

Bibliometric Analysis on Emotional Intelligence Research



Heamalatha Krishnan, Siti Rahmah Awang, Norhayati Zakuan, Khalil Md Nor

Abstract: *The concept of Emotional Intelligence (EI) has gained a great amount of public popularity and business attention in the past two decades. EI is currently considered a broadly recognized practitioner instrument for hiring, training, leadership development, and team building by the business people. In this context, the analysis of the evolution and development of this concept is crucial. In order to do so, this study presents the global research trends in EI area. The article presents a bibliometric analysis of 4297 journal articles on EI. These works come from the Scopus database for the period 1966-2018. The study sorts these articles according to the following bibliographic indicators: journal with most published research, highly cited articles, countries with the highest rate of productivity, prolific authors, year of publication, language, and research area. Besides, the study graphically maps the bibliographic material by using the visualization of similarities (VOS) viewer software. In order to do so, the work uses co-authorship among authors and affiliated countries, and co-occurrence of author keywords. Results have shown that since 2005, the number of publications has increased exponentially, resulting in the steady increase in the cumulative total publications until present. The United States (US) is the most productive country. Also, among the most productive university from each of the 15 leading countries, three were amongst the world's top 100 universities. The prominent authors were Petrides, Konstantinos V. and Extremera Pacheco, Natalio. whereas the top journals were the Personality and Individual Differences, Frontiers in Psychology and Life Science Journal. A network visualisation map showed that 'emotional intelligence', 'emotions' and 'personality' were the most encountered key terms. Therefore, this paper serves as a platform for the new researchers to refer concerning which journals, authors and articles they may consult while establishing the future research direction.*

Keywords: *Bibliometric analysis, Author keywords co-occurrences, Co-authorship, Emotional Intelligence, VOSviewer, Scopus database.*

I. INTRODUCTION

The concept of emotional intelligence (EI) has made a high level of public and scientific attention and debated ever since it is emerged [1]. EI concerned with the way people perceive, regulate, use, and understand our own emotions and the emotions of others [2]. Related to the increased importance of emotional competencies in the 21st century, we focus in this research on EI. There are three relevant models of EI: Ability Model, Mixed Models and Trait Model. The term "EI" appeared first in Peter Salovey and Jack Mayer's ability model defining EI as a cognitive ability [3]. In 1995 Daniel Goleman introduced his book Emotional Intelligence: Why It Can Matter More Than IQ, in which he suggests a new performance based EI model that includes self-awareness, self-regulation, motivation, empathy and social skills [4]. Finally, [5] propose the distinction of EI as a trait and as an ability.

According to the World Economic Forum's Future of Jobs Report [6], EI will be one of the top 10 job skills in 2020. In recent years, the priority given to EI as an important job skill has even surpassing technical abilities [7]. In view of this trend, the literature related to EI has grown substantially. It is a precise time to implement bibliometric analytical techniques to evaluate the growing body of knowledge on EI. Bibliometric technique provides a useful tool to quantitatively analyse the development of academic literatures of a particular subject [8].

However, few comprehensive bibliometric studies have been performed on the research trends on EI. [9] presents a bibliometric study in the field of EI (2001-2005), which mainly studied and identify the Indian contributions in the field of EI which covered in PsycINFO database and number of publications in Psychology Journal. Recently [10] conducted an analysis on publications on education-related emotional intelligence during the period of 1996-2018, which used Web of Science (WoS) as a source of data mining. However, the bibliometric analysis of this study is based on literature recorded in the Scopus citation database. The decision to choose this database is because Scopus is the largest abstract and citation database of peer-reviewed research literature in the fields of science, technology, medicine, social sciences, and arts and humanities [11]. Thus, using Scopus is an attempt to cover more topics which may not be available in WoS and may not be discussed by [10] and [9].

Manuscript received on February 10, 2020.

Revised Manuscript received on February 20, 2020.

Manuscript published on March 30, 2020.

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The purpose of this study is to provide a bibliometric analysis of published EI studies for the period of 1966-2018 to comprehensively explore the trends of the EI related research literature. In this paper, our objectives were as follows: 1) to investigate the growth pattern and distribution of EI research literature; 2) to show contributions of prolific authors, leading countries and the most productive academic institutions; 3) to determine the core journals that contains a substantial portion of journal literature on EI; and 4) to highlight common terminology and research topics.

II. METHODS

Bibliometric mapping allows for the representation of information in ways which make relationships more obvious and easier to understand and can lead to new insight and breakthrough [12]. It applies quantitative analysis and statistics to describe collaboration patterns and research patterns of authors, journals, publications, countries and institutes and on the other hand, they are used to assess their contribution on specific topics. Bibliometric analysis has been widely used in various fields, including the natural sciences, engineering, the social sciences, and the humanities [13]; [14]; [15]; [16].

A. Data Source and Search Strategy

Data mining was conducted within October 1 and 7, 2019 using Scopus database. Scopus offers a basic search or an advanced search. In this study advanced search has been operated since search string is used to retrieve the data. The search output from Scopus can be presented as a list of 20-200 items per page and extracted documents can be exported to Microsoft Excel. The results can be refined by document type, author name, source title, publication per year and subject area. The central theme in this study was research articles containing “emotional intelligence” in the title and abstract. The oldest publication dates to 1966 [17] and the more recent ones are from 2018 [18]. The query string used for the search was: (TITLE-ABS (“emotional intelligence”)) AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (SRCTYPE, “j”)) AND (EXCLUDE (PUBYEAR, 2020) OR EXCLUDE (PUBYEAR, 2019)). This query string resulted in 4534 documents. To ensure no review articles were in our analysis, additional phases were added in the query string which resulted in 460 articles being potentially irrelevant to our study. These articles contained terms such as review, recent, progress, critical, revisit, advance, highlight, in the title and abstract. After screening them by reading abstracts and full texts, we identified 237 of them were review articles. EID, a Scopus unique article identifier, of these review articles were noted and added in the next search string so that they would never appear in the next search results.

The search results were analysed based on year, source, author, affiliation, country/territory, subject area, and language. Bibliometric indicators such as total publications, total citations, CiteScore, and h-index were used for ranking purposes. The summary of the methodology for conducting the search is shown in Table I. The details on search strings used in Scopus are provided in Table II (Appendix).

Table-I: Summary of data collection

Document type	Articles
Source type	Journals
Period of analysis	1966-2018
Search engines	Scopus
Query string	(TITLE-ABS (“emotional intelligence”)) AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (SRCTYPE, “j”)) AND (EXCLUDE (PUBYEAR, 2020) OR EXCLUDE (PUBYEAR, 2019)) AND NOT EID (<i>insert EID of review articles here**</i>)
Total number of articles	4297

B. Bibliometric Maps

Several software packages can be used to process bibliometric data such as CiteSpace [19], Visualisation of Similarities (VOS) Viewer [20] and Gephi software [21], each with different capabilities and limitations. In this study, the bibliometric analysis was performed using the free bibliometric analysis software VOSviewer (version 1.6.13). VOSviewer is a software tool based on social network analysis allowing for the creation, visualization, and exploration of maps based on bibliometric network data [20]. The main technical terms used by the software are explained in Table III (Appendix). In this study, two types of analysis were used: co-authorship analysis and co-occurrence of keywords. Table IV explains different VOSviewer types of analyses used in this study.

Table-IV: Different VOSviewer types of analyses used in this study

Types of analysis	Description
Co-authorship	Co-authorship analysis illustrates the research collaborations within the domain by producing a visualization of networks of authors based on institutions and countries [22].
Co-occurrence	The number of co-occurrences of two keywords is the number of publications in which both keywords occur together in the title, abstract and keyword list [20].

