INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 12, Issue 3, (2022) E-ISSN: 2222-6990

A Scientometric Analysis of Twenty Years Trends in Bring Your Own Device (BYOD) Research

Wan Abdul Rahim Wan Mohd Isa[1], Indah Mohd Amin[2], Fendy Suhariadi[3]

[1]Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Malaysia,
[2]Faculty of Dentistry, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor, Malaysia,
[3]Postgraduate School, Universitas Airlangga, Indonesia.
Corresponding Author Email: indahma@uitm.edu.my

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v12-i3/12332 DOI:10.6007/IJARBSS/v12-i3/12332

Published Date: 13 March 2022

Abstract

The main objective of this study is to determine a scientometric analysis of twenty years of trends in Bring Your Own Device (BYOD) research. Papers published on 'Bring Your Own Device' or 'BYOD' topics were extracted and analyzed using the Web of Science database. VOSViewer software was used to identify and visualize key trends, influential authors, and journals. The 281 filtered documents were selected based on three main criteria which are (i) Topics on 'Bring Your Own Device' or 'BYOD', (ii) Type of documents on 'Article', and (iii) Year Published within 2000 to 2020. We conducted several types of analyses on the body of research using VOSViewer which are (i) Co-authorship analysis, (ii) Co-occurrence analysis, (iii) Citation analysis, and (iv) Co-citation analysis. The main contribution and motivation for this study is in the form of a conceptual framework of types of BYOD based on user orientation was proposed to guide possible future research in Information Technology or interdisciplinary research in Behavioral Science and support the UN Sustainable Development Goals agenda. The four major keyword clusters concerning user-oriented cluster main themes are (i) consumer-oriented, (ii) organization-oriented, (iii) students-oriented, and (iv) mobile users-oriented.

Keywords: Bring Your Own Device, BYOD, Information Technology, Behavioral Science, Sustainable Development Goals

Introduction

There is an ongoing trend in corporate and organization related to Bring Your Own Device (BYOD) to work (Hayes & Kotwica, 2013; Keyes, 2014). In general, BYOD is the practice of employees bringing their own mobile devices to work (such as cellphones, tablets, and laptops) and utilizing those devices to access company services including email, file servers, and databases (Hayes & Kotwica, 2013). However, the concepts had transcended to other scenarios such as in Higher Education Institutions (Marshall, 2018), schools (Crompton & Traxler, 2015), and supporting the UN Sustainable Development Goals agenda (Makarov et

al., 2022). Because academic literature on 'Bring Your Own Device,' or 'BYOD,' is dispersed across domains, a full literature mapping is required. Specifically, we seek answers to the following questions:

- Over the last two decades (2000-2020), how has the amount of study on 'Bring Your Own Device,' or 'BYOD,' changed?
- What are the key terms associated with 'Bring Your Own Device' or 'BYOD' in the literature (2000-2020)?
- Who are the most prolific researchers and what links do they have to each other in the 'Bring Your Own Device' or 'BYOD' literature (2000-2020)?
- Which journals and universities are the most prominent and influential in their publication of 'Bring Your Own Device' or 'BYOD' literature (2000-2020)?
- What is the conceptual framework of types of BYOD based on user orientation that may be used to guide future research in Information Technology or interdisciplinary research in Behavioral Science?

Method

The main objective of this study is to determine a scientometric analysis of twenty years of trends in Bring Your Own Device (BYOD) research. Using the method of extraction of information from the Web of Science database and VOSViewer software (Van Eck, & Waltman, 2010) techniques, analysis, and reporting (Park, Montecchi, Feng, Plangger, & Pitt, 2020), papers published on 'Bring Your Own Device' or 'BYOD' topics were extracted and analyzed to identify and visualize main trends, authors (influential), and related journals. The 281 filtered documents were selected based on three main criteria which are (i) Topics on 'Bring Your Own Device' or 'BYOD', (ii) Type of documents on 'Article', and (iii) Year Published within 2000 to 2020. VOSViewer analyses were done which include (i) 'Co-authorship analysis', (ii) 'Co-occurrence analysis', (iii) 'Citation analysis', and (iv) 'Co-citation analysis'. The results are presented in the next section.

