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Exploring Human Capital Training Trends Using Bibliometric Analysis

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Abstract

A workforce is so called human capital is an asset to country, organization and company. An effective investment in human capital can be seen in the development of innovation, productivity, and competitiveness of a country. This topic of human capital training is important because most developing countries human capital investment is done through training and education. It is believed that sustainable human capital investment in training and education is vital to ensure a high economic growth and development. Thus, the objective of this study is to perform bibliometric analysis on scientific literature published in the field of human capital training and education. Scopus database was used to gather all related literature on human capital training and education. The methodology used for this study apart from SPSS and Microsoft Excel software, we also utilise Publish or Perish software to integrate the data and perform simple analysis before using VOSviewer to perform data visualisation. . The main finding for this research indicates a total of 1,218 documents were retrieved based on the keyword search results and 10 articles were excluded. The study of human capital training and education begins 53 years ago to be exact in 1968. Most articles were written in English and published in journals and conferences articles. Majority of these articles were in the Business, Management and Accounting fields. The bibliometric analysis presents the advancement of the scientific literature on human capital training and education and highlights the area of interest where future researchers could explore. The area for future research in human capital development including education, training, personal training, employment, human capital, economics, humans and innovation

Keywords: Human Capital Training, Bibliometric Analysis, Education

Introduction

The concept of human capital investment allows organisations to understand the value of investing time and resources in opportunities for education and training. In general, human capital refers to the facts, skill sets, and experience that employees have in an economy. Since a skilled workforce will contribute to improve efficiency, the skilled workers will eventually provide economic benefit to the organisations in long run. The concept of human capital is the recognition that not everyone has the same skills or expertise. Usually, by investing in the

education of people, the quality of work can be increased or improved. In fact, there is a strong connection exists between economic growth and human capital investment.

Human capital influences economic development and will help to build an economy through the expansion of its people's knowledge and skills. The analysis is therefore aware of the comprehensive advancement of human capital preparation for education and training in the field of research and practise that led us to carry out this bibliometric analysis. Therefore, we want to review human capital training and education on the Internet over the last 25 years and how this bibliometric analysis can influence future research. The following research questions are answered in this bibliometric review:

1. What is the current trend in human capital training and education?
2. Which are the most influential articles on human capital training and education?
3. Which are the most popular themes of human capital training and education among scholars?
4. Who are the most influential authors of human capital training and education?
5. What is the current state of collaboration involving human capital training and education?
6. What is the intellectual structure of current research on human capital training and education?

There are five key sections of the organisation of this study: Introduction, Review of Literature, Data and Methods, Results and Discussion, and Conclusion and Limitation. The Results and Discussion section is assisted by a detailed descriptive study by analyzing the types of documents and sources, the year of publication, the languages used in publications, the sources of publication, the geographical and institutional distribution, the subject area and the trend in the fundamental intellectual structure of the publication. Finally, we illustrate the findings, restrictions, and suggest which areas should be investigated by future researchers.

Literature Review

The impact of human capital training and education on economic development is central to research on human capital training. Lucas (1988) states that the level of production is a function of human capital inventory. Knowledge acquired through education is human capital. Lucas's first model is the accumulation of human capital and the second model is the accumulation of human capital by labour with two main variables: human capital and physical capital. Physical capital consists equipment and structures that assist in the production of goods and services, and different technologies are used to obtain human capital. In producing the next generation of human capital development, human capital is a vital element. The model function of Lucas indicates that higher education productivity increases the marginal labour product, higher wage rates and increased economic growth (Islam et al., 2016).

