ESports Research

Subjects: Others

Contributor: Weisheng Chiu

eSports has been defined as sports competitions conducted with an electronic system and technological immersion in an organized and structured environment.

eSports competitive gaming bibliometric analysis

1. Introduction

eSports has been defined as sports competitions conducted with an electronic system and technological immersion in an organized and structured environment [1][2][3]. In general, eSports is organized around specific game genres, such as multiplayer online battle arena (MOBA; e.g., League of Legends or Dota 2), player versus player (PvP; e.g., Street Fighter), real-time strategy (RTS; e.g., Warcraft or StarCraft), first-person shooter (FPS; e.g., Counter-Strike), or sports games (e.g., the NBA 2K series) [2][4][5]. Like other traditional sports, the main goal of eSports games is to defeat one's opponent to achieve victory [3]. eSports games require solid and stable cognitive responses during decision making and strategic planning [1][2][3]. Therefore, practice is vital for eSports players to advance their performance. Moreover, to fully occupy the functions of the mouse and keyboard, eSports games involve numerous fine motor skills that require the control of small muscle groups, especially the fingers [3]. However, scholars have argued against eSports as a form of sport due to its perceived lack of physicality for a long time [6]. More recently, scholars have gradually considered eSports to be a form of sport, as it is a highly structured activity that requires physical execution to determine a competitive outcome [5][7][8]. It should be noted that eSports and traditional sports are primarily different in two main aspects: equipment and environment [2][5]. The equipment of eSports is primarily a human-computer interface, and eSports happens within electronic systems instead of the real world [2].

The eSports industry has become one of the fastest-growing industries globally in the past decade due to the increased prevalence of various online games and improved live streaming technology [2][9][10]. According to an eSports market report [11], the value of the global eSports market surpassed USD 1 billion in 2021 and is projected to grow to over USD 1.6 billion by 2024. The rapid development of eSports has been fueled by its numerous participants, various tournaments, increasing audience, and high media coverage. For example, the largest eSports game, League of Legends, has over 100 million active players every month [12]. Meanwhile, recently there have been more than 9000 eSports tournaments worldwide [11]. Moreover, the global eSports audience is expected to increase from 593.2 million in 2019 to 920.3 million in 2024, representing a 9.2% compound annual growth rate (CAGR) [11]. In addition, the increasing media exposure of eSports generates revenue from advertising and sponsorships. A 2019 report projected that spending on sponsorships and advertising in the eSports market in

North America would increase from USD 124 million in 2017 to over USD 634 million in 2023, reflecting a CAGR of 31.3% [13]. This indicates that the eSports industry has been expanding and developing rapidly in recent years. Recently, eSports has been officially accepted as a form of sport in over 60 countries [9]. This has attracted many prestigious international sports clubs (e.g., F.C. Barcelona) to branch out into eSports by sponsoring and sending their teams to play in various virtual sports tournaments, such as the Pro Evolution Soccer 2018 gaming championship [9]. Furthermore, eSports will be introduced as an official sports event at the Asian Games 2022, which will serve to energize eSports development in Asia [9].

Given the rapid development and expansion of the eSports industry, scholars from various disciplines have started to pay increasing attention to eSports research [7][14][15]. For example, scholars in the fields of informatics have explored human-computer interactions as well as users' motivations to view and participate in eSports competitions [16][17]. Moreover, psychologists have investigated the impact of eSports on individuals' psychological and behavioral outcomes, such as mental health or addiction [18][19]. In addition, sports management scholars have discussed and debated the role of eSports in the discipline of sports management and provided research opportunities and directions [5][7][20]. These examples indicate that eSports is a multidisciplinary topic that attracts the interest of many scholars from different disciplines. Moreover, it should be noted that these scholars applied the knowledge in their research fields (e.g., informatics, psychology, or sports management) to explore eSports from various perspectives.

