Akademik Araştırmalar ve Çalışmalar Dergisi 2024, 16(30), 1-18
Journal of Academic Researches and Studies 2024, 16(30), 1-18
https://doi.org/10.20990/kilisiibfakademik.1423932

Makale Türü: Araştırma Makalesi
Paper Type: Research Paper

Geliş Tarihi/Received Date: 22.01.2024
Kabul Tarihi/Accepted Date: 29.04.2024

Bibliometric Analysis Of Publications On Time-Driven Activity Based Costing Method

Zamana Dayalı Faaliyet Tabanlı Maliyetleme Yöntemine İlişkin Yayınların Bibliyometrik Analizi

Ömer Burak PAKSOY[1]

Abstract

Purpose: This research seeks to conduct a comprehensive review of the Time-Driven Activity Based Costing (TDABC) literature employing a bibliometric analysis methodology.

Design/Methodology: In this study, it was systematically examined parameters such as annual publication count, primary contributors in terms of countries and organizations, most cited studies in Web of Science (WoS), prolific authors, and influential journals. Structural aspects of the field were delineated using keywords, and prevailing trends within the TDABC literature were analyzed using VOSviewer software.

Findings: The findings indicate a substantial growth in the TDABC literature. The seminal work by Kaplan & Anderson (2004) stands out as the most frequently cited study. In co-citation analysis, author R.S. Kaplan leads with 655 citations, while Harvard Business Review attains the highest citation count among journals with 500 citations. The United States emerges as the predominant contributor to TDABC literature in terms of documents. The Journal of Arthroplasty emerges as the most prolific journal, producing 14 articles.

Limitations: The primary constraint of this study that for the analysis covering the period 2004-2023 resides in its exclusive reliance on the WoS Database for analysis, thereby excluding sources not disseminated online through databases like ULAKBİM in Turkey, as well as Scopus and PubMed in the international scholarly domain.

Originality/Value: This study exhibits originality and scholarly merit through a systematic examination of TDABC literature using bibliometric analysis. Anticipated contributions include assessing the impact of TDABC research, mapping the knowledge structure within the field, and offering valuable insights to inform future research agendas.

Keywords: Cost Accounting, Time Driven Activity Based Costing, Cost Analysis, Bibliometric Analysis, Web of Science Database

Öz

Amaç: Bu araştırma, bibliyometrik analiz metodolojisi kullanarak Zamana Dayalı Faaliyet Tabanlı Maliyetleme (ZDFTM) literatürünün kapsamlı bir incelemesini yapmayı amaçlamaktadır.

Tasarım/Yöntem: Bu çalışma kapsamında, Web of Science (WoS) veritabanında yıllık yayın sayısı, en çok katkıda bulunan ülke ve kuruluşlar, en çok atıf alan çalışmalar, en üretken yazarlar ve en etkili dergiler gibi parametreler sistematik olarak incelenmiştir. Ayrıca, alanın yapısal hatlarını belirlemek için anahtar kelimeler analizi kullanılmıştır. ZDFTM literatüründeki hâkim eğilimleri ayırt etmek için VOSviewer yazılımı kullanılmıştır.

Bulgular: Bulgular, ZDFTM literatüründe önemli bir büyüme olduğunu göstermektedir. Kaplan & Anderson (2004) tarafından yapılan ufuk açıcı çalışma, en çok atıf alan çalışma olarak öne çıkmaktadır. Ortak atıf analizinde, yazar R.S. Kaplan 655 atıfla ilk sırada yer alırken, Harvard Business Review 500 atıfla dergiler arasında en yüksek atıf sayısına ulaşmaktadır. Amerika Birleşik Devletleri, doküman sayısı bakımından ZDFTM literatürüne en fazla katkıda bulunan ülke olarak öne çıkmaktadır. The Journal of Arthroplasty, 14 makale ile en üretken dergi olarak öne çıkmaktadır.

Sınırlılıklar: Bu çalışmanın temel kısıtı, 2004-2023 dönemlerini kapsayan analiz için yalnızca WOS Veritabanına dayanması, dolayısıyla Türkiye'de ULAKBİM, uluslararası akademik alanda ise Scopus ve PubMed gibi veri tabanları aracılığıyla çevrimiçi olarak yayımlanmayan kaynakları hariç tutmasıdır.

Özgünlük/Değer: Bu çalışma, ZDFTM literatürünün bibliyometrik analiz perspektifinden sistematik bir şekilde incelenmesine öncülük ederek özgünlük ve bilimsel değer ortaya koymaktadır. ZDFTM araştırmalarının etkisini değerlendirme, alandaki bilgi yapısını haritalandırma ve gelecekteki araştırma gündemlerini bilgilendirme açısından literatüre katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Maliyet Muhasebesi, Zamana Dayalı Faaliyet Tabanlı Maliyetleme, Maliyet Analizi, Bibliyometrik Analiz, Web of Science Veritabanı

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1. INTRODUCTION

Due to advancements in cost strategies, a plethora of cost and management accounting methodologies has emerged since the 1980s (Elshahat, 2016). Traditional cost methods have been deemed inadequate in furnishing precise cost information, necessitating the development of alternative approaches. Among these methodologies, Activity-Based Costing (ABC) stands out (Barrett, 2005). Originating in the early 1990s, it was conceptualized by Kaplan and Cooper, offering a framework for evaluating the cost and performance of activities and associated resources. In accordance with ABC principles, activities are influenced by cost drivers, while these activities, in turn, impact resource consumption. Subsequent to heightened interest in the early 1990s, the ABC method encountered criticism for being perceived as time-consuming, financially burdensome, and challenging to implement. The method witnessed a decline in prominence over time due to the dissemination of unfavorable perceptions and its inherent high costs. However, contemporary resurgence has transpired with the advent of Time-Driven Activity-Based Costing (TDABC), an approach rooted in ABC (Hoozee & Hansen, 2018). Challenges for practitioners lie in ABC's inadequacy for intricate activities and its prohibitive cost for adaptation in dynamic environments. Addressing these concerns, Kaplan and Anderson introduced the TDABC method to mitigate these challenges (Kaplan & Anderson, 2004).

The concept of TDABC has garnered scholarly attention since the early 2000s, prompting extensive research endeavors into the methodology. Despite the abundance of studies on TDABC, a noticeable dearth of bibliometric analyses on this methodology is apparent. Within this context, the present study endeavors to scrutinize the TDABC method within the Web of Science (WoS) database spanning the period from 2004 to 2023.

A bibliometric analysis on TDABC involves a quantitative investigation of scholarly publications, applying statistical methods to discern patterns, trends, and relationships within the literature. Key facets encompass the examination of publication trends over time, geographic distribution of research contributions, authorship patterns, citation analyses to identify influential works and authors, evaluation of journal impact, scrutiny of keywords for thematic insights, and the construction of networks to visualize relationships among documents and authors. Such an analysis provides a systematic understanding of the development, impact, and key contributors in the TDABC research domain, facilitating informed insights and guiding future research endeavors.

The present research provides valuable insights into topics directly pertinent to TDABC, thereby warranting additional scholarly investigation. Its significance lies in its potential to aid scholars in cost and managerial accounting to discern entities, institutions, or governmental bodies with optimal potential for research development and knowledge dissemination. Furthermore, this study contributes to elucidating the critical role of advancing contemporary cost analyses. An in-depth exploration of the subject matter has the potential to garner support for the evolution of TDABC across diverse domains associated with cost accounting.

In alignment with the research objectives, the organizational structure of this paper is delineated as follows. The second section delves into the conceptual framework encompassing TDABC. Subsequently, the third section elucidates the methodologies employed in the research. The fourth section presents the findings. Lastly, the concluding section encapsulates a conclusion, delineation of limitations, and propositions for future research endeavors.