According to Nagaraj et al (2009), the impact of human capital and income through education and training is significant. The difference occurs within the determined income gain of human capital. Nowadays, households typically allocate more investment in education (human capital) for their kids to boost future achievements. The role of human capital in contributing to economic growth has primarily become more important. More trained populations have increased the requisite human resources to succeed globally. For example, the allocation for

education and training budget in Malaysia is high, representing more than 20 percent of total government expenditure over the period 2000-2003. Student enrolment in tertiary education rose from 2000 to 2010. (Ismail and Yussof, 2010). The current trends also point out the importance of human capital investment through education and training. The future will certainly belong to organisation which pay most attention to effective management of human resources. This can be seen in terms of digitalisation and technology training as important prerequisite for competitiveness and growth of a country. This has remained the central argument in favour of human capital training that supposed to benefit diverse perspectives and therefore can perform their duties better with the strong support by government. Many researchers have found a positive relationship between human capital training and education with economic development (Diebolt and Hippe, 2019; Alawamleh et al., 2019).

A study in the Jordanian community by Alawamleh et al (2019) states the importance of human capital investment via innovation in education to accelerate socio-economic development. The results show that the relationship between innovation and human capital investment, and this combination will lead to the development of Jordanian culture and the economy. The findings also similar with the study in Ukraine economy by Kuzmin et al (2020) which claims that crucial condition for sustainable development of the country is the implementation of the strategy of increasing the quality of human capital, which is actively involved in innovation processes and serves as a key resource for improving the competitiveness of the national economy. This innovation is reflected in the model which generally called "lifelong learning" using modern technologies.

In addition, in recent years, Science, Technology, Engineering, and Math (STEM) education has become important in many countries around the world. Study by Ha et al (2020) for ASEAN countries shows that the trend of research in this field of STEM has shown a dramatic increase in scientific production in the last three years. The main findings support the investment in human capital training and education is worth it to sustain country competitiveness and economic development.

Methods

As one of the methods used to reveal the study trend (Ahmi and Mohammad, 2019), bibliometric analysis is gaining popularity and has been commonly used in recent years in management (Ferreira et al., 2014). It is an alternative to traditional literature review. Bibliometrics is a comparative analysis of reported physical units, bibliographic units, or surrogates of each (Broadus, 1987). Moreover, a methodological approach to performing a bibliometric analysis can discover more detailed publication-related data, including authors, keyword frequency and citations (Rusly et al., 2019). Bibliometric analysis could provide descriptive publishing patterns based on a domain, area, country, and period. In bibliographic research, various metrics such as publishing outlet, publishing types, authorship, affiliations, country, h-index, and g-index were among the most frequently examined aspects (Ahmi and Mohammad, 2019).

Scopus is the largest archive of scholarly works (Burnham, 2006) and the most comprehensive searchable citation and abstract search literature source (Chadegani et al., 2013). This database was used as the platform for extracting previous web accessibility works. The database provides details of the publication that include the type of access, year, author

name, area topic, type of text, title of source, keyword, affiliation, country, type of source and language.

We narrowed the search of web accessibility studies based on titles to further specify important academic works on the research domain examined. Due to the large number of studies on economics studies, this review concentrated only on documents relevant to human capital. As such, the following questionnaire was carried out: TITLE-ABS-KEY ("human capital" AND "training" AND "education")

