

## TRENDS AND CHALLENGES IN TALENT MANAGEMENT – MIND MAP

Monika SIPA

Czestochowa University of Technology, Czestochowa; monika.sipa@pcz.pl, ORCID 0000-0002-1634-9368

**Purpose:** The aim of the paper is to identify leading trends and challenges in talent management research through knowledge mapping.

**Design/methodology/approach:** The paper presents results of the analysis of bibliometric data of international literature, taking into account time horizon, frequency and problem scope. The main source of data was Web of Science (WoS) and Scopus data bases. Excel spreadsheet, software VOSviewer 1.6.18 and data analysis tools available in Web of Science and Scopus data bases were used to conduct the analysis. A total of 2141 publications on talent management indexed in Scopus data base between 2001 and 2022 were identified.

**Findings:** The main findings of the study are as follows: (i) research related to talent management has been developing quickly in the global academic community, especially over the last decade; (ii) pioneering subjects in this research comprise four representative areas concentrated on main key words such as: human resource management, information management, management and leadership; (iii) the latest trends in the research into the aspects of talent management mainly deal with the context of digital transformation, artificial intelligence, big data, business development, skills, job satisfaction, attention.

**Research limitations/implications:** The present study only concentrated on the leading trends in the area under study, with the analysis limited to data from Scopus data base. It would be recommendable to conduct further, in-depth studies using multiple data bases. As far as the research methodology is concerned, a more detailed analysis of citations could be prepared. It is worth analysing the number of paper downloads from the data base or the co-occurrence of bibliographic links or the relationships between authors or scientific centres.

**Originality/value:** The added value of the article is the answer to the questions, how has the academic research into talent management evolved over the last twenty years and what are the leading research areas and new trends in this area.

**Keywords:** talent management, bibliometrics, scientific mapping, co-occurrence analysis.

**Category of the paper:** Research paper.

## 1. Introduction

Talent management (TM) is a complex process of systematic attraction, identification, development, retention and use of people with high potential who are particularly valuable for an organisation (Lanvin, Evans, Rodriguez-Montemayor, 2017). Lewis and Heckman (2006) distinguish three different perspectives of talent management: the first one defines talent management as a set of typical practices, functions and actions in the area of human resources, such as recruitment, selection, development, career management and succession; the second one mainly focuses on the concept of talent pool, while the third perspective concentrates on talent - irrespective of organisational boundaries or specific job positions. The main strategy of talent management is seeking, defining and nurturing skills that will be needed to maintain future competitive advantage (Lanvin, Evans, Rodriguez-Montemayor, 2017).

Dynamic changes impact the reality, including the functioning of enterprises and economies. Automaton and digitalisation, which enable reduction of costs, productivity increase and innovation stimulation, combinations of information technologies, global networks and algorithms create new business and social models (Gorzeń-Mitka, 2019; Wyrwa, Barska, Jędrzejczak-Gas et al., 2020). Also the COVID-19 pandemic and lockdown, followed by employees' return to work in office, have led to change in the attitudes of employees and employers. One can see an evaluation of the demand for certain skills, competencies and knowledge which will enable entities to develop and be competitive. Accordingly, it is necessary to adopt new management tactics in which people and their talents become a strategic source of competitive and economic advantage. Under such conditions, entrepreneurial success requires new qualitative parameters, such as ability, perseverance to follow changes and knowledge of the surrounding world and business (Parkitna, 2020).

Managers indicate a clear relationship between the work of talent and the quality and financial performance of the projects run by them. The impact of talent on the shape and quality of the other human resources is also recognised (Pocztowski, 2016). Governments, enterprises as well as other organisations interested in talent management need quantitative tools informing about undertaken activities and supporting the design and implementation of appropriate policies, for example in the area of education, employment or migration.

The necessity of undertaking research on talent management is made more urgent by such factors as: concerns about loss, migration and reduced supply of talent due to changes on the labour market (Pocztowski, 2016). One should also add: increasing competitive requirements, concerning demographic trends, movement towards knowledge-based management, change in the attitude of individuals functioning on the labour market, change in the behaviour of individuals entering the labour market and changes in the approach to own career modelling (Listwan, 2005). All of these elements contribute to multifaceted view of talent management and unwavering interest in this subject among researchers.

Research into talent management is conducted at micro, mezo and macro levels, however that at the organisational level dominates. Little attention is given to research at individual level (e.g. King, 2016, Swailes, Blackburn, 2016) or at macro level (e.g. Khilji, Tarique, Schuler, 2015; Vaiman, Sparrow, Schuler et al., 2018). Discrepancies in the interpretation of and approach to the problem of talent management are noted by Al Arissa, Casciob and Paauwec, among others (2014). As indicated by Michaels, Handfield-Jones, Axelrod (2001), change in the approach to talent management is determined by the conditions in which enterprises function.

Given the multidimensionality of the subject of talent management, knowledge identification within the area of the examination of current trends in talent management is vital for further development of this area. The aim of this paper is to identify the leading research directions in and emerging challenges of talent management using various techniques of bibliometric analysis.

