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EXPLORING THE DYNAMIC LANDSCAPE OF PERFORMANCE MANAGEMENT: A BIBLIOMETRIC ANALYSIS OF EMERGING TRENDS

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Abstract:

Performance management, as a systematic and continuous process of planning, measuring and improving performance, is an important endeavor for any organization, regardless of being private or public. To understand the current state of research on performance management, a comprehensive bibliometric study was conducted. This paper aims to provide a co-occurrence analysis to identify and explore clusters, prevailing and emerging themes, and future research directions. For this purpose data was collected from the WoS database and processed with VOSviewer and Microsoft Excel. The paper contains visual representations of clusters, keywords and their relationships, as well as an analysis of the novelty of the concepts. Based on the average published year (APY), the hottest keywords identified are Covid-19 (APY: 2021), followed by Industry 4.0 (APY: 2020.17), together with other 4IR tools (big data analytics, big data, machine learning, artificial intelligence, cloud, IoT, etc.). Resulting from the analysis of concepts with APY after 2017, in terms of their representativeness (occurrence), links, and total link strengths (TLS) with other items from the map, three concepts significantly emerged: framework (Cluster 1); public sector (Cluster 3); sustainability (Cluster 4). Based on the overall findings, new research directions were proposed.

Key words: Covid-19; Industry 4.0; framework; performance management; sustainability.

1. Introduction

Performance management has received notable attention from both scholars and practitioners, with its significance and relevance being increasingly recognized and attested by the extensive literature that encompasses a broad range of concepts, methodologies, frameworks, systems, models and recommendations, that are associated with performance management. As an essential exercise for any organization, performance management integrates both performance measurement and improvement, while enabling a holistic and integrated overview of how all organizational components align towards reaching expected results (Helmold & Samara, 2019, pp.1-2). The

importance of performance measurement is highlighted by Neely and his collaborators in one of the most cited papers on the topic (2nd most cited paper on the topic “performance management” in WoS, with 1,104 citations), the authors noting that without the quantification inherent in the measurement process, entities do not have the ability to undertake data driven actions that will influence performance (Neely et al., 1995). The link between performance management and performance measurement is also highlighted by Lebas (2005, p. 34), who defines the connection between the two as a virtuous spiral in which performance management sets the basis for the measurement process which then in turn facilitates the management of performance. From an improvement perspective, performance management entails the planning and implementation of corrective actions aimed at addressing discrepancies between established objectives and actual outcomes, in the pursuit of continuous development. (Amedzro St-Hilaire, 2022, p.83).

Performance management is viewed as sum of connected components which have as a core purpose the achievement of strategic organizational objectives (Franco-Santos et al., 2014, pp.14, 56; Brudan, 2010), while also playing a key role in improving strategic alignment (Bourne et al., 2013, p. 5). In addition to setting company level goals, communicating them and ensuring their alignment across the organization, performance management has two additional purposes: objective evaluation of achievement and an increase in staff motivation (Samsonowa, 2012, pp.43-45). In his work, Armstrong points out that performance management refers to a regular and systemic process aimed at improving organizational results through a continuous focus on development at both the individual and the team level. In this regard, the author identifies and submits for consideration four inclusions within the overarching performance management process: (1) Performance planning aimed at achieving company objectives; (2) Aligning corporate objectives to individual ones; (3) Performance evaluation or assessment; (4) Staff capability/competency development (Armstrong, 2018, p.7).

There is a noticeable emphasis on the public sector in performance management research, with great attention paid to the implementation of various performance management principles within various such entities. Moynihan (2018, p.2) emphasizes that the study of performance management has become perhaps the most interesting subfield within public administration. In their bibliometric literature review on public performance management and measurement, Garengo & Sardi (2021, p.1642), highlight the fact that although plenty literature has been published in the last decade concerning public sector performance management and measurement, the identified research themes are too generic and transversal, showing a lack a clear focus. This led to the conclusion that further research should be dedicated towards identifying and clarifying performance management and measurement practices that are suitable for the public sector and which tackle its growing complexities.

The present paper is part of a more comprehensive research study that aims to identify the defining and characteristic elements of performance management as a concept. In this regard, the following aspects have previously been identified, analyzed and discussed (Gorski & Dumitrașcu, 2022): the temporal evolution of the number of documents (from 1976 to 2022); the primary areas of interest according to Web of Science (WoS); the most important publishers and sources, including an analysis of their evolution

over time (from their inception up to 2022); the most prolific authors (in terms of number of documents published and number of citations); the countries that have contributed most significantly to the scientific output – along with a hierarchical analysis of their rankings based on the number of documents, citations and collaborations between them; the most prolific organizations; the top 50 keywords, and the Density Visualization Map.

In this paper, additional insightful elements drawn from the conducted extensive research are presented, in order to fulfill the established purpose, namely: determining the most frequent and up-to date concepts related to performance management. To achieve the goal, the following objectives have been formulated: (1) To identify and analyze the resulting clusters and the primary themes resulting from each; (2) To identify and examine the prevailing and emerging themes; (3) To establish future research directions in the field.

In order to establish the research sample, a bibliometric analysis was conducted using the Web of Science (WoS) Core Collection database, in July 2022. By querying the database according to the title, abstract and keywords on the topic "performance management", 6,730 documents have been identified. These documents were subsequently filtered, according to the language criterion, and further exported to be processed by using VOSviewer and Microsoft Excel. VOSviewer played a key role in this study, as it was used for the creation of maps based on bibliographic data. As it employs text-mining techniques, which analyze the content of the titles, keywords and abstracts, VOSviewer is well-suited and can be successfully used for visualizing keyword networks, overlay visualizations, and density visualization maps (Van Eck & Waltman, 2010, 2022; Shah et al., 2019, p.1023).

Throughout the research two of analyses were deployed: (1) Co-authorship analysis (encompassing authors, organizations, countries); (2) Word co-occurrence – considering All Keywords, defined as Author Keywords (AK) and Keywords Plus (KP). While the co-authorship analysis, including the most prolific authors, countries, and organizations, was presented in detail in a previous paper (Gorski & Dumitraşcu, 2022), the focus of the present paper is primarily aimed at the word co-occurrence and the subsequent analysis.

2. Methodology

As previously highlighted, Web of Science (WoS) database, VOSviewer and Microsoft Excel software solutions have been utilized in order to collect and analyze the data that is presented in this paper. The following subsection provides a summary of the queries and actions performed to create the "co-occurrence map" and to analyze clusters and keywords based on their occurrences and novelty.

- *Web of Science (WoS) Core Collection – a scientific database used to discover and collect academic works (document collection).*

For the purpose of the paper, data for the research sample was collected using the WoS database. Prior to 2004, WoS was the sole source of data available for citation analysis and was widely considered to be the "gold standard." WoS is a reliable and robust source of bibliometric data, and its use requires little justification (Harzing & Alakangas, 2015, p. 5). A previous paper has extensively examined the role, appearance, evolution, importance, and rationales behind the use of WoS (Gorski & Dumitraşcu, 2022, p. 391).

For the document identification phase the following query was deployed: (TS=("performance management")) AND (LA=("ENGLISH")). This means that all the documents in English on the topic "performance management" were included. The "topic" option involves inclusion in the search of the following elements: "title, abstract, author keywords, and keywords plus". The search carried out in WoS resulted in the identification of 6,730 documents. Of these, 6,580 were published in English, while the remaining documents were in various other languages such as Chinese, Portuguese, French, German, Spanish, Russian, Turkish, Czech, Croatian, Norwegian, Polish, Arabic, Finnish, Hungarian, Malay, and Slovenian. The temporal scope of the search spanned between 1976 to 2022. For exporting documents, WoS supports several formats: Plain text file, RIS, BibTex, Excel etc. The 6,580 documents in English were exported in Plain Text File (.txt) sequentially, in batches of 500, and afterwards concatenated, thus resulting in a single file that was used as the basis for subsequent analyses.

- *All Keywords as unit of analysis. Thesaurus file.*

To gain a comprehensive understanding of the "performance management" field of study, for the words co-occurrence analysis the search included both Author Keywords and Keywords Plus. While keywords express the main topics discussed in the article, key words plus enable the researcher to capture additional relevant information and help interlink diverse research areas (Tripathi et.al, 2018, p.216). The resulting synthesis file (.txt) from the export of 6,580 documents from WoS was imported into VOSviewer for processing with All Keywords as the unit of analysis, generating a total of 15,176 keywords. Initially, a minimum of five occurrences was set as the threshold for keyword inclusion, as recommended by VOSviewer, in order to avert the depiction of less relevant concepts. (Renzi et al., 2020, p.3). Thus, of the 15,176 keywords, the threshold of five occurrence was met by 1,253 keywords.