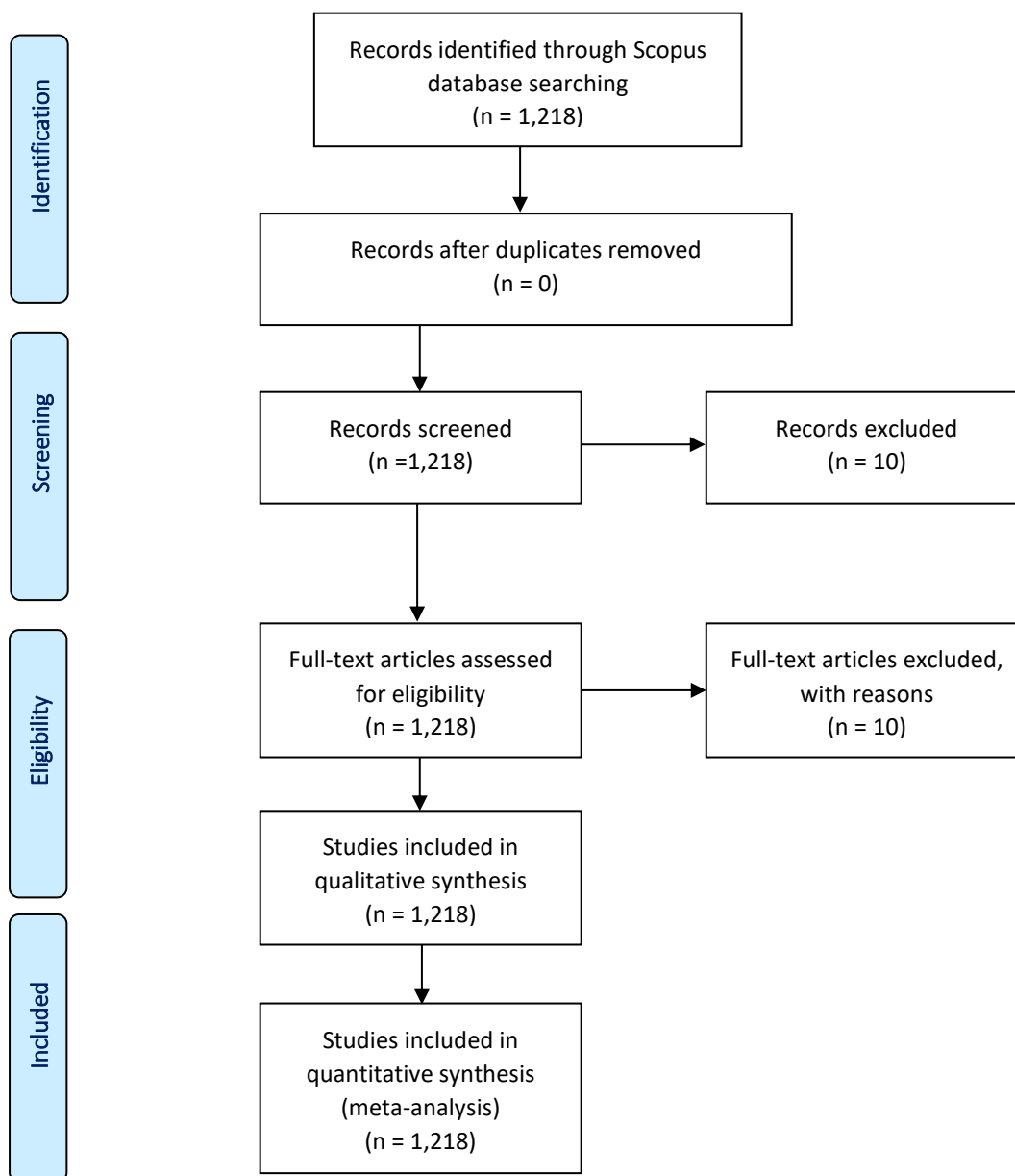


Figure 1. PRISMA Flow Diagram

Source: Moher et al (2009)

Results

The analysis of the extracted scholarly works covers document types and source types, annual growth, document language, subject area, analysis of keywords, productivity of the country, analysis of authorship and citation. The bulk of the results are interpreted in terms of

frequency and percentage. Meanwhile, as some retrieved documents per year, we present the annual growth data, including their frequency, percentage, and cumulative percentage until November 2020. As citation metrics, we publish citation analysis and reveal 52 years of the most cited papers in web accessibility.

Evolution of Publication

The growth of related publications subsequently increased gradually, especially in 1993. In 2000, total publications started to exceed 2-digit and increased significantly over the years, as shown in Figure 1. We expect the number of publications to rise gradually in the future as more and more research will be performed for training and education studies on human capital issues. The largest number of publications was in 2019. More than 90 papers have been published until 31 October 2020, although the year is still going. Some publications have already been scheduled and indexed in the Scopus database. Firestone, O.J. (1968) conducted the first study on human capital issues for education and training studies in 1968. with "Education and Economic Development-The Canadian Case" in his article.