2. CONCEPTUAL FRAMEWORK

The inception of the TDABC method dates back to 1997 when Steven Anderson, in collaboration with Acorn Systems, addressed operational challenges encountered with the traditional ABC approach. Prior to the development of TDABC, inefficiencies were observed in resource allocation processes, prompting Anderson to initiate research endeavors in partnership with Robert Kaplan in 2001, aimed at refining ABC applications. Subsequent collaborative efforts between Anderson and Kaplan led to numerous scholarly contributions and publications, advancing the discourse on TDABC methodology. The resultant TDABC framework emerged as a notable cost system, demonstrating efficacy in diverse organizational contexts. From its conceptualization until 2006, TDABC garnered

widespread adoption, exhibiting successful implementation across various large-scale enterprises (Kaplan & Anderson, 2007).

TDABC method, an enhanced version of the activity-based cost methodology, is characterized by its reliance on time based metrics within organizational activities (Kaplan & Anderson, 2004). This method facilitates the streamlined representation of intricate and specialized operations through time equations, culminating in the precise computation of costs inclusive of idle capacity. The innovative approach allows the direct allocation of resource costs to cost objects, necessitating solely two parameters: the unit cost of resource capacity and the quantity of capacity expended per cost object. The transfer of resource costs to resources is governed by the utilization of the capacity cost ratio (Kaplan & Anderson, 2007; Namazi, 2016; Öker & Adıgüzel, 2016).

TDABC and traditional ABC methodologies diverge in several critical dimensions. While both methods aim to enhance cost allocation accuracy, TDABC distinguishes itself through its primary reliance on time as the key cost driver, achieved through time equations estimating activity durations. This contrasts with ABC, which identifies cost drivers across various activities. TDABC's streamlined approach simplifies implementation and reduces complexity, addressing limitations encountered by ABC, such as time-consuming resource allocation processes. TDABC's emphasis on time-based metrics enhances cost accuracy and flexibility, allowing for rapid adjustments to changing business environments. Moreover, TDABC requires fewer data inputs compared to ABC, facilitating more efficient cost analysis. These distinctions position TDABC as a promising alternative for organizations seeking precise cost information with minimized administrative burden (Kaplan & Anderson, 2007; Dalcı et al., 2010; Dejnega, 2011).

TDABC implementation follows a structured process (Siguenza-Guzman et al., 2016; Reynolds et al., 2018), beginning with the identification and grouping of activities into homogeneous pools based on resource consumption patterns. Subsequently, resource costs are determined, and time equations are developed to estimate activity times based on relevant drivers. Capacity cost rates are then calculated to allocate resource costs to activities, reflecting the cost per unit of time for each resource. Finally, utilizing the derived time equations, activity times are estimated, and costs are allocated to cost objects such as products or services (Everaert & Bruggeman, 2007; Dejnega, 2011). Noteworthy features of TDABC include its emphasis on time as a primary cost driver, its relative simplicity compared to traditional ABC, and its capacity to provide granular and accurate cost information for informed decision-making within organizations (Everaert et al., 2008; Bruggeman et al., 2005; Dalcı et al., 2010).

TDABC offers a streamlined yet accurate approach to cost allocation by integrating time as a fundamental driver within the ABC framework. Its simplicity, driven by time estimates rather than exhaustive activity analysis, enhances efficiency and reduces administrative complexity. TDABC's focus on time enables greater accuracy in cost allocation, fostering improved decision-making by providing transparent insights into resource consumption and cost structures (McGowan, 2009; Tanış & Özyapıcı, 2012). This methodological transparency aids in identifying non-value-adding activities, facilitating targeted efforts toward efficiency enhancement and cost reduction. Moreover, TDABC's adaptability allows for swift adjustments to changing business dynamics, ensuring continued relevance and applicability in increasingly dynamic environments. Through enhanced resource utilization and performance measurement, TDABC contributes to optimizing operational efficiency and strategic decision-making within organizations (Tse & Gong, 2009; Ganorkar et al., 2018).

TDABC has emerged as a prominent costing method in various industries, particularly in healthcare and business sectors. TDABC is recognized as a valuable method for accurately measuring costs and providing reliable data for decision-making and process redesign. It has been suggested as a cost-component of value-based healthcare (VBHC) and has shown potential in addressing costing challenges in health care organizations (Keel et al., 2017). Additionally, TDABC has been applied to assess and manage costs in cancer prevention, diagnosis, and treatment, demonstrating its versatility and relevance in economic analyses in the healthcare sector (Vargas Alves et al., 2018). Furthermore, TDABC is considered a pragmatic method for costing implementation strategies, offering opportunities for redesigning business activities to realize potential areas for improvement (Cidav et al., 2020).

In the healthcare field, TDABC has been compared with traditional systems and has been found to be a superior alternative, providing accurate costing and process data to support effective care redesign (Simmonds et al., 2018). Moreover, TDABC has been associated with significant cost savings in healthcare facilities in high-income countries, highlighting its potential for driving reforms and improving cost-effectiveness (McBain et al., 2016). In the context of internal audit departments in banks, TDABC has been identified as an effective costing system for measuring product or service costs with accurate and reliable data, emphasizing its applicability across diverse organizational functions (Erkek et al., 2022).

TDABC has also been compared with ABC, with the former being developed to provide a costing system that is easier to update and offering simplification of the costing process (Hoozée & Hansen, 2018). Furthermore, TDABC has been recognized as an innovative method for estimating costs, indicating its potential for driving innovation and efficiency in cost estimation processes (Vargas Alves et al., 2021).

TDABC exhibits certain limitations that warrant consideration within organizational cost management frameworks. Its dependence on time estimates for cost allocation introduces susceptibility to inaccuracies stemming from imprecise estimations or variability in activity durations. Furthermore, the method's reliance on simplified time-based metrics may obscure nuanced resource consumption patterns, potentially distorting cost interpretations and strategic decision-making (Wegmann, 2009; Namazi, 2016). TDABC's challenge in capturing and allocating intangible costs, coupled with its assumption of constant resource prices, underscores its limitations in addressing dynamic and multifaceted cost structures. Implementation costs, including data collection, system setup, and staff training, alongside scalability concerns in complex organizational settings, necessitate cautious deliberation (Stouthuysen et al., 2010). Moreover, resistance to change among stakeholders accustomed to traditional costing paradigms may impede TDABC's adoption and integration into organizational practices. Thus, while TDABC offers conceptual advantages, its practical application requires thorough consideration of its inherent limitations within diverse operational contexts (Barret, 2005; Lambino, 2007; Saban ve İrak, 2009).

Overall, the literature review indicates that TDABC is a valuable and versatile costing method with applications across various sectors, including healthcare, business, and manufacturing. Its ability to provide accurate costing data, support decision-making, and drive process redesign makes it a compelling approach for organizations seeking to enhance cost-effectiveness and operational efficiency.

3. METHODOLOGY

3.1. Research Model

The research utilized the bibliometric analysis method on the dataset extracted from the Web of Science database. Bibliometric analysis is a quantitative method employed to discern patterns, relationships, and trends within scholarly literature by employing statistical techniques on bibliographic information. It aims to unveil insights into research structure, evolution, and impact, often focusing on quantitative indicators such as citations, authorship, journal sources, co-citations and co-authorship. Examining the studies on a discipline with the bibliometric analysis technique has an important role in evaluating the performance of the discipline in question and seeing its development in terms of quality and quantity (Zhang et.al., 2019). There are various types of bibliometric analysis methods and bibliometric mapping is one of them. In addition, there are many software programs used to visualize the links of the mentioned analyses.