Due to the increasing interest in eSports from scholars, it is not surprising to see a surge of publications relevant to eSports in recent years [14]. Specifically, scholars have gradually recognized eSports as a new and emerging topic and invested increasing efforts into eSports research [14][21]. Although the number of publications in eSports continues to grow rapidly, little is known about the comprehensive and quantitative reviews that exclusively focus on eSports research. To ensure the sustainable development of eSports research, it is necessary to understand its status quo, evolution, and theoretical advancement. Many scholars have used bibliometric analysis to evaluate the growing number of publications and provide a comprehensive profile and research network of a given field [22][23][24][25][26][27][28][29][30][31][32][33]. This technique is often used to examine performance metrics related to authors, journals, institutions, and countries as well as to map the structure of a research field and unpack the relationships between its subfields [34][35][36]. Ultimately, the findings of bibliometric analysis can advance theoretical development and provide directions for the sustainable development of research in a specific field [34][37].

2. Bibliometric Analysis

Bibliometric analysis was conducted to achieve the research purposes. The term "bibliometrics" was originally defined by Pritchard [38] as the "*application of mathematics and statistical methods to books and other media of communication*" (p. 349). More recently, bibliometric analysis has been used as a statistical approach for investigating the academic literature in a focal field by quantitatively assessing publications' bibliographic information, such as the author name, title, source title, and affiliation, and this technique has been widely used to understand the structure, evolution, and trend of a given scientific domain [35][36][39][40]. Due to the objective and quantitative nature of the bibliographic information of publications acquired in digital databases, this technique

allows researchers to generate a highly reliable and quality review through its systematic, transparent, and reproducible analytic process [40][41][42].

According to Noyons et al. [43], there are two primary procedures in bibliometric analysis: performance analysis and science mapping. First, performance analysis is used to assess performance by calculating the number of publications by authors, institutions, universities, and countries [44]. Moreover, performance analysis involves examining the contributions of the authors, publications, countries, and affiliations involved (e.g., [30][39][45]). More specifically, this technique, which is descriptive in nature, is regarded as the standard practice of bibliometric studies for presenting the performance of various features in different fields [40]. In this study, the average citations per publication were also calculated as an indicator to reflect the relative importance of publications, authors, journals, institutions, and countries [45]. In addition, the Citescore values provided by Scopus were used to indicate the quality of the journals [46].

Second, science mapping is a graphical representation of research fields and subfields [34][37][39][47]. This technique can map the evolution and structure of a research field as well as visualize its thematic networks and relationships between its subfields. In particular, this technique focuses on the intellectual interactions and structural linkages between research constituents (e.g., authors, institutions, countries, and journals) [40]. In this study, three types of co-citation analysis were conducted. First, a co-citation analysis on cited references was performed to understand the structure of the cited references in the focal field. Second, a co-citation analysis on cited authors was performed to identify influential authors by estimating the citation records. Third, a co-citation analysis on cited journals was conducted to understand the relationships between scientific journals in a specific area [34][37]. These co-citation analyses assume that publications frequently cited together are similar thematically [48], and the results of a series of co-citation analyses can reflect how researchers attach to specific references, authors, and journals, indicating the development and trend of a given scientific area [34][37]. In addition, co-occurrence analysis was conducted to analyze the words that frequently co-occur in the publications to understand the thematic relationships [34][37]. This technique is useful for supplementing co-citation analysis and forecasting future research in the field [40].

In recent years, bibliometric analysis has been widely employed to investigate the development of a given scientific area, such as tourism and sustainability [22][23][24], green innovation [25][26], risk management [27][28], entrepreneurship [29][30], and COVID-19 research [31][32][33]. Although Zhang [49] conducted a bibliometric analysis in 2012, it should be noted that the study was conducted in the early stages of eSports research [7][14], and the scope was limited to a Chinese digital database (China National Knowledge Infrastructure (CNKI)). Therefore, to address the gap and limitations in the extant literature and gain a comprehensive understanding of eSports research, the present study adopted bibliometric analysis to investigate the up-to-date knowledge of eSports research and the sustainable development of future eSports research.

3. Data Source and Collection

Data were collected in June 2021 from Scopus, which is developed by Elsevier. Scopus is one of the largest abstract and citation databases, covering more than 24,600 active titles (peer-reviewed journals, book, trade publications, and articles in process) and over 5000 publishers. It has been regarded as one of the most widely recognized and reliable databases [50][51][52][53]. Compared with the Web of Science databases, Scopus is known for covering more categories and articles [52][53][54]. Various studies have used the Scopus database as the main source for conducting bibliometric analysis [55][56][57][58]. Moreover, it should be noted that using a single database is recommended, as this can minimize the likelihood of potential human errors [40]. Therefore, the Scopus database was deemed to be adequate for bibliometric analysis.