Results and Discussion

Figure 1 shows the number of documents features' search terms – 'Bring Your Own Device' or 'BYOD' (2000-2020). The following discusses the results and discussion for (i) 'Co-authorship analysis', (ii) 'Co-occurrence analysis', (iii) 'Citation analysis', and (iv) 'Co-citation analysis'. A conceptual framework was also being developed.

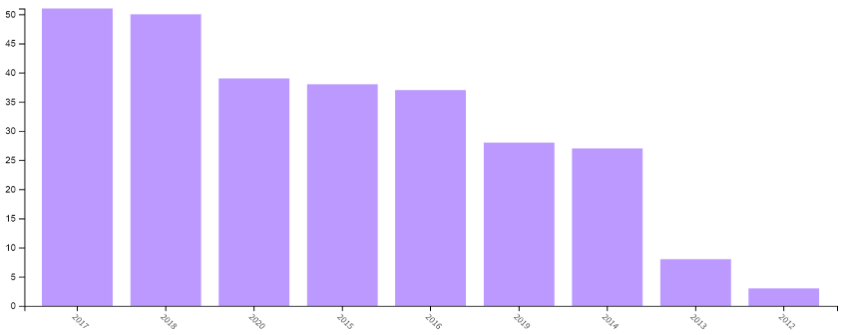

Figure 1. Number of documents feature search terms – 'Bring Your Own Device' or 'BYOD' (2000-2020)

Co-Authorship Analysis

In general, 'co-authorship analysis can be described as the greater the number of co-authored papers, the higher the relatedness of authors, institutions, and countries' (Van Eck, & Waltman, 2010; Park et al., 2020). In total, 798 authors were involved in writing the 281 articles that comprised the Web of Science results related to 'Bring Your Own Device', and 'BYOD' from the year 2000 to 2020. By using VOSviewer, the minimum number of documents published by an author was set to one and the minimum number of citations of an author to 30. 88 authors who met this threshold. Subsequently, the result of co-authorship analysis is shown in Figure 2 which includes nine prominent authors. The most prominent author's network of which is a network between Angela Murphy (University of Southern Queensland), Brad Carter (University of Southern Queensland), Helen Farley (University of Southern Queensland), Andy Koronios (University of South Australia), Stinjn Dekeyser (University of Southern Queensland), Chris Johnson (The Australian National University), Abdul Hafeez-Baig (University of Southern Queensland), Warren Mindgley (University of Southern Queensland) and Michael Lane (University of Southern Queensland).

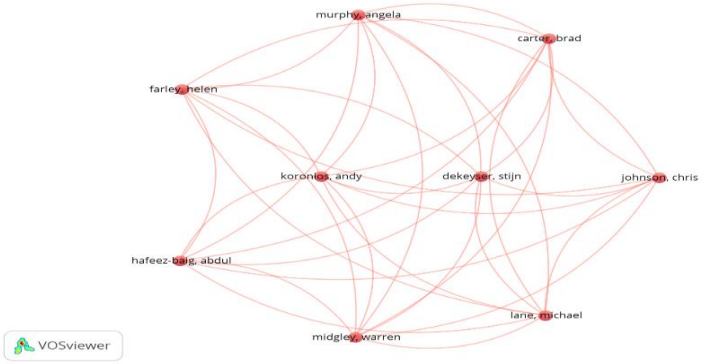

Figure 2. Co-authorship diagram (Generated by VOSviewer)

The top six countries in terms of the number of papers published are listed in Table 2. Scholars from the United States of America (USA), England, and Australia have the most papers, whereas scholars from the United States of America (USA), England, and China have the most citations (by country).