3.2. Research Group and Data Collection

The study sample comprised 562 publications retrieved from the Web of Science database spanning the period from 2004 to 2023, focusing on the topic of 'TDABC'. The dataset was gathered from documents indexed in the 'Social Science Citation Index' (SSCI), 'Science Citation Index-Expanded' (SCI-E), and 'Emerging Sources Citation Index' within the WOS database. In this study, bibliometric data is extracted from “Web of Science-WOS” using the keyword terms “Time Driven Activity Based Costing”, “TDABC” and “Time-Driven ABC”.

The WOS database sample was restricted to only “articles” and “review articles” in the research; therefore, editorial materials, book chapters, proceeding papers, working papers, and other unpublished material were excluded. In addition, no time restriction was imposed, and only English-language items were included. The screening using these parameters yielded 394 articles. The data were analyzed through author, citation, keyword and abstract analysis. The content indexed in Web of Science was taken as a criterion as a database. The downloaded file was transferred to the VOSviewer analysis programme and made ready for analysis.

3.3. Analysis of Data

The gathered data underwent analysis utilizing VOSviewer (version 1.6.20), a bibliometric analysis software renowned for its capacity in visualizing scholarly networks and patterns. VOSviewer, an acronym for 'Visualization of Similarities,' was developed in 2010 by van Eck and Waltman. This widely employed analytical tool facilitates the visualization of various metrics, including highly cited publications, the network topology of research cohorts, and collaborative patterns among authors in multi-authored works, thus enabling a comprehensive visual representation of scientific literature analyses.

3.4. Limitations of The Research

In this study, data on TDABC were obtained and analyzed by searching the Web of Science (WOS) database. The primary constraint of this study that for the analysis covering the period 2004-2023 resides in its exclusive reliance on the WoS Database for analysis, thereby excluding sources not disseminated online through databases like ULAKBİM in Turkey, as well as Scopus and PubMed in the international scholarly domain. Also, this study was executed by establishing specific criteria, with variations in the outcomes of the ranking possible due to the differential determination of criteria.

4. ANALYSIS AND DISCUSSION OF RESULTS

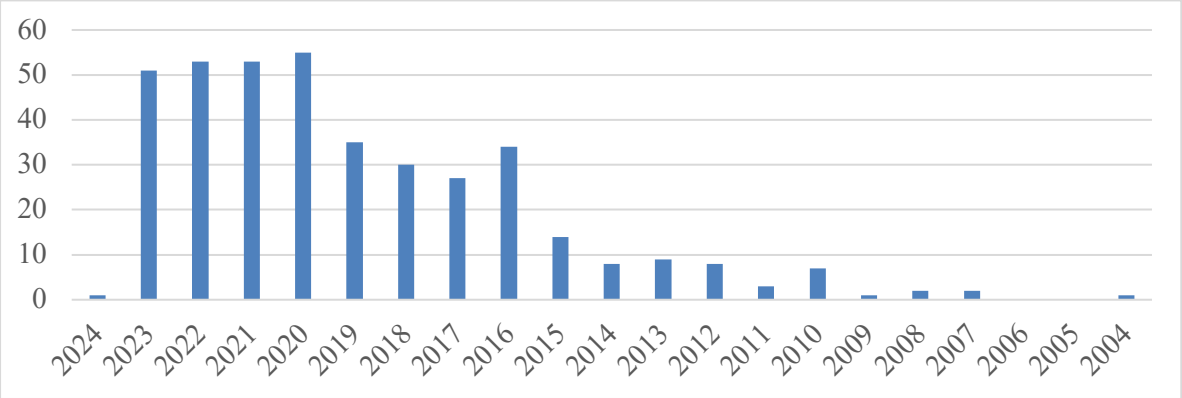
4.1. Web of Science Database Analysis Findings

The temporal progression of research papers focused on “Time Driven Activity Based Costing” (TDABC) is depicted in Table 1 and Figure 1, illustrating a growing scholarly interest in the subject.

Table 1: Number of publications through the years

Years	Number of Publications
2024	1
2023	51
2022	53
2021	53
2020	55
2019	35
2018	30
2017	27
2016	34
2015	14
2014	8
2013	9
2012	8
2011	3
2010	7
2009	1
2008	2
2007	2
2006	0
2005	0
2004	1

Figure 1: Number of publications through the years



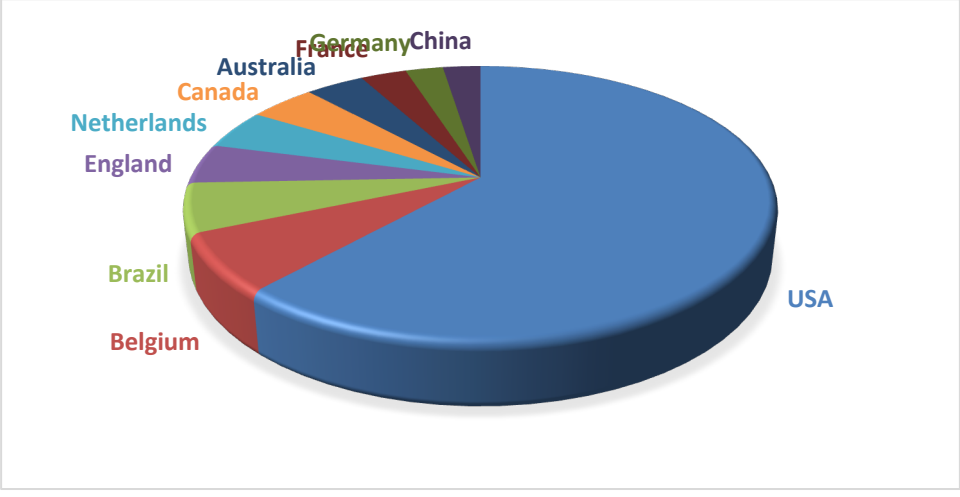
The peak in productivity occurred in 2020, with 55 publications, signifying a significant year for research in TDABC. In 2021 and 2022, 53 articles were published on the subject and 51 articles were published in 2023. The high number of articles on the subject in the last three years underlines its ongoing interest and continuing importance in the scientific community. On the other hand, in 2005 and 2006, no articles were published on the subject.

Among 56 countries with at least 1 publications and at least 1 citations, top 10 countries that met the search criteria were included in the analysis. The percentage distribution of the top 10 countries in terms of the number of publications on TDABC is shown in Table 2 and Figure 2.

Table 2: Top 10 countries by number of publications

Country	Number of Publications	Percentage
USA	224	61.71%
Belgium	25	6.89%
Brazil	21	5.79%
England	17	4.68%
Netherlands	17	4.68%
Canada	16	4.41%
Australia	14	3.86%
France	11	3.03%
Germany	9	2.48%
China	9	2.48%
TOTAL	**363**	**100%**

Figure 2: Analysis of the number of publications



According to the analysis, the top ten countries with the highest number of publications were the United States (224), Belgium (25), Brazil (21), England (17), Netherlands (17), Canada (16), Australia (14), France (11), Germany (9) and China (9) ranks tenth among 22 countries. Table 2 shows the ten countries that contribute 92 percent of all documents. The United States has published the most articles as of 2023.

Studies on TDABC are generally interdisciplinary. Web of Science categories were created according to the research areas of the relevant journals. The analysis of the articles published on TDABC according to the subject categories of the journals is given in Table 3.

