating the country and book name, a total of 345 keywords met the criteria of minimum occurrence 10 times for the mapping in VOSviewer. Because minimizing the occurrence of less than 10 increase the numbers of keywords and overlap many important keywords in VOSviewer. So, that's why a minimum threshold of 10 was set for the author's keyword analysis. Most interestingly, it was also found that training transfer was the most important keywords with total occurrence 1150 and having 294 links with other keywords followed by: 'training' (812 occurrences, 264 links), 'motor learning' (158 occurrences, 77 links), 'education' (131 occurrences, 78 links), 'simulation' (122 occurrences, 76 link strength) and 'working memory' (116 occurrences, 69 links).

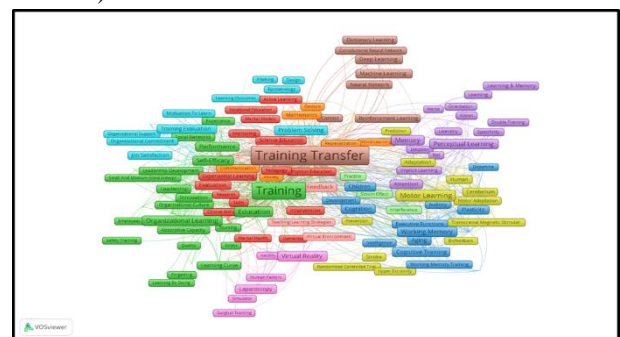


Figure 4a: A view of the keywords co-occurrence map in network visualization mode with a minimum of 10 occurrences of a keyword. See the online article for the color version of this figure. Source: Scopus

A considerable amount of training transfer literature confirmed that work environment, trainee characteristics, and training design are the most influential factors that affect training transfer (Baldwin & Ford, 1988; Bhatti et al., 2013; Blume et al., 2010). In order to further validate these keywords and to examine their co-occurrence, a threshold of minimum 5 occurrences was set so that we can examine the maximum occurrence of these keywords. As work environment is the most influential keyword that affects more training transfer (Blume et al., 2010; Velada, Caetano, Michel, Lyons, & Kavanagh, 2007), but the most striking results to emerge from this analysis is that the work environment appeared just only 8 times. This a rather surprising result. Interestingly, results of the other prolific keywords like learning environment (n=19), social support (n=8), organization support (n=10), supervisor support (n=16), perceived organization support (n=10), peer feedback (n=5), feedback (n=69), visual feedback (n=6), motivation to transfer (n=16), transfer motivation (n=6), self-efficacy (n=67) and organizational culture (n=65) no

significant difference was observed. These trends show that there is still a paucity of research in these keywords and demands more systematic research in these areas.

Although training transfer is the highly occurred keyword with the average publication year 2010, keyword overlay analysis in (Fig.4b) shows that, in recent years, potentially new keywords have been evolved and researchers have shown a keen interest in these keywords. In this regard, keyword ‘convolutional neural network’ with average publication year 2017, occurrence 11 and 3 link to other keyword, followed by ‘deep learning’, average publication year 2017, occurrence 54 and 13 links with other keywords, ‘randomized controlled trial’ with average publication year 2016, occurrence 13 and links to other keyword 19 and ‘working memory training’ with average publication year 2015, occurrence 19 and 17 links with other keywords.



Figure 4b: A view of the keywords co-occurrence in overlay visualization mode with the minimum occurrence of a keyword is set to ten. See the online article for the color version of this figure. Source: Scopus

4. Practical Implications

The current study also suggests a number of implications for the researchers and academicians, particularly in developing countries. As findings of the Bibliometric study reveal that the USA and the European Union countries having a 46 % and 43 % research contribution in the field of training transfer and the authors of these countries have strong intra-county and inter-country research liaison and collaboration. Moreover, these prolific research institutes and leading scholars also belong to these developed countries. Furthermore, these countries have also shown a keen interest in employee training and are investing billions of dollars in their human resource development (Baldwin et al., 2017). Whereas, Asia which holds 50 % of the world population ("World Population by Country," 2019),but has a very insignificant 6 % research contribution in the field of training transfer. Instead of China and Japan has only 2 % research contribution in the domain of training transfer.

Therefore, this study proposes that the scholars of these countries should develop a strong research collaboration with the scholars of developed countries so that they can get maximum benefits and enhance their research competencies and expertise. The findings of the study can be used by the academicians to understand the importance of training transfer in the overall effectiveness of a training program and can take into account the curriculum and prepare policies to nurture the training transfer knowledge and application for the usefulness of a training program.