The subsequent step in the analysis was the creation of the Thesaurus file, which proved to be relatively complex due to the multitude of synonyms identified: (1) various keywords appeared in both their singular and plural form and/ or (2) numerous keywords appeared in both their full and abbreviated or acronym form. Such circumstance could have very easily generated confusion and an incorrect presentation of the results, regarding both relevance and representation of the keywords as well as a correct depiction of clusters and the links between the keywords. Hence, all 1,253 keywords have been exported from VOSviewer in Excel for a thorough examination with the aim of identifying and merging synonyms (Liu et al., 2021 p.6). As a result of this endeavor, a Thesaurus file was created, which facilitates data cleaning and the consolidation of synonymous terms. This file was then carefully examined and subsequently loaded into VOSviewer to be able to proceed with the analysis.

- *Maps based on bibliometric data.*

As previously highlighted, the initial step in the establishment of the keyword map, words that had five or more occurrences were depicted, aggregated in a map divided into 12 clusters. As the number of resulted clusters and keywords was too high to enable a relevant analysis, the final map has been created by considering only those keywords with at least 10 occurrences. The final map thus comprises 555 keywords distributed across five clusters.

3. Results and discussions

In this section results obtained after processing with VOSviewer and Excel data collected from WoS are presented and discussed. The objectives are to identify and analyze: (1) cluster structure and maps; (2) top keywords in each cluster, based on occurrence; (3) keyword novelty (after 2017) characteristics – occurrence, links, and total link strengths (TLS); (4) hot topics in each cluster.

3.1 Clusters description and overlay visualization

The Network Visualization Map – resulting from keywords with occurrences higher than ten – is depicted in Figure 1. As can be observed, it contains 555 items (keywords) grouped into five clusters. The clusters map is characterized by: colors (automatically assigned); number of Items: 555; Links: 28,457 and Total link strength: 70,836.

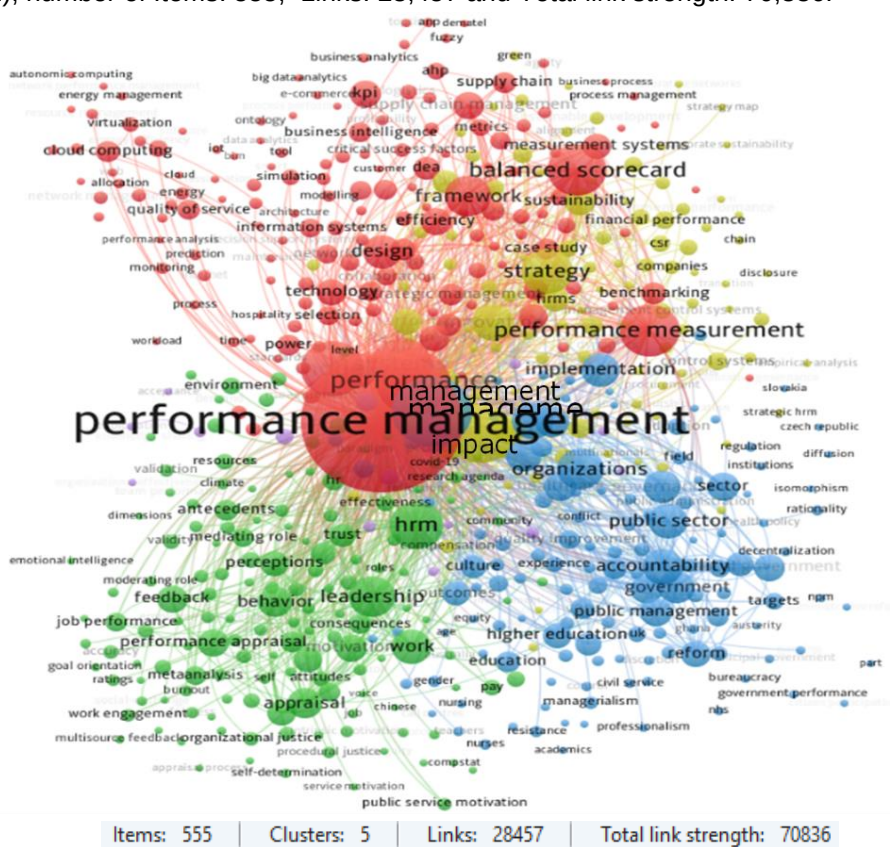


Figure 1. "performance management" – Network Vizualization

Source: Authors' computation with VOSviewer

Figure 2 highlights that four out of five clusters are comparably balanced considering the number of items: Cluster 1 – red (158 items); Cluster 2 – green (144 items); Cluster 3 – blue (130 items); Cluster 4 – yellow (107 items). Cluster 5 – magenta – is small in comparison to the previous and encompasses only 16 items.

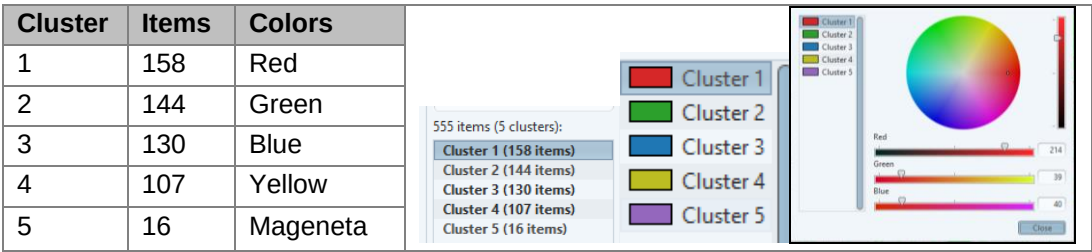


Figure 2. Cluster description – Number of items and assigned colors

Source: Authors' computation with VOSviewer

In Figure 3 the top 10 keywords in each cluster are represented (Occ. and TLS), in descending order based on their number of occurrences. As such, the resulting clusters are: "Performance Management"; "HRM"; "Management and Public Sector"; "Strategy and Impact"; "Performance Management System" (the cluster name is assigned by the authors).

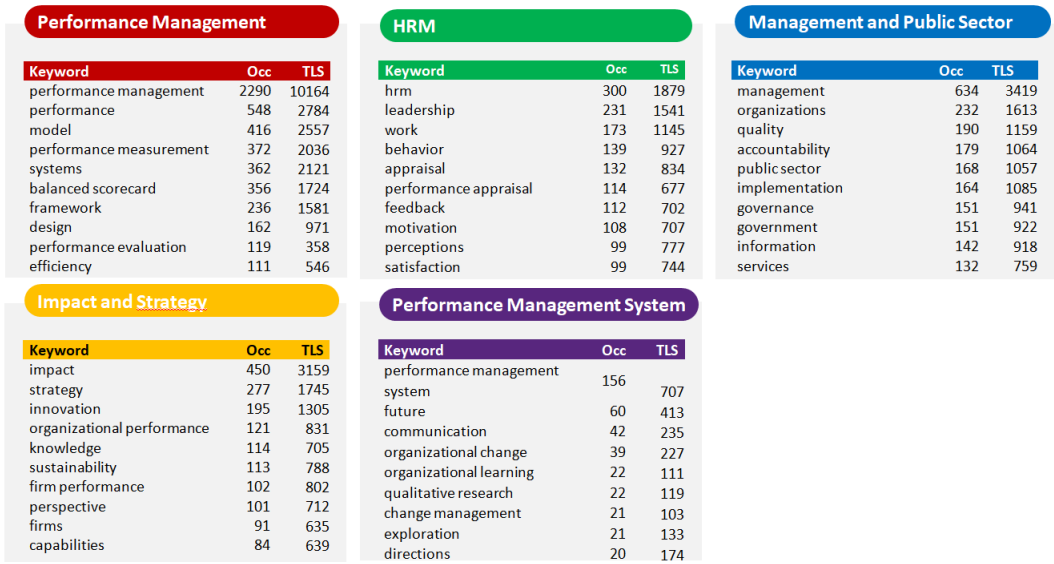


Figure 3. Top 10 keywords by cluster: Occurrence and Total link strength

Source: Authors' computation with VOSviewer

The *Overlay visualization* of the bibliometric network has been used in order to represent, identify and analyze keyword evolution over time (Figure 4). The novelty of the terms, based on the average publication year (APY), is emphasized through colors that vary on the spectral scale from indigo (the older terms) to red (the newer terms).