Table 3: Web of Science Categories (Top 10)

Web of Science Categories	Number of Publications	Percentage
Orthopedics	55	14.51%
Surgery	53	13.98%
Radiology Nuclear Medicine Medical Imaging	49	12.93%
Health Care Sciences Services	46	12.14%
Oncology	46	12.14%
Health Policy Services	38	10.03%
Business Finance	28	7.39%
Medicine General Internal	23	6.07%
Management	21	5.54%
Public Environmental Occupational Health	20	5.28%

Table 3 shows that studies on TDABC are more concentrated in the field of health. TDABC is highly relevant in healthcare due to its ability to address complex processes and diverse activities. It optimizes resource allocation, aligns with value-based care, and adapts to evolving reimbursement models. TDABC contributes to patient-centric approaches, identifies inefficiencies for improvement, and enhances transparency and accountability in healthcare. Its concentration in the field is justified by its capacity to meet the industry's unique challenges and contribute to ongoing improvements in healthcare delivery.

When the inclusion criteria were set as publications with at least one citation and one publication, a comprehensive analysis covered a total of 194 journals. The top 10 journals in terms of the number of publications and citations received by the journals on the TDABC topic are shown in Table 4.

Table 4: Top 10 journals by number of publications and citations

Publication Titles	Number of Publications	Publication Titles	Citations
Journal of Arthroplasty	14	Harvard Business Review	509
Brachytherapy	13	Health Policy	329
BMJ Open	11	Journal of Arthroplasty	179
Journal of American College of Radiology	10	Journal of Healthcare Management	156
BMC Health Services Research	9	Journal of Bone and Joint Surgery American Volume	151
Journal of Shoulder and Elbow Surgery	7	Clinical Orthopaedics and Related Research	150
Journal of Bone and Joint Surgery American Volume	6	Brachytherapy	149
Plos One	6	EJSO	130
Journal of Corporate Accounting and Finance	5	Healthcare-The Journal of Delivery Science and Innovation	125
Journal of Healthcare Management	5	Cancer	109

In Table 4, the journals in which the articles published on TDABC are mentioned as publication titles are listed in terms of the number of publications and citations they received. In terms of the number of publications, "Journal of Arthroplasty" ranked first with 14 articles, followed by "Brachytherapy" with 13 articles and "BMJ Open" with 11 articles. However, in terms of citations received by the journals, “Harvard Business Review” ranks first with 509 citations. This is followed by "Health Policy" with 329 citations and "Journal of Arthroplasty" with 179 citations.

4.2. Visual Mapping Method Analysis Findings

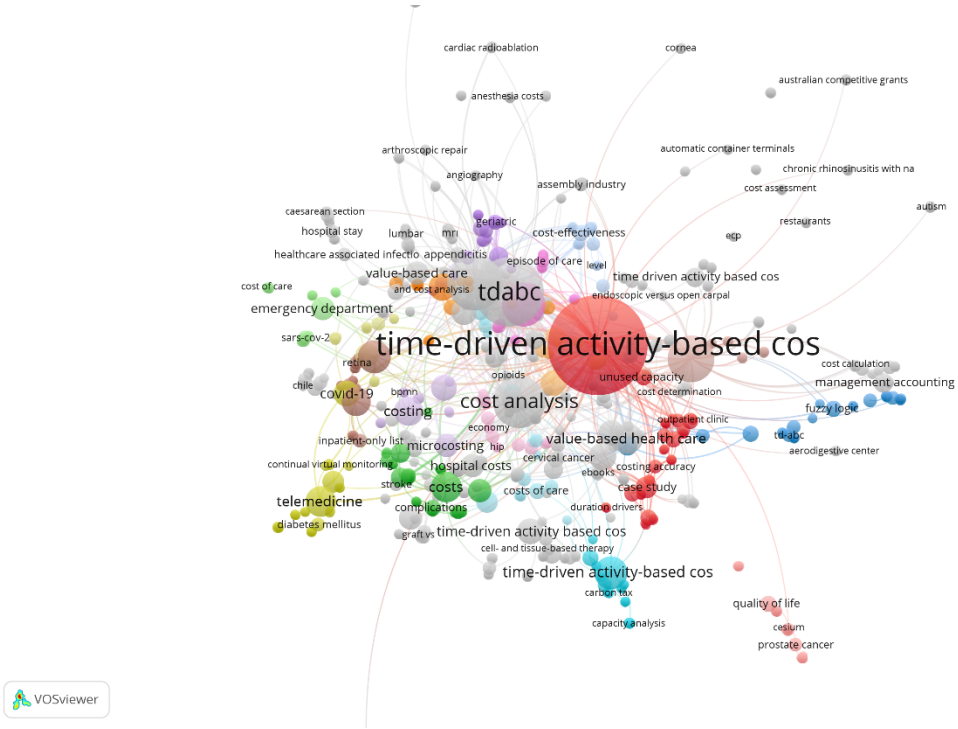
The study's gathered data underwent analysis utilizing VOSviewer (version 1.6.20), a bibliometric analysis software. VOSviewer, an acronym denoting 'Visualization of Similarities' technology, represents a widely employed analytical approach developed in 2010 by van Eck and Waltman. Through the application of VOSviewer for scientific literature analysis, salient features such as the most frequently cited publications, network structures within research groups, and collaborative patterns among authors in multi-author studies are visually represented.

In this section, it is aimed to reveal the countries, sources and authors that are influential in TDABC by using "Bibliometric Data Based Mapping Method" and "Citation", "Co-Occurrence" and "Co-Citation" techniques. In addition, the "Bibliometric Mapping Method" aims to reveal the most frequently used keywords in the abstracts of articles on TDABC.

4.2.1. Bibliometric analysis of the co-occurrence of keywords

The search criteria for keywords encompassed the inclusion of a minimum of one or more recurrent keywords. The outcome of the search yielded 883 keywords that adhered to this specified criterion.

Figure 3: Link of keywords

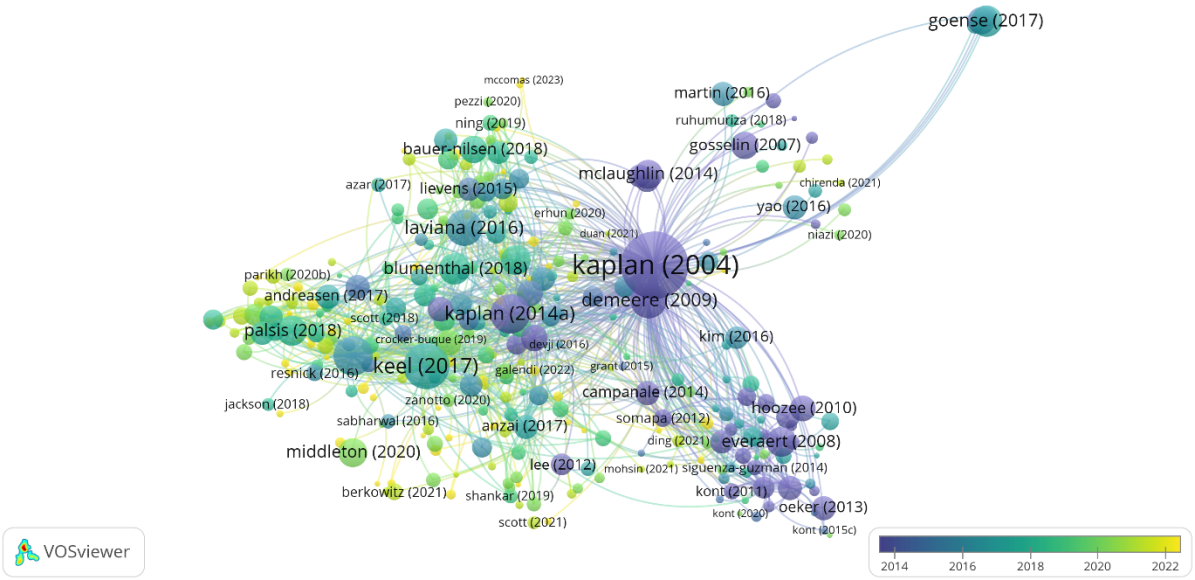


As per the findings derived from the bibliometric analysis, the preeminent five keywords by occurrences of usage were identified as follows: “time-driven activity-based costing” (105), “tdabc” (51), cost (33), cost analysis (29), and “activity-based costing” (23). The keyword "time-driven activity-based costing" has a strong connection with other clusters. The clusters close to the red color represent the keywords in recent studies (cost analysis, accounting, costing, brachythreapy, healthcare costs, hospital costs, cost effectiveness etc.).