As a next step, the literature search was conducted using the keyword “eSport” to search within the “Article Title, Abstract, Keywords.” The initial search generated 647 publications. Following the guidelines of previous studies [45][59], the initially generated studies were limited to articles or reviews and those published in English, leading to a total of 305 studies being extracted. After screening the studies, those for which the source was “Apunts Medicina De L’Esport” (Apunts Sports Medicine in English) were excluded from the list as they were not relevant to eSports. As a result, the literature search finally identified 260 studies published between 2010 and 2021, which were included for bibliometric analysis using VOSviewer.

References

1. Cranmer, E.E.; Han, D.-I.D.; Van Gisbergen, M.; Jung, T. Esports matrix: Structuring the esports research agenda. Comput. Hum. Behav. 2021, 117, 106671.
2. Hamari, J.; Sjöblom, M. What is eSports and why do people watch it? Internet Res. 2017, 27, 211–232.
3. Chikish, Y.; Carreras, M.; García, J. eSports: A new era for the sports industry and a new impulse for the research in sports (and) economics. In Sports (and) Economics; García, J., Ed.; FUNCAS: Madrid, Spain, 2019; pp. 477–508.
4. Llorens, M.R. eSport gaming: The rise of a new sports practice. Sport Ethics Philos. 2017, 11, 464–476.
5. Hallmann, K.; Giel, T. eSports–Competitive sports or recreational activity? Sport Manag. Rev. 2018, 21, 14–20.
6. Thiel, A.; John, J.M. Is eSport a ‘real’ sport? Reflections on the spread of virtual competitions. Eur. J. Sport Soc. 2018, 15, 311–315.
7. Funk, D.C.; Pizzo, A.D.; Baker, B.J. eSport management: Embracing eSport education and research opportunities. Sport Manag. Rev. 2018, 21, 7–13.

8. Jonasson, K. Broadband and circuits: The place of public gaming in the history of sport. Sport Ethics Philos. 2016, 10, 28–41.
9. PwC. E-Sport's Moving into the Big Leagues—A Business Study of the E-Sport Market in Hungary and the V4 Countries; PwC: London, UK, 2018.
10. Nielsen. New Research Details Audience Behavior across Biggest Esports Titles and Tournaments. Available online: https://nielsensports.com/new-research-details-audience-behavior-across-biggest-esports-titles-tournaments/ (accessed on 17 August 2021).
11. Newzoo. Global Esports & Live Streaming Market Report. Available online: https://newzoo.com/products/reports/global-esports-live-streaming-market-report/ (accessed on 18 June 2021).
12. Toth, A.J.; Conroy, E.; Campbell, M.J. Beyond action video games: Differences in gameplay and ability preferences among gaming genres. Entertain. Comput. 2021, 38, 100408.
13. North American Equity Research. Esports in N. America: Entering the Major Leagues. Available online: https://strivesponsorship.com/wp-content/uploads/2019/11/State-of-Esports-July-2019-Canaccord-Genuity-Capital-Markets.pdf (accessed on 18 June 2021).
14. Reitman, J.G.; Anderson-Coto, M.J.; Wu, M.; Lee, J.S.; Steinkuehler, C. Esports research: A literature review. Games Cult. 2020, 15, 32–50.
15. Jenny, S.E.; Manning, R.D.; Keiper, M.C.; Olrich, T.W. Virtual(ly) Athletes: Where eSports Fit within the Definition of "Sport". Quest 2017, 69, 1–18.
16. Seo, Y. Electronic sports: A new marketing landscape of the experience economy. J. Mark. Manag. 2013, 29, 1542–1560.
17. Skubida, D. Can some computer games be a sport?: Issues with legitimization of eSport as a sporting activity. Int. J. Gaming Comput.-Mediat. Simul. 2016, 8, 38–52.
18. Macey, J.; Hamari, J. eSports, skins and loot boxes: Participants, practices and problematic behaviour associated with emergent forms of gambling. New Media Soc. 2019, 21, 20–41.
19. Bányai, F.; Griffiths, M.D.; Demetrovics, Z.; Király, O. The mediating effect of motivations between psychiatric distress and gaming disorder among esport gamers and recreational gamers. Compr. Psychiatry 2019, 94, 152117.
20. Cunningham, G.B.; Fairley, S.; Ferkins, L.; Kerwin, S.; Lock, D.; Shaw, S.; Wicker, P. eSport: Construct specifications and implications for sport management. Sport Manag. Rev. 2018, 21, 1–6.
21. Bányai, F.; Griffiths, M.D.; Király, O.; Demetrovics, Z. The psychology of Esports: A systematic literature review. J. Gambl. Stud. 2019, 35, 351–365.