III. RESULTS AND DISCUSSION

A. Publication Output and Growth Trend

The quantity of the publications is an important indicator that reveals the development trends of scientific research. Overall, the search on Scopus produce 4297 research articles published from 1966 to 2018. Being still in progress, the year 2019 was omitted from this analysis. The oldest publication dates to 1966 and there was no other publication record until 1990. In 1990, Peter Salovey and John Mayer published the first paper on EI in a scientific psychological journal [23]. The paper received little recognition from the scientific community, however, until Goleman’s bestseller in 1995 [4]. Since then, annual publications have increased steadily, resulting in rapid increase in the cumulative total publications. Fig. 1 (Appendix) shows the annual and cumulative numbers of research articles on EI in Scopus from 1966 until 2018.



As shown in Fig. 1 (Appendix), most works on EI have been published after 2005. Between years 2006 and 2018, there were 3876 publications, representing 90.2% of the total volume, being 2018 the year with more publications (508, representing 11.8% of the total). This growth provides evidence that the concept of EI was drawing more attentions of the research scholars. However, most of these articles are not freely available and the users has to pay to access the information in them.

It is suggested that an article will probably receive more citation if it is published through an open access journal. As of 2018, only 29.1% (148 articles) were published as an open access type.

It is evident that from the analysis on subject area that EI research field are broad and many researches are being done worldwide. Analysis on subject area showed that psychology is the primary focus in EI studies. This is supported by the total publications classified under the following subject areas as shown in Fig. 2: Psychology (1726 articles), Social Sciences (1359 articles), Business Management and Accounting (897 articles) and Arts and Humanities (369 articles).

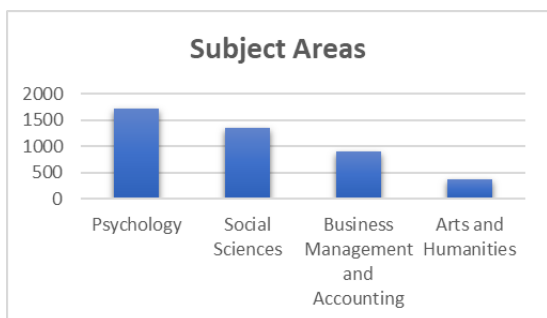


Fig. 2. Distribution of Documents by Subject Area

Results also showed that the articles used in this study were published in 32 languages. This shows the growing number of languages in which EI literature is being communicated. The results presented in Fig. 3 shows that English is the dominant language with 3957 records followed by Spanish (209), Russian (28) and French (20). This suggests that the English language is a common medium of communication in these research activities. This may be due to the fact that the UK and the USA are the predominant countries of publications. When a publisher submits an article in a foreign language to be indexed in Scopus, the article should have a title and abstract in English [24]. Moreover, English is the official language for most international conferences [8].

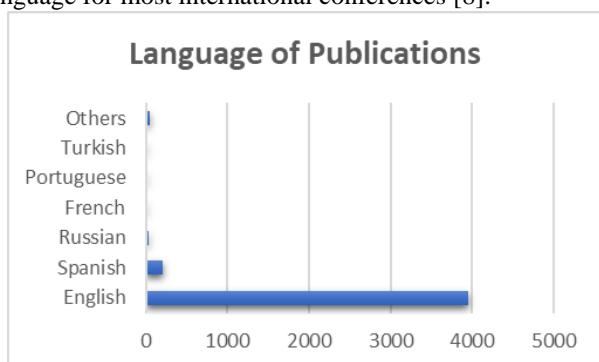


Fig. 3. Language of Publications

B. Preferred Journals

In order to identify the most productive journals in the field of study, Table V (Appendix) presents a list of the top 10 journals with the highest number of publications in EI research. The table includes different information of these journals. Journals are ranked based on the number of publications in the field of EI. In the case of a tie, the total citations are considered.

Personality and Individual Differences is the most productive journal with 265 articles covering 6.17% of the total publications. The total citation of this journal is 14103 and it is the outlet of the most cited paper in this field. The journal with second highest number of publications is Frontiers in Psychology with 43 articles covering 1% of the total publications, followed by Life Science Journal (34, 0.79%), Psychological Reports and Advances in Environmental Biology (33, 0.77%). Other journals with less than 30 articles are Emotion, Nurse Education Today, Social Behaviour and Personality, Psicothema and Journal of The Indian Academy of Applied Psychology.

CiteScore metrics for a journal are published by Scopus once in a year. However, CiteScore tracker is updated every month and is a current indicator for a journal's performance [25]. According to the CiteScore 2018 report, journals of the highest and lowest CiteScore belonged to Emotion (3.6), and Journal of Indian Academy of Applied Psychology (0.26), respectively. Although ranked 5th with 33 articles in Scopus, the total citations of Advances in Environmental Biology were significantly lower compared to other journals. This might be due to the accessibility of the articles itself whereby the authors purposely not listed the article as an open access articles which cause the number of citations become lower. CiteScore should not be the only factor to be considered in selecting journals to publish our work. Authors should also consider whether the journal can deliver the work to the right readers and contributes to the body of knowledge [24]. Therefore, we have listed top 14 journals which writers may consider submitting their EI-related work in Table VI (Appendix).

C. The Most Highly Cited Articles

In Table VII (Appendix), a list of 15 most cited articles from 1966 to 2018 is shown. The articles are ranked based on number of citations received. In the case of a tie, the average number of citations per year are considered. Although there are many aspects that can influence the value of a paper, the number of citations is usually considered as a good reflection of the popularity and influence of a work among the scientific community [26].

As it can be observed, the most highly cited article is entitled "Development and validation of a measure of emotional intelligence" which was published in Personality and Individual Differences in 1998, with 1372 citations [27]. Essentially, this paper is one of the pioneering studies in EI research. In total, three articles have more than 1000 citations, all of them receiving more than fifty citations per year.

The second most highly cited paper is entitled “Toward machine emotional intelligence: Analysis of affective physiological state” published in IEEE Transactions on Pattern Analysis and Machine Intelligence in 2001 [28], with 1247 citations and the most average citations per year at 73. The oldest paper of the list was published in 1998 and there were three articles in the respective year.

The citations of the most recent paper published in 2010 is improving quickly and is in the 14th place of the list with 522 citations [29]. Approximately 50% of the top 15 most cited articles received more than fifty citations per year. Almost three quarters of the articles in the list were published after 2000.

D. Leading Countries, Top Institutions, and International Collaboration

Table VIII (Appendix) shows ranking list of 15 countries whose researchers published the largest number of articles related to EI during the period from 1966 to 2018. When the data were analysed by country, the largest number of articles related to EI was from United States (US) with 1103 publications, 25.7% of the global publications. Less than one-half of US's total publication, United Kingdom (UK) was ranked the second most productive country with 504 publications in a total of 160 journals, covering 11.7% of the total publications. The most productive academic institution for US was contributed by Yale University with 45 publications. University College London (UCL) was the most productive academic institute of UK with 97 publications.

Among the 15 countries, India (90.72%), Turkey (88.89%), Iran (87.92%), and South Africa (81.82%) had more than 80% single-country publications (SCP). This suggests that this country have a strong intra-country collaboration. On the other hand, Germany was the country of the least SCP with 40.66%, where 54 out of 91 publications were linked to multiple affiliations from 22 different countries. There are several advantages of international research collaboration such as creating opportunities to share experiences, data and methods that can provide the new perspectives on existing practices. Furthermore, international research collaboration also an effective strategy for ranking up [24].