The current research also has several major implications for human resource management professionals. As organizations are investing a substantial amount on the training of their human resources (Baldwin et al., 2017).The considerable yearly investment made by organizations globally in training initiatives (Bersin, 2014; Hurt, 2016), suggests that organizational top management and leaders view training as a vital strategic initiative. However, as findings of the previous studies shows that a major portion of training investment is wasted due to poor training transfer (Dhaka et al., 2018). Therefore, this study suggests that human resources management professionals must have to develop a conducive working environment inside the organization where trainees can easily apply all the newly learned skills and knowledge. They must also have to develop a mechanism that fosters training transfer culture inside the organization and organize training program that focuses on the importance of training transfer in the overall effectiveness of a training program. Moreover, they should set goals for trainees based on the skills which they have acquired during the training program and develop the strong coordination with the trainees to understand the possible problems during the implementation of newly learned skills and knowledge.

We also believe that training consultants and service providers must have to understand the important role of training transfer while designing a training program for the organization. They should work closely with the top management and leaders and guide them in the designing of a comprehensive framework and policies that help the individuals to perform his/her tasks in an efficient manner. Thus, training consultants must hold top management liable for developing a training culture inside the organization to gain a competitive advantage but also responsible for assuring that the training is transferred and maintained over a long period of time. Furthermore, in the same way, departmental heads must hold accountable for their subordinates and make sure that their activities are highly integrated with the overall organizational training transfer policies and procedures.

5. Limitations of the study

Although the bibliometric technique is a set of statistical methods to analyze the global research patterns and publication trends in a particular area which is based on the outputs of the academic literature database, this study has several limitations that warrant mention. The first limitation lies in the fact that this technique has been criticized due to its coverage and scope. For example, it can only be applied to the research article that is published in the journal and did not include any documents that are a review, meta-analysis, unpublished works, and non-journal printed works such as research reports, conference proceeding, dissertations, government reports, and books.

Second, it is unfortunate that the search strategy of TT was limited to title, abstract and keyword, the search strategy might not cover all the studies on training transfer available on Scopus. Therefore, this restricted criteria and search strategy may have affected the overall results and findings of the study because large numbers of research articles have not been examined.

Third, one source of weakness in this study that could have affected the graphical presentation of co-authorship analysis, keyword network analysis, keyword overlay analysis and country links strength analysis is due to the limitation of VOSviewer software. Since this study lies on the keywords of 65 % (7142) research articles and by imposing some threshold limitation, valuable information of countries and keywords has not been included in these analyses and has affected the graphical visualization analysis.

Fourth, the main paucity lies in the fact is that this bibliometric study only follows defined procedures for the extracting and analysis of data with no multivariate analysis, reliability and validity testing, demographic analysis, hypothesis testing, and structural equation modeling. Although the data was extracted from the Scopus database in a systematic way, all the analyses were performed manually with the help of Microsoft excel. Therefore, this human interaction and absence of statistical analysis may cause the generalizability problem as well as its partiality of the results. Finally, being limited to the Scopus database, a large set of diverse information has not been included from other databases, thus this has affected the overall analysis and findings of the study.

6. Conclusions

This study presented an inclusive analysis of training transfer research by using a bibliometric technique to understand the global research trends, publication language, year to year publication trends, the most prolific and highly cited training transfer authors, most productive journals,

highly cited papers and the leading countries in the training transfer research. This comprehensive and detailed overview has extended our knowledge and provides a detailed snapshot for the leading researchers and also opens an avenue for the beginners who are interested to expand and explore new domains in the field of training transfer research.

This bibliometric analysis of 10,905 training transfer research articles gathered from the Scopus database shows that the term training transfer first appears in 1909, but this area attracts researchers' attention and rapid growth has been observed since in the last ten years. We have found that English is the most popular language for publication, the USA and UK are the two countries that have a considerable research publication and strong research collaboration. One of the more significant findings to emerge from this study is that the USA has a greater contribution to the research of training transfer and this area has wider scope and application in various subject fields. The present study has been one of the first attempts to thoroughly examine the training transfer from a wider perspective.

This study reveals some findings that can help guide researchers in the field of training transfer. Future studies should be repeated using another database like Web of Science. By conducting, bibliometric analysis by using other databases will be more useful for a detailed and comprehensive comparison. Considerably more works needed to be done to determine the most influential factors like work environment, trainee characteristics and training methods that have been less examined less. In addition, new keywords have been explored and needed a comprehensive study to examine the research potential of these keywords. Although training transfer has attained remarkable attention from a wider range of researchers, there is research paucity in developing countries and future research should be carried out to examine the training transfer and link with factors affecting training transfer.

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