The analysis conducted in the study seeks to answers two research questions:

RQ1: How has the perspective of academic research into talent management evolved over the last twenty years?

RQ2: What are the leading research areas and new trends in talent management research?

The paper presents results of the analysis of bibliometric data of international literature, taking into account time horizon, frequency and problem scope. The main source of data was Web of Science (WoS) and Scopus data bases. The results of the studies were presented in the form of knowledge map (Xin, Wen Long, Hai, 2018). Excel spreadsheet, software VOSviewer 1.6.18 and data analysis tools available in Web of Science and Scopus data bases were used to conduct the analysis.

## **2. Data and methodology**

The source of the initial data for the study was WoS and Scopus data bases. By using the searching mechanisms of these data bases, scientific publications containing the term "talent management" in the title, abstract or key words were identified.

The research method employed to assess publications on talent management was bibliometric analysis. It had been used by numerous researchers (Gudanowska, 2017; Gorzeń-Mitka, 2020; Lobonț, Purcarița, Vatavu et al., 2021). Excel spreadsheet, software VOSviewer 1.6.18 and data analysis tools available in Web of Science and Scopus data bases were used to conduct the analysis. The analysis was performed based on bibliographical data retrieved on 5 April 2022.

The study was carried out in several stages:

1. Determining the number of publications related to the research area under study available in WoS and Scopus data bases, and assessing changes in their number over time.
2. Identifying the dominant subject areas to which the publications were classified based on Scopus data base.
3. Identifying the countries/regions and scientific centres and universities of key importance for the research area under study based on Scopus data base.
4. Identifying the publications of key importance for the research area under study based on Scopus data base.
5. Identifying research sub-areas based on the connections in the co-occurrence of key terms with the term "talent management" in Scopus data base using the VOSviewer computer programme.

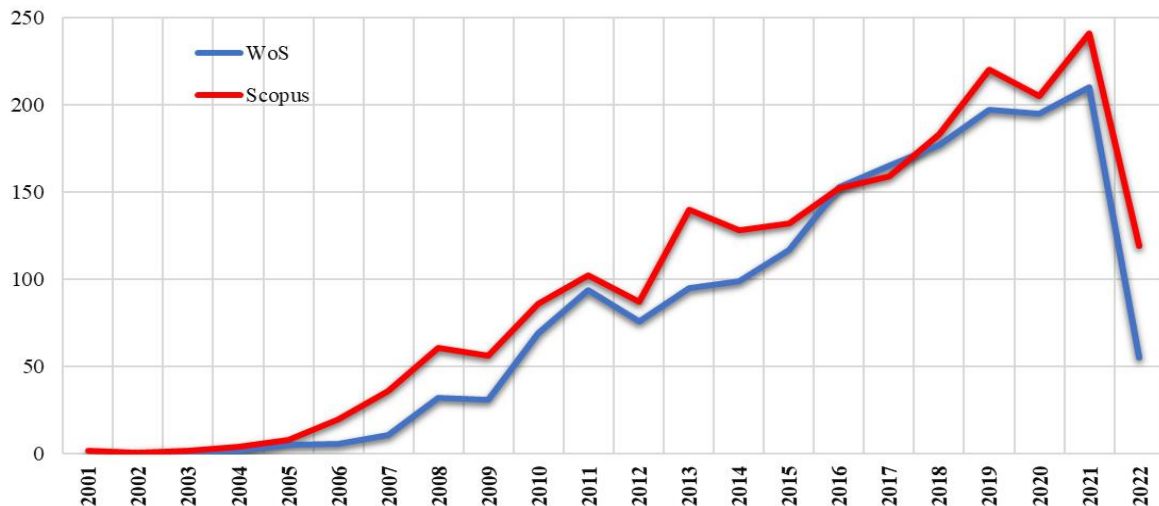
For constructing and visualising bibliometric networks (scientific mapping), the software VOSviewer - Visualizing scientific landscapes, version 1.6.18, was used, which is available at <http://www.vosviewer.com>.

The software is a widely used tool in bibliometric studies, as it makes it easier to understand the field under study, delivering results in the form of bibliometric maps, providing information on the structure and network of authors, typology of journals, institutions, research centres or universities interested in a given area. Scientific mapping can be performed based on citations, bibliographic links or co-author relationships.

### **3. Analysis results**

The analysis started with the filtration of Web of Science and Scopus data bases as well as analysis of time series reflecting the number of contained publications. The first publications addressing the subject under study were indexed in Scopus data base in 2001, and in Web of Science data base - in 2002. Therefore, the analysis covered the period 2001-2022. The number of papers containing references to the concept of talent management available in WOS data base was 1791, whereas in the case of Scopus data base, there were 2141 such publications (Figure 1). The results were sorted and partially aggregated.