Furthermore, there were also three universities listed in the top 100 best universities based on the World University Ranking 2019 – Yale University (ranking 8th), UCL (15th) and The University of Sydney (60th) [30]. This demonstrates that EI field has received attention at the top universities in the world. The distribution of countries/territories per region is shown in Fig. 4 (Appendix). In the analysis of co-authorship, we included all 97 countries. The affiliated countries were clustered into 5 continents: Africa, America, Asia, Europe and Oceania. The highest number of countries per region came from Asia (30) and Europe (30), followed by America (13), Africa (11), and Oceania (2). Results of co-authorship showed that the UK was the most affiliated country, linked to 51 countries/territories with 266 times of co-authorship. The list was followed by United States (46 links, 344 co-authorships), Canada (33 links, 137 co-authorships), Australia (27 links, 126 co-authorships), Netherlands (25 links, 64 co-authorships), and others. It was also shown that 2/3 of the listed countries had international collaborative

publications with less than 10 countries. In addition, the researchers in Bhutan, Cuba, Iceland, Kenya, Latvia, Macedonia, Sri Lanka, Trinidad and Tobago and Uruguay were not affiliated with any other country for publishing articles on EI.

Effective international collaboration become possible with the growth of communication modes and the ease of international travel. Academics and researchers are finding it easier than ever to collaborate with their foreign colleagues, making the exchange of academic ideas much simpler to organize. The more researchers collaborate, the greater are the chances for success and problem solving. In developing countries, where world-class resources are extremely limited, collaboration becomes particularly valuable to acquire knowledge and experience. Thus, it is imperative to have a collaborative approach, not only in sharing knowledge but also in making equipment, facilities, and laboratories available to other researchers even if they belong to another institution [31]. In addition, collaboration with world-class education institutions can raise the standards of universities in developing countries through exposure to teaching and research methods.

E. Leading Authors

Table IX (Appendix) lists the 15 most prolific authors in EI, affiliated to nine countries as follows; United Kingdom (3 authors), Spain (3 authors), Norway (1 author), Canada (1 author), Australia (2 authors), Japan (1 author), United States (2 authors), Italy (1 authors) and Belgium (1 authors). The first publications ranged between year 1990-2008 in which 7 authors had a role as the first author, 5 as co-author, and 3 as the last author.

KV Petrides from UK led the list with a record of 71 publications since 2000, 35 h-index, and 5109 times citations. The 2nd and 3rd top authors, N Extremera Pacheco and P Fernández-Berrocal are both affiliated with the Universidad de Malaga, Spain. Another pair from the same affiliation is L Rey (15th). We also found that the publication dates back to 1990 in Table VII refers to the same article [23], written by two prolific authors, John D. Mayer and Peter Salovey. John D. Mayer is from US and the author's current affiliation is University System of New Hampshire, Durham. The latter author is shown to be affiliated with Tohoku University, Sendai in Japan, the authors' current affiliation.

It should be noted that the authors for the most cited articles listed in Table VII (Appendix) does not necessarily to appear in Table IX. Their names would only be found in both tables if they had published prolifically such as authors Petrides, K.V., Mayer, J.D., Salovey, P., Schutte, N.S., and Furnham, A.

F. Authors Keywords

The keyword is a noun or phrase that can exhibit the core content of a publication. To illustrate the research hotspots in the EI area, keywords co-occurrence was analysed with VOSviewer. Keywords co-occurrence analysis measures the association strength of terms representative of the publications in the field by analysing the co-occurrence frequency of pairs of keywords.

This technique provides a more in-dept understanding of the keywords that may contribute in the development of EI research. During the process, keywords with the same meaning were combined, such as decision making and decision-making. The co-occurrence analysis of keywords was performed for the period of 1966-2018.

For the analyses, a threshold of a minimum number of keyword occurrences equal to 5 was set. After re-labelling synonymic single words and congeneric phrases, the analysis resulted in 373 keywords out of a total of 6593.

G. Terminology and Concept

In Fig. 5 (Appendix), the size of the frames represents the frequency of keywords. The higher frequency of keywords, the larger the size of the frame. The thickness of line is related to the closeness of connections between two keywords. The thicker line between two words, the closer relationship is. Our results showed that EI node has the biggest size representing EI has the highest frequency of keywords with 2449 occurrences and 367 links to other keywords (Fig. 5). We also came across the use of general terms such as ‘emotions’ (179 occurrences, 144 links), ‘adolescent’ (145 occurrences, 105 links) and ‘gender’ (105 occurrences, 93 links). EI was also seen co-occurred with keywords such as ‘personality’ (164 occurrences, 157 links), ‘leadership’ (144 occurrences, 102 links) and ‘job satisfaction’ (88 occurrences, 65 links). The summary of the link and total link strength information of the top 10 occurrence keywords were presented in Table X (Appendix).

In addition, we noticed several keywords related to instruments to measure EI. For example, Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) (51 occurrences), Trait Emotional Intelligence Questionnaire (TEIQue) (46 occurrences), Trait Meta-Mood Scale (TMMS) (18 occurrences), Bar-On Emotional Quotient Inventory (EQ-i) (5 occurrences) and Wong and Law Emotional Intelligence Scale (5 occurrences). This suggests that MSCEIT is the most widely used performance-based ability model test. But ability-based measures are weak predictors of a range of outcomes including work related attitudes such as job satisfaction [32] and job performance [33]. In contrast, trait EI tend to provide a good prediction of actual behaviour in a range of situations [34]. Goleman argued EI played a particularly important role in the workplace [4]. For instance, co-occurrence analysis of author keywords showed that EI plays important role in all kinds of jobs. This is evident from several terms such as ‘nurse’ (52 occurrences), ‘teachers’ (28 occurrences), ‘managers’ (11 occurrences) and ‘doctors’ (5 occurrences).

H. Topics of Interest

There has been emerging interest in EI among adolescents over recent years due to evidence from several studies regarding its importance in early ages for variables such as academic performance, social interaction, self-concept and social adaptation [35]; [36]; [37]. Keywords containing ‘adolescent’ were repeated 145 times. Adolescents’ ability to understand and regulate their emotions may also decrease because of higher emotional sensitivity which comes with the onset of puberty. Keywords addressing psychological

maladjustment with adolescents were also found. For instance, ‘stress’ (92 occurrences) [38], ‘anxiety’ (56 occurrences) [39] and ‘depression’ (54 occurrences) [40].

We found that keywords containing ‘emotions’ appeared the most by 179 occurrences. Emotions have an important influence on our cognitive processing. EI is the concept which connect the emotion and cognition concepts. Our results found that keyword ‘emotions’ co-occurred with several keywords such as personality (164 occurrences), leadership (144 occurrences), gender (105 occurrences), stress (92 occurrences), emotion regulation (80 occurrences), empathy (71 occurrences). Furthermore, emotions have an important impact on athletic performance. Athletes’ ability to identify and understand emotions, and to regulate them in order to achieve ideal performance attracts the sport psychology [41]. The keyword ‘sport’ appeared 19 times, and co-occurred with ‘coping’, ‘anxiety’ and ‘emotions’.

Research interest in certain areas can also be analysed by the link strength of two keywords. For example, ‘personality’ had 157 links (i.e. connected to 157 other keywords), namely ‘emotions’, ‘trait emotional intelligence’, ‘self-efficacy’, MSCEIT and TEIQue. It is suggested that research interest on TEIQue was stronger compared to MSCEIT as shown by the link strength which were 11 and 5, respectively. This is because TEIQue belongs within the realm of personality, whereas the MSCEIT belongs within the domain of cognitive ability.