Table 2
The top six countries in terms of the number of papers published

Country	Documents	Citations	Citations Per Paper
USA	71	892	12.56
England	29	454	15.66
China	23	390	16.96
Taiwan	11	261	23.73
Australia	24	248	10.33
Norway	5	233	46.6

By using VOSviewer, the threshold for analysis was set for one document published per country with 50 citations. As a result, sixteen of the 56 countries in our data met this criterion. The United States of America (USA) is the largest node because it has the most papers

published. These clusters, when analyzed further, comprise five networks of countries that work together, as shown in Figure 3. The first most prominent network consists of scholars from the USA, Germany, and France. The second network in red consists of countries such as Australia, Austria, Portugal, and South Korea. The third green network consists of Italy, Netherlands, and China. The fourth blue network consists of England, New Zealand, and South Africa, and the fifth yellow network consists of Norway, Taiwan, and Spain.

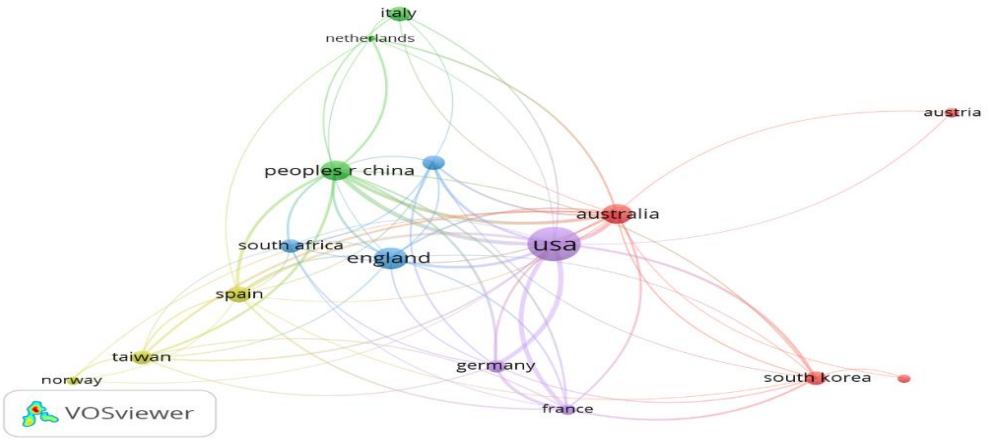

Figure 3. Co-authoring countries are shown on the mapping (Generated by VOSviewer)

Co-Occurrence Analysis

In general, 'the bigger the number of papers in which two keywords appear together, the higher the relatedness of these keywords, according to co-occurrence analysis' (Van Eck, & Waltman, 2010; Park et al., 2020). VOSViewer collects 'co-occurrences of both author keywords and all other keywords, demonstrating their frequency and relatedness' (Van Eck, & Waltman, 2010; Park et al., 2020). Co-occurrence analysis includes 'measuring the number of documents in which two terms or words are found together' (Van Eck, & Waltman, 2010; Park et al., 2020). VOSWiever was set for a threshold of ten documents in which a keyword had to appear for it to be included. The data subsequently resulted in 19 keywords with accord to the aforementioned threshold. Table 3 lists the ten most commonly occurring keywords that appeared in our sample of 281 papers. The top five most common occurring keywords are 'BYOD', 'Technology', 'Bring Your Own Device', 'mobile', and 'students'.

There are four major keyword clusters concerning user-oriented clusters that we had determined based on the clusters which are (i) consumer-oriented, (ii) organization-oriented, (iii) students-oriented, and (iv) mobile users-oriented. Figure 4 shows the mapping of the keyword co-occurrences and also depicts the dominant links between keywords and clusters. First, the shown in red that we classify as consumer-oriented keywords —'BYOD', 'consumerization', 'impact', 'information-technology', 'model', and 'systems'.

Second, the keywords that are shown in green that we classified as organization-oriented keywords are 'Bring Your Own Device', 'Bring Your Own Device (BYOD)', devices, security, and technology. Third, the terms, that are shown in blue that we classified as student-oriented keywords, are 'classroom', 'education', 'higher education', 'mobile devices',

and 'students'. Fourth, the terms that are shown in yellow that we classifIed as mobile users-oriented keywords are 'framework', 'mobile', and 'mobile learning'.