4.2.2. Bibliometric analysis of citations

Through citation analysis, it was determined that there were 327 articles with at least 1 citation out of a total of 394 articles.

Figure 4: Citations of documents



The network maps reveal the most cited articles on "TDABC". This reveals the basic studies on TDABC. Looking at the network maps, the most cited articles are Kaplan (2004) with 509 citations; Keel (2017) with 188 citations; Akhavan (2016) with 132 citations; Kaplan (2014a) with 130 citations and Laviana (2016) with 109 citations.

Table 5: Top 10 most cited publications

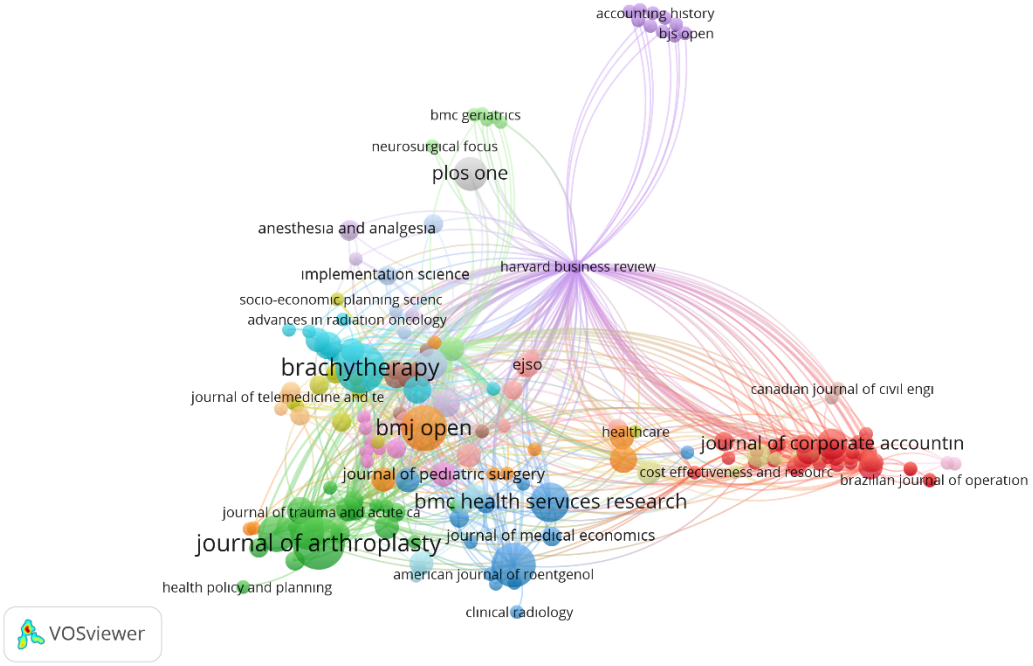
Authors	Publications Title	Source	Citations
Kaplan & Anderson (2004)	Time-driven activity-based costing	Harvard Business Review	509
Keel, Savage, Rafiq & Mazzocato (2017)	Time-driven activity-based costing in health care: A systematic review of the literature	Health Policy	188
Akhavan, Ward & Bozic (2016)	Time-driven Activity-based Costing More Accurately Reflects Costs in Arthroplasty Surgery	Clinical Orthopaedics and Related Research	132
Kaplan et al. (2014)	Using Time-Driven Activity-Based Costing to Identify Value Improvement Opportunities in Healthcare	Journal of Healthcare Management	130
Laviana et al. (2016)	Utilizing time-driven activity-based costing to understand the short- and long-term costs of treating localized, low-risk prostate cancer	Cancer	109
Demeere, Stouthuysen & Roodhoft (2009)	Time-driven activity-based costing in an outpatient clinic environment: Development, relevance and managerial impact	Health Policy	108
Nwachukwu, Hamid & Bozic (2013)	Measuring Value in Orthopaedic Surgery	JBJS Reviews	90
Goense et al. (2017)	Hospital costs of complications after esophagectomy for cancer	EJSO	77

Bluementhal et al. (2018)	The Cost of Penicillin Allergy Evaluation	Journal of Allergy and Clinical Immunology-In Practice	75
Tseng et al. (2018)	Administrative Costs Associated With Physician Billing and Insurance-Related Activities at an Academic Health Care System	JAMA-Journal of The American Medical Association	68

Table 5 presents details pertaining to the authors, publication titles, sources, and citation counts for the top ten publications that garnered the highest number of references. Notably, the findings indicate that the work by Kaplan & Anderson in 2007 attained the highest citation count among the analyzed publications.

In scrutinizing the citation analysis across journals, it becomes evident that among the pool of 234 journals, 194 journals received a minimum of one citation.

Figure 5: Number of journal citations



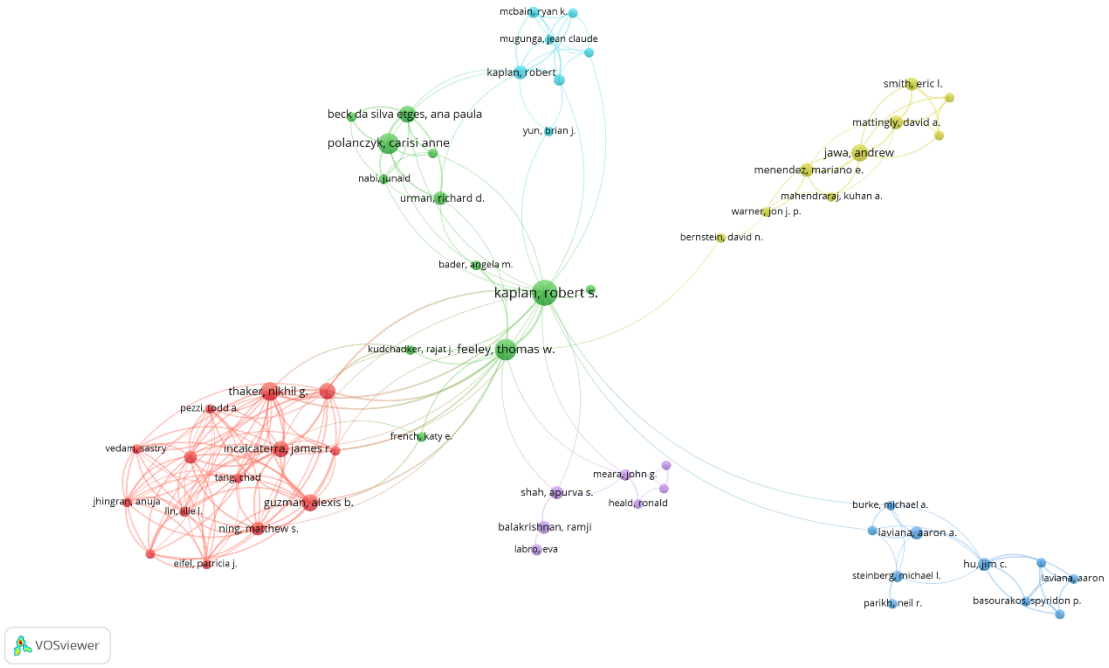
Looking at the network maps; it was determined that the most cited journal among the journals published in the field of "TDABC" was Harvard Business Review. This journal was followed by “Health Policy” in second place, “Journal of Arthroplasty” in third place, “Journal of Healthcare Management” in fourth place, and “Journal of Bone and Joint Surgery” in fifth place. The journal with the highest total link strength was again found to be “Harvard Business Review”.