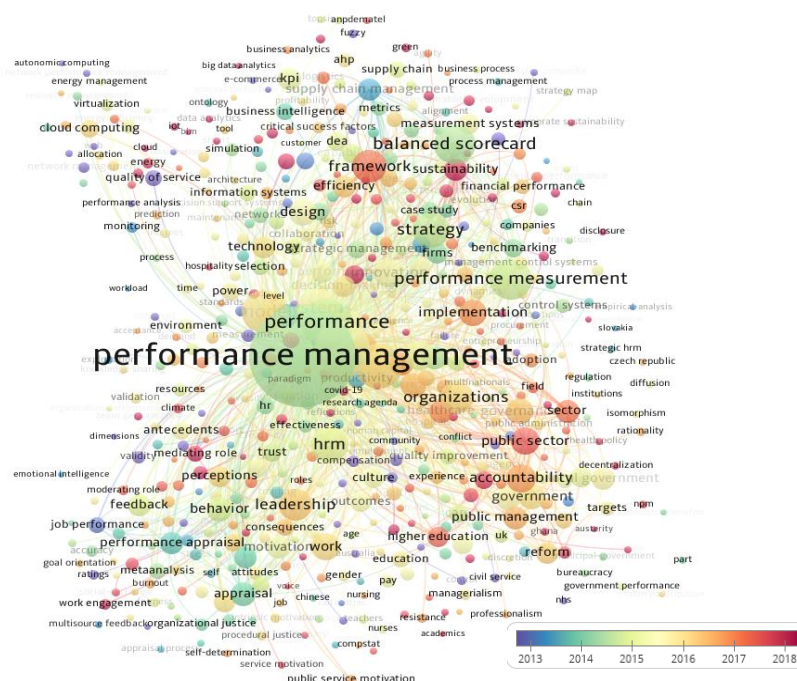


Figure 4. Overlay Visualization of the bibliometric network
Source: Authors' computation with VOSviewer

1.2 Clusters analysis

This section entails an examination of the outcomes derived from the utilization of VOSviewer and Excel for data processing. The results will be showcased through 10 summary figures (two figures dedicated to each cluster). Figure 5 and 6 provide a condensed representation of the information that will be subsequently presented in the results for each of the five clusters. As Figure 5 indicates, within each cluster, a composite figure will appear initially, highlighting two occurrence-related aspects – namely, the top 30 keywords and the cluster map.

OCCURENCE	
Keywords	Map
<ul style="list-style-type: none"> • Processed in Excel based on data exported from VOSViewer. • Occurrences (Occ.) – Top 30 keywords in the respective cluster. • Keywords with occurrence above 100 are represented with Cluster color. 	<ul style="list-style-type: none"> • Processed in VOSViewer. • Presents the concepts that form each cluster and the relationships between them. • The higher the occurrence of the concept, the larger the corresponding circle and label will appear.

Figure 5. Information related to occurrence and map – presented for each cluster
Source: Authors' computation

Subsequently, the analysis will proceed to identify and showcase keywords within each of the five clusters that have an average publication year (APY) after 2017. As shown in Figure 6, a composite figure will be presented for each cluster that focuses on the novelty of the concepts, including a table containing information on keywords with an APY after 2017 (Occurrence – Occ., Links, Total Link Strengths – TLS), and a graphic representation of the concepts arranged from newest to oldest (but still after 2017).

AVERAGE PUBLISHING YEAR (APY) – after 2017	
Keywords	APY - Graphic
<ul style="list-style-type: none"> • Table that summarizes the concepts with an APY after 2017. • Presented characteristics: Links; TLS (Total Links Strengths); Occurrence. 	<ul style="list-style-type: none"> • Graphical representation in Excel of the Links and TLS associated with concepts with an APY after 2017. • The green rectangle highlights the newest concept in each cluster. • The dark red rectangle highlights the concepts after 2017 - with the highest occurrence.

Figure 6. Information about keywords novelty – presented for each cluster

Source: Authors' computation

(1) Cluster 1 – Performance Management

Cluster 1 – "Performance Management" is represented in the cluster map in red and comprises a total of 158 items. The cluster name, as previously mentioned, has been determined by the authors based on the keyword with the highest occurrence, which in this case is "performance management" (Occurrence: 2,290). The Top 30 keywords in descending order based on the number of occurrences are represented in Figure 7.

It is clear from the figure that the cluster is imbalanced, because of the dominant concept "performance management", that appears with a significantly higher frequency than the following terms. Performance management is preceded by 12 additional concepts that have an occurrence of over 100, namely: *performance* (548); *model* (416); *performance measurement* (372); *systems* (362); *balanced scorecard* (356); *framework* (236); *design* (162); *performance evaluation* (119); *efficiency* (11); *kpi* (110); *supply chain management* (108); *technology* (107); *decision-making* (102).

In terms of novelty, as can be seen in Figure 8, this cluster exhibits the highest number of new keywords – 25 – that have an average published year (APY) after 2017. Specifically, one concept has an APY after 2020; four concepts have their APY as 2019; nine are at APY 2018; and there are eleven with an APY of 2017. As can be observed, *Industry 4.0* and other related terms are among the top novel keywords.

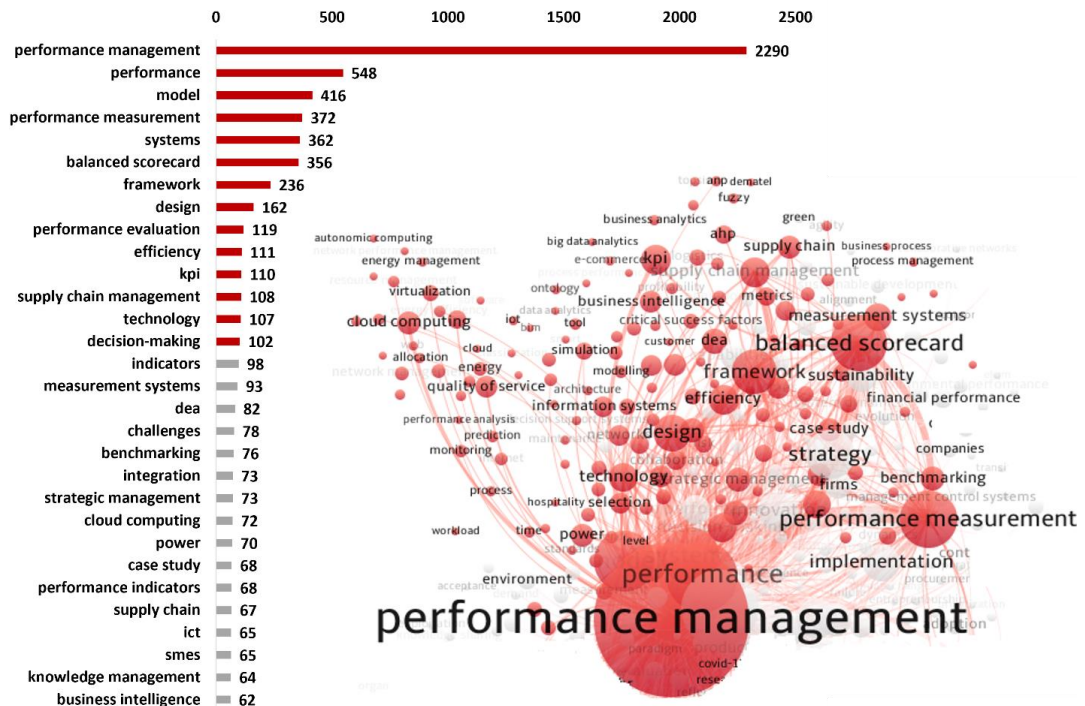


Figure 7. Cluster 1 – Map and Top 30 Keywords and their occurrence

Source: Authors' computation with Excel and VOSviewer

Additionally, several other concepts with an APY after 2017 have been identified, which can be categorized based on common characteristics. These include: *collaborative governance* (APY: 2019.90); *dynamic performance management* (APY: 2019.06) and *system dynamics* (APY: 2017.78); *business model* (APY: 2018.90) and *maturity model* (APY: 2017.78); *supply chain performance* (APY: 2018.61); *energy* (APY: 2017.74) and *energy efficiency* (APY: 2017.05). Keeping within the same cluster, the focus within the last few years on *challenges* (APY: 2018.15), *trends* (APY: 2017.89), *barriers* (2018.38) is noteworthy. The term "challenges" stands out significantly (Occ – 72; Link – 201; TLS – 502), as it is linked to keywords *performance management* and *performance measurement* from Cluster 1, as well as keywords from other clusters, such as *management* (Cluster 3), *impact* and *strategy* (Cluster 4). The top newest keywords also include *methodology* (APY: 2017.52) and *dematel* (APY: 2017.38). Decision Making Trial and Evaluation Laboratory (DEMATEL), as a widely used multi-criteria decision-making method, is deployed to solve complex and difficult causal relationships between criteria.

