

Scholarly Communications on Internet of Things

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Abstract

The present generation immensely understands the significance and value of the Internet of Things (IoT) for the development of the society. A sizeable amount of researches are found to be conducted by scientists and academicians around the world related to IoT. Analysis of the scholarly communications of the researchers in the field could provide us many clues on various dimensions in this field of new emerging area of study. In the present study, webometric techniques have been used to investigate scholarly publications in IoT indexed in the Emerald Insight database which are published during the span of 7 years i.e. 2013 to 2019. Data analysis reveals us perspectives on the growth of IoT research, core journals, discipline domain, and top productive countries. As the findings of the study indicates IoT research productivity has grown rapidly with time significantly during the last 4 years i.e. 2016-2019. The articles are mainly based on Social Science discipline, business and management being highest. China amongst other countries tops in research in IoT as the findings show.

Keywords: Emerald, Internet of Things(IoT), Research Productivity

1. Introduction

The concept of Internet of Things (IoT) has become a boom in this modern technological era of wireless telecommunication. It is a computing concept that describes the idea of connecting everyday physical objects to the internet. IoT connects people and the physical activities with the virtual world which is a boon in today's busy life of people. It represents the next step towards moving to a virtual society and economy, where things and people and the surrounding environment are interconnected through communication networks. According to the International Telecommunication Union(IUT)(n.d), IoT can be perceived as a vision with technological and societal implications. It is a global infrastructure for the information society, enabling advanced

services by interconnecting things based on existing and evolving interoperable information and communication technologies. Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of "things" to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled. The IoT is expected to greatly integrate leading technologies, such as technologies related to advanced machine-to-machine communication, autonomic networking, data mining and decision-making, security and privacy protection and cloud computing, with technologies for advanced sensing. In recent past, many government and non-government organizations are found to profoundly invest on projects related to IoT infrastructures and facilities to amplify their business, services and knowledge management. Many scientists around the world also



validate their interests in IoT research. This is all because of the various applications of IoT in every field and discipline. IoT can be used in the field of communications, medical and health care, transportations, building and home automation, energy management, environment monitoring, agriculture, etc. All these factors boost a country's economy at a higher level and elevates the living standard of people.

The Emerald Insight is a database for searching academic journals maintained by Emerald Publishing Limited. The company founded in United Kingdom in the year 1967 with its headquarters at Bingley provides and manages portfolios of nearly 300 journals, 2500 and above books and over 1,500 teaching cases. Research articles based on the IoT has been randomly selected for the study to analyze how and in what field the scholars around the world are undergoing their research work relating to the field. The scholarly communication involves the creation, publication, dissemination and discovery of academic research, primarily in peer-reviewed journals and books(Fruin,n.d.). It is "the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use (Principles and Strategies for the reform of Scholarly Communication, n.d.). This primarily involves the publication of peer-reviewed academic journals, books and conference papers.

2. Past Studies

In recent past many scholars have given thrust on IoT and its application in various fields of study. Studying about the emergence of IoT, Arafatur and Taufiq(2019) have reviewed the latest contributions

of IoT application frameworks and the advancement of their supporting technology. Perwej, Kerim, Aboughaly, Harb(2019) carried out an extended review on IoT and provided an overview of the technical details and its applications in the newly emerging area. Analyzing the past, present and future of IoT from user centered and smart environment perspective, Chin, Callaghan, Allauch(2019) described the evolution of IoT, to the present day where the devices of IoT are available as off-the-shelf products from major manufacturers. In a study Gomes et. al.(2019) evaluated different approaches to reduce the inherent cost of semantic search. The same reports the results of performance experiments on QoDisco to handle resource discovery requests in IoT.Pistone(2019) in her study described about the technology driven challenges in which the information professionals and academic librarians faced in order to stay relevant in the digital age.Qin(2018) studied library services based on IoT in which he emphasized upon the possible scope and usage forms of IoT technology in library services. Falguni, Rishabh, Prathamesh(2018) also discussed the various myths that might hamper the progress of IoT, security of data being the most critical factor of all. A survey conducted on IoT architectures by Ray(2018) has summarized the current state-of-the-art of the same in various domains systematically.Maximillian, Markl and Mohamed(2018) discussed the state-of -the-art, trends and development, challenges and opportunities in cyber security management for IoT.A new approach for user's interaction with the IoT has been presented studying about the ethical designs of IoT by Gianmarco, Maarten, Ricardo, Mariachiara(2018).

