Journal of Humanities and Social Sciences, Suan Sunandha Rajabhat University Vol.6 No.1 January – June 2023
Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

การใช้เวิร์ดคลาวด์และความถี่ของคำเพื่อสรุปสถานการณ์โรคโควิด-19 ในประเทศไทยผ่านข่าวภาษาอังกฤษออนไลน์

มณฑรัตน์ รุ่งเรืองธรรม[*], ศตวรรษ ไชยสิทธิ์[2]
[*]คณะศิลปศาสตร์ มหาวิทยลัยเทคโนโลยีราชมงคลพระนคร
[2]คณะวิทยาศาสตร์และศิลปศาสตร์ มหาวิทยาลัยบูรพา วิทยาเขตจันทบุรี
E-mail: montarat.ru@rmutp.ac.th[*]
[*]ผู้ประสานงานหลัก

บทคัดย่อ

เวิร์ดคลาวด์ หมายถึง การแสดงภาพข้อความเพื่อสรุปข้อความตัวอักษรโดยการนำเสนอคำสำคัญซึ่งมีความถี่ที่ปรากฏออกมาด้วยขนาดตัวอักษรและสีที่มีความแตกต่างกัน งานวิจัยล่าสุดได้ใช้เทคนิคการแสดงภาพเวิร์ดคลาวด์และความถี่ของคำเพื่อสรุปข้อมูลจำนวนมาก ดังนั้นงานวิจัยนี้มีวัตถุประสงค์คือศึกษาการใช้เวิร์ดคลาวด์และความถี่ของคำเพื่อแสดงผลข้อมูลที่เกี่ยวข้องโรคโควิด-19 จากข่าวภาษาอังกฤษออนไลน์จากหนังสือพิมพ์บางกอกโพสต์ ในงานวิจัยนี้ข้อมูลข่าวภาษาอังกฤษออนไลน์ทั้งหมดมีจำนวน 303 ข่าว ประกอบด้วย 198,685 คำ เพื่อดูปรากฏการแพร่ระบาดระลอกที่ 1 ชุดข้อมูลมีการจัดเตรียมข้อมูลก่อนทำการวิเคราะห์โดยใช้ Word sift ผลจากการวิจัยแสดงภาพกลุ่มคำ 12 ภาพ และคำสำคัญที่ปรากฏบ่อยที่สุด 10 อันดับในแต่ละเดือน และผลวิจัยซึ่งวิเคราะห์เชิงพรรณนาแสดงความสอดคล้องของความเวิร์ดคลาวด์และความถี่ของคำเกี่ยวกับการแพร่ระบาดระลอกที่ 1 ของโรคโควิด-19 ในประเทศไทย ประจำปีพ.ศ. 2563 ผลจากงานวิจัยสนับสนุนการใช้เวิร์ดคลาวด์ และความถี่ของกลุ่มคำเพื่อสรุปภาพรวมของชุดข้อมูลขนาดใหญ่ได้ อย่างไรก็ตาม งานวิจัยนี้แสดงให้เห็นถึงปัญหาอื่น ๆ เช่น การจัดเตรียมข้อมูล จำนวนกลุ่มคำที่เหมาะสมเพื่อแสดงในเวิร์ดคลาวด์ และผลวิจัยเชิงคุณภาพนั้นไม่สามารถอาศัยการวิเคราะห์จากเวิร์ดคลาวด์เพียงอย่างเดียวได้ อย่างไรก็ตามงานวิจัยนี้ได้อภิปรายผล ตลอดจนเสนอแนะแนวทางการใช้เวิร์ดคลาวด์ควบคู่กับกระบวนการวิเคราะห์อื่น ๆ เพื่อวิเคราะห์ข้อมูลเชิงคุณภาพ

คำสำคัญ: ภาพกลุ่มคำ, โรคโควิด-19, ข่าวออนไลน์, ภาษาอังกฤษ

วารสารมนุษยศาสตร์และสังคมศาสตร์ มหาวิทยาลัยราชภัฏสวนสุนันทา ปีที่ 6 ฉบับที่ 1 มกราคม – มิถุนายน 2566
Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Using Word Clouds and Word Frequency to Preview the COVID-19 Situation in Thailand through English Online News

Montarat Rungruangthum[*], Sattawat Chaiyasit[2]
[*]Faculty of Liberal arts, Rajamangala University of Technology Phra Nakhon
[2]Faculty of Science and Arts, Burapha University, Chantaburi Campus
E-mail: montarat.ru@rmutp.ac.th[*]
[*]Corresponding author

Abstract

Word Clouds means graphic visualization which is used to summarize textual data by showing frequent keywords occurring in the text in different sizes and colors. Recent studies have used word clouds and word frequency to summarize a large collection of data. Our paper, therefore, aims to investigate whether word clouds and word frequency could be utilized for previewing data related to the COVID-19 through English online news from the Bangkok Post. In this study, there were 303 English online news, consisting of 198,685 words in order to see the first wave of pandemic situation. The data were prepared before being processed. After that, the data were then processed by using Word sift. The results of the study present twelve-word clouds, and top-ten keywords in each month. The results obtained from descriptive analysis were utilized to see the how word clouds and word frequency connect to the first wave of the COVID-19 pandemic situation in Thailand in 2020. Our results support the use of word clouds and word frequency for previewing large data collection. However, this study also presents some problematic issues, for example, data preparation, the appropriate number of keywords used in word clouds, and the qualitative data should not be solely relied on using word clouds. The results of the study report the discussion and provide guidance on how to use word clouds together with other research approaches for analyzing qualitative data.