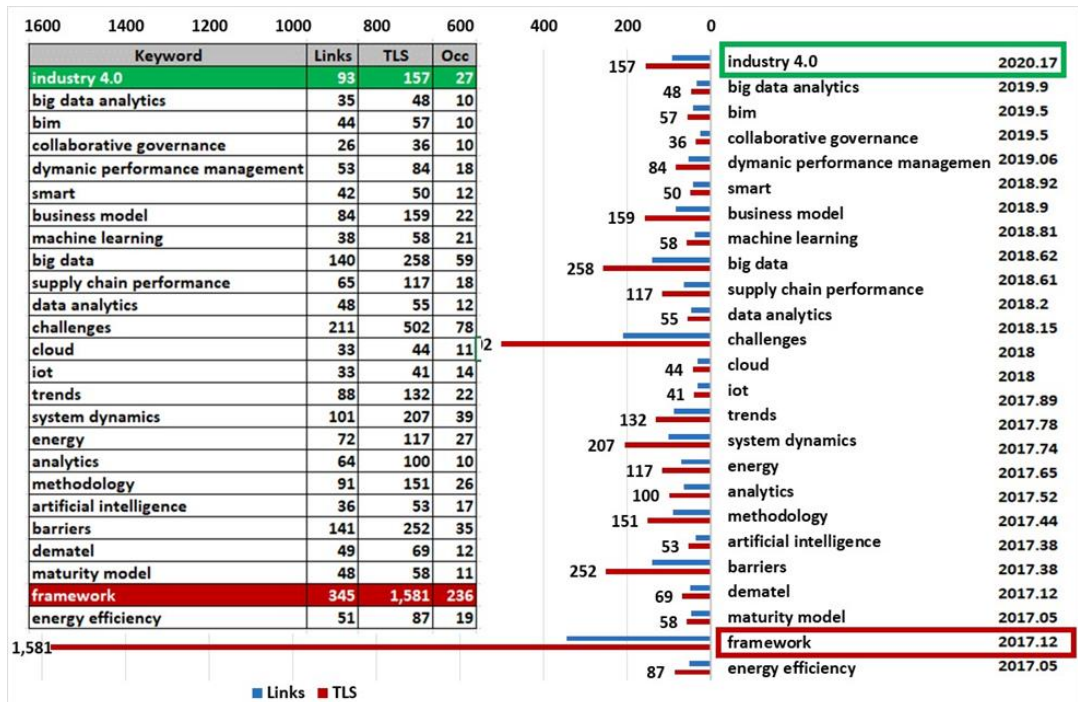


Figure 8. Cluster 1 – Keywords with APY after 2017
Source: Authors' computation with Excel and VOSviewer

Within the next subsection, both the newest concept as well as the one with the highest occurrence (and APY after 2017) are analyzed in increased detail.

- *Industry 4.0 and other 4IR tools – the latest trending concepts in Cluster 1*

Industry 4.0 is the keyword with the most recent average published year (APY: 2020.17). Under the same category other important keywords can be found – *big data analytics* (APY: 2019.9); *bim* (APY: 2019.5); *smart* (APY: 2018.92); *machine learning* (APY: 2018.81) *big data* (APY: 2018.62); *cloud* (APY: 2018), *iot* (APY: 2018), *analytics* (APY: 2017.75), *artificial intelligence* (APY: 2017.44).

All these keywords are primarily linked with challenges regarding digital transformation and the fourth industrial revolution (4IR) for performance management. Amongst these, *big data* has the highest number of links and TLS (Links: 58; TLS: 258) and goes hand in hand with *big data analytics* and *analytics* in terms of working with data in the context of performance management. In the age of 4IR, these *business intelligence technologies*, together with *artificial intelligence* and *machine learning* provide the basis for decision-making support systems which facilitate obtaining and maintaining long-term competitive advantages. Another contemporary topic is *Bim* (*Building Information Modeling*) technology, which in collaboration with others like big data, artificial intelligence (AI), sensors, internet of Things (IoT) and cyber-physical systems are valuable tools for Industry 4.0 and Construction 4.0 – especially in the construction of smart cities, in context of sustainable development (Chen et al., 2022, p. 2).

- *Framework* – the most representative keyword in Cluster 1

The data presented in Figure 8 suggests an increasing level of interest in the concept of *framework* (Occ.: 236; Links: 345; TLS: 1,581). To provide a more detailed examination of this concept, Figure 9 utilizes a dual representation approach: *Network Visualization*, to highlight links between framework and other related concepts, from both the same and different clusters; *Overlay Visualization*, a simultaneous representation of the links between the terms and their degree of novelty.

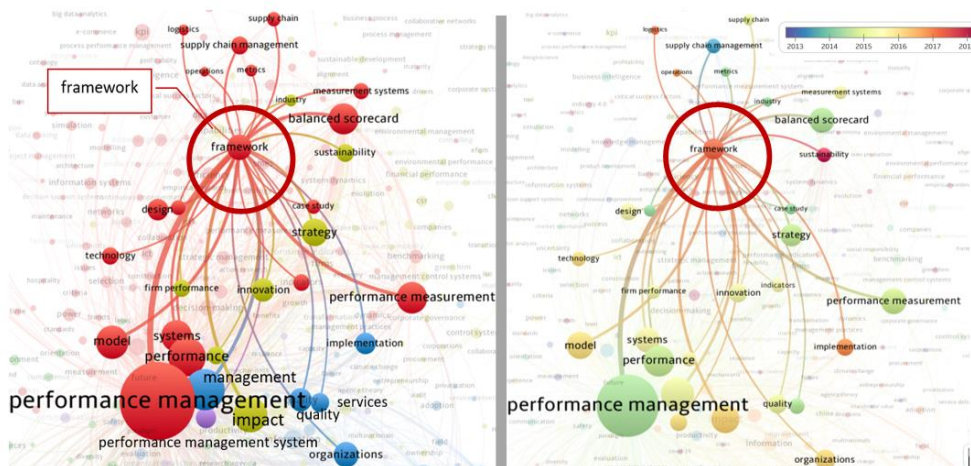


Figure 9. Framework – Network and Overlay Visualization

Source: Authors' computation with VOSviewer

As can be seen in Figure 9, *framework* is closely linked with various keywords from the same cluster – *performance management, performance, balanced scorecard, performance measurement, model, systems, design, efficiency, indicators, metrics, supply chain management, supply chain, logistic* – as well as with keywords from other two clusters: Cluster 3 – *management, implementation, organizations, quality* etc.; Cluster 4 – *strategy, innovation, sustainability, firm performance, industry*, etc. An analysis based on keyword novelty reveals that the most recent keywords associated with *framework* are: *sustainability* (dark red; APY: 2017.37), *implementation* (orange; APY: 2016.81), *model, technology, design, systems* (yellow). An interesting find to highlight is represented by the concepts linked with *technology* (Cluster 1) and *sustainability* (Cluster 4). Both – *technology* and *sustainability* – are drivers for designing and rethinking performance management within any organization. Moreover, a systemic approach and the development of new models are essential in order to cope and address current challenges and to capitalize on emerging opportunities.

(2) Cluster 2 – Human Resource Management (HRM)

Cluster 2 – HRM – is depicted in green and contains 144 items. As can be drawn from Figure 10, the cluster contains items closely related to the individual/ employee level, respectively human resources and their performance. Aside from the dominant keyword *hrm* (300), other keywords with over 100 occurrences include: *leadership* (231); *work* (173); *behavior* (139); *appraisal* (132); *performance appraisal* (114); *feedback* (112); *motivation* (108).

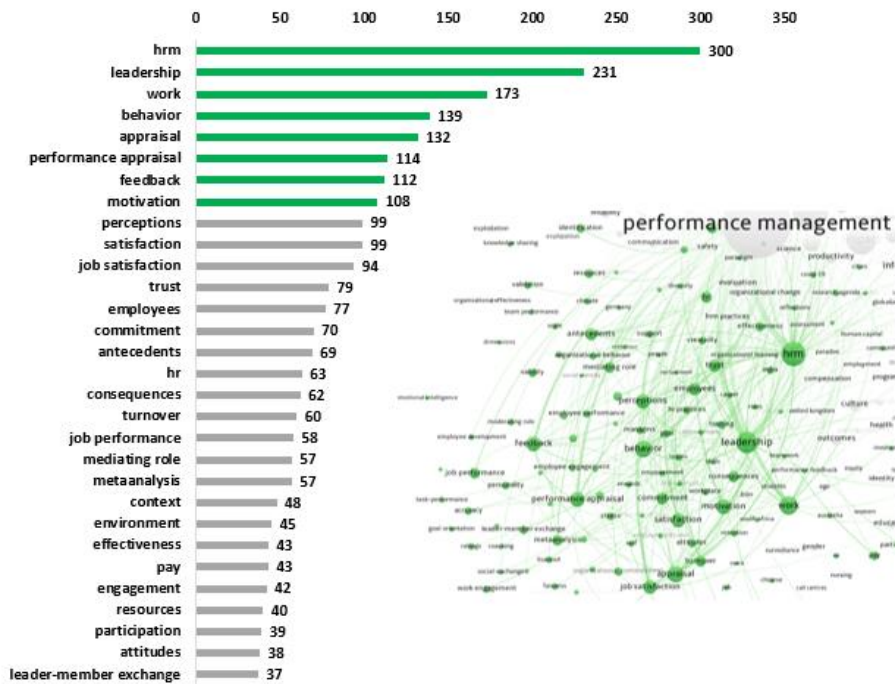


Figure 10. Cluster 2 – Top 30 Keywords and their occurrence

Source: Authors' computation with Excel and VOSviewer

With regard to novelty, Cluster 2 is comprised of 17 items that have an APY after 2017: one very recent (APY: 2021); three with an APY: 2019; thirteen with their APY: 2017. Visibly in Figure 11, *Covid-19* is the most recent and intensively discussed term in the cluster. Notably, in terms of novel concept characteristics (Occ.; Links; TLS) – the most salient keywords are: *engagement* (represented in two forms – *engagement* and *work engagement*); *mediating role*; and *leader-member exchange*.

