

Scientometric Analysis of Research on eSports from 2007 to 2017

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Abstract

A scientometric analysis about eSports publications from 2007 to 2017 was carried out. HistCite was used to analyze the data collected from Web of Science during the period mentioned. The results suggest that eSports research has increased during the 11 years of study; the country with the highest number of publications was the United States of America, with eight institutions predominant in the number of publications. Most of the articles and the highest local score of total citations come from countries where eSports are considered sport; the top three journals with the most publications were International Journal of Gaming and Computer-Mediated Simulations, Games and Culture and Psychology of Sport and Exercise, where the top three journals with the highest TLCS are Games and Culture, New Media & Society and Computers in Human Behavior.

Keywords: eSports, scientometrics, visualization analysis

1. Introduction

During the last ten years, video games have been used for many purposes such as art, literature, psychology, among others, placing video games in new perspectives [1]. Electronic sports have gained greater recognition over the last 10 years, to the

point of being recognized as a sport, as well as studies are being conducted to be included in future Olympic Games [2], [3].

Online video games have gained millions of users worldwide, showing how to make online friendships, connect virtually and accumulate online social capital; studies have been conducted to assess the behavior of users belonging to video game groups and how it affects relationships between group members offline through an online survey (N=811) in the Electronic Sports League [6]. Studies have been conducted on how games induce cooperation, using the virtual reality game Ingress as a basis; taking data from 206 users, the results show that the characteristics of cooperative games increase the norms of groups, social identity, collective commitments, among others, applying the uses of gamification [4]. In addition to studying players belonging to eSports groups, the reasons for belonging to an eSports group, such as achieving life goals, meetings with other players, among others, are analyzed [5]. Electronic sports should be analyzed from the standpoint of sports management because they are a manifestation of sportsmanship, for which they fulfill the two fundamental objectives of sportsmanship, such as the organization, regulation of a non-sporting activity in a healthy environment in order to compete and cooperate and make sports attractive to others; leaving the basis for future analysis of its effect on the sports industry [7]. The growing electronic sports and several of their aspects such as structure, organization and institutionalization, management research, education and practice were analyzed with respect to other sports, with the result that eSports is being recognized as a sport [8]. Electronic sports were analyzed in the area of consumer and marketing, taking into account the current consumer culture and the professionalized consumer field [9]. Several authors analyzed the conditions and specifications for sports management, mentioning that the role of eSports in sports management could be further advanced in the future [10]. A study was carried out among the media and electronic sports, taking the World Cyber Games (WCG) as a case study, with the result that this type of study cannot have a relationship with previous video game studies, but rather as the consolidation of sport as a means of communication, combining media content, sport, information technology and network communications [11]. Studies have been conducted on how gambling practices based on gambling such as social network casinos, free gaming mechanisms, aspects of video games, among others, affect electronic sports, resulting in a direct relationship between video game addiction and gambling problems [12]. Studies were carried out on the analysis of the game genre and gameplay of MOBA and FPS games, on the behavior of players at each stage of the game, performing dynamic analyses [13], [14]. A master's thesis for master's degree analyzed the past and future of eSports, where an analysis of their origin and a look at their future prospective growth was carried out using information technology management tools. Figure 1 shows the most popular game genres in eSports events between 1980 and 2015, where FPS (First Person Shooter), RTS (Real Time Strategy) and MOBA (Multiplayer Online Battle Arena) dominate with 250, 204 and 138 respectively [15].

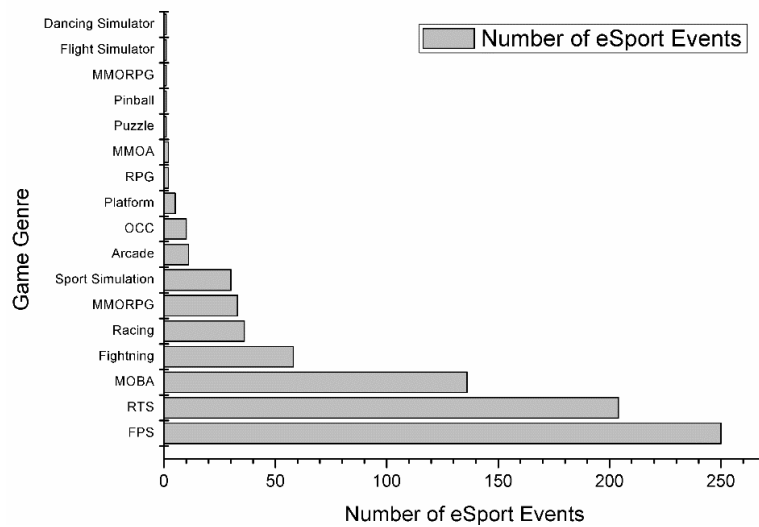


Figure 1. Most popular Game genres used in eSport events.

In this research, an analysis of research and citations will be conducted using HistCite software to show research trends and the status of publications in this area.