4.2.3. Bibliometric analysis of co-authorship

Co-authorship analysis is a method used in academic research to examine and evaluate collaborative relationships among researchers by analyzing patterns of co-authorship in scholarly publications. In this analysis, researchers investigate the frequency and nature of collaborations between authors who contribute to the same publication. The primary focus is on understanding how authors collaborate, the extent of their collaborations, and the network structures that emerge from these collaborations. Co-authorship analysis often employs network analysis techniques to visualize and quantify collaborative networks. Nodes in the network represent authors, and edges (connections) represent co-authorship relationships.

When co-authors with at least 3 publications and 3 citations were included in the search criteria, 104 out of 1886 a total of co-authors were analysed.

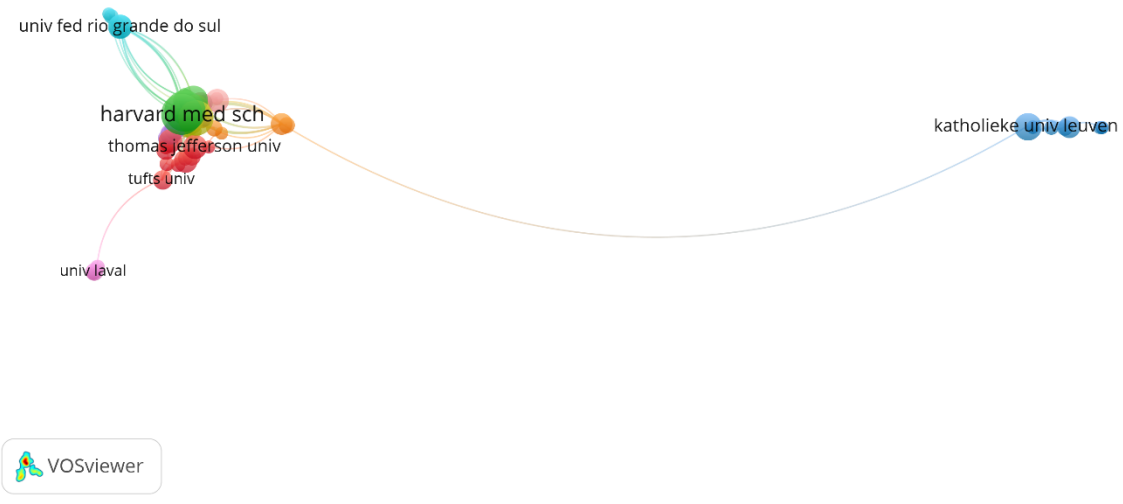
Figure 6: Co-authorship analysis of authors



According to the co-author analysis, Robert S. Kaplan ranked first with 20 articles and 386 citations. He was followed by Thomas W. Feely with 14 articles and 339 citations and Michael A. Burke with 3 articles and 195 citations. Filip Roodhoft ranked fourth with 6 articles and 191 citations and Apurva S. Shah ranked fifth with 5 articles and 180 citations.

When organizations with at least 3 publications and 3 citations were included in the search criteria, 89 out of 649 a total of organizations were analysed.

Figure 7: Co-authorship of organizations



According to the co-author analysis, organizations are ranked according to total link strength. Harvard Medical School ranked first with 31 publications and 372 citations. It was followed by Harvard School Business with 31 publications and 329 citations; Brigham & Womens Hospital with 15

publications and 250 citations; University Texas MD Anderson Cancer Center with 23 publications and 382 citations; Federal University of Rio Grande do Sul with 11 publications and 106 citations.

4.2.4. Bibliometric analysis of co-citation

Co-citation analysis is a bibliometric method used in academic research to examine the relationships between documents (such as articles, books, or journals) based on their common citation by other documents. It involves identifying and analyzing the frequency with which two or more works are cited together in the bibliographies of other publications. The underlying assumption is that if two works are frequently cited together by other authors, there is a relationship or intellectual connection between them.

A total of 9,387 cited references were found through co-citation analysis. Taking the minimum number of citations of a reference shown in these 9,387 citations as 20, it was seen that 28 of them met the threshold value. Network and density maps were created in line with the analysis.

Figure 8: Co-citation analysis of references (Network Visualization)

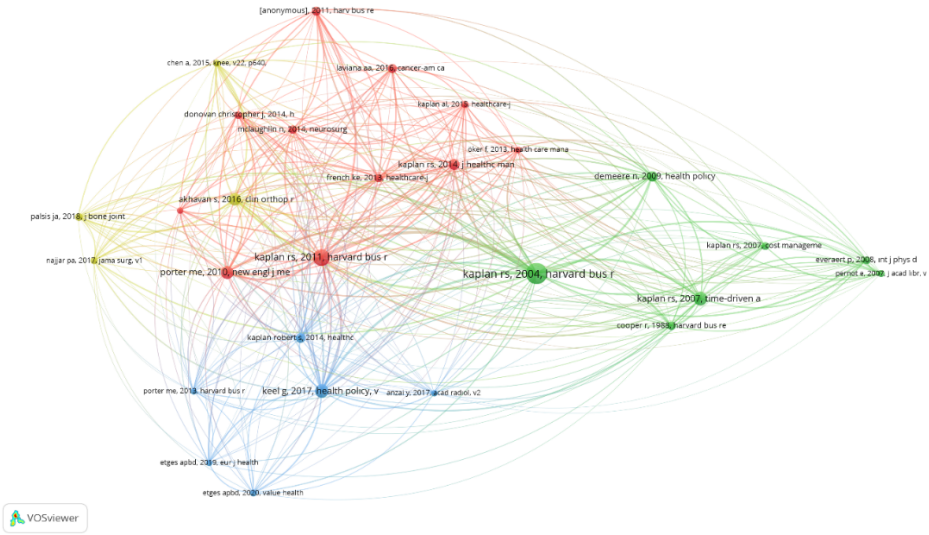
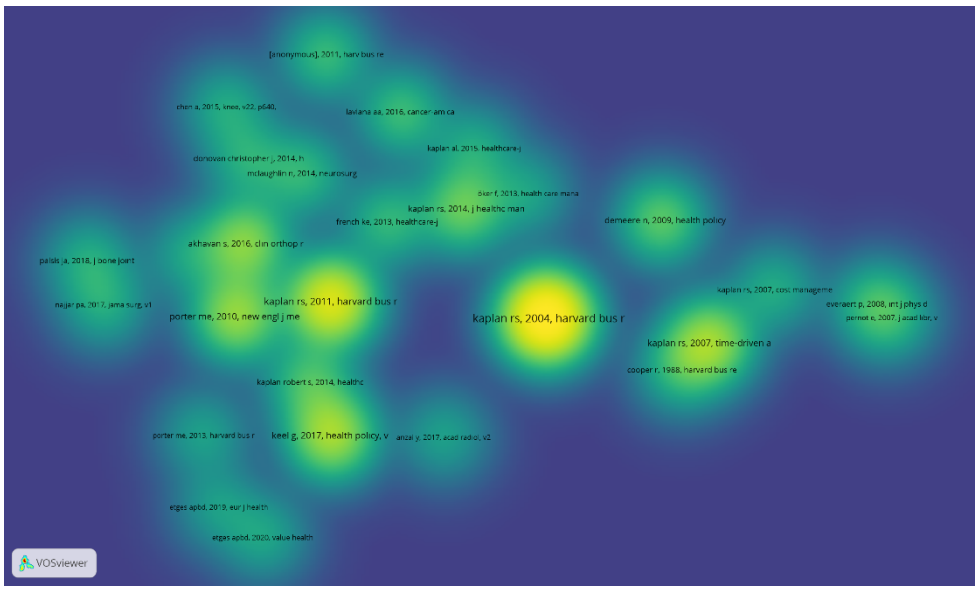


Figure 9: Co-citation analysis of references (Density Visualization)



Examining the co-citation network and density maps revealed the delineation of references into four distinct clusters, demonstrating direct or indirect interrelations among these groups. According to

the co-citation analysis maps, it was determined that the most cited article with a total of 216 citations was "Kaplan (2004) doi: 10.2139/ssrn.485443".