EI has been suggested to be an important factor to predict mental and physical health. The keywords ‘mental health’ and ‘physical health’ were used 57 and 5 times, respectively. This shows EI are better predictors of mental health than physical health. Keywords containing ‘trait meta-mood scale’ and ‘trait meta-mood scale-24’ were repeated 18 and 6 times, respectively. Hence, trait EI is a strong positive predictor of mental health and well-being. Another area of interest is the relation between EI and specific types of health conditions with the occurrences of certain keywords such as alexithymia (27 occurrences), schizophrenia (26 occurrences), bipolar disorder (6 occurrences), trauma (6 occurrences) and autism spectrum disorders (5 occurrences). Studies have also examined the relation between EI and consumption of substances such as alcohol and tobacco. The keywords ‘alcohol’, ‘tobacco’ and ‘smoking’ were used 7, 6 and 5 times, respectively.

EI has gained attention as a set of skills that can promote well-being. Progress on well-being in EI research was also noticed as evidenced by the keyword ‘well-being’ was repeated 52 times. The management and regulation of emotions in carrying out a job are imperative to employee well-being. Higher levels of EI have been found to be associated with various positive outcomes, and especially with indices of subjective well-being such as positive affect and life satisfaction. Keywords associated with ‘life satisfaction’, ‘subjective well-being’ and ‘positive affect’ were used 58, 28 and 19 times. EI is related to high level of psychological well-being as individuals with high EI are able to maintain positive mental states longer and more often (Salovey and Mayer 1990).

This can be seen from keywords ‘psychological well-being’ (17 occurrences), ‘happiness’ (22 occurrences) and ‘optimism’ (15 occurrences). However, it is suggested that research interest between EI and subjective well-being was stronger compared to psychological well-being as shown by the link strength which were 21 and 13, respectively.

In comparison to many positive job-related outcomes, ‘job satisfaction’, ‘job performance’ and ‘organizational citizenship behaviour’ were the top three keywords which were used 88, 43 and 26 times, respectively. Among job-related negative outcomes, ‘anxiety’ and ‘burnout’ was heavily used (occurrences: 56, avg. publication year: 2013.9-2014.4). This was followed by ‘depression’ (54 occurrences; 2013.8), as well as ‘emotional labour’ (53 occurrences; 2013.5). Emotional labour is frequently been linked to burnout. These keywords were both linked to other keywords such as ‘emotional dissonance’, ‘job satisfaction’, ‘trait emotional intelligence’, ‘organizational citizenship behaviour’, ‘personality’ and ‘emotions’. Trait EI acts as a coping mechanism and thus moderates the relationship between emotional labour and burnout.

Much has been said about the impact of EI on human performance since the 1995 publication of Daniel Goleman’s international bestseller *Emotional Intelligence, Why It Can Matter More Than IQ*. Keywords containing ‘performance’ were repeated 44 times, and co-occurred with ‘leadership’, ‘motivation’, ‘burnout’, ‘stress’, ‘emotions’, and ‘personality’. Recent research suggests that EI is important for work settings and classroom.

Progress on research which examined EI and performance can be seen by certain keywords such as ‘job performance’ (43 occurrences; 2014.8), ‘academic performance’ (26 occurrences; 2014.9), ‘team performance’ (11 occurrences; 2013.1), ‘service performance’ (7 occurrences; 2013.7), ‘organizational performance’ (7 occurrences; 2013), ‘employee performance’ (6 occurrences; 2015.8), ‘work performance’ (6 occurrences; 2014.5) and ‘sales performance’ (5 occurrences; 2014).

Ability in EI is becoming a vital requirement in prolonged or intense areas of emotional work such as nursing and teaching. ‘Nurse’, ‘nursing’ and ‘nursing students’ were the keywords used and summed to a total of 131 occurrences. While, keywords ‘teachers’ and ‘teaching’ were used 28 and 8 times, respectively. Research on teachers consisted of several related keywords such as ‘self-efficacy’ (84 occurrences), ‘burnout’ (56 occurrences) and ‘perceived emotional intelligence’ (42 occurrences). Keyword ‘burnout’ was linked to both teachers and nurses. Caregiving service professionals are more likely to face a relatively higher risk of burnout due to increasing mental workloads and demands [42]. In EI research, self-efficacy and burnout has a negative and significant relationship as people with high levels of EI have a better sense of self-efficacy, and in turn avoid suffering from burnout syndrome [43].

As shown in Fig. 5 (Appendix), the colours were used to represent the time-varying keywords occurrences from 2011 (in dark purple) to 2015 (yellow). With an average publication year of 2017, our results show that ‘career adaptability’ and ‘emotional stability’ was the one latest advancement in EI studies. Both keywords appeared 5 times

and co-occurred with ‘trait emotional intelligence’. In current demanding work environment, coping with the stress associated with career uncertainty and unpredictable job changes is unavoidable. Therefore, to be productive in a demanding work environment, individuals must display both EI and career adaptability.

I. Limitations and Future Research

To the best of our knowledge, there are no bibliometric analysis focusing strictly on scientific research on EI. Our results may facilitate the planning, designing and publishing of future research on this topic. In that sense, this paper aims to fulfil this gap in the literature. Nevertheless, the interpretation of the results presented and discussed above is subject to several limitations. First, this research is based on a sample of documents published in the Scopus. There are more studies on EI published in non-Scopus-cited journals were not included, although they might contribute to scientific productivity in EI research. Second, the data collection employed refinement such as “document types”. Journal articles were evaluated for this study, which limits the variety of academic papers that were included in the data collection stage. This was due to the accessibility of the articles, which was a necessity for thorough analysis. Third, even though a detailed literature search was conducted to the best of the authors’ ability, it is likely that not all publications were acquired as some articles did not point out “Emotional Intelligence” and related terms in the articles titles, however, these terms were mentioned through-out the text. Fourth, when analysing the most influential researchers, our analysis does not take into account the number of researchers that contributed in writing a specific publication. Therefore, single-authored papers are equally accounted as multiple-authored works. Fifth, while the results give a picture of the current situation, this situation may change over time, especially for the publications from the past two years that still have to grow considerably in terms of the number of citations.

For future research studies, scholars might consider conducting a bibliometric analysis using other databases (e.g., Google Scholar, Web of Science or PubMed), which would contribute to gathering more information and reaching a better understanding of the topic. In addition, it could be interesting to perform an analysis that reflects the current topics in the field and their evolution over time. Future studies can incorporate conference proceedings and book chapters to diversify the data set as well as enrich the results.

IV. CONCLUSION

This paper evaluated the global research trends in EI publications from 1966 to 2018. The topic of EI has been a field with extensive research during the last 15 years, most notably the publication output on EI has increased exponentially since 2005. There is a growing interest in the research related to the EI, which correspond to the active rise of EI as crucial skills for the fourth industrial revolution. We have discovered countries/academic institutions that have dominated in research productivity.

The country with maximum number of publications is the US. In addition to that UK and Spain are holding second and third position respectively in terms of total publications. However, certain smaller countries, such as Poland, have high scientific output. Research output can be improved by investing more international collaborative research projects related to EI.

UCL is the most productive institutions in term of total numbers of paper (97). The most highly cited article is entitled "Development and validation of a measure of emotional intelligence" with 1372 citations, published in 1998.

The top five author keywords were 'EI', 'emotions', 'personality', 'trait emotional intelligence' and 'adolescent'. In addition, co-occurrence of keywords shows that several keywords related to instruments to measure EI were

encountered. Such as MSCEIT, TEIQue, TMMS, EQ-i and Wong and Law Emotional Intelligence scale. The three models of EI (Ability Model, Mixed Models and Trait Model) use different EI measuring instruments. One of the mostly used questionnaires in the study of EI is the MSCEIT for the ability model [44]. The ability measure is a more objective form of evaluation and relies less on the perception of the subjects themselves with regards to their emotional abilities. On the other hand, a popular instrument of trait EI is the TEIQue to measure personality-based EI [45]. In conclusion, we believe this article provides a sound and comprehensive view of research on EI that might be helpful for those researchers interested in advancing future knowledge in this area.