22. Niñerola, A.; Sánchez-Rebull, M.-V.; Hernández-Lara, A.-B. Tourism research on sustainability: A bibliometric analysis. Sustainability 2019, 11, 1377.
23. Garrigos-Simon, F.J.; Narangajavana-Kaosiri, Y.; Lengua-Lengua, I. Tourism and sustainability: A bibliometric and visualization analysis. Sustainability 2018, 10, 1976.
24. Jiménez-García, M.; Ruiz-Chico, J.; Peña-Sánchez, A.R.; López-Sánchez, J.A. A Bibliometric Analysis of Sports Tourism and Sustainability (2002–2019). Sustainability 2020, 12, 2840.
25. Albort-Morant, G.; Henseler, J.; Leal-Millán, A.; Cepeda-Carrión, G. Mapping the field: A bibliometric analysis of green innovation. Sustainability 2017, 9, 1011.
26. Yin, J.; Gong, L.; Wang, S. Large-scale assessment of global green innovation research trends from 1981 to 2016: A bibliometric study. J. Clean. Prod. 2018, 197, 827–841.
27. Nobanee, H.; Al Hamadi, F.Y.; Abdulaziz, F.A.; Abukarsh, L.S.; Alqahtani, A.F.; AlSubaey, S.K.; Alqahtani, S.M.; Almansoori, H.A. A Bibliometric Analysis of Sustainability and Risk Management. Sustainability 2021, 13, 3277.
28. Braun, A.B.; da Silva Trentin, A.W.; Visentin, C.; Thome, A. Sustainable remediation through the risk management perspective and stakeholder involvement: A systematic and bibliometric view of the literature. Environ. Pollut. 2019, 255, 113221.
29. Huertas González-Serrano, M.; Jones, P.; Llanos-Contrera, O. An overview of sport entrepreneurship field: A bibliometric analysis of the articles published in the Web of Science. Sport Soc. 2020, 23, 296–314.
30. Baier-Fuentes, H.; Merigó, J.M.; Amorós, J.E.; Gaviria-Marín, M. International entrepreneurship: A bibliometric overview. Int. Entrep. Manag. J. 2019, 15, 385–429.
31. Aristovnik, A.; Ravšelj, D.; Umek, L. A bibliometric analysis of COVID-19 across science and social science research landscape. Sustainability 2020, 12, 9132.
32. Verma, S.; Gustafsson, A. Investigating the emerging COVID-19 research trends in the field of business and management: A bibliometric analysis approach. J. Bus. Res. 2020, 118, 253–261.
33. Yu, Y.; Li, Y.; Zhang, Z.; Gu, Z.; Zhong, H.; Zha, Q.; Yang, L.; Zhu, C.; Chen, E. A bibliometric analysis using VOSviewer of publications on COVID-19. Ann. Transl. Med. 2020, 8, 816.
34. Cobo, M.J.; López-Herrera, A.G.; Herrera-Viedma, E.; Herrera, F. Science mapping software tools: Review, analysis, and cooperative study among tools. J. Am. Soc. Inf. Sci. Technol. 2011, 62, 1382–1402.
35. Ellegaard, O.; Wallin, J.A. The bibliometric analysis of scholarly production: How great is the impact? Scientometrics 2015, 105, 1809–1831.