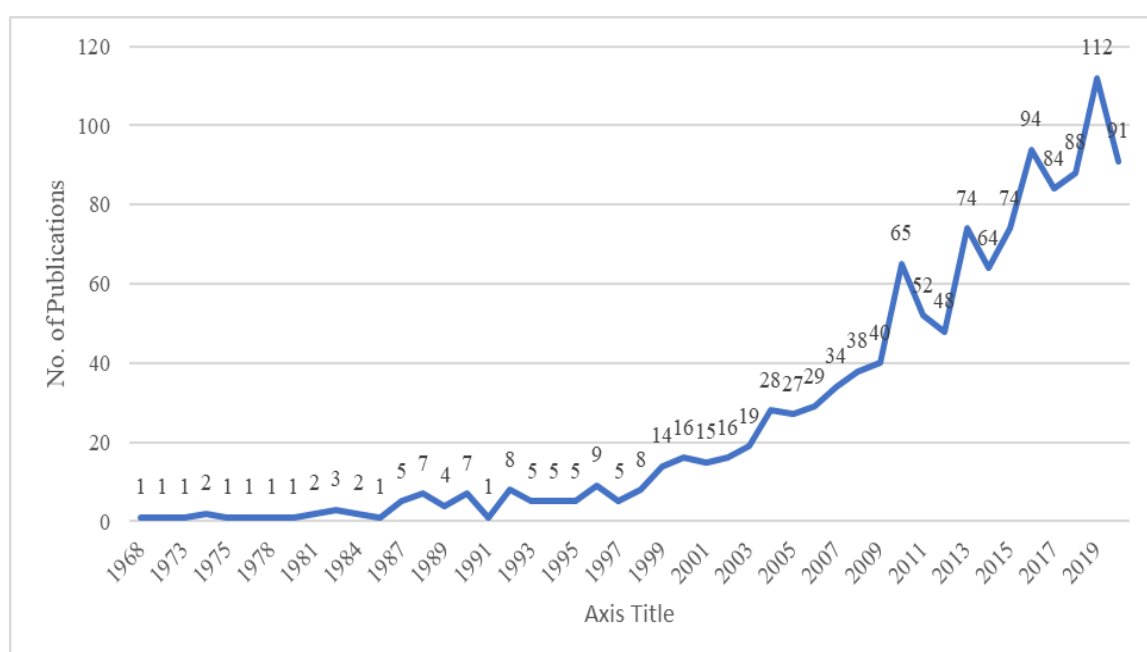


Fig. 1: Internet Financial Reporting publications, 1968-2020 (n=1,208)

Document and Source Types

This study found 6 types of published documents related to human capital training and education, namely article, conference paper, book chapter, review, book, and conference review. As exhibits in Table 1, most publications were articles, which account for 72.8%, followed by conference papers, 11.4%. Collectively, the other types of documents made up about 15.7%, with each type being less than 10.0% of the total documents. Furthermore, four source types are also presented in Table 1. Journals (77.2%) are the highest category, followed by conference proceedings with 9.9%. The number of documents accounted of 8.8%, 3.6% and 0.6% respectively represent book, book series and trade journal. Meanwhile, other access type accounted about 84.4% and the remaining articles were published as open access documents.