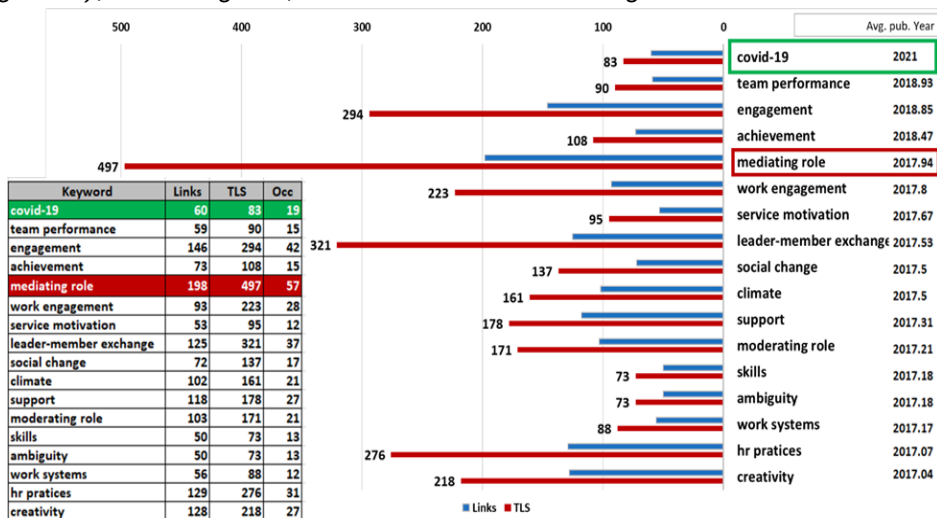


Figure 11. Cluster 2 – Keywords with APY after 2017

Source: Authors' computation with Excel and VOSviewer

- *Covid-19 – the hottest keyword*

It is unsurprising that Covid-19 has emerged as a highly debated and researched topic (APY: 2021), given the profound impact the pandemic has had on employees, employers, working environments, and thus by association on performance management. In the context of the pandemic, managers worldwide have faced an increased incidence of burnout among their employees.

Moreover, stress has escalated dramatically under the pandemic's pressure, impacting employee performance as well. Social distancing, isolation, uncertainty, fear of unemployment, emotional exhaustion, "Zoom fatigue" are factors that lead to employee stress and burnout (Gabriel & Aguinis, 2022, pp. 188-189). Even though before the pandemic the vast majority of organizations have linked compensation systems to performance, during the crisis many organizations approached them separately. This could be expected, as during pandemic times and under extreme conditions it was increasingly difficult to measure performance objectively.

Unfortunately, during the crisis, many organizations almost completely renounced their performance evaluation practices. This is partially due to the focus on performance appraisals alone, rather than on integrated performance management systems, as frequently when organizations struggle for survival, there is a temptation to sacrifice performance management practices (Aguinis, 2021a, p. 235). Such an approach is counterproductive, especially taking into consideration the importance of performance management in gaining competitive advantages. Even in the context of the Covid-19 pandemic, the ongoing struggle to attract, maintain and engage talented employees is dire. This situation requires a different approach towards performance management that relies on characteristics such as: measuring of both results and behaviors; 360-degree systems (multisource performance systems); measuring adaptive performance – taking into consideration the fact that adaptability is a vital skill (Aguinis, 2021a, pp. 237-238).

The solution is to adapt performance management to the new societal and organizational realities (Aguinis, et al., 2021b, p. 158), as such the aforementioned authors have proposed a Performance Promoter Score (PPS) – an innovative, practical, clear, and useful instrument to measure performance not only during this crisis, but useful in future situations as well. Nowadays, especially when confronted with COVID-19 related issues, effects and challenges, global performance is linked to the strength of the relationships between productivity, efficient communication, teamwork, leadership, and ethics (Mercader et al., 2021, p. 21).

- *Mediating role – the most frequent used keyword with APY after 2017*

From the group of terms with an APY after 2017, *mediating role* is the most frequently used keyword (Occ.: 57) and the one with the best score in terms of links and TLS (Links-198; TLS-497). Mediating role as a keyword is linked both with concepts from the same cluster – *hrm* and *leadership* – as well as keywords from other clusters, such as: *performance management*, *performance*, *model* (cluster 1) and *impact* (cluster3). Regarding concept novelty, mediating role (APY: 2017.94) is linked with other relatively new concepts, with orange colour: *model* (APY: 2016.95); *leadership* (APY: 2016.26); and *impact* (APY: 2016.12).

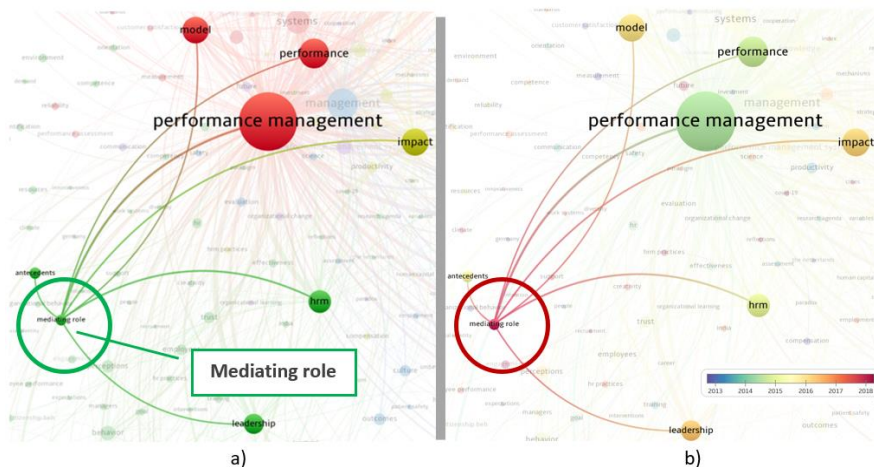


Figure 12. Item: Mediating role. Network and Overlay Visualization
Source: Authors' computation with VOSviewer

The mediator variable (observer/ mediator) explains the relationship between an independent variable (predictor) and a dependent variable. This causal relationship that is completely dependent on the mediator (the independent variable has no effect on the dependent variable in the absence of the mediator), is very important in performance management research.

Papers present different issues regarding the mediating role of: information technology management on service performance management (Lenuwat & Boon-itt, 2021); trust in leaders (authentic leadership) and reaction regarding performance feedback (Asad et.al, 2022); environmental performance and employee performance (Amjad, 2021); organizational innovation (product, service, knowledge innovation) in the relationship between human resource management and sustainable organizational performance (Rasool at. Al, 2021); performance management systems – with both financial and non-financial indicators – in the relationship between company performance and strategy (Micheli, P. Y Mura, 2017).

- *Other important new concepts*

Engagement (APY: 2018.85), another modern concept, is well represented (Occ: 42; Link: 146; TLS: 294) and complemented by a similar term – *work engagement* (Occ.: 28; Links: 93; TLS: 222; APY: 2017.8). Furthermore, *employee engagement* (Occ: 25; Link: 87; TLS: 164) is also part of the same cluster – even though it is not captured in Figure 11, because it's APY is before 2017 (namely, 2016.48).

Leader-member exchange is another concept that scores high (Occ: 37; Link: 125; TLS: 321) being strongly connected to *social change* (cluster 2; APY: 2017.5), and *performance management* (cluster 1).

From a recency perspective, keywords such as, *team performance* (APY: 2018.93) and *achievement* (APY: 2018.47) can be also highlighted. In addition to the previously analyzed keywords, after an APY of 2017, other terms worth mentioning are: *service motivation*, *climate*, *support*, *moderating role*, *skills*, *ambiguity*, *work systems*, *hr practices*, and *creativity*.

(3) Cluster 3 – Management and Public Sector

Cluster 3 – "Management and Public Sector" – is represented in the cluster map in blue and contains 120 items. The cluster name is assigned by the authors, based on the keyword with the highest occurrence, namely management (Occurrence: 634), in combination with term public sector, which encompasses within the cluster other terms such as: government; public management; local government; new public management etc.

Figure 13 depicts the top 30 keywords in descending order based on the number of occurrences. As can be seen, *management* is followed by 15 items that have an occurrence of over 100, namely: *organizations* (232); *quality* (190); *accountability* (179); *public sector* (168); *implementation* (164); *governance* (151); *government* (151); *information* (142); *services* (132); *sector* (122); *public management* (118); *healthcare* (116); *policy* (116); *local government* (110); *reform* (102).