2. Methodology

First, eSport-related items are collected using Web of Science (WoS). The research was carried out using the words "e-sports", "esports", and "electronic sports". The research collected 71 documents of all kinds, including reviews, book reviews, editorial material and meeting summaries.

The information was exported as a text file from the Web of Science (WoS), then imported into HistCite and analyzed. Output data such as citations for each year, country, institution and journals were abbreviated; in addition, high-impact articles and authors and research trends were analyzed. With the UCINET 6 software, using the NetDraw tool, a network was created to visualize the analysis of citations.

3. Results and Discussion

3.1 Document type, language and annual research output

Five document types have been identified in the 71 documents collected, most of which are articles, which represent 91.5% of the documents, indicating that it is the main model for scientific communication about eSports. The articles were written in two languages, of which 97.2% of the results are in English. The reason for this may be that articles indexed by WoS are, for the most part, published in English. In addition, English is accepted as the international language for all articles indexed in WoS, procedure documents, reviews, among others.

Figure 2 shows the production of research in each year from 2007 to 2017, according to data collection on December 3, 2017. During the eleven-year period,

the overall trend has been a steady increase in annual production, although in 2014 and 2017 it decreased compared to previous years. This shows that the issue of eSports has received the attention of some academics and has developed at a considerably good pace over the last eleven years.

Research-based distribution analysis helps to understand a country's capacity to produce and to explore the difference in production between various countries. A total of 30 countries, 15.54% of all countries, have contributed to eSports research, indicating that this topic has not yet reached the attention of the world. Of the Figure 2, the 5 countries that contribute the most are the United States of America, Canada, United Kingdom, Australia and Germany, their articles account for 62.38% of the total articles.

Citations may reflect the impact of published articles. In this study, the total global citation score (TGCS) was selected as the indicator to measure total academic influence among these countries. As Table 1 shows, the United States of America, which has the highest number of published articles, also has the highest number of global citations. Of the 353 citations, the United States of America has 40.4% of the total global citations. The second was Canada, which has only one article, has 121 global citations. Following these are Germany, Italy and the United Kingdom, with 103, 100 and 50 global citations respectively. The average number of citations of articles was used as an indicator to analyze the influence of an article. For best academic impact, countries with more than 4 articles, a total of seven countries, were chosen to calculate the average number of citations per article. The selected countries were ranked according to the average citations of articles in descending order. Table 1 shows that the first three countries are Italy, the United States of America and Canada. Your average citations per item are 33.3, 25.21 and 17.28 respectively. Compared to the remaining countries, the articles from the first three countries demonstrated a good academic impact, influencing research studies on this topic.

Table 1. Ranking of results, total global citation score (TGCS) and TGCS/records for five top countries.

Country	TGCS	Country	TGCS/records
USA	353	Italy	33.3
Canada	121	USA	25.21
Germany	103	Canada	17.28
Italy	100	Germany	17.18
UK	50	Australia	7.66

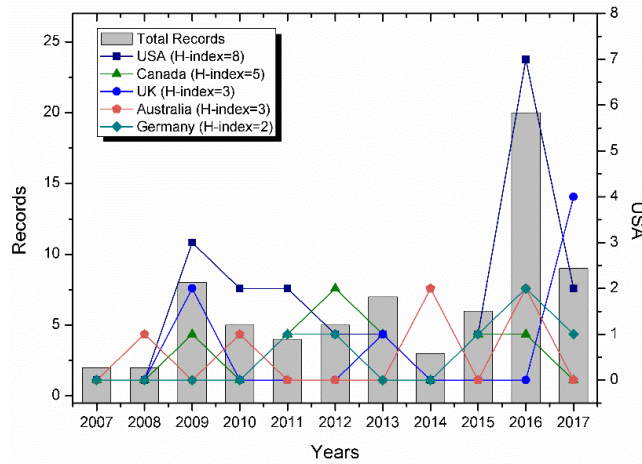


Figure 2. Annual eSports research product from 2007 to 2017

3.2 Distribution of central journals and quotations

71 articles have been published in 60 leading eSports journals. All journals were organized in descending order with their respective issues of published articles. The International Journal Of Gaming And Computer-Mediated Simulations has a total of 4 publications, with a percentage of 5.6% of the total number of articles published by magazines. In reference to the overall total citations score, Emotion scores 158, with a percentage of 18.1% of the overall total citations score.

The journals that publish more articles do not necessarily guarantee a great TLCS. For example, BMC Public Health magazine has three published articles, but no local total citations score (TLCS), like Games and Culture magazine, which has 3 published articles and an TLCS of 11, which is the second with the most published articles and has the highest TLCS. Together with these two journals, Computers in Human Behavior was the third highest scoring TLCS with 4. These journals, with high TLCS scores, have a major influence on the development of eSports research, as shown in Table 2.