Table 1

Document and Source Types

Document Type	NP	%	Source Type	NP	%	Access Type	NP	%
Article	880	72.8	Journal	932	77.2	Open Access	189	15.6
Conference Paper	138	11.4	Conference Proceeding	119	9.9	Other	1019	84.4
Book Chapter	95	7.9	Book	106	8.8			
Review	65	5.4	Book Series	44	3.6			
Book	21	1.7	Trade Journal	7	0.6			
Conference Review	9	0.7						

Note: NP = No. of Publications

Languages of Documents

Since English is the universally recognised scholarly language, almost all papers were written in English. Table 2 reveals that most of the documents obtained were published in English (91.6%). Meanwhile, 2.6% published article, however, 32 were released in Russian, 31 in Spanish and 15 in French. The rest published articles about less than 1.0% were written in German, Portuguese, Chinese, Dutch, Malay, Afrikaans, Bosnian and Italian.

Table 2

Languages

Language	NP	%
English	1106	91.6
Russian	32	2.6
Spanish	31	2.6
French	15	1.2
German	10	0.8
Portuguese	8	0.7
Chinese	3	0.2
Dutch	2	0.2
Malay	2	0.2
Persian	2	0.2
Polish	2	0.2
Afrikaans	1	0.1
Bosnian	1	0.1
Croatian	1	0.1
Italian	1	0.1
Lithuanian	1	0.1
Moldavian	1	0.1
Moldovan	1	0.1
Romanian	1	0.1
Ukrainian	1	0.1
Total	1208	100

Note: NP = No. of Publications

Subject Area

The written documents were also submitted by this study based on its subject areas. Much of the human capital training and education studies were in Social Sciences representing for

about 51.2% of the total reports, followed by Business, Management, and Accounting, (26.2%), Economics, Econometrics and Finance (25.8%), Engineering (9.2%) and Computer Science (6.5%), and Environmental Science (6.5%). Table 3 includes the other subject areas covered in the research on human capital training and education. Veterinary, Neuroscience, and Dentistry were the least article written in this topic.

Table 3

Subject Area

Subject Area	NP	%
Social Sciences	618	51.2
Business, Management and Accounting	317	26.2
Economics, Econometrics and Finance	312	25.8
Engineering	111	9.2
Computer Science	78	6.5
Environmental Science	78	6.5
Arts and Humanities	66	5.5
Medicine	56	4.6
Psychology	53	4.4
Decision Sciences	51	4.2
Agricultural and Biological Sciences	43	3.6
Earth and Planetary Sciences	29	2.4
Energy	26	2.2
Mathematics	21	1.7
Materials Science	19	1.6
Nursing	17	1.4
Health Professions	13	1.1
Biochemistry, Genetics and Molecular Biology	12	1.0
Physics and Astronomy	11	0.9
Multidisciplinary	9	0.7
Chemical Engineering	7	0.6
Chemistry	7	0.6
Pharmacology, Toxicology and Pharmaceutics	7	0.6
Veterinary	3	0.2
Neuroscience	2	0.2
Dentistry	1	0.1

Geographic Distribution of Publication and Affiliation

Researchers from 12 different countries contributed to the publication of the retrieved documents. The top 12 countries contributing to the publications in human training and education are listed in Table 4. The United States (USA) was ranked first with a total of 263 documents, followed by United Kingdom (UK) (121), the Russian Federation (91), Australia (58) and Malaysia (54). In terms of the number of total citations by country, the United States (US) was ranked first with a total of 53,46 citations, followed by United Kingdom (UK) (1,839).

Table 4

Top 12 Countries Contributed to the Publications

	Country	TP	NCP	TC	CP	C/CP	h	g
1	United States	263	216	5346	20.3	24.8	47	91
2	United Kingdom	121	109	1839	15.2	16.9	20	39
3	Russian Federation	91	49	231	2.5	4.7	8	11
4	Australia	58	50	448	7.7	9.0	11	19
5	Malaysia	54	36	185	3.4	5.1	7	11
6	Italy	52	39	638	12.3	16.4	11	24
7	China	45	23	215	4.8	9.3	7	14
8	Germany	45	37	438	9.7	11.8	11	20
9	Spain	44	29	339	7.7	11.7	9	17
10	Canada	38	30	1119	29.4	37.3	14	33
11	France	31	23	226	7.3	9.8	6	14
12	South Africa	30	22	250	8.3	11.4	6	15