3. Objectives

The main objectives of the study are:

- ❖ To find out the subject domain of the research articles on IoT;
- ❖ To identify journals contributing the top research article;
- ❖ To analyze the highly productive year of the research article;
- ❖ To know the author's collaboration pattern; &
- ❖ To identify the most productive countries of the research articles.

4. Scope & Methodology

The current study has covered 100 research articles on IoT indexed in the Emerald Insight database from 2013 to 2019(September). The following methods and procedures have been used in the study.

- ❖ Relevant data have been collected using the prominent search engine "Google Chrome";
- ❖ The bibliographic details of the scholarly articles have been retrieved from the database "Emerald Insight";
- ❖ Full texts of the articles have also been accessed on online mode to study the metrics of the articles;
- ❖ Basic statistical techniques have been used for presenting and analyzing the data;
- ❖ The articles have been selected randomly from the said database.

5. Data Analysis

5.1 Top Journal

The following top 10 journals play a dominant role in contributing scholarly research articles on IoT during the period under study.

Table 1: Top 10 Journals

Sl. No.	Name of the Journal	No. of Articles	Rank
1	Industrial Management and Data System	11	1
2	Business Process Management Journal	10	2
3	Library Hi Tech	9	3
4	International Journal of Pervasive Computing and Communications	7	4
	Internet Research	7	4
	Journal of Business and Industrial Marketing	7	4
5	Digital Policy, Regulation and Governance	3	5
	Foresight	3	5
	Info	3	5
	Sensor Review	3	5

The above table shows the top10 journals indexed by the Emerald Insight that contribute scholarly articles in the field of IoT. However they are found to be within the top 5 rank only, three journals contributing similar number of 7 research articles and four journals contributing three articles each in the field. It is found that the journal, Industrial Management and Data System ranked highest contributing 11 research articles followed by Business Process Management Journal contributing 10 research articles and Library Hi Tech contributing 9 research articles. International Journal of Pervasive Computing and Communications, Internet Research and Journal of Business and Industrial Marketing contributed 7 research articles each. By contributing research 3 articles each, Digital Policy, Regulation and Governance; Foresight; Info and Sensor Review rank the 5th place.

The other journals contributing research articles on IoT which rank after 5th position include: Library Review; Journal of Documentation; Innovation and Management Review; Strategy and Leadership; Information and Computer Security; The Electronic Library; Journal of Manufacturing Technology Management; Journal of Knowledge Management; Kybernetes; Asia Pacific Journal of Marketing and Logistics; Asia Pacific Journal of Innovation and Entrepreneurship; VINE Journal of Information and Knowledge Management Systems; Journal of Business Strategy; IMP Journal; Industrial and Commercial Training; International Journal of Human Rights in Healthcare; Journal of Service Management; Supply Chain Management; International Journal of Logistics Management; International Journal of Intelligence Computing and Cybernetics; Journal of Enabling Technologies; Emerald Emerging Markets Case Studies;

International Journal of Web Information System; Strategic Direction; Information Technology and People; Online Information Review; Circuit World; PSU Research Review; International Journal of Information Technology and Library Science; Journal of Advancements in Library Science; New Library World; European Journal of Innovation Management; and International Journal of Intelligent Unmanned Systems.

5.2. Years of Publication

Table-2 below indicates the publication years of the articles covered in the present analysis.

Table 2: Year-wise Distribution of the Articles

Sl. No.	Year	No. of Articles	Percentage
1	2013	1	1%
2	2014	3	3%
3	2015	4	4%
4	2016	25	25%
5	2017	25	25%
6	2018	24	24%
7	2019	18	18%
Total		100	100%

As the table shows, the year 2016 and 2017 are found to be the highest productive years of the articles related to IoT, which is followed by 2018 with 24% and 2019 with 18%. The year 2014 and 2015 have produced only 3 and 4 articles respectively, the lowest production of article being the year 2013 with only 1%. It is also observed that the production of article relating to IoT increases drastically from the past years. Considering the trend as in the year 2019, it is expected that by the end of the year the number

and percentage of articles would be increased. This shows the focus and thrust given by the researchers in the field.