The number of the publications indexed in Scopus and WoS data bases was small until 2005 and 2007 respectively. In the years that followed, a dynamic increase was visible in the number of indexed publications tackling the subject under study. Negative growth was only recorded in the years 2009, 2012 and 2020 for both of the data bases and for 2014 in the case of Scopus data base. The number of indexed publications exceeded 1000 after 17 years in Web of Science data base and after 16 years in Scopus data base.



**Figure 1.** The number of publications dedicated to talent management in the period 2001-2022.

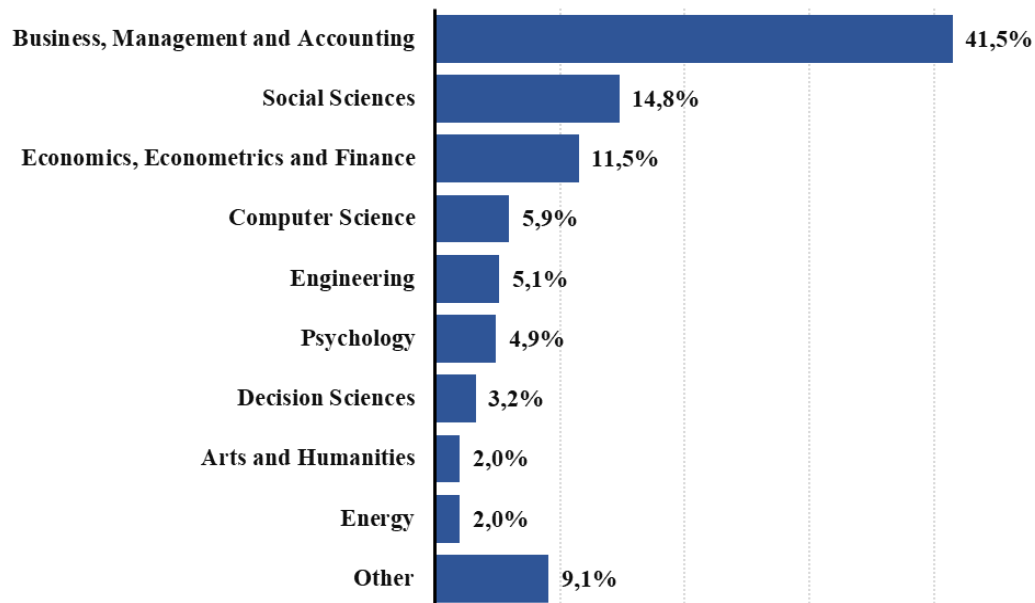
Source: own work based on WoS and Scopus data bases.

Moreover, it should be noted that in the last decade, the number of publications indexed in Scopus data base regularly exceeded 100 studies per year, which contributed to the expansion of data base by another 1000 publications over the following 5 years. The dynamically increasing number of publications in both of the data bases indicates a constantly growing interest in the subject of talent management. As was already mentioned, in WoS data base, the first study on talent management was indexed in 2002. It was the publication by J.A. Thompsen entitled "Achieving return on critical talent in technology-intensive organizations." In Scopus data base, the first publications on this subject appeared in 2001. They included two entries: Clarke R.L (2001), "Talent management nurtures future healthcare leaders" and Brown, V. (2001) "Talent management: Admiring America's most admired companies."

Further analysis focused on data from Scopus data base due to a slightly larger number of publications contained in it (2141 publications versus 1791 in WoS data base). By performing data aggregation, publication record was analysed with respect to: subject areas to which publications were classified; nationality of the authors with the largest number of publications (geographical structure), and journals/publishing houses most frequently publishing studies on talent management; authors of most cited publications, and scientific centres represented by the most prolific researchers in terms of publications.

Scientific papers represented the vast majority of the publications on talent management available in Scopus data base. They accounted for 65.2% of all of the publications. The second most numerous type of publications was book chapters (11.4%), followed by conference papers (11.3%). Analysis of the subject areas to which the publications available in Scopus data base were classified leads to the conclusion that all of the identified publications mainly represented two areas: business, management and accountancy (41% of publications) and social sciences (15% publications). The other areas where the number of publications exceeded 100 papers

were: economics, econometrics and finances; information technology; engineering; psychology and studies of decision making. Figure 2 presents the details.



**Figure 2.** Main subject areas.

Source: own work based on WoS and Scopus data bases.

In terms of the source of publications, the leader in the number of publications on talent management indexed in Scopus data base was the journal "International Journal of Human Resource Management" with Impact Factor 5.546 (2020). It was followed by "Human Resource Management International Digest" with 55 publications, whereas the third position was occupied by "T and D" with 39 publications on TM. Table 1 presents a ranking of sources with the largest number of publications on the subject under study.

**Table 1.**

*List of sources with the largest number of publications on the subject of TM*

Item	Publication source	number
1	International Journal Of Human Resource Management	73
2	Human Resource Management International Digest	55
3	T and D	39
4	International Journal Of Contemporary Hospitality Management	31
5	Human Resource Management Review	30
6	Journal Of World Business	30
7	Industrial And Commercial Training	29
8	Employee Relations	26
9	Human Resource Management	21
10	Thunderbird International Business Review	21

Source: own work based on Scopus data base.