Table 3

Most Commonly Occurring Keywords

Keyword	Number of Occurrences
BYOD	99
Technology	31
Bring Your Own Device	37
Mobile	24
Students	17
Security	24
Consumerization	13
Education	17
Impact	14
Model	16

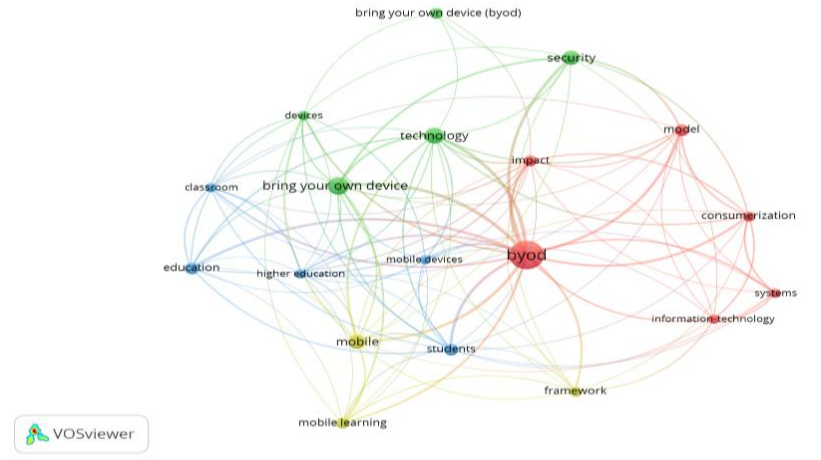

Figure 4. Keyword co-occurrences are shown on the mapping (Created by VOSviewer)

Figure 5 shows the author keyword co-occurrence for the mapping. This is based on the results after the threshold of 10 papers was set in VOSviewer to narrow the map to the most frequently-appearing terms. This resulted in seven keywords (see Figure 5).

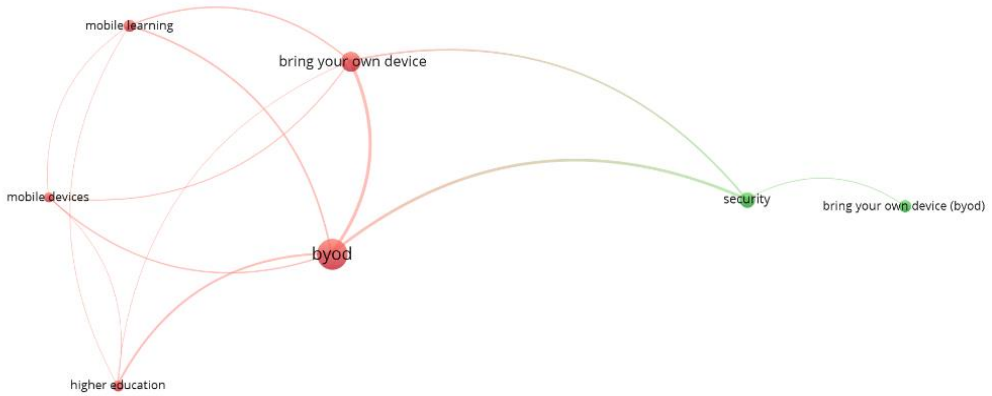

Figure 5. Author keyword co-occurrence are shown on the mapping (Created by VOSviewer)

Citation Analysis

In general, 'the more the number of times authors, journals, and publications cite each other, the more connected these items are, according to citation analysis' (Van Eck, & Waltman, 2010; Park et al., 2020). Citation analysis is 'based on the relatedness of entities like authors and journals, which is determined by how many times they cite each other' (Van Eck, & Waltman, 2010; Park et al., 2020). Which documents in the field of BYOD cite each other? We use VOSviewer and set the threshold that a paper is cited at least fifteen times. Out of 281 documents, only 59 documents met this threshold which created seven clusters as shown in Figure 6.