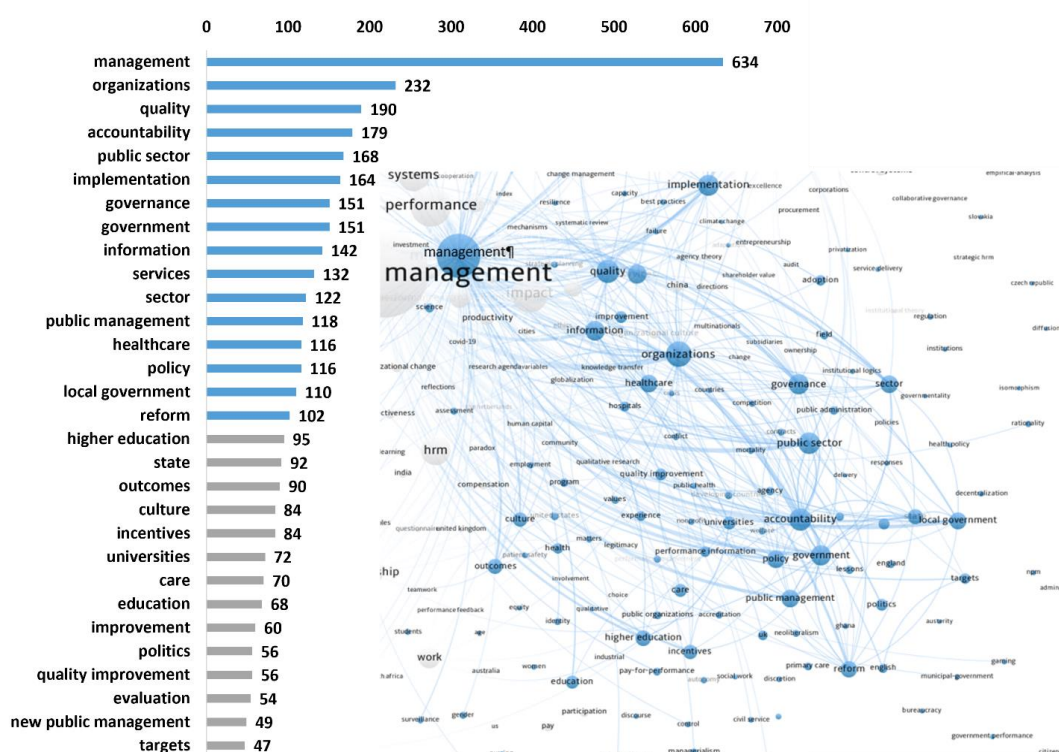


Figure 13. Cluster 3 – Top 30 Keywords and their occurrence

Source: Authors' computation with Excel and VOSviewer

With regards to novelty, Cluster 3 comprises 16 terms, with APYs after 2017, consisting of three terms in 2019 and thirteen in 2017. Based on the findings, it can be inferred that this cluster lacks the novelty observed in the previous two, as no APYs have been registered in 2021, 2020 or 2019. *Health policy* (APY: 2018.38), emerged as the latest topic to have been explored after 2018.

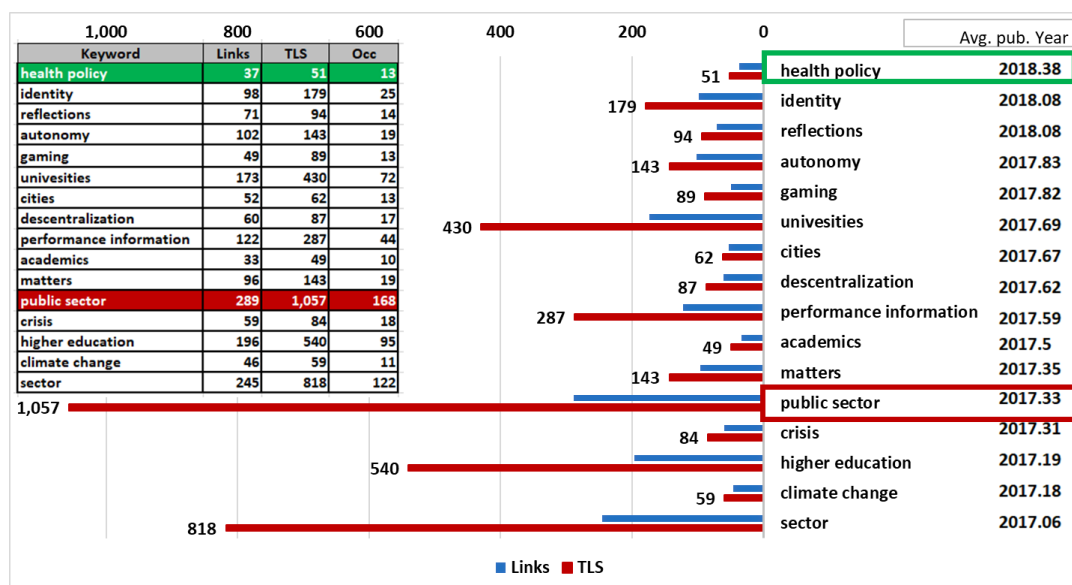


Figure 14. Cluster 3 – Keywords with APY after 2017
Source: Authors' computation with Excel and VOSviewer

- *Health policy – the concept with the newest APY in Cluster 3*

In terms of *health policy*, most likely the high level of interest comes from complex issues and challenges – demographic changes (population aging), pandemic explosion, new emergent and disruptive technologies (e.g. big data, artificial intelligence), economic and financial shocks – that have an important impact on public health systems.

Nowadays, countries all over the world are confronted with complex issues regarding public health. Moreover, health inequalities are a reality. In this context, in order to provide proper national healthcare, research and practice regarding health policy emphasize a need for a modern healthcare system, with a performance measurement and management orientation, that ensure not only the quality of care, but also proper prevention (Reibling et al., 2019, pp. 611, 618).

The Covid-19 pandemic has affected worker health and thus huge problems have arisen especially in low-income countries with under-resourced healthcare systems. In the eventuality of possible other pandemics, it is important to protect the most vulnerable communities and peoples, and this represents a significant problem, especially when confronted with low-level resilience of healthcare systems. For this purpose, healthcare reforms are a must. Infrastructure, leadership, and coordination between sectors – in order to align Health Ministries and other authorities plans and protocols – are very important for the quality of treatments and care.

- *Public sector – the best represented keyword with APY after 2017*

An important concept in cluster 3 is represented by *public sector* which finds itself amongst the top new topics (APY: 2017.33) while also being one of the most frequent keywords, with the highest number of links and total link strengths (Occ-168; Link-289; TLS-1,057).

The concept has strong links with keywords in other clusters, namely: Cluster 1 – *performance management, performance, model, system, performance measurement balanced scorecard*; Cluster 2 – *hrm; leadership; appraisal*; Cluster 3 – *management, governance accountability; reform; incentives; information* etc. Cluster 4 – *impact, innovation, and organizational effectiveness*.

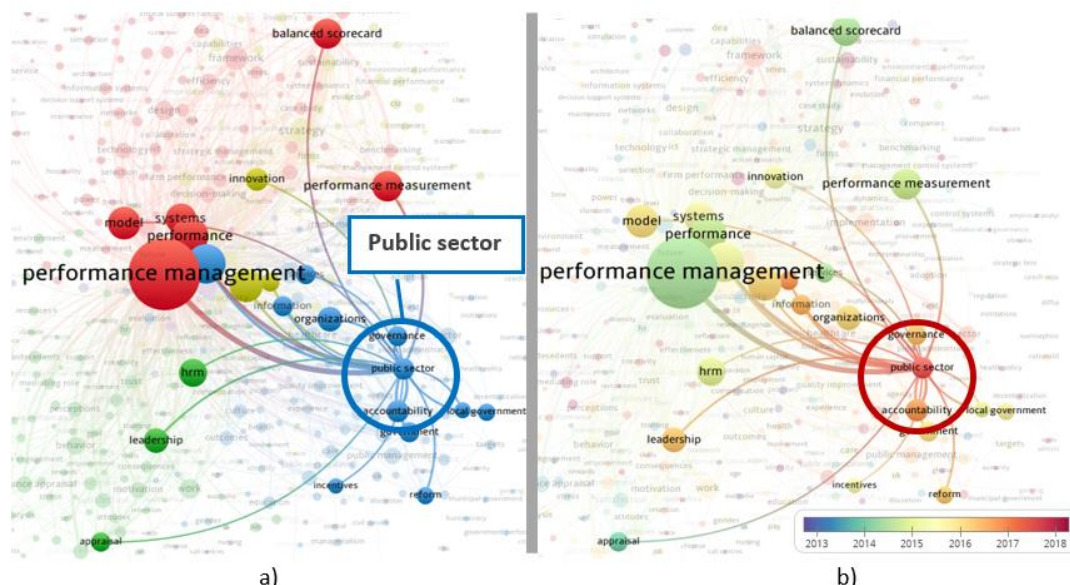


Figure 15. Item: Public Sector. Network and Overlay Visualization
Source: Authors' computation with VOSviewer

Goal ambiguity, political conflicts, structural barriers and implementation problems are some of the key Public Management reform challenges and risks (Ingrams et al., 2020, p. 260). To overcome these issues, it is important to have a modern performance management approach which starts from strategy and takes into account current challenges and opportunities.

New public management (NPM) reforms have generated pressure on public sector organizations to overcome the traditional model of public administration and implement an innovative performance measurement and management framework, aligned with strategic goals and objectives. To gain knowledge regarding governance performance, it is important to link program evaluation and performance management (Kroll & Moynihan, 2018).

- *Other concepts*

A further interesting topic in public management is linked with the managerial use of *performance information* and the relationship between organizational performance and performance management (Han & Moynihan, 2022). This is further validated by the fact that *performance information* is in the novelty top of the topics in the public sector cluster (APY: 2017.99; Occ: 44; Links: 122; TLS:287).