A cumulative of 4087 cited sources (journals) were identified through co-citation analysis. Initially, a threshold of 20 minimum citations for a source (journal) was established, resulting in the identification of 89 sources meeting this criterion from the pool of 4087. Subsequently, network and density maps were generated for the subset of 89 cited sources characterized by the highest aggregate link strength.

Figure 10: Co-citation analysis of sources (Network Visualization)

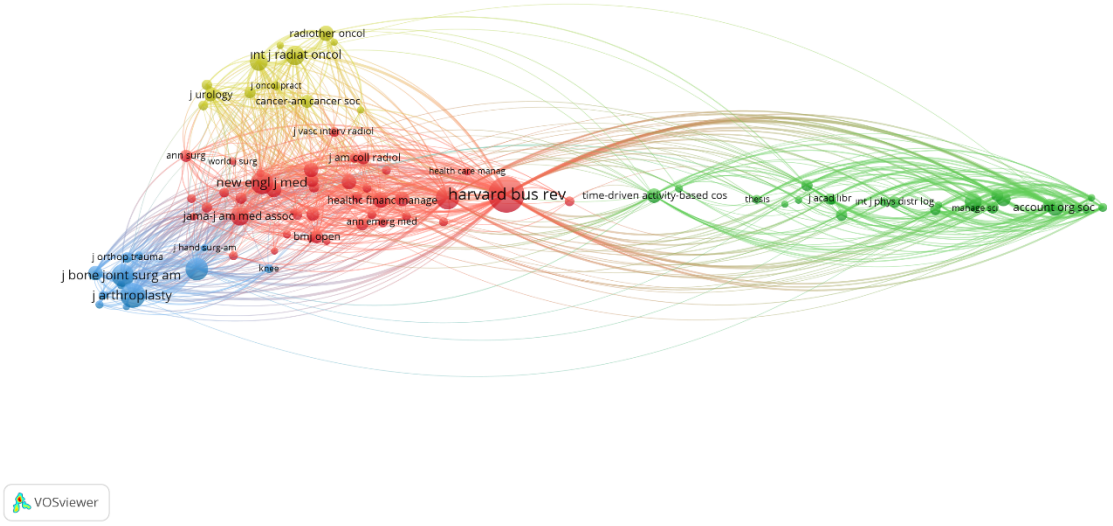
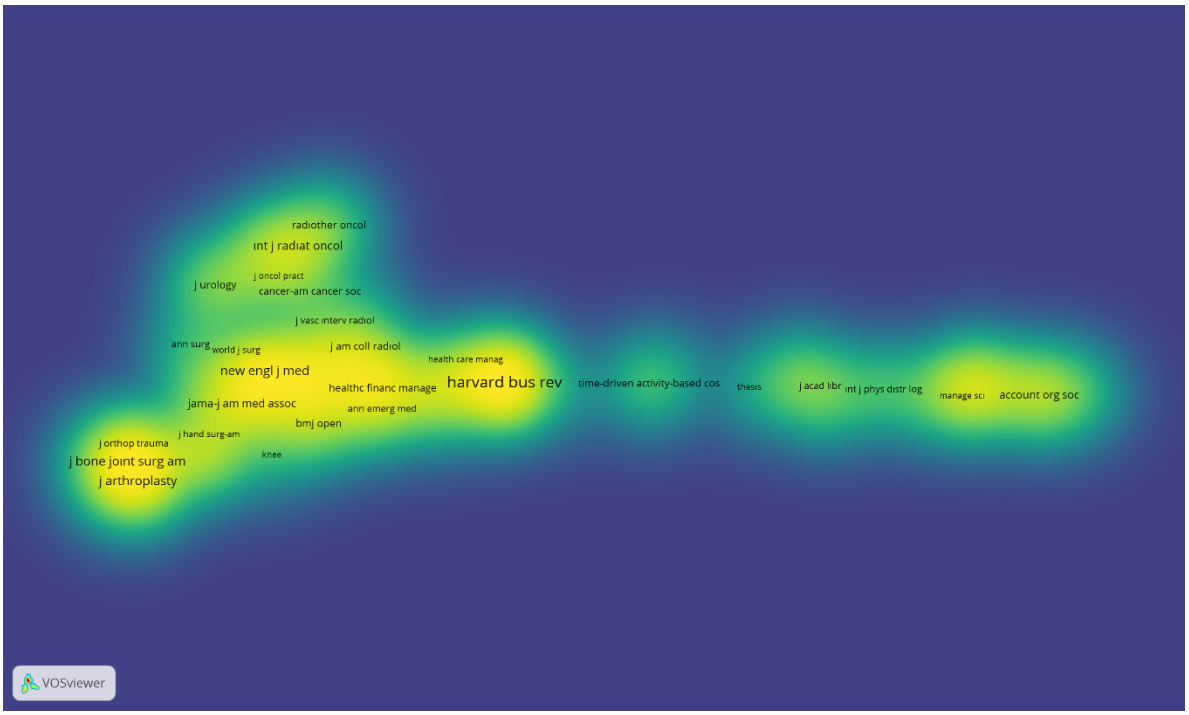


Figure 11: Co-citation analysis of sources (Density Visualization)



Upon examination of the network and density visualization maps, it is evident that the preeminent journal, with the highest citation count, is "Harvard Business Review" with 500 citations. Subsequently, "Journal of Arthroplasty" secures the second position with 233 citations, followed by "Health Policy" in the third position with 199 citations.

A total of 7327 cited authors were found through co-citation analysis. Due to the large number of authors, the minimum number of citations of an author was limited to 30 and it was determined that 21 of the 7327 cited authors met the threshold. Network and density maps were created for the first 21 authors with the highest total link strength.

Figure 12: Co-citation analysis of authors (Network Visualization)