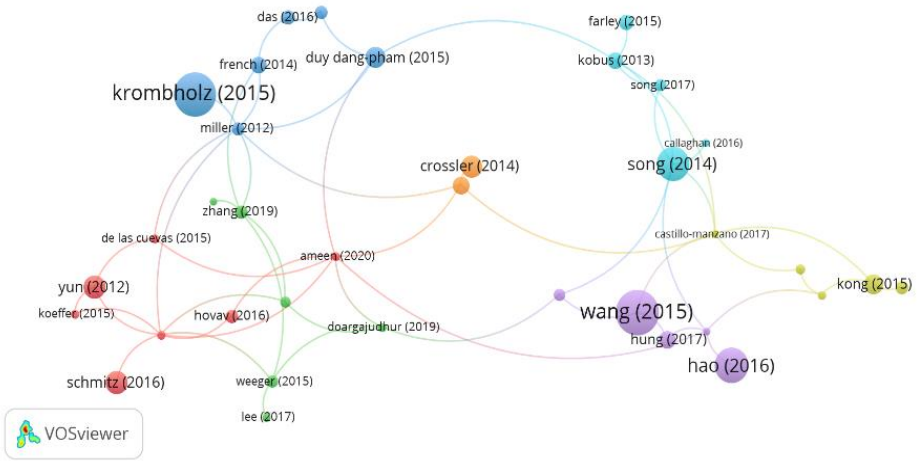

Figure 6. Citations by paper are shown on the mapping (Created by VOSviewer)

The threshold was set in VOSviewer that a journal had to be cited at least five times to be included in the map and the minimum number of a document of a source is three. 18 journals met this criterion and of these and created four main clusters. First, the cluster comprises of 'Communications of the Association for Information Systems', 'IBM Journal of Research and Development', 'Information and Computer Security', 'International Journal of Information Management', 'Journal of Computer Information Systems'. Second, the cluster comprises of 'British Journal of Educational Technology', 'Education and Information Technologies', 'Research in Learning Technology', 'Techtrends'. Third, the cluster comprises of 'Computers and Security', 'Electronic Journal of Information Systems in Developing Countries', 'International Journal of Advanced Computer Science and Applications', 'International Journal of Security and Its Application'. Fourth, the cluster comprises of 'Computers and Education', 'Computers in Human Behavior', 'Interactive Learning Environment', 'International Journal of Mobile and Blended Learning'.

Figure 7. Citations by the journal are shown on the mapping (Created by VOSviewer)

Co-Citation Analysis

In general, 'the greater the number of times authors, journals, and publications are referenced together, the stronger the relatedness of these items, according to the co-citation analysis' (Van Eck, & Waltman, 2010; Park et al., 2020). Co-citation analysis looks at 'how closely elements like authors, journals, and publications are mentioned together and how it has shaped academic discussions in the subject' (Van Eck, & Waltman, 2010; Park et al., 2020). The co-citation analysis was done with all the references cited in the 281 papers in our dataset. The threshold was set in VOSviewer that a reference is cited at least twenty times. Thus, three references met this criterion.

Figure 8. Map of co-citations analysis based on the unit of analysis of cited references (VOSviewer)

The top three most cited papers were; (i) Kong (Kong, & Song, 2015), (ii) Song (Song, 2014, Song, & Wen, 2018), and (iii) Morrow Bill (Bill, 2012). The co-citation analysis was done on all journals cited in the dataset. A threshold of fifty citations per journal was set in the VOSviewer, which reduced the dataset to 10 data. Some of the most highly cited academic journals include (number of citations in parentheses): MIS Quarterly (210), Computers & Education (287), Computers in Human Behavior (109) (148), Computers and Security (110), and British Journal of Educational Technology (85). Co-citations by source mapping are provided in Figure 10.