Education is also well represented from a novelty point of view – *universities* (APY: 2017.69; Occ-72; Links-173; TLS-430), *higher education* (APY: 2017.19; Occ-95; Links-196; TLS-540) and *academics*. As new topics, the following can also be highlighted: *autonomy* (APY: 2017.83); *gaming* (APY: 2017.82); *cities* (APY: 2017.67); *decentralization* (APY: 2017.62), *crisis* (APY: 2017.31); *climate change* (APY: 2017.18).

(4) Cluster 4 – Impact and Strategy

The most representative words in Cluster 4 are: *impact* (450); *strategy* (277); *innovation* (195); *organizational performance* (121); *knowledge* (114); *sustainability* (112); *firm performance* (102); *perspective* (101) – the remaining are all below 100 occurrences (Figure 16).

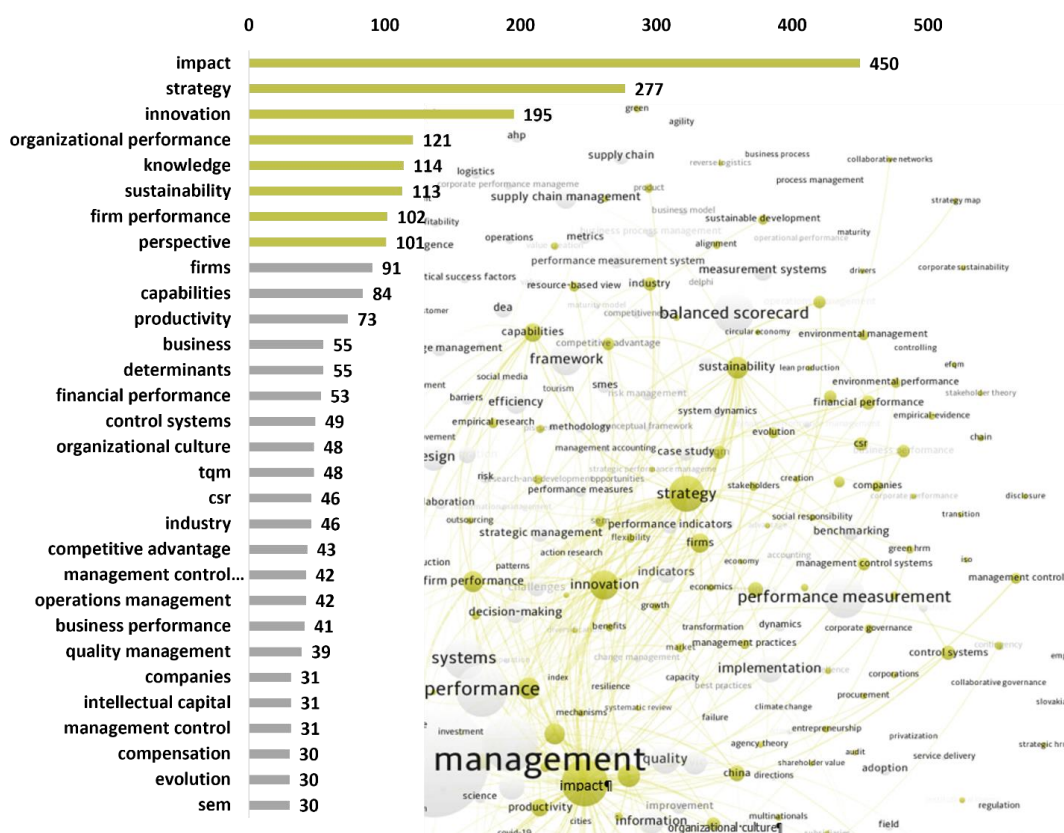


Figure 16. Cluster 4 – Top 30 Keywords and their occurrence
Source: Authors' computation with Excel and VOSviewer

In terms of novelty, Cluster 4 contains 11 (eleven) terms with APYs after 2017, respectively: one in 2019; five in 2018 and six in 2017 (Figure 17). As can be observed, this cluster has no concepts with APY in 2021 or 2020. Cluster 4's newest term is *drivers* (2019.18), followed by other five keywords with APY after 2018, respectively: *green hrm* (APY: 2018.79), *disclosure* (APY: 2018.6), *empirical evidence* (APY: 2018.38), *pls-sem* (APY: 2018.24) and *green* (APY: 2018.18).

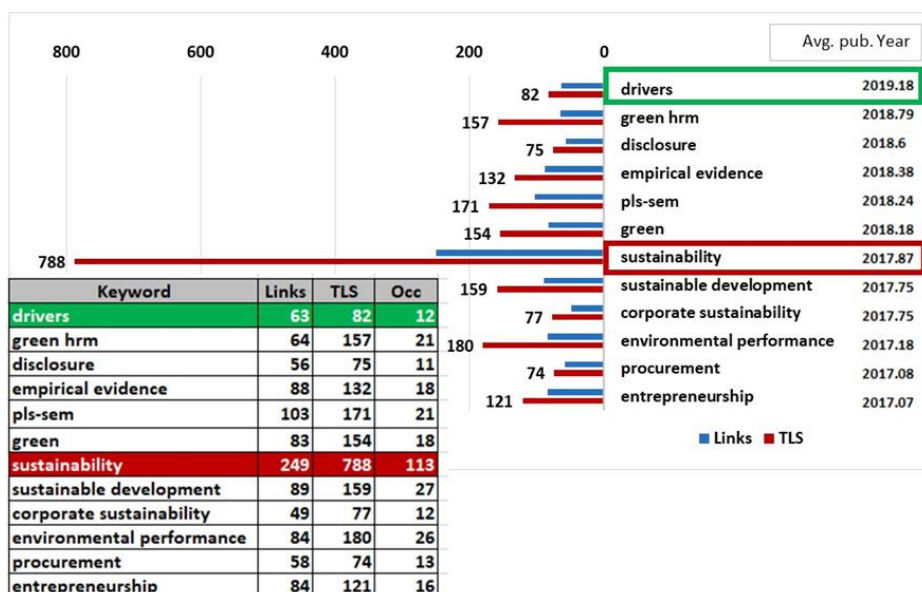


Figure 17. Cluster 4 – Keywords with APY after 2017
Source: Authors' computation with Excel and VOSviewer

- *Drivers – the hottest topic in cluster 4*

In the present landscape defined by formidable challenges, the emphasis on generating sustainable value for multi-stakeholders has led to an increasing interest in identifying the *key drivers* that influence and shape performance management frameworks. *Digitalization* and *Industry 4.0* are probably the most notable drivers considering the fact that digital transformation is influencing both public and private organization, as well as individuals. Emerging technologies, such as Artificial Intelligence (AI), smart robotics, Internet of Things, Blockchain, intelligent automation, big data, etc., are transforming traditional approaches to work and enhancing productivity (Gorski et. al, 2022, pp.187-188). Incorporating digital and technological dimensions can extend a company's performance management systems (Obermayer et al., 2022, p. 1042), but in order to successfully implement these emergent technologies there is a clear need to develop new competencies and skills (Gorski & Gorski, 2021, p.34).

Another key driver is the *environmental perspective of sustainability* and its *integration in business strategies*, especially in the context of the *green transition* (Hristov et al., 2022). Moreover, the sustainability culture of both companies and individuals plays a crucial role in the integration process of sustainability in organizational strategy. In this regard, *cultural change* supports and reinforces the processes of sustainability implementation at organizational level and influences performance results (Hristov and Chirico, 2022, p. 79). In the public sector, research on performance management has identified three principal drivers: Leadership – characterized by an empowering, ethical, inclusive, transformative style; Managerial behavior – empowering, entrepreneurial behavior, power sharing, involvement; HRM (Human Resource Management) – involving recruitment, talent management, diversity management, job design (Asif, & Rathore, 2021, p. 8).

- *Sustainability – the best represented concept after 2017*

An important conclusion to be drawn is the significance of the keyword *sustainability* (Occ.: 113; Links: 249; TLS: 788). It is also a novel term (APY: 2017.87) and intrinsically linked with others under the same "umbrella": *green hrm* (APY: 2018.79); *disclosure* (APY: 2018.60); *green* (APY: 2018.18), *sustainable development*, *corporate sustainability*, *environmental performance* (the last four between 2017 and 2018).

As shown in *Figure 18*, this concept is interlinked with other terms from both the same and different clusters: Cluster 1 – *performance management*, *performance*, *performance measurement*, *balanced scorecard*, *framework*, *model*, *systems*, *supply chain management*; Cluster 2 – *hrm*; Cluster 3 – *management*; Cluster 4 – *strategy*, *impact*, *innovation*, *csr*, *green hrm*, *environmental performance*, *companies*.