Scientific papers addressing TM are most often published by researchers from the following research centres: National University of Ireland Galway, KU Leuven and Pennsylvania State University. Analysis of the countries of origin of the authors with the largest number of

publications on talent management reveals a dominant role of English speaking countries. The first place is occupied by authors coming from the United States, followed by authors from the Great Britain. Other countries include: India, China and Australia. Table 2 presents a list of top ten countries and scientific centres from which researchers dealing with the subject of TM come.

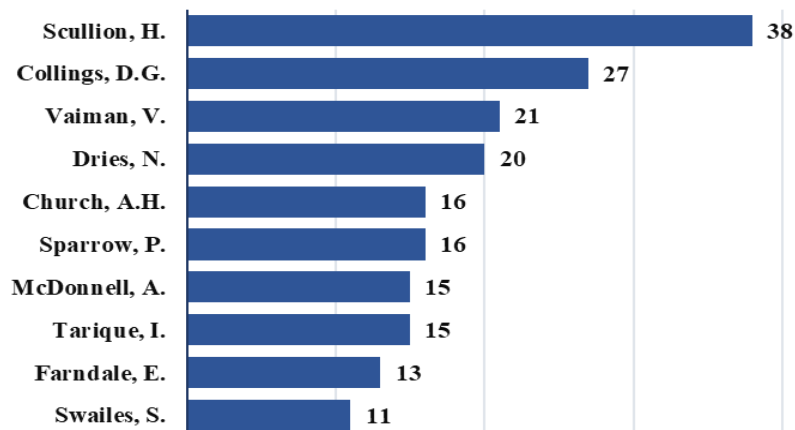
**Table 2.**

*List of countries and scientific centres from which researchers dealing with the subject of TM come - Top 10*

Item	Country/Region	Number	University	Number
1	United States	455	NUI Galway	34
2	Great Britain	327	KU Leuven	21
3	India	186	Pennsylvania State University	20
4	China	112	Saint Petersburg State University	19
5	Australia	96	Lancaster University Management School	19
6	Ireland	76	Tilburg University	18
7	Malaysia	76	DCU Business School	18
8	South Africa	68	North-West University	17
9	Germany	67	University of Limerick	16
10	Russia	63	Pace University	16

Source: own work based on Scopus data base.

The three most prolific researchers in terms of the number of publications, according to Scopus data base, are: Scullion H. (38 publications) and Collings D.G. (27 publications), who represent Irish universities, Vaiman V. (21 publications) from Lutheran University School of Management in the United States, and Dries N. (20 publications) from KU Leuven, Belgium. (Figure 3)



**Figure 3.** Authors most frequently publishing in the area of TM - Top 10.

Source: own work based on Scopus data base.

At the same time, it can be noted that among the authors of most cited publications are Scullion H., Collings D.G. and Dries N. Among the ten most cited publications dedicated to talent management, the top position, with 758 citations, was occupied by the paper by Collings, D.G. and Mellahi, K. entitled Strategic talent management: A review and research agenda,

published in 2009 in "Human Resource Management Review". Table 3 presents a ranking of ten most cited publications in the field of talent management.

The last stage of the study of bibliometric data on talent management publications was analysis of word co-occurrence, which, as pointed out by Liu, Yin, Liu, Dunford (2015), is used to identify key research subjects in a research field or knowledge domain. For constructing and visualising bibliometric networks and scientific mapping, the VOSviewer visualisation software was applied, which is particularly useful when working with a large amount of data. It was used to group and assess research sub-areas.

**Table 3.**

*Most cited publications on TM (top-10)*

Author	Title	Journal	Year	Number of citations
Collings, D.G., Mellahi, K.	<i>Strategic talent management: A review and research agenda</i>	Human Resource Management Review	2009	758
Lewis, R.E., Heckman, R.J.	<i>Talent management: A critical review</i>	Human Resource Management Review	2006	551
Tarique, I., Schuler, R.S.	<i>Global talent management: Literature review, integrative framework, and suggestions for further research</i>	Journal of World Business	2010	448
Gruman, J.A., Saks, A.M.	<i>Performance management and employee engagement</i>	Human Resource Management Review	2011	340
Farndale, E., Scullion, H., Sparrow, P.	<i>The role of the corporate HR function in global talent management</i>	Journal of World Business	2010	326
Bhatnagar, J.	<i>Talent management strategy of employee engagement in Indian ITES employees: Key to retention</i>	Employee Relations	2007	285
Cappelli, P.	<i>Talent management for the twenty-first century</i>	Harvard Business Review	2008	264
Gallardo-Gallardo, E., Dries, N., González-Cruz, T.F.	<i>What is the meaning of 'talent' in the world of work?</i>	Human Resource Management Review	2013	253
Al Ariss, A., Cascio, W.F., Paauwe, J.	<i>Talent management: Current theories and future research directions</i>	Journal of World Business	2014	250
Dries, N.	<i>The psychology of talent management: A review and research agenda</i>	Human Resource Management Review	2013	245

Source: own work based on Scopus data base.