Notes: TP=Total number of publications; NCP=Number of Cited Publications; TC=Total Citations; C/P=Average

Citations per Publication; C/CP=Average Citations per Cited Publication; h = h-index; and g = g-index

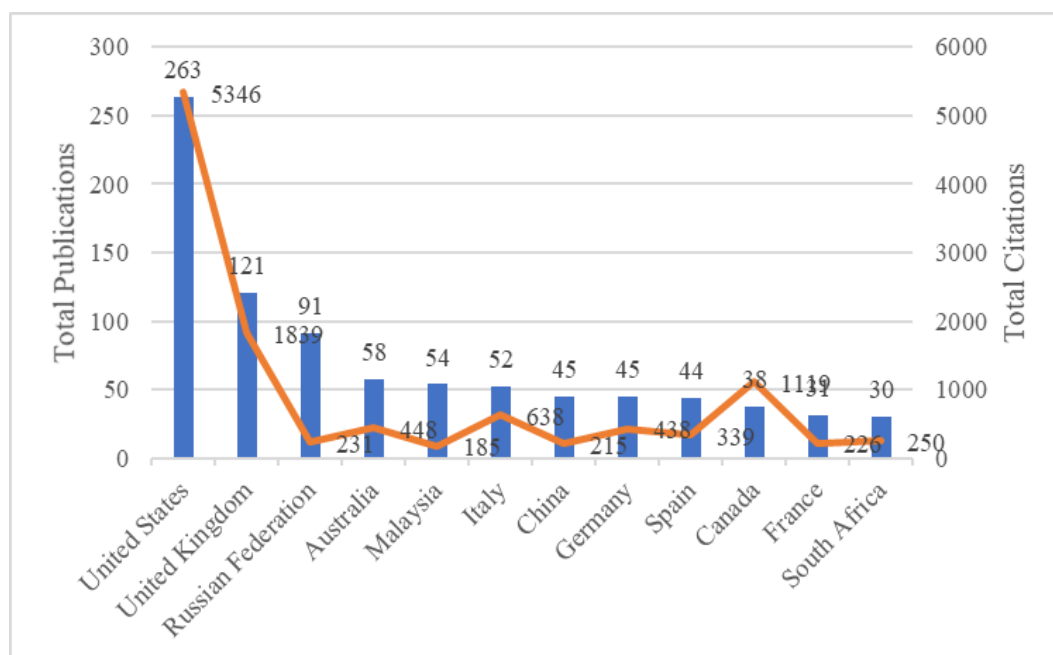


Figure 2: Total Publications and Citations by Countries

Authorship Analysis

This research also analyses the most prolific writers publishing human capital documents for training and education studies. Table 5 identified the authors with at least five publications. Odoardi, Bucciarelli, Muratore, Xiao, Brunello and Yoshikawa are among the top scholars in this area of study with at least four publications on human capital for training and education studies. The total citation indicates the number of times that other publications mentioned in Scopus referenced human capital articles for training and education studies. While Odoardi contributed most papers, the works of the author were not the highest cited. Brunello's works

have the highest cited publications. Therefore, the number of publications did not correspond with the number of citations.

Table 5

Top 6 Productive Authors

	Country	TP	NCP	TC	CP	C/CP	h	g
1	Odoardi, I.	6	4	9	1.5	2.3	2	2
2	Bucciarelli, E.	5	3	8	1.6	2.7	2	2
3	Muratore, F.	5	3	8	1.6	2.7	2	2
4	Xiao, J.	5	5	55	11.0	11.0	4	5
5	Brunello, G.	4	2	274	68.5	137.0	2	4
6	Yoshikawa, H.	4	3	57	14.3	19.0	3	4

Notes: TP=Total number of publications; NCP=Number of Cited Publications; TC=Total Citations; C/P=Average Citations per Publication; C/CP=Average Citations per Cited Publication; h = h-index; and g = g-index

Citation Analysis

We used Harzing's Publish or Perish software to obtain the citation metrics for the retrieved data. Data gathered from the Scopus database has been imported into this software to generate the citation metrics. Table 6 summarizes the citation metrics for the retrieved documents, as of November 3, 2020. The summary includes the total number of citations with their citation per year, citations per paper, and citations per author.