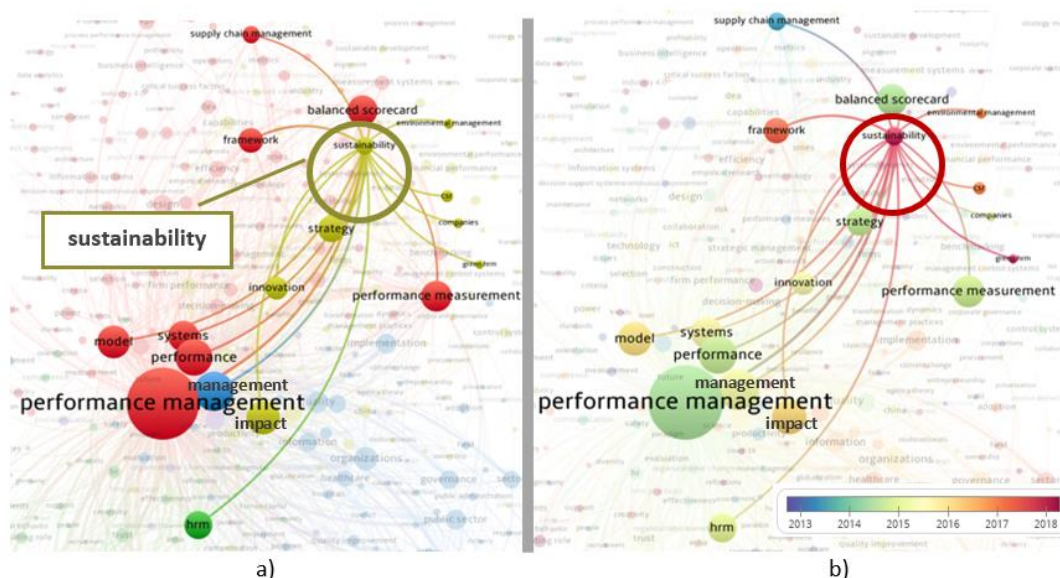


Figure 18. Item: Sustainability. Network and Overlay Visualization

Source: Authors' computation with VOSviewer

In terms of novelty, *sustainability* (APY: 2017.87) is linked with other up-to-date concepts – *green hrm* (APY: 2018.79) – as well as terms depicted in dark orange and orange – *environmental management* (APY: 2017.87); *framework* (APY: 2017.12) *csr* (APY: 2016.88); *impact* (APY: 2016.12); *model* (APY: 2015.95); *systems* (APY: 2015.60); *innovation* (APY: 2015.42).

The imperative for a shift towards environmentally sustainable practices is a global necessity affecting various stakeholders including nations, organizations, employees, customers, and citizens, primarily due to climate change and resource scarcity issues. The challenges related to climate change, as defined by the Paris Agreement of 2015, and the transition from fossil fuels (gas and oil) to more sustainable energy sources (solar, wind, hydrogen, biogas) call for novel approaches, methods, metrics, and indicators for measuring and managing performance.

Hristov et al. (2021, p. 14) emphasize the need for the integration of the environmental dimension and performance management systems (PMS) in both the

private and public sector. This approach improves sustainability performance of organizational performance management systems. Moreover, sustainable value creation is closely linked with green transitions, thus in this context, not just for survival, but also for establishing long term competitive advantages, companies should benefit from the strategic integration of environmental performance management systems and corporate social responsibility (Hristov et al., 2022).

- *Other terms*

PLS-Sem or Partial Least Squares Structural Equation Modelling is also an important (Occ. 21; Links; 103; TLS: 171) and novel topic (APY: 2018.24) in the study of performance management. In business research *pls—sem* is an emerging tool (Hair et al., 2014, Hair et al., 2021).

(5) Cluster 5 – Performance Management System

Cluster 5 is the smallest – containing only 16 entities, that are relatively dispersed and less visible. As presented in Figure 19, *performance management system* (156) is the preeminent concept, followed by: *future* (60); *communication* (42); *organizational change* (39); *organizational learning* (22); *qualitative research* (22); *change management* (21); *exploration* (21); *directions* (20); *exploitation* (15); *paradox* (14); *cooperation* (11); *change* (10); *acceptance* (10); *organizational effectiveness* (10).

In the context of challenges, rethinking the performance management systems is closely related with the necessity of *change*, *organizational change* and *change management*. *Communication*, *cooperation*, and *organizational learning* can be important enablers and/ or drivers for this transformation, in order to ensure *organizational effectiveness*.

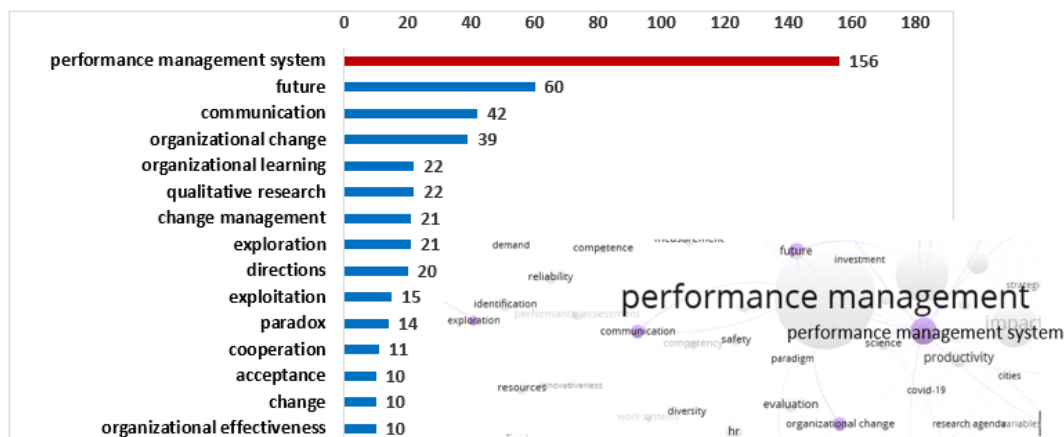


Figure 19. Cluster 5 – Top 30 Keywords and their occurrence

Source: Authors' computation with Excel and VOSviewer

In terms of novelty, Cluster 5 has no keywords with recent APYs: 2021, 2020, 2018 or 2019, with only *future* (APY: 2017.76) and *direction* (APY: 2017.35) being in 2017. There are also three terms between 2016 and 2017: *qualitative research* (APY: 2016.62); *acceptance* (APY: 2016.56); *performance management system* (APY: 2016.00), while the others are older (between 2013 and 2016).

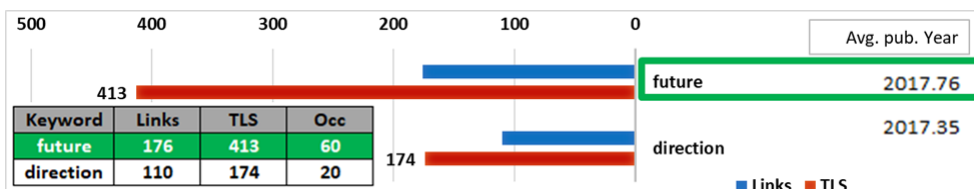


Figure 20. Cluster 5 – Keywords with APY after 2017

Source: Authors' computation with Excel and VOSviewer

4. Conclusions

To identify and analyze the current state of knowledge concerning performance management, the authors have deployed bibliometric methods. Data collected from WoS (6,580 documents in English) have been processed using both VOSviewer and Microsoft Excel. In the following, the key conclusions are presented regarding the most frequently addressed topics in research papers (timespan 2017-2022), as well as the hottest keywords and trends in the stated research field.

Framework (Cluster 1); *mediating-role* (Cluster 2); *public sector* (Cluster 3); *sustainability* (Cluster 4); and *future* (Cluster 5) – are the most representative keywords in each cluster – for the timespan of 2017-2022. Among these, *framework* and *sustainability* have the most significant occurrences, links and TLS with other keywords from the conceptual map – both from the same cluster or from different ones.

Regarding performance management topic, in terms of novelty, the hottest keywords are *Covid-19* (APY: 2021) and *Industry 4.0* (APY: 2020.17). These findings are expected, considering the implications that the *Covid-19* pandemic has had on employees, employers, working environment and thus on performance management. When it comes to *Industry 4.0*, other important keywords can be found under the same category – *big data analytics*; *smart*; *machine learning*; *big data*; *cloud*; *IoT*; *analytics*; *artificial intelligence*. All these keywords are primarily linked with challenges regarding digital transformation and the fourth industrial revolution (4IR) when it comes to performance management practices. The onset of the Fourth Industrial Revolution (4IR) and the Covid-19 epidemic have created a volatile, unpredictable, complex, and ambiguous (VUCA) environment that poses a challenge to organizations worldwide and requires a shift in their operating model (Ivanova, 2022, p.41).

Another particularly important aspect in the context of the current challenges is related to the issue of *sustainability*. Unfortunately, unbalanced industrial development has contributed enormously to the deepening of problems related to global warming and climate change, pollution, reduction of biodiversity, etc. In addition, humanity is currently facing profound imbalances and inequalities in wealth distribution. It is obvious that a sustainable approach deployed in an organizational context, in an integrated development of the three dimensions - economic, social, environmental - generates significant direct and indirect changes that will impact performance management.

As possible future research directions, important aspects to address would be represented by the impact that different challenges, such as Covid-19, digitalization, Industry 4.0 technologies, and the transition towards sustainability, would influence changes in approaches to performance management.

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