APPENDIX

Table-II: The search strategies and query strings used in Scopus

Item	Search for	Search string	Search result
I	EQ research articles	(TITLE-ABS ("emotional intelligence")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j")) AND (EXCLUDE (PUBYEAR , 2020) OR EXCLUDE (PUBYEAR , 2019))	4534
II	Review articles in (I)	(TITLE-ABS ("emotional intelligence")) AND (TITLE ("recent" OR progress OR review OR critical OR revisit OR advance OR development OR highlight OR perspective OR prospect OR trends OR bibliometric OR scientometric)) OR (ABS (progress OR review OR bibliometric OR scientometric)) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (EXCLUDE (PUBYEAR , 2019))	460
III	EI research without review articles	(TITLE-ABS ("emotional intelligence")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SRCTYPE, "j")) AND (EXCLUDE (PUBYEAR, 2020) OR EXCLUDE (PUBYEAR, 2019)) AND NOT EID (<i>insert EID of review articles here**</i>)	4297

**EID of review articles:

(2-s2.0-0034148589 OR 2-s2.0-0036081048 OR 2-s2.0-0036794573 OR 2-s2.0-84986131252 OR 2-s2.0-0036226720 OR 2-s2.0-79959621159 OR 2-s2.0-51549116903 OR 2-s2.0-79954990648 OR 2-s2.0-22144487762 OR 2-s2.0-84951071588 OR 2-s2.0-84929783000 OR 2-s2.0-70449134715 OR 2-s2.0-34547415575 OR 2-s2.0-84990987998 OR 2-s2.0-33947407717 OR 2-s2.0-82955227464 OR 2-s2.0-77951984048 OR 2-s2.0-8481559747 OR 2-s2.0-33644922681 OR 2-s2.0-10144228415 OR 2-s2.0-85043469926 OR 2-s2.0-39049183235 OR 2-s2.0-33747742466 OR 2-s2.0-70149097620 OR 2-s2.0-84861831754 OR 2-s2.0-40949148565 OR 2-s2.0-84898722980 OR 2-s2.0-43149101272 OR 2-s2.0-34247399917 OR 2-s2.0-85043481296 OR 2-s2.0-0034182848 OR 2-s2.0-84930920346 OR 2-s2.0-84963884829 OR 2-s2.0-42649133507 OR 2-s2.0-33846614979 OR 2-s2.0-70449521857 OR 2-s2.0-84993660785 OR 2-s2.0-10844227215 OR 2-s2.0-84921980309 OR 2-s2.0-71149088294 OR 2-s2.0-84872284993 OR 2-s2.0-84855939141 OR 2-s2.0-0642379605 OR 2-s2.0-84861525025 OR 2-s2.0-0035025551 OR 2-s2.0-53349177060 OR 2-s2.0-78650299034 OR 2-s2.0-0033483493 OR 2-s2.0-77956117097 OR 2-s2.0-84992778080 OR 2-s2.0-34249749872 OR 2-s2.0-84914125303 OR 2-s2.0-46249123246 OR 2-s2.0-33646902377 OR 2-s2.0-0035732696 OR 2-s2.0-65349177738 OR 2-s2.0-0036994943 OR 2-s2.0-84986103636 OR 2-s2.0-84856457564 OR 2-s2.0-84872848600 OR 2-s2.0-77957859545 OR 2-s2.0-0012360448 OR 2-s2.0-84990878215 OR 2-s2.0-84946600557 OR 2-s2.0-84901685314 OR 2-s2.0-85039846197 OR 2-s2.0-84991017431 OR 2-s2.0-84952802995 OR 2-s2.0-84940750829 OR 2-s2.0-84912053401 OR 2-s2.0-80053048829 OR 2-s2.0-85011356972 OR 2-s2.0-39049175343 OR 2-s2.0-85026758224 OR 2-s2.0-84925021365 OR 2-s2.0-77951659064 OR 2-s2.0-85065188541 OR 2-s2.0-84876189554 OR 2-s2.0-85009544199 OR 2-s2.0-33646486568 OR 2-s2.0-79951644997 OR 2-s2.0-78751521455 OR 2-s2.0-84888334403 OR 2-s2.0-84879955457 OR 2-s2.0-84899114554 OR 2-s2.0-77956555578 OR 2-s2.0-33750433197 OR 2-s2.0-84902985525 OR 2-s2.0-84876322053 OR 2-s2.0-35748956700 OR 2-s2.0-17144446988 OR 2-s2.0-85029599870 OR 2-s2.0-84931827370 OR 2-s2.0-84883022228 OR 2-s2.0-77649247787 OR 2-s2.0-54249090560 OR 2-s2.0-85013422368 OR 2-s2.0-84937966050 OR 2-s2.0-84949807825 OR 2-s2.0-84877351961 OR 2-s2.0-84866878221 OR 2-s2.0-62749184331 OR 2-s2.0-84880300610 OR 2-s2.0-77949504989 OR 2-s2.0-77949896693 OR 2-s2.0-85033451881 OR 2-s2.0-79953800172 OR 2-s2.0-57049188269 OR 2-s2.0-85018620272 OR 2-s2.0-85020105689 OR 2-s2.0-85009344482 OR 2-s2.0-84929705400 OR 2-s2.0-84938082656 OR 2-s2.0-84921757843 OR 2-s2.0-27744449885 OR 2-s2.0-80051738106 OR 2-s2.0-85042906211 OR 2-s2.0-85038074719 OR 2-s2.0-85007240238 OR 2-s2.0-84959217080 OR 2-s2.0-84899832979 OR 2-s2.0-84928192134 OR 2-s2.0-84864458362 OR 2-s2.0-0036858053 OR 2-s2.0-85003561628 OR 2-s2.0-85019648721 OR 2-s2.0-84956590223 OR 2-s2.0-84925859111 OR 2-s2.0-84923115015 OR 2-s2.0-84899707708 OR 2-s2.0-84927655980 OR 2-s2.0-84891807509 OR 2-s2.0-84861486603 OR 2-s2.0-84858245533 OR 2-s2.0-84867400327 OR 2-s2.0-68149180833 OR 2-s2.0-84867507101 OR 2-s2.0-85043486744 OR 2-s2.0-40949096439 OR 2-s2.0-34948853268 OR 2-s2.0-85040491730 OR 2-s2.0-85002945774 OR 2-s2.0-34249983859 OR 2-s2.0-85053831725 OR 2-s2.0-85047422168 OR 2-s2.0-85033496973 OR 2-s2.0-85032473769 OR 2-s2.0-85021764038 OR 2-s2.0-85033575095 OR 2-s2.0-84982295471 OR 2-s2.0-84995678170 OR 2-s2.0-84989193458 OR 2-s2.0-84944810173 OR 2-s2.0-84941766257 OR 2-s2.0-84923336439 OR 2-s2.0-84856186886 OR 2-s2.0-84904127176 OR 2-s2.0-79952926338 OR 2-s2.0-74749104238 OR 2-s2.0-79960321498 OR 2-s2.0-33744479748 OR 2-s2.0-85045738977 OR 2-s2.0-85045287409 OR 2-s2.0-85044536290 OR 2-s2.0-84998816254 OR 2-s2.0-84990249622 OR 2-s2.0-84914166873 OR 2-s2.0-799