Table 6

Citations Metrics

Metrics	Data
Publication years	1968-2020
Citation years	52 (1968-2020)
Papers	1208
Authors	316
Citations	13066
Citations/year	251.27
Citations/paper	10.82
Citations/author	41.35
Papers/author	3.83
Authors/paper	0.26
h-index	47
g-index	91

Keywords Analysis

The authors' keywords were mapped with VOSviewer, a software tool for constructing and visualizing bibliometric networks. Figure 3 presents a network visualization of the authors' keywords, whereby colour, frame size, font size, and thickness of connecting lines were used to indicate the relationships among the keywords. For example, keywords with the same colour were commonly listed together. Thus, in this analysis, for instance, management,

innovation, learning, and teaching shared a similar colour (green), suggesting these keywords are closely linked and usually co-occurred.

Visualisation Map

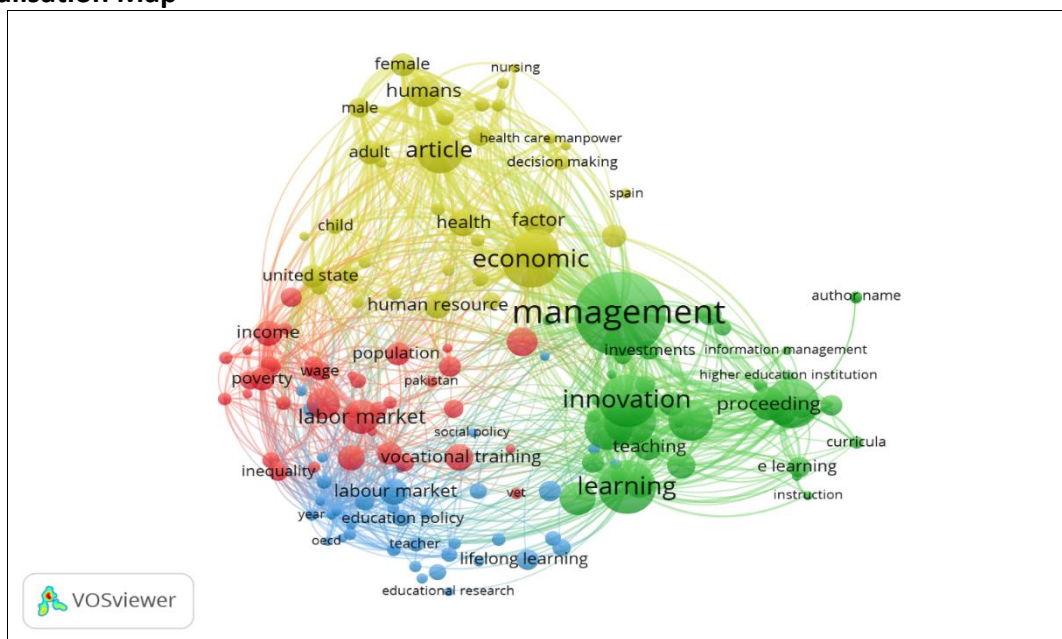


Figure 3: Network visualisation map of the author keywords

Meanwhile, after excluding core keywords listed in the search query: TITLE-ABS-KEY ("human capital" AND "training" AND "education") among the keywords with the highest occurrences are education, training, personal training, employment, human capital, economics, humans and innovation. Table 7 displays the top 10 keywords used in human capital for training and education studies.