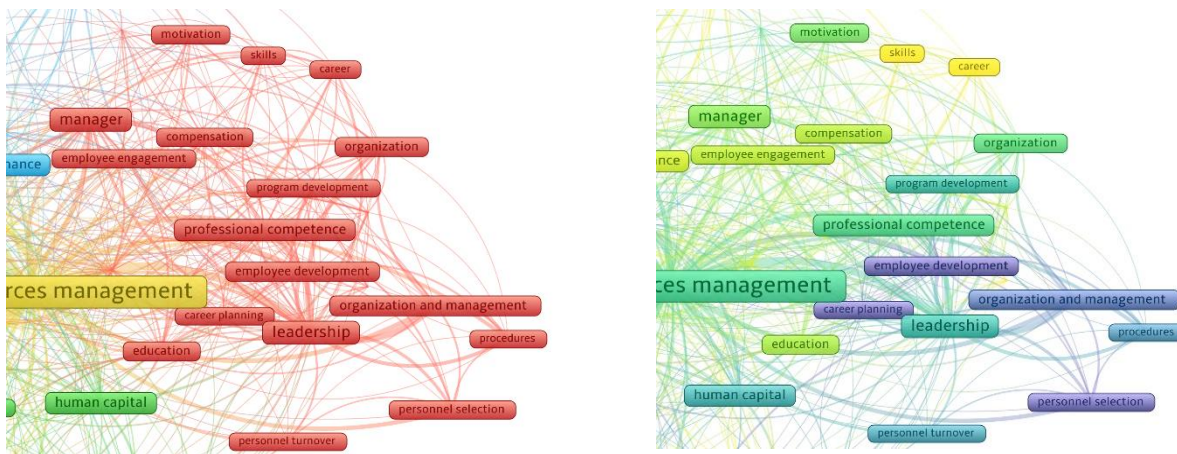
The analysis involved preparing a knowledge map of research trends connected with talent management in the context of publications indexed in Scopus data base in the period 2001-2022. A file with saved records from Scopus data base was imported to the VOSviewer software. In the analysis of interrelations, "indexed key words" were used, as they reduce duplicates and similar terms (Zhang, Yu, Zheng et al., 2016). In order to present a clear visualisation, extraction of terms was performed with an indication of words that were repeated in bibliographical descriptions 5 times at the minimum. In addition, terms that were substantially unrelated to the research area under study, such as China, Vietnam, article, India, issue, review survey, were eliminated from the analysis. Taking into account the criteria above,





Each cluster is marked in a different colour: red, blue, green or yellow. Connections were identified between pairs of analysed terms indicating co-occurrence of such terms in the text. The size of the elements (nodes and font) presented on the maps indicates the frequencies of the occurrence of a given term, whereas the connections between network nodes represent their co-occurrence in the analysed group of publications. The stronger the connection, the more often both of the terms appear in publications. The distance between the items in the visualisation is an approximate indication of their relationship in a co-occurrence network. Thus, the closer two items are to each other, the stronger the connections between them (van Eck, Waltman, 2019). The map of relationships created using the VOSviewer software is characterised by numerous connections, which makes the network quite dense - it consists of 72 items and 775 links, with its central part containing the most frequent key words. The subjects most strongly connected with others within the network were: human resource management, employee, information management.

The figures that follow (Fig. 5-8) present maps of the individual clusters and their connections detected in time. The first cluster classified in VOSviewer (Figure 5) is the most numerous group numbering 22 key words. It was marked in red.



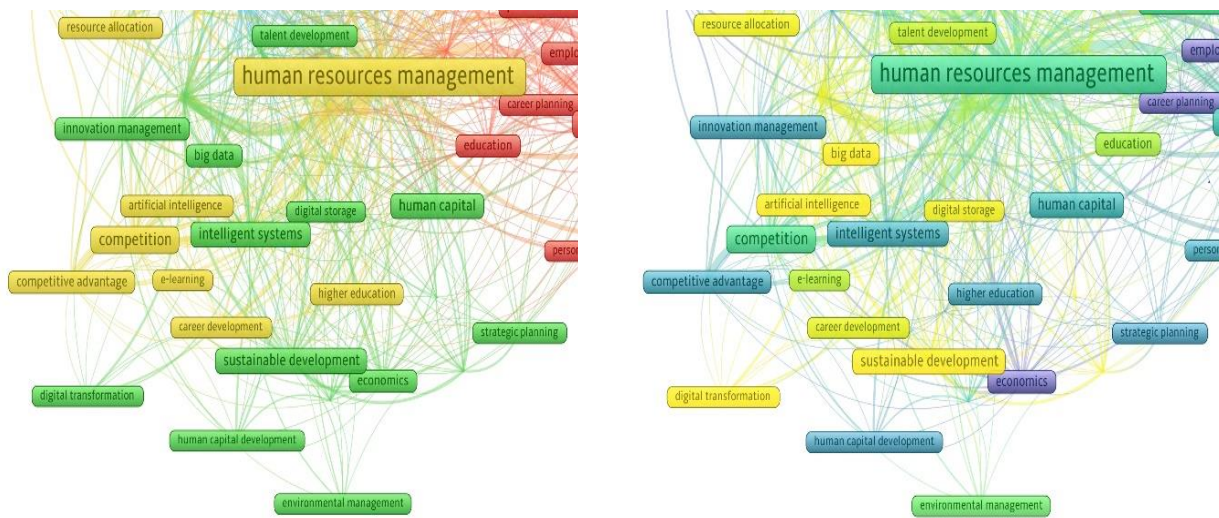
**Figure 5.** Key words, co-occurrence and relationships detected in time – cluster 1.