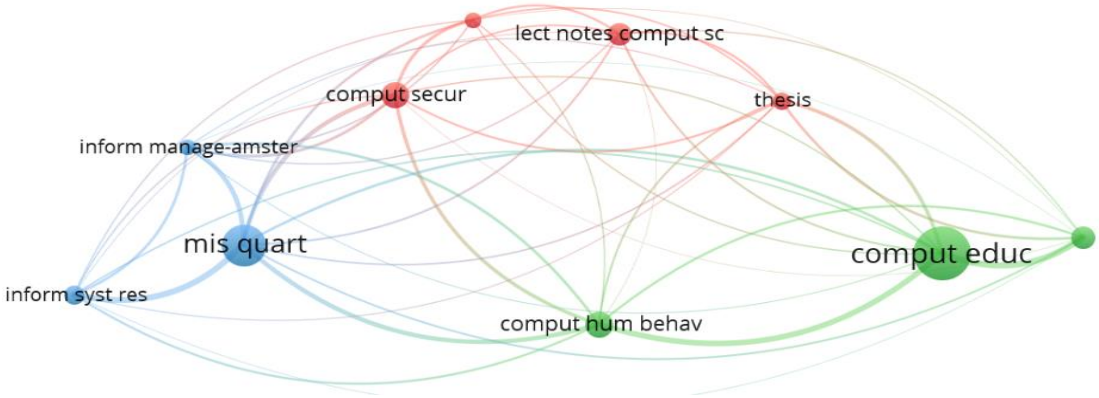

Figure 10. Co-citations by source mapping (Created by VOSviewer)

The co-citation analysis was done on all authors cited in the 281 papers. A threshold of 30 citations per author was set in the VOSviewer. Thus, this subsequently filtered the data to only fifteen authors to be analyzed for the co-citation network map analysis. The top five most-cited authors were shown in Figure 11.

Figure 11. Co-citations by the author are shown on the mapping (Created by VOSviewer)