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55067231 OR 2-s2.0-77950197079 OR 2-s2.0-79951842896 OR 2-s2.0-85051376726 OR 2-s2.0-85059165321 OR 2-s2.0-85049566076 OR 2-s2.0-85063344356 OR 2-s2.0-85052683213 OR 2-s2.0-85046999143 OR 2-s2.0-85014002113 OR 2-s2.0-85025090507 OR 2-s2.0-85017096347 OR 2-s2.0-85017019734 OR 2-s2.0-84990040776 OR 2-s2.0-84989348402 OR 2-s2.0-84951745359 OR 2-s2.0-84969524032 OR 2-s2.0-84959353968 OR 2-s2.0-84947749582 OR 2-s2.0-84894883004 OR 2-s2.0-84924953533 OR 2-s2.0-84907046990 OR 2-s2.0-84884410447 OR 2-s2.0-84865556761 OR 2-s2.0-84862170290 OR 2-s2.0-84858063053 OR 2-s2.0-84927550900 OR 2-s2.0-79957868395 OR 2-s2.0-77957255111 OR 2-s2.0-33745314871 OR 2-s2.0-77956313847 OR 2-s2.0-85057456772 OR 2-s2.0-85056329676 OR 2-s2.0-85055201291 OR 2-s2.0-85047918456 OR 2-s2.0-85061401816 OR 2-s2.0-85046078787 OR 2-s2.0-85019347283 OR 2-s2.0-85063355430 OR 2-s2.0-85059626985 OR 2-s2.0-85050819635 OR 2-s2.0-85046492928 OR 2-s2.0-85044630648 OR 2-s2.0-85042454781 OR 2-s2.0-85018586454 OR 2-s2.0-85014566625 OR 2-s2.0-85046285098 OR 2-s2.0-85036663381 OR 2-s2.0-85033590126 OR 2-s2.0-85030570308 OR 2-s2.0-85021263569 OR 2-s2.0-85019070265 OR 2-s2.0-84992390044 OR 2-s2.0-84969509159 OR 2-s2.0-84965185822 OR 2-s2.0-84960984327 OR 2-s2.0-84932115411 OR 2-s2.0-84918564056 OR 2-s2.0-85063826071 OR 2-s2.0-84887341271 OR 2-s2.0-84881164881 OR 2-s2.0-84880096807 OR 2-s2.0-84869476601 OR 2-s2.0-84155179038 OR 2-s2.0-77954970111 OR 2-s2.0-77955849108 OR 2-s2.0-51349089666 OR 2-s2.0-85064802307 OR 2-s2.0-79957860570 OR 2-s2.0-79951847223))

Table-III: Terminology Used by Vosviewer Software [20]

Term	Description
Items	Objects of interest, namely the publications, researchers, keywords, authors
Link	Connection or a relation between two items, for example co-authorship links between researchers, and co-occurrence links between terms.
Link strength	Each link has a strength, represented by a positive numerical value. The higher this value, the stronger the link. In the case of co-authorship analysis, the link strength between countries indicates the number of publications that two affiliated countries have co-authored. Similarly, in the case of co-occurrence analysis, the total link strength between author keywords indicates the number of publications in which two keywords occur together.
Network	Set of items connected by their links
Cluster	set of items included in a map. Clusters are non-overlapping. In other words, an item may belong to only one cluster.

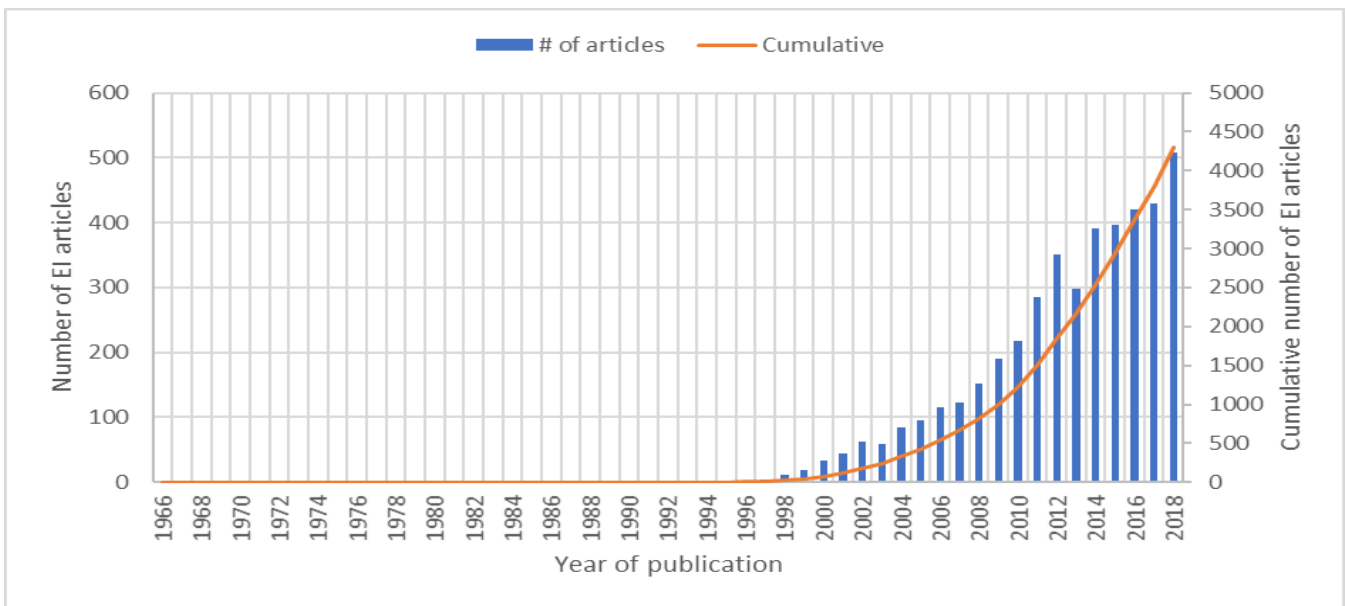


Fig. 1. The Annual and Cumulative Numbers of Research Articles on Emotional Intelligence Indexed In Scopus From 1966 Until 2018

Table-V: The Top 10 Most Productive Journals on EI Research with Their Most Cited Articles

Rank	Journal	TP (%)	TC	CiteScore 2018
1	Personality and Individual Differences	265 (6.17)	14103	2.65
2	Frontiers in Psychology	43 (1)	275	2.4
3	Life Science Journal	34 (0.79)	35	N/A
4	Psychological Reports	33 (0.77)	140	1.11
5	Advances in Environmental Biology	33 (0.77)	6	N/A
6	Emotion	28 (0.65)	2746	3.6

7	Nurse Education Today	28 (0.65)	459	2.65
8	Social Behavior And Personality	28 (0.65)	452	0.8
9	Psicothema	25 (0.58)	824	1.81
10	Journal of The Indian Academy of Applied Psychology	24 (0.56)	33	0.26

TP: total publications; TC: total citations; N/A: not available (coverage discontinued in Scopus)

Table-VI: The Top Citescore Journals Publishing EI Research with Minimum 20 Research Articles