Source: own work with the aid of the VOSviewer software, Scopus data base.

This cluster focuses on leadership and manager. These terms show the highest co-occurrence rates for the group. The most frequent and most interrelated component in the cluster was leadership with organisation and management and with professional competencies; the minimum strength of links was 9. The red cluster comprises publications addressing issues connected with procedures, employee development, education, selection, employee engagement and education. It also indicates relations with the problem of personnel turnover. The aspects of leadership in the context of career, skills and attention are a relatively new element in the cluster, which was presented on the map of connections detected in time.

Another cluster – the green one – focuses on "information management" in close connection with other key words (Fig. 6). The strongest and most interlinked relationship within this group relates to the following terms: "intelligent systems" (14 links), "big data" (6) and "innovation

management" (5). The scientific interests of the publications in this cluster also include subjects connected with talent management in the context of strategic management, human capital and human resources planning, sustainable development and talent development.



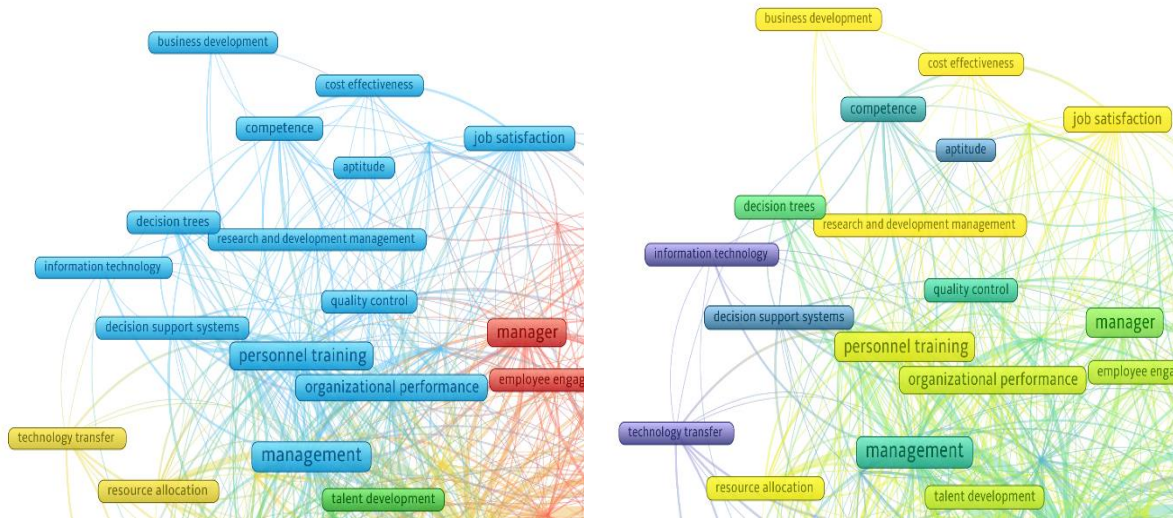
**Figure 6.** Key words, co-occurrence and links detected in time – cluster 2.

Source: own work with the aid of the VOSviewer software, Scopus data base.

The subjects addressed in publications from this group mainly concentrate around information management, human capital and intelligent systems. The links detected in time indicate that the research on these subjects is still at quite an early stage. This is the youngest group in terms of the average year of publication: 2016.77. The cluster also contains links with the term "digital transformation", for which the average time of publication is the year 2020.

The third cluster – the blue one (Fig.7) – is connected with the aspects of management, in particular decision-making and personnel training. The biggest strength of links within the cluster refers to management, project management and personnel training. In addition, a significant portion of the research grouped in this cluster deals with decision-making support systems and employee retention, skills, competencies and job satisfaction. As far as the average time of publications is concerned, research related to business development has appeared in this group in recent years. It includes the oldest term - technology information.