Conceptual Framework

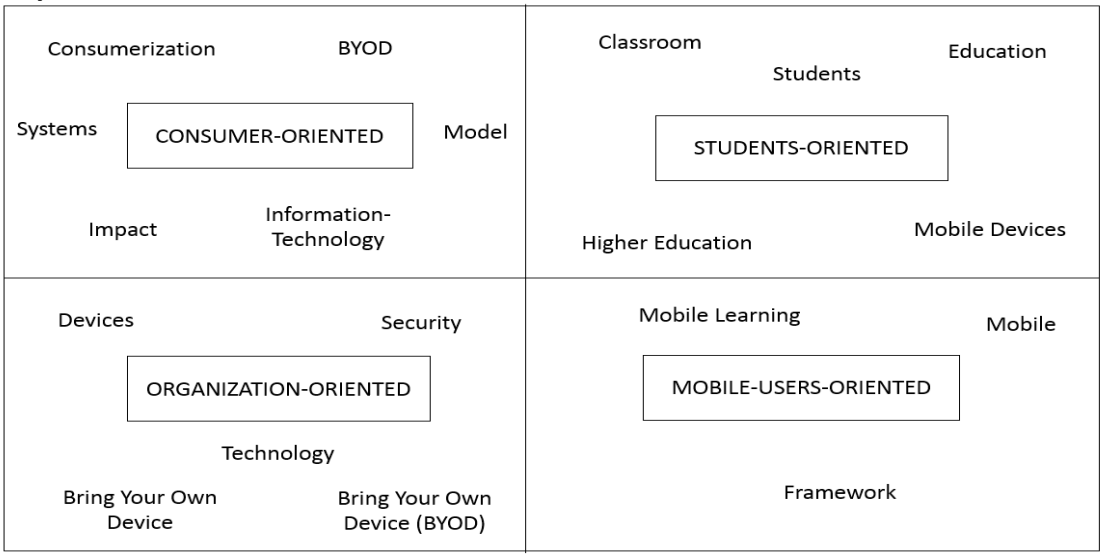

Figure 12. Conceptual Framework of types of BYOD based on user-orientation

Using these two dimensions and insights gleaned from the 'Bring Your Own Device' or 'BYOD' literature, we propose a conceptual framework of types of BYOD based on user orientation (see Figure 12) to guide future research in Information Technology or interdisciplinary research in Behavioral Science. There are four major keyword clusters concerning user-oriented cluster main themes that we had determined based on the main theme clusters which are (i) consumer-oriented, (ii) organization-oriented, (iii) students-oriented, and (iv) mobile users-oriented. Figure 4 shows the mapping of the keyword co-occurrences and also depicts the dominant links between keywords and clusters. First, the shown in red that we classify as the first main theme which is consumer-oriented which associated with six sub-themes keywords, which are (i) 'BYOD', (ii) 'consumerization', (iii) 'impact', (iv) 'information-technology', (v) 'model', and (vi) 'systems'. The second main theme, we had classified as organization-oriented which associated with five sub-theme keywords, which are (i) 'Bring Your Own Device', (ii) 'Bring Your Own Device (BYOD)', (iii) devices, (iv) security and (v) technology. Security had become a predominant issue in the computing-related field (Morrow, 2012; Rahman, Wu, & Liton, 2020; Mohammed & Redzuan, 2020; Wan Mohd Isa et al., 2019). The third main theme, we had classified as student-oriented is associated with five sub-themes – (i) 'classroom', (ii) 'education', (iii) 'higher education', (iv) 'mobile devices' and (v) 'students'. The fourth main theme is mobile-users-oriented sub-theme keywords which are 'framework', 'mobile', and 'mobile learning'. The theme and sub-themes on 'Bring Your Own Device' or 'BYOD' as shown in Figure 12 are important to be referred for future possible research in Information Technology and interdisciplinary research in Behavioral Science.

Conclusion

The results of the scientometric analysis are significant for future possible research in Information Technology and interdisciplinary research in Behavioral Science. 'Bring Your Own Device' or 'BYOD' will continue to be important issues in research and practices due to the positive and emerging trends reflected in this study. Policy-makers, practitioners, and scholars can benefit from this study as it provides future direction, work, and insightful

perspectives. The main contribution and motivation for this study is in the form of a the conceptual framework of types of BYOD based on user orientation (see Figure 12) to guide future research in Information Technology or interdisciplinary research in Behavioral Science and support the UN Sustainable Development Goals agenda.

Acknowledgements

This research is funded by the LESTARI SDG TRIANGLE grant, Universiti Teknologi MARA, Malaysia. (Project Code: 600-RMC/LESTARI SDG-T 5/3 (138/2019))

References

Hayes, B., & Kotwica, K. (2013). *Bring your own device (byod) to work: Trend Report.* Newnes, 2013.

Keyes, J. (2014). *BYOD for Healthcare*. CRC Press.

Marshall, S. J. (2018). *Shaping the university of the future: using technology to catalyse change in university learning and teaching*. Springer, 2018.

Crompton, H., & Traxler, J. (2015). *Mobile learning and mathematics: foundations, design, and case studies*. Routledge.

Makarov, S., Petrova, N. Solareva, S., & Sushin, V. (2022). Smart innovations, systems, and technologies in university libraries. In A. Rocha, & E. Isaeva (Eds.), Science and global challenges of the 21st century - science and technology (pp. 493-500). Springer.

Van Eck, N. J., & Waltman, L. (2010). Software survey: vosviewer, a computer program for bibliometric mapping. *Scientometrics*, 84, 523–538.

Park, A., Montecchi, M., Feng, C., Plangger, K., & Pitt, L. (2020*). Understanding 'fake news': a bibliographic perspective*. *Defence Strategic Communications*, 8, 141-172.

Kong, S. C., & Song, Y. (2015). An experience of personalized learning hub initiative embedding byod for reflective engagement in higher education. *Computers & Education*, 88, 227-240.

Song, Y. (2014). Bring your own device (byod) for seamless science inquiry in a primary school. *Computers & Education*, 74, 50-60.

Song, Y., & Wen, Y. (2018). Integrating various apps on byod (bring your own device) into seamless inquiry-based learning to enhance primary students' science learning. *Journal of Science Education and Technology*, 27, 165–176.

Morrow, B. (2012). Byod security challenges: control and protect your most sensitive data, *Network Security*, 2012 (12), 5-8.

Rahman, A., Wu, G., & Liton, A. M. (2020). Mobile edge computing for internet of things (iot): security and privacy issues. *Indonesian Journal of Electrical Engineering and Computer Science*, 18 (3), 1486 – 1493.

Isa, W. M., Suhaimi, A. I. H., Noordin, N., Harun, A. F., Ismail, J., & Teh, R. A. (2019). Cloud computing adoption reference model. *Indonesian Journal of Electrical Engineering and Computer Science*, 16(1), 395 – 400.