Rank	Journal	CiteScore 2018	Journal's homepage	Publisher	No. of publications
1	Emotion	3.6	https://www.apa.org/pubs/journals/emo/	APA	28
2	Intelligence	3.35	https://www.journals.elsevier.com/intelligence	Elsevier	21
3	Plos One	2.97	https://journals.plos.org/plosone/	Public Library of Science	20
4	Personality and Individual Differences	2.65	https://www.journals.elsevier.com/personality-and-individual-differences	Elsevier	265
5	Nurse Education Today	2.65	https://www.journals.elsevier.com/nurse-education-today	Elsevier	28
6	Frontiers in Psychology	2.4	https://www.frontiersin.org/journals/psychology	Frontiers Media S.A.	43
7	Leadership and Organizational Development Journal	1.82	https://www.emeraldgroupublishing.com/products/journals/journals.htm?id=lodj	Emerald	20
8	Psicothema	1.81	http://www.psicothema.com/english/presentation.asp	Colegio Oficial de Psicólogos	25
9	Journal of Psychoeducational Assessment	1.67	https://journals.sagepub.com/home/jpa	SAGE	23
10	Psychological Reports	1.11	https://journals.sagepub.com/home/prx	SAGE	33
11	Behavioral Psychology Psicología Conductual	0.9	https://www.behavioralpsycho.com/?lang=en	Fundacion VECA	21
12	Social Behavior and Personality	0.8	https://www.sbp-journal.com/index.php/sbp	Society for Personality Research	28
13	Electronic Journal of Research in Educational Psychology	0.54	http://investigacion-psicopedagogica.org/revista/new/english/index.php	University of Almeria	21
14	Journal of the Indian Academy of Applied Psychology	0.26	http://medind.nic.in/jak/jakaj.shtml	Indian Academy of Applied Psychology	24

Table-VII: The Top 15 Most Cited Articles

Rank	Article	TC	Journal	Author/s	Year	C/Y
1	Development and validation of a measure of emotional intelligence	1372	Personality and Individual Differences	Schutte, N.S., Malouff, J.M., Hall, L.E., Haggerty, D.J., Cooper, J.T., Golden, C.J., Dornheim, L.	1998	69
2	Toward machine emotional intelligence: Analysis of affective physiological state	1247	IEEE Transactions on Pattern Analysis and Machine Intelligence	Picard, R.W., Vyzas, E., Healey, J.	2001	73
3	Emotional intelligence meets traditional standards for an intelligence	1115	Intelligence	Mayer, J.D., Caruso, D.R., Salovey, P.	1999	59
4	The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study	995	Leadership Quarterly	Wong, C.-S., Law, K.S.	2002	62
5	Assessment of mindfulness by self-report: The Kentucky inventory of mindfulness skills	945	Assessment	Baer, R.A., Smith, G.T., Allen, K.B.	2004	68

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6	Emotions and leadership: The role of emotional intelligence	750	Human Relations	George, J.M.	2000	42
7	Measuring Emotional Intelligence with the MSCEIT V2.0	729	Emotion	Mayer, J.D., Salovey, P., Caruso, D.R., Sitarenios, G.	2003	49
8	Convergent, discriminant, and incremental validity of competing measures of emotional intelligence	644	Personality and Social Psychology Bulletin	Brackett, M.A., Mayer, J.D.	2003	43
9	Trait emotional intelligence: Psychometric investigation with reference to established trait taxonomies	629	European Journal of Personality	Petrides, K.V., Furnham, A.	2001	37
10	Emotional intelligence: in search of an elusive construct.	629	Journal of personality and social psychology	Davies, M., Stankov, L., Roberts, R.D.	1998	31
11	The location of trait emotional intelligence in personality factor space	568	British Journal of Psychology	Petrides, K.V., Pita, R., Kokkinaki, F.	2007	52
12	Development and validation of the political skill inventory	550	Journal of Management	Ferris, G.R., Treadway, D.C., Kolodinsky, R.W., Hochwarter, W.A., Kacmar, C.J., Douglas, C., Frink, D.D.	2005	42
13	What makes a leader?	542	Harvard business review	Goleman, D.	1998	27
14	Emotional Intelligence: An Integrative Meta-Analysis and Cascading Model	522	Journal of Applied Psychology	Joseph, D.L., Newman, D.A.	2010	65
15	Mood and emotions in small groups and work teams	507	Organizational Behavior and Human Decision Processes	Kelly, J.R., Barsade, S.G.	2001	30

TC: total citations; C/Y: average number of citations per year

Table-VIII: The Top 15 Most Productive Countries and Academic Institutions in EI Publications.

Rank	Country	TPc	SCP (%)	The most productive academic institution	TPI
1	United States	1103	75.61	Yale University	45
2	United Kingdom	504	59.92	UCL	97
3	Spain	418	77.51	Universidad de Malaga	81
4	Australia	301	70.00	The University of Sydney	37
5	Iran	265	87.92	Islamic Azad University	49
6	Canada	204	50.00	Western University	45
7	India	194	90.72	Vellore Institute of Technology, Vellore	11
8	China	132	62.88	Beijing Normal University	19
9	Malaysia	132	73.48	Universiti Putra Malaysia	34
10	Italy	108	57.41	Università degli Studi di Firenze	27
11	Germany	91	40.66	Deutsche Sporthochschule Köln	14
12	South Africa	88	81.82	North-West University	19
13	South Korea	83	75.9	Kyung Hee University	6
14	Turkey	81	88.89	Hacettepe Üniversitesi	5
15	Poland	76	77.63	Uniwersytet Warszawski	16

TPc: total publications of a given country; TPI: total publications of a given academic institution; SCP: single-country publications.

Table-IX: List of the 15 most prolific authors in EI research area.

Rank	Author	Scopus author ID	Year of 1st publication*	TP	h-index	TC	Current affiliation	Country
1	Petrides, Konstantinos V.	6603597461	2000 ^a	71	35	5109	UCL Institute of Education, London	United Kingdom
2	Extremera Pacheco, Natalio	6602380970	2002 ^a	47	20	1183	Universidad de Malaga, Malaga	Spain
3	Berrocal, Pablo Fernández	6603121863	2002 ^b	40	18	967	Universidad de Malaga, Malaga	Spain
4	Furnham, Adrian F.	36045985300	2000 ^b	33	22	3229	Norwegian Business School, Oslo	Norway
5	Saklofske, Donald H.	7004876348	2003 ^a	32	17	1425	Western University, London	Canada
6	Schutte, Nicola S.	6701817726	1998 ^a	30	18	2666	University of New England Australia, Armidale	Australia
7	Salovey, Peter	7005302162	1990 ^c	28	23	5705	Tohoku University, Sendai	Japan
8	Stough, Con	7004331792	2001 ^b	25	16	1221	Swinburne University of Technology, Melbourne	Australia
9	Austin, Elizabeth J.	7102409259	2003 ^b	24	18	1775	University of Edinburgh	United Kingdom
10	Roberts, Richard D.	35617689800	1998 ^c	24	15	1871	Rad Science Solution, Philadelphia	United States
11	Di Fabio, Annamaria	23097256500	2008 ^a	23	18	739	Università degli Studi di Firenze, Florence	Italy
12	Mikolajczak, M.	55956444300	2006 ^a	23	16	1351	Université Catholique de Louvain, Louvain-la-Neuve	Belgium
13	Qualter, Pamela	6506225017	2006 ^b	20	13	451	University of Manchester, Manchester	United Kingdom
14	Mayer, John D.	7403140597	1990 ^a	19	17	4667	University System of New Hampshire, Durham	United States
15	Rey, Lourdes	7005153945	2006 ^c	19	11	380	Universidad de Malaga, Malaga	Spain

* Role in co-authorship, superscripts

^a First author.

^b Co-author.

^c Last author.