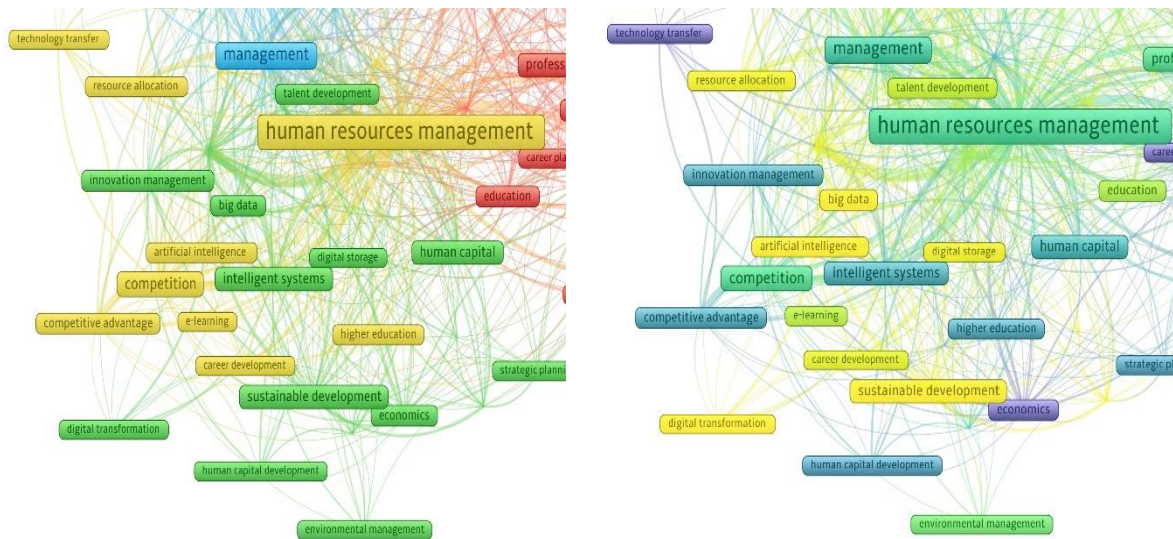
The last cluster classified in VOSviewer was marked in yellow. This is the least numerous cluster containing 13 key words (Fig. 8). On the map of trends, the aspects of human resources management and employees are clearly shifted towards the centre of the map, which indicates their numerous and quite strong links with a lot of other subjects. These terms represent the most frequent and most interlinked component not only in the cluster alone but also in the whole network.



**Figure 7.** Key words, co-occurrence and links detected in time – cluster 3.

Source: own work with the aid of the VOSviewer software, Scopus data base.

The yellow cluster comprises publications referring to the subjects connected with human resources management, knowledge management and competitive advantage development. The relationship between these terms and talent management seems quite obvious. Numerous authors stress that human resources management (Michaels, Handfield-Jones, Axelrod, 2001) and knowledge management are a key factor of competitiveness (Ragab, Arisha, 2013; Shubham, Shiwangi, Sanjay, Swati, 2021). We also observe an intense development and specialisation of talent management in the context of higher education, e-learning, artificial intelligence and social media.



**Figure 8.** Key words, co-occurrence and links detected in time – cluster 4.

Source: own work with the aid of the VOSviewer software, Scopus data base.

The links detected in time demonstrated that most of the selected subjects have been analysed in the last decade. It can be concluded that research on these subjects has been intensely developing, since the relationship between the elements is quite strong. It should be

stressed, however, that viewing talent management in the context of artificial intelligence is a relatively new approach (see the links detected in time). This may indicate that the research on these issues is at quite an early stage.

## Conclusion

The present study shows the evolution of the research conducted in the field of talent management in the period 2001-2022. The analysis and identification of new trends in the research under study was based on a comprehensive literature review involving analysis of co-occurrence networks using the VOSviewer software. The main conclusions from the study are as follows:

- The number of publications indexed in the analysed data bases is systematically growing, which indicates an increasing interest in talent management among researchers.
- By constructing a network map for key word co-occurrence and analysing research activities in the area of talent management (TM), it was found that the border subjects in such research comprise four representative areas concentrated on the following main key words: human resources management, information management, management and leadership.
- The latest trends in TM research were identified, which referred to such subjects as digital transformation, artificial intelligence, big data, business development, skills, job satisfaction and need for attention.

The research presented in this publication may constitute a basis for further work in this area. The findings of the analysis can represent an important voice in the discussion on the evolution of the subject of talent management. Their aim was to identify selected challenges in an exploratory way. However, it should be stressed that the present study only concentrated on the leading trends in the area under study, with the analysis limited to data from Scopus data base. Moreover, the results are not universal due to the qualitative character of the study. It would be recommendable to conduct further, in-depth studies using multiple data bases. As far as the research methodology is concerned, a more detailed analysis of citations could be prepared. It is worth analysing the number of paper downloads from the data base or the co-occurrence of bibliographic links or the relationships between authors or scientific centres. Summing up the trends indicated in the study, it can be concluded that the subject of talent management continues to be a huge challenge for today's entities and economies, which represents an area of exploration for academic researchers.