36. Liao, H.; Tang, M.; Luo, L.; Li, C.; Chiclana, F.; Zeng, X.-J. A bibliometric analysis and visualization of medical big data research. Sustainability 2018, 10, 166.
37. Chen, C.; Dubin, R.; Schultz, T. Science mapping. In Encyclopedia of Information Science and Technology, 3rd ed.; IGI Global: Hershey, PA, USA, 2015; pp. 4171–4184.
38. Pritchard, A. Statistical bibliography or bibliometrics. JD 1969, 25, 348–349.
39. Cobo, M.J.; López-Herrera, A.G.; Herrera-Viedma, E.; Herrera, F. An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the Fuzzy Sets Theory field. J. Informetr. 2011, 5, 146–166.
40. Donthu, N.; Kumar, S.; Mukherjee, D.; Pandey, N.; Lim, W.M. How to conduct a bibliometric analysis: An overview and guidelines. J. Bus. Res. 2021, 133, 285–296.
41. De Bellis, N. Bibliometrics and Citation Analysis: From the Science Citation Index to Cybermetrics; Scarecrow Press: Lanham, MD, USA, 2009.
42. Cronin, B. Bibliometrics and beyond: Some thoughts on web-based citation analysis. J. Inf. Sci. 2001, 27, 1–7.
43. Noyons, E.C.; Moed, H.F.; Luwel, M. Combining mapping and citation analysis for evaluative bibliometric purposes: A bibliometric study. J. Am. Soc. Inf. Sci. 1999, 50, 115–131.
44. Thelwall, M. Bibliometrics to webometrics. J. Inf. Sci. 2008, 34, 605–621.
45. Ding, X.; Yang, Z. Knowledge mapping of platform research: A visual analysis using VOSviewer and CiteSpace. Electron. Commer. Res. 2020.
46. da Silva, J.A.T.; Memon, A.R. CiteScore: A cite for sore eyes, or a valuable, transparent metric? Scientometrics 2017, 111, 553–556.
47. Herrera-Franco, G.; Montalván-Burbano, N.; Carrión-Mero, P.; Bravo-Montero, L. Worldwide research on socio-hydrology: A bibliometric analysis. Water 2021, 13, 1283.
48. Hjørland, B. Facet analysis: The logical approach to knowledge organization. Inf. Process. Manag. 2013, 49, 545–557.
49. Zhang, G. Bibliometric Analysis on E-Sports in China; Springer: Berlin/Heidelberg, Germany, 2012; pp. 111–118.
50. Falagas, M.E.; Pitsouni, E.I.; Malietzis, G.A.; Pappas, G. Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. FASEB J. 2008, 22, 338–342.
51. Harzing, A.-W.; Alakangas, S. Google Scholar, Scopus and the Web of Science: A longitudinal and cross-disciplinary comparison. Scientometrics 2016, 106, 787–804.
52. Mongeon, P.; Paul-Hus, A. The journal coverage of Web of Science and Scopus: A comparative analysis. Scientometrics 2016, 106, 213–228.

53. Martín-Martín, A.; Orduna-Malea, E.; Thelwall, M.; López-Cózar, E.D. Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. J. Informetr. 2018, 12, 1160–1177.
54. AlRyalat, S.A.S.; Malkawi, L.W.; Momani, S.M. Comparing bibliometric analysis using PubMed, Scopus, and Web of Science databases. J. Vis. Exp. 2019, 152, e58494.
55. Herrera-Franco, G.; Montalván-Burbano, N.; Carrión-Mero, P.; Apolo-Masache, B.; Jaya-Montalvo, M. Research trends in geotourism: A bibliometric analysis using the scopus database. Geosciences 2020, 10, 379.
56. Khudzari, J.M.; Kurian, J.; Tartakovsky, B.; Raghavan, G.V. Bibliometric analysis of global research trends on microbial fuel cells using Scopus database. Biochem. Eng. J. 2018, 136, 51–60.
57. Kipper, L.M.; Furstenau, L.B.; Hoppe, D.; Frozza, R.; Iepsen, S. Scopus scientific mapping production in industry 4.0 (2011–2018): A bibliometric analysis. Int. J. Prod. Res. 2020, 58, 1605–1627.
58. Sweileh, W.M. Research trends on human trafficking: A bibliometric analysis using Scopus database. Glob. Health 2018, 14, 1–12.
59. Linnenluecke, M.K.; Marrone, M.; Singh, A.K. Conducting systematic literature reviews and bibliometric analyses. Aust. J. Manag. 2019, 45, 175–194.