Table 7

Top 10 Keywords

	Keyword	Total Publications (TP)	%
1	Human Capital	414	12.2
2	Education	212	6.2
3	Training	148	4.4
4	Personnel Training	77	2.3
5	Employment	74	2.2
6	Human	73	2.1
7	Human Capitals	69	2.0
8	Economics	47	1.4
9	Humans	45	1.3
10	Innovation	42	1.2

Discussion

In this section, we summarize our findings and suggest future research directions. We highlight an issue on research of human capital training and education and what areas in human capital training and education need additional study. We expect the number of publications to rise gradually in the future as more and more research will be performed for

training and education studies on human capital issues. More than 90 papers have been published until 31 October 2020, although the year is still going. Based on the reported data, most of the geographic distribution of publications focusing in developed countries such as United States (US), United Kingdom (UK), the Russian Federation and Australia. Thus, we suggest that human capital training and education research should be carried out in other developing countries or Asian countries, as the influence of human capital training and education has been internationally recognized as affecting economic growth.

Much of the human capital training and education studies subject area were in Social Sciences representing for 51.2% of the total reports and followed by Business, Management, and Accounting. However, it shows that there is limited research on human capital training related to Veterinary, Neuroscience, and Dentistry. In fact, it is interesting subject area to explore particularly in the era of industrial revolution (IR 4.0). The development of innovation in human capital training and education is thus essential in a digitalisation economy.

The search query could be expanded to other accessible databases, such as the Web of Science, Google Scholar in future studies. Future human capital training research may be aimed at filling some of the holes we highlight. Additional insights into a wide variety of sectors or cross-country research and further study will also be useful.

Conclusion

This paper presents a bibliometric review to gain a clearer picture into the trends, historical review, forecasts and contributions of the human capital training and education. The research on this research started 1968 and increased year by year since then. It is expected the total number of publications drastically increased more in 2021 as more than 90 papers have been published until 31 October 2020, although the year is still going. Articles related to human capital training and education also written by multiple authors with a mean collaboration index of 3.65 authors per article.

This study also reveals that the areas mostly covered in the human capital training and education research are related to education, training, personal training, employment, human capital, economics, humans and innovation based on the keywords used by authors. Other potential areas worth exploring include human capital innovation and digitalisation in line with current situation of Covid-19 pandemic around the world.

The geographic dispersion of the literature shows that United States has the largest number of publications as well as influence in terms of the number of citations as compared to other developed countries such as United Kingdom and Germany or Canada. We propose that the research on human capital training and education should be conducted in other developing countries, as the impact of human capital and education were globally recognized able to affect the economic development.

The citation analysis presented in our study was based data from Scopus. The total number of publications and citations is only correct at the time of the search. Despite the study limitation, this study among the limited edition to analyse the detailed bibliometric indicators of the published literature on human capital training and education apart of the bibliometrics

study conducted by Danvila-del-Valle et al (2019) who discussed only keyword used in publication related to human resources training.

Limitation and Study Forward

Our study has a few limitations that are inherent to the database used. Thus, it should be emphasized that even though Scopus is one of the largest databases, there are still journals unindexed, and therefore, publications in these journals might have been overlooked. Furthermore, this study only focused on the topic related to human capital for training and education studies based on the title of the documents. Therefore, other literature related to human capital training but did not explicitly use the word in the title was also disregarded. It is also important to highlight that no search query is 100% perfect, false positive and false negative results may occur. Future studies should expand the search query to other available databases, such as Web of Science, Google Scholar, and Dimensions. Future research on human capital training and education could aim to fill some of the gaps we highlight. It would be interesting to gain further insights into a broad range of industries or cross countries studies and perform more analyses. Finally, we think that our contribution provides a resourceful foundation on which to develop meta-analyses on this topic. Therefore, combining all these databases would possibly contribute to more exciting and invaluable results.

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