## References

1. Al Arissa, A., Casciob, W.F., Paauwec, J. (2014). Talent management: Current theories and future research directions. *Journal of World Business*, Vol. 49(2), pp. 173-179. Retrieved from <https://doi.org/10.1016/j.jwb.2013.11.001>, 10.03.2022.
2. Gorzen-Mitka, I. (2019). Interpretive Structural Modeling Approach to Analyze the Interaction Among Key Factors of Risk Management Process in SMEs: Polish Experience. *European Journal of Sustainable Development*, 8(1), pp. 339-349.
3. Gorzeń-Mitka, I. (2020). The Latest Streams Of Research On Communication In Risk Management: A Large-Scale Literature Review Based On Co-Occurrence Data. *Zeszyty Naukowe. Organizacja i Zarządzanie, Politechnika Śląska*, z. 149, pp. 219-237.
4. Gudanowska, A.E. (2017). A Map Of Current Research Trends Within Technology Management In The Light Of Selected Literature. *Management and Production Engineering Review*, Vol. 8, pp. 78-88, doi: 10.1515/mper-2017-0009.
5. Khilji, S.E., Tarique, I., Schuler, R.S. (2015). Incorporating the macro view in global talent management Hum. *Resource Management Review*, 25(3), pp. 236-248.
6. King, K. (2016). The talent deal and journey: understanding how employees respond to talent identification over time. *Employee Relat.*, 38(1), pp. 94-111.
7. Lanvin, B., Evans, P., Rodriguez-Montemayor, E. (2017). The Global Talent Competitiveness Index. Talent and Technology. In: B. Lanvin, P. Evans (Eds.), *INSEAD: The Global Talent Competitiveness Index 2017*. France: Fontainebleau.
8. Lewis, R.E., Heckman, R.J. (2006). Talent management: A critical review. *Human Resource Management Review*, 16(2), pp. 139-154.
9. Listwan, T. (2005). Zarządzanie talentami – wyzwanie współczesnych organizacji. In: S. Borkowska (Ed.), *Zarządzanie talentami*. Warszawa: IPiSS.
10. Liu, Z., Yin, Y., Liu, W., Dunford, M. (2015). Visualizing the intellectual structure and evolution of innovation systems research: a bibliometric analysis. *Scientometrics*, 103(1), pp. 135-158, doi:10.1007/s11192-014-1517-y.
11. Lobonț, O.R., Purcarița, R., Vatavu, S., Costea, F. (2021). A Bibliometric Mapping of the Research Trends of Public Governance and Entrepreneurship Framework. *Postmodern Openings*, 12(1Sup1), pp. 35-53. Retrieved from <https://doi.org/10.18662/po/12.1Sup1/270>, 15.03.2022.
12. Michaels, E., Handfield-Jones, H., Axelrod, B. (2001). *War for talent*. Boston, MA: Harvard Business Press.
13. Parkitna, A. (2020), *Determinants of efficiency of a small business*. Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej.
14. Pochtowski, A. (ed.). (2016). *Zarządzanie talentami w organizacji*. Warszawa: Wolters Kluwer Polska SA.

15. Ragab, M.A.F., Arisha, A. (2013). Knowledge management and measurement: A critical review. *Journal of Knowledge Management*, Vol. 17, Iss. 6, pp.873-901.
16. Shubham, D., Shiwangi, S., Sanjay, D., Swati, D. (2021). Antecedents of strategic thinking and its impact on competitive advantage. *Journal of Indian Business Research*, Vol. 13, Iss. 4, pp. 437-45816.
17. Swailes, S., Blackburn, M. (2016). Employee reactions to talent pool membership, *Employee Relations*, 38(1), pp. 94-111.
18. Vaiman, V., Sparrow, P.R., Schuler, R., Collings, D. (Ed.). (2018). *Macro Talent Management: A Global Perspective on Managing Talent in Developed Markets*. London: Routledge.
19. Van Eck, N.J., Waltman, L. (2019). *VOSviewer Manual. Manual for VOSviewer version 1.6.11*. Universiteit Leiden, software documentation.
20. Wyrwa, J., Barska, A., Jędrzejczak-Gas, J., Siničáková, M. (2020). Industry 4.0 and Social Development in the Aspect of Sustainable Development: Relations in EC Countries Submitted. *European Research Studies Journal*, Vol. XXIII, Iss. 4, pp. 1068-1097. Retrieved from [https://www.um.edu.mt/library/oar/bitstream/123456789/76037/1/Industry\\_4.0\\_and\\_social\\_development\\_in\\_the\\_aspect\\_of\\_sustainable\\_development.pdf](https://www.um.edu.mt/library/oar/bitstream/123456789/76037/1/Industry_4.0_and_social_development_in_the_aspect_of_sustainable_development.pdf), 12.02.2022.
21. Xin, Z., Wen Long, Y., Hai, L.V. (2018). Visualization and analysis of mapping knowledge domain of road safety studies. *Accident Analysis and Prevention*, Vol. 118, pp. 131-145, doi: 10.1016/j.aap.2018.06.010.
22. Zhang, J., Yu, Q., Zheng, F., Long, Ch., Lu, Z., Duan, Z. (2016). Comparing keywords plus of WOS and author keywords: A case study of patient adherence research. *Journal of the Association for Information Science and Technology*, 67(4), pp. 967-972.