The highest average citations per item is in the Industrial & Engineering Chemistry Research articles, which contain approximately 9 citations per item, followed by Applied Energy and Energy & Fuels, which have citations per item are 8.52 and 8.44 respectively.

Table 2. Classification of the first five journal with average citations by papers.

Journal	Records	TLCS	TGCS
International Journal of Gaming and Computer-Mediated Simulations	4	1	3
Games and Culture	3	11	24
Psychology of Sport And Exercise	3	1	36
BMC Public Health	2	0	40
Computers in Human Behavior	2	4	78

The highest average citation score per article is in New Media and Society magazine, which produces 10 citations per article, followed by Games and Culture and Computers in Human Behavior, which average citations per article are 3.6 and 2 respectively.

Table 3. Classification of the first five journals with average citations per paper.

Journal	Records	TLCS	TLCS/records
New Media & Society	1	10	10
Games and Culture	3	11	3.6
Computers in Human Behavior	2	4	2
Convergence-The International Journal of Research Into New Media Technologies	1	2	2
Journal of Gaming and Virtual Worlds	1	1	1

3.3 High-impact papers

High impact articles are selected using TLCS. From Table 4, they were written by five authors. The high impact articles were published in 4 different magazines, two of which were published in Games and Culture [16],[17]. Considering that Games and Culture has published 3 articles and that New Media & Society only one, it is concluded that, for a high-level magazine, an important factor is the impact of an article. It can be noted that most of the high-impact articles were published between 2012 and 2016, indicating that the research focused on this topic is constantly being updated and is a topic of interest today.

Table 4. Classification of the top five high impact articles

Author	Title	Journal	Year	TLCS
Hutchins B.	Signs of meta-change in second modernity: the growth of e-sport and the World Cyber Games	New Media & Society	2008	10
Witkowski E.	On the Digital Playing Field: How We "Do Sport" With Networked Computer Games	Games and Culture	2012	9
Martoncik M.	e-Sports: Playing just for fun or playing to satisfy life goals?	Computers in Human Behavior	2015	3

Table 4. (Continued): Classification of the top five high impact articles

Taylor N.	Play to the camera: Video ethnography, spectatorship, and e-sports	Convergence-The International Journal Of Research Into New Media Technologies	2016	2
Szablewicz M.	A Realm of Mere Representation? "Live" E-Sports Spectacles and the Crafting of China's Digital Gaming Image	Games and Culture	2016	2

3.4 Citation Visualization Analysis

NetDraw was used to generate a visualization of the citation timeline for eSports research articles. In Figure 3, it shows the articles with the highest list of citations. It can be observed that the articles written by Hutchins B. and Witkowski E have a high correlation factor, due to their well-developed studies on eSports [11],[16]. Articles written between 2008 and 2012 have a higher correlation with more recent articles (2012-2017) due to their academic impact.

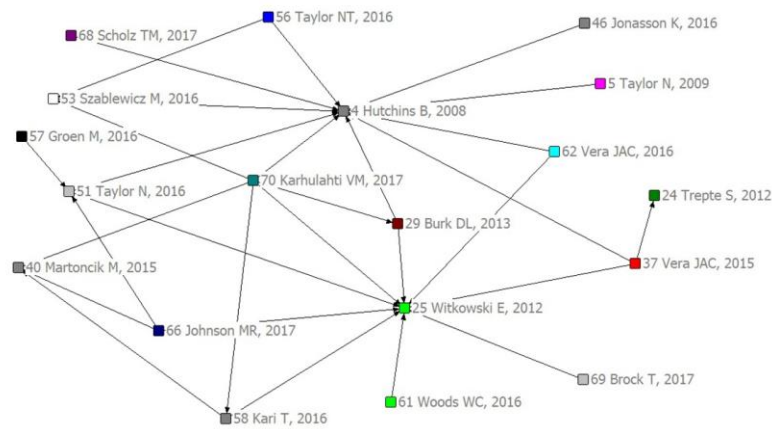


Figure 3. Chronological citation chart for research output of eSports.

4. Conclusions

Overall, the eSports research trend has increased from 2007 to 2017, which in 2016 increased. These results imply that the topic of eSports is gaining a lot of interest in the sports, economic and academic fields, so it is expected that its research will continue to increase.

The research focused on countries where eSports are considered as a sport and/or are close to them, where in countries such as the United States of America and Canada, scholarships can be acquired for participating in competitive video game tournaments. Many articles were published in journals with specific disciplines such as

computers, video games, human behavior, therefore, articles accepted by these journals have more citations.

The research had three branches of interest between 2007 and 2017. The first, focused on how electronic sports impact human behavior. The second is how the economy is influencing eSports events and how the current economy is influencing and adapting to the rise of electronic sports. The last branch focused on analyzing game genres and player behavior in game sessions. Research on eSports showed that the topic is still new to academics, so there is not yet a consensus among researchers, but this leaves a basis for future research on the topic.

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