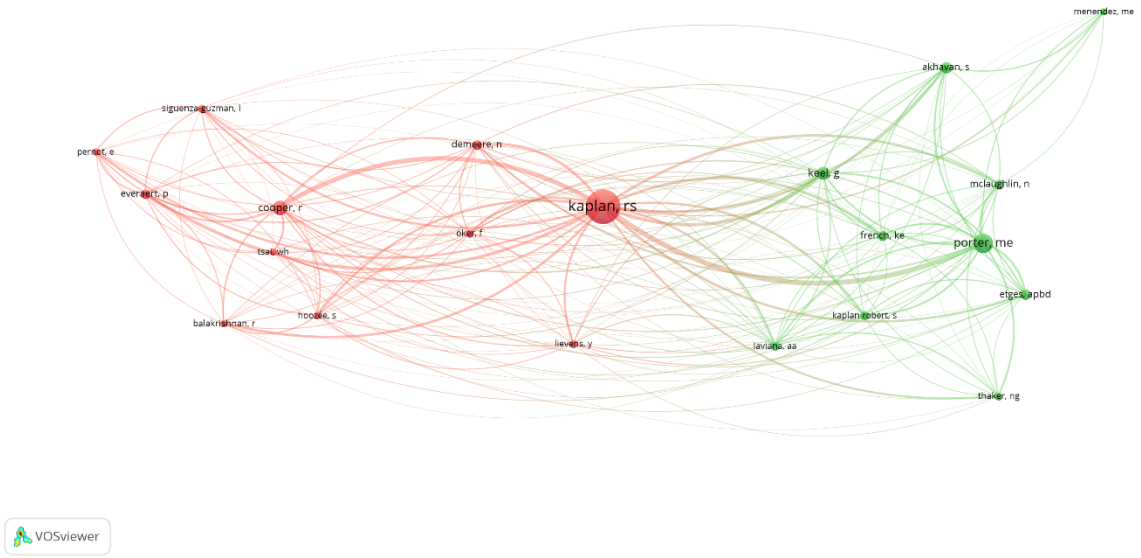
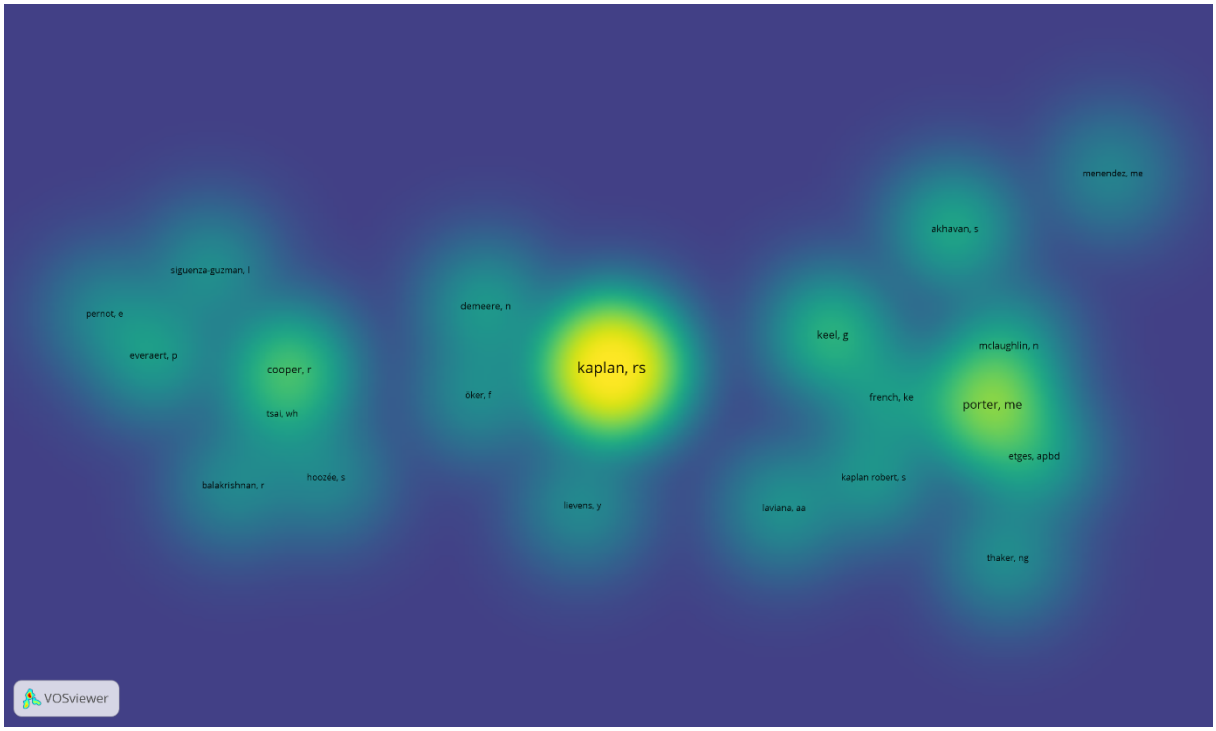


Figure 13: Co-citation analysis of authors (Density Visualization)



For each of the 21 cited authors, the total strength of the co-citation links of the other cited authors was calculated. The citation numbers of the top 10 authors with the highest total link strength are respectively; Kaplan, R.S. (655 citations), Porter, M.E. (208 citations), Cooper, R. (123 citations), Keel, G. (96 citations), Everaert, P. (57 citations), Demeere, N. (54 citations), Akhavan, S. (74 citations), French, K.E. (50 citations), Mclaughlin, N. (50 citations) and Etges, A.P.B.D. (63 citations).

5. CONCLUSION

Time-Driven Activity-Based Costing (TDABC) is a costing methodology that integrates Activity-Based Costing (ABC) principles with time-based factors to enhance precision in cost allocation. It involves assessing costs by multiplying the time spent on an activity by the unit cost of resources utilized during that time. TDABC provides accurate cost estimations, supports resource optimization, aids decision-making, and enhances transparency in cost structures. Its adaptability across industries, particularly in healthcare, makes it valuable for organizations seeking continuous improvement and strategic cost management.

TDABC is one of the contemporary cost methods and has been a major and current area of study for accounting and health academics for a long time, especially in recent years. In the present context, the study endeavors to conduct a bibliometric analysis of research pertaining to TDABC. To achieve this objective, the investigation encompasses the entirety of available literature within the Web of Science database, totaling 394 studies spanning the period from 2004 to 2023. The study sample was delimited to exclusively encompass published peer-reviewed journal articles and review articles. Temporal constraints were absent, and sole inclusion comprised items presented in the English language. The screening process, adhering to these criteria, resulted in the identification of 394 articles. The principal analytical instrument employed in our investigation is the publicly accessible Visualization of Similarities (VOS) viewer. This tool is applied to visually and analytically elucidate trends and patterns related to journals, authors, countries, keywords, and citations within the realm of sustainability accounting and reporting studies. The principal findings emanating from this study are as follows;

- The analysis identified 2020 as the pinnacle year for TDABC publications, recording 55 articles. Conversely, the absence of publications on the subject was noted in both 2005 and 2006. Given the ongoing nature of the current year, 2024, at the time of research and analysis, considerations were extended to encompass articles published within the initial month of this year as part of the analytical framework.
- As of 2023, the United States exhibits the highest volume of published articles, succeeded sequentially by Belgium, Brazil, England, and the Netherlands in descending order of scholarly output.
- The predominant subject matter of the articles pertaining to TDABC aligns predominantly with health sciences, establishing this thematic category as the primary focus of scholarly output within the analyzed publications.
- Within the scope of this study's analysis, Harvard Business Review Journal emerges as the most frequently cited journal, while the Journal of Arthroplasty attains prominence for producing the highest volume of articles among all the sources examined.
- As per the outcomes derived from the mapping analysis grounded in citation metrics, the preeminent article in TDABC is identified as the seminal work conducted by Kaplan and Anderson in 2004, emerging as the most frequently cited contribution in the field.
- The outcomes of the mapping analysis utilizing co-occurrence analysis revealed that the preeminent keyword exhibiting the highest co-occurrence and total link strength in the domain of TDABC is identified as 'time-driven activity-based costing'.

In this study, data on TDABC were obtained and analyzed by searching the Web of Science (WOS) database. The primary constraint of this study resides in its exclusive reliance on the WOS Core Collection for analysis, thereby excluding sources not disseminated online through databases like Tübitak ULAKBİM in Turkey, as well as Scopus and PubMed in the international scholarly domain. In this context, it is recommended for future research to undertake an assessment of diverse documents associated with the subject available in alternative databases. Additionally, prospective studies could benefit from longitudinal analysis to discern the evolutionary trajectory of the field, uncover trends, and

identify patterns. The application of advanced methodologies such as text mining, altmetrics, and natural language processing is also proposed for further in-depth analysis. The primary outcomes of this study are anticipated to offer a valuable synthesis of TDABC research through the lens of bibliometric indicators. Consequently, it will facilitate the identification of noteworthy contributions within this domain, utilizing fundamental metrics such as article count, citation frequency, and keyword prominence.

Ethics Statement: *In this study, no method requiring the permission of the "Ethics Committee" was used.*

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