5.3. Collaborative Aspects

The collaboration amongst the authors of the articles is understood from the table-3 below.

Table 3: Authors Collaboration

Sl. No.	No. of Authors	No. of Articles	Percentage
1	1 Author	20	20%
2	2 Authors	26	26%
3	3 Authors	25	25%
4	4 Authors	15	15%
5	5 Authors	6	6%
6	6 Authors	7	7%
7	9 Authors	1	1%
Total		100	100%

It is observed that the articles written by 2 authors occupy the highest rank by contributing 26% of the articles, followed by collaboration of 3 authors with 25%. Contribution made by single author is found to be 20% while 15% of the articles are contributed by 4 authors. Collaborating 5 and 6 authors the rate of contribution are found to be 6% and 7% of the total articles respectively. However, highest number of collaboration i.e., 9 authors, contribute only 1% of the total articles.

5.4. Articles by Subject

The subject wise distribution of the articles on IoT is shown under the table- 4 below.

Table 4: Distribution of the Articles by Subject

Sl. No.	Discipline	No. of Articles	Percentage
1	Social Sciences	55	55%
2	Sciences	45	45%
Total		100	100

While examining the different discipline of the research articles, only two branches of knowledge are found to be emerged i.e., 55% of the total articles are in the field of Social Science while the rest 45% of the articles being in Science.

5.5. Articles by Countries

The articles contributed by the authors of different countries are shown under table - 5 below:

Table 5: Productivity of Articles by Countries

Sl. No.	Name of the Country	Articles with Collaboration	Articles Without Collaboration	Total No. of Articles
1	Australia	3	2	5
2	Algeria	0	1	1
3	Belgium	0	1	1
4	Brazil	1	1	2
5	Canada	2	0	2
6	China	11	11	22
7	Estonia	0	1	1
8	Finland	3	2	5
9	France	1	2	3
10	Germany	1	3	4
11	India	3	16	19
12	Iran	4	1	5
13	Ireland	2	0	2
14	Israel	0	1	1

15	Italy	5	3	8
16	Japan	1	1	2
17	Kenya	0	1	1
18	Korea	1	2	3
19	Malaysia	0	1	1
20	Netherlands	0	1	1
21	New Zealand	1	0	1
22	Poland	0	1	1
23	Qatar	0	1	1
24	Sweden	0	4	4
25	Taiwan	1	2	3
26	Turkey	0	1	1
27	U.A.E.	1	0	1
28	U.K.	4	6	10
29	U.S.A.	13	8	21

The above table depicts the research output on IoT by different countries during 2013 to 2019 taking into account both single authored and collaborative articles. The table indicates the research output among the countries in terms of productivity and collaboration with other countries. China is found to be the highest in number of production with 22 research articles, followed by U.S.A. with 21 research articles and India with 19 research articles. It is also seen that 25 countries produce single authored research articles and the country ranked the highest by producing 16 research articles. On the other hand 12 countries produced only one research article each during the period.

6. Findings and Discussion

IoT is found to be an emerging area of multidisciplinary research as its productivity has grown rapidly increased with time. The productivity of research on IoT has significantly increased during 2016-2019, the thrust area of which are mainly in

Social Science discipline. Majority of the research articles communicated through journals are in the field of business and management. It is also observed that research in the field are of collaborative in nature between two authors followed by three authors with a slight difference. Of the many research articles produced amongst the countries China tops the list followed by U.S.A and India.

7. Conclusion

With the increasing interest in smart services, expert systems and artificial intelligence, stakeholders and decision makers of academic institutions, government and non-government organizations of the new world of hi-tech era are encouraging the researchers around the world providing all kinds of support for conducting research on IoT. As this trend of research work is continuing speedily the intellectual productivity and developments in the field is expected to take place a new shape in the days to come.

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