Table-X: The Link and Total Link Strength of The Top 10 Occurrence Keywords

Rank	Keywords	Links	Total Link Strength	Occurrences	APY
1	Emotional Intelligence	367	3989	2449	2013
2	Emotions	144	418	179	2012
3	Personality	157	457	164	2011
4	Trait Emotional Intelligence	137	342	159	2014
5	Adolescent	105	345	145	2014
6	Leadership	102	298	144	2011
7	Gender	93	260	105	2013
8	Stress	87	253	92	2013
9	Job Satisfaction	65	193	88	2014
10	Intelligence	80	205	85	2009

APY: Average Publications Year

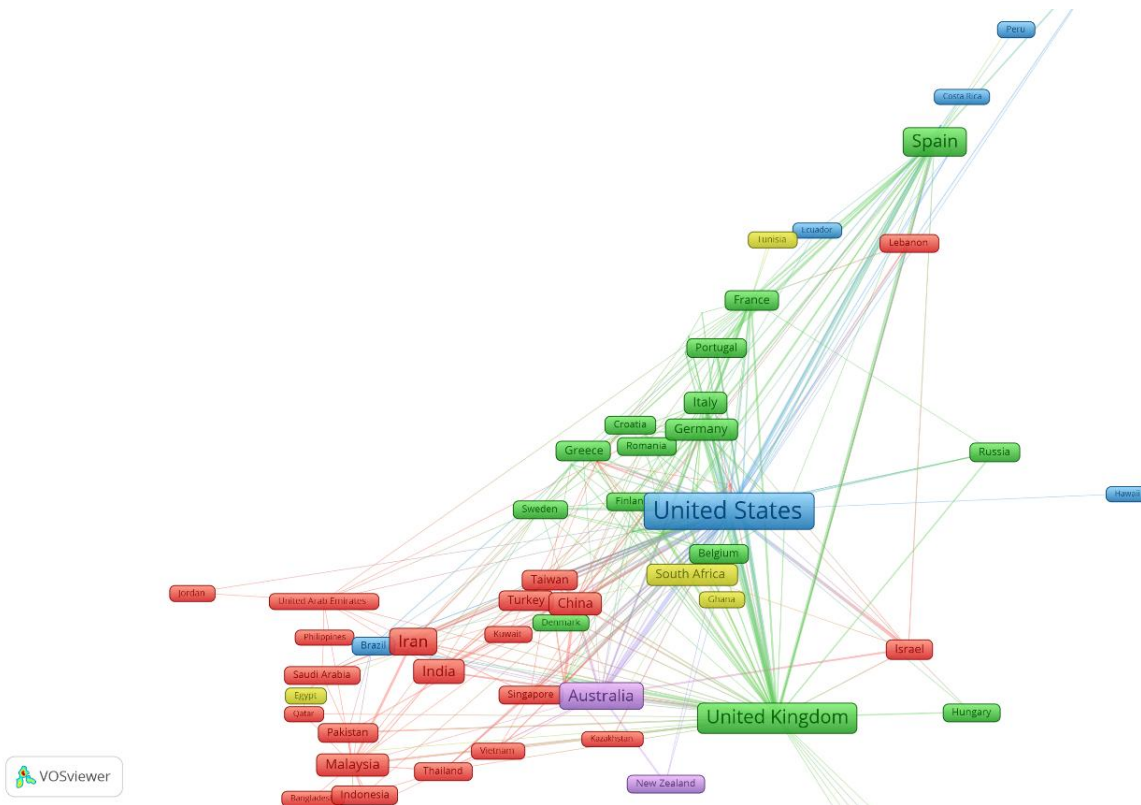


Fig. 4. A screenshot of bibliometric map created based on co-authorship with network visualization mode. The following URL can be used to open Fig. 4 in VOSviewer: <http://bit.ly/2Rik3pm>

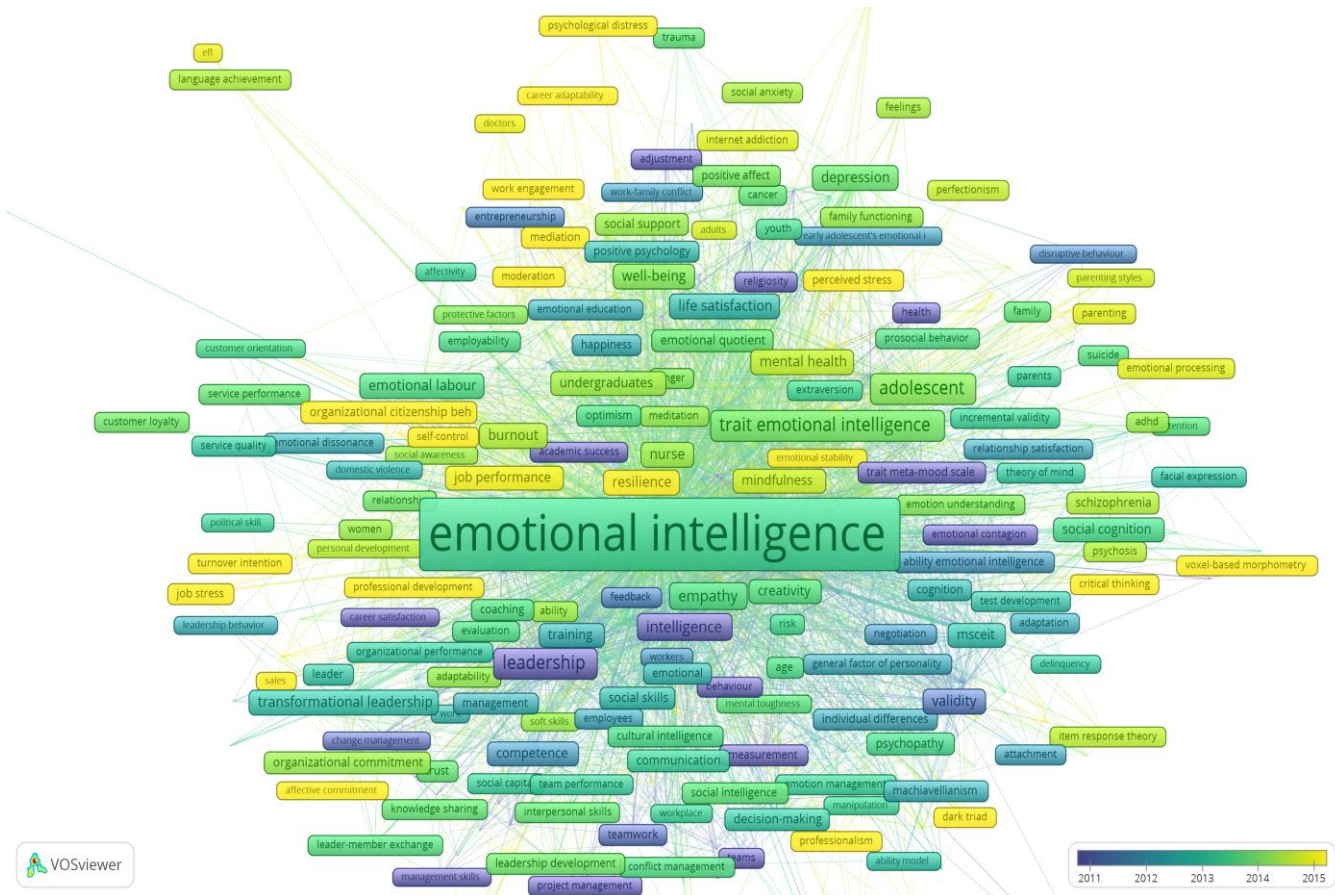


Fig. 5. A screenshot of the bibliometric map based on author keywords co-occurrence with overlay visualization mode. Minimum occurrences of a keyword are set to five. The following URL can be used to open Fig. 5 in VOSviewer: <http://bit.ly/2qHIZmK>

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