Keywords: Word clouds, COVID-19, Online news, English

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Introduction

Word Clouds for Analyzing Textual Data

Word clouds, one of research tools for summarizing large amounts of textual data, can be defined as a textual data presentation according to the total number of words occurring in the data (McNaught & Lam, 2010). The more words appear in textual information, the larger words present in different sizes or colors (Bromley, 2013). However, little information is available on the use of word clouds for textual data. Most of the traditional studies have been limited to the field of Information Technology since researchers are required to have computer skills, such as text mining techniques and using specific programs: Python, R-program. Recent studies (e.g., Roman, Thompson, Ernst, & Hakuta, 2016) have suggested using web-based word cloud generators to summarize numerous qualitative data by using Word Cloud Generators (WCGs). For instance, https://wordsift.org/, https://tagcrowd.com/ https://wordart.com/, and https://worditout.com/. These free websites enable researchers to design and summarize textual data.

To give a clear picture of how word clouds can be used to analyze textual data, Table 1 reviews previous studies using word clouds as one of the alternatives in analyzing textual data such as political speech, customers' reviews, research articles, etc.

Table 1 A summary of Word Clouds for analyzing textual data

Author(s)	Year	Results
Arnaboldi, Cho, J., &Sternberg,	2021	Proposing the use of Wormicloud to summarize scientific articles in a graphical way through word clouds which was useful for literature review from scientific database.
DePaolo, & Wilkinson	2014	Using word clouds for analyzing qualitative data, for example students' responses, longitudinal study, self-reflection, evaluation students' knowledge, as well as qualitative research
Harris	2011	Examining word clouds could impact the results of data visualization and mislead information.
Kalmukov	2021	Applying word clouds visualization to conference management system: facilitating reviewers and identifying research topics in the conference system.
Rungruangthum, Hongsachat, & Wangkaewhiran	2022	Using word clouds to analyze students' attitudes towards English course training. The results show that word clouds and word frequency could be utilized for giving an overview of the questionnaire. Factors including frequent words, data preparation, and different use of word clouds generators resulted in data presentation.

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Author(s)	Year	Results
Salloum, Al-Emran, Monem, & Shaalan	2015	Using word clouds to extract the overview of research articles by using text mining techniques and sort related research topics from six databases.
Seifert, Ulbrich, & Granitzer,	2011.	Introducing the use of word clouds for categorizing large text data, or annotation.

Considering the situation in Thailand, our research focus was emphasis on the COVID-19 pandemic situation which has a strong impact in national and international levels.

The COVID-19 Pandemic in Thailand

The COVID-19 pandemic has changed the world after China reported to the World Health Organization (WHO) that there were 139 new cases of coronavirus infection in Wuhan (WHO, 2020). This situation has resulted in many areas, such as education, online business, healthcare prevention, logistics, as well as government policy. Similar to Thailand, foreign tourists get a lot of the COVID-19 information and read online news to follow government' measures and policies. Some of them can access this information from English online news, like the Bangkok Post (https://www.bangkokpost.com/).

While we were collecting the COVID-19 online news from 2020 to 2021, we found that there were 5,471 English online news. Traditionally, to review this enormous textual data, this can be done by hand; however, it was very time consuming and required technical skills. As recent research has proposed using word clouds, this paper, therefore intends to use this technique together with other approaches in order to reflect the COVID-19 pandemic situation in Thailand.

Research Objectives

Therefore, in this paper, we aim to find out whether word clouds and word frequency can be used to preview the COVID-19 pandemic in Thailand from English online news in 2020. Our scope focuses on the first wave outbreak of the COVID-19 in Thailand.

Research Methodology

This section presents how the data were collected and analyzed to explore the COVID-19 situation in Thailand using word clouds via 5,471 English online news from 2020 to 2021. However, this paper focused on the English online news from January 2020 to December 2020 so as to find out whether word clouds and word frequency could be utilized to preview the linkage how Thai government responded: to the first wave of the COVID-19 outbreak. Hence, this section presents the overview of the

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

selected data from the Bangkok Post English online news, the process of data collection, data preparation, and the selection of word cloud generators used in this study.

Regarding the selected data, English online news associated with the COVID-19 were filtered by using four keywords search: coronavirus or COVID-19, Thailand, measures, and policies to distinguish English online news focusing only the COVID-19 pandemic in Thailand, connecting how Thai government established measures and policies when encountering the pandemic period. Table 2 summarizes 303 English online news consisting of 198,685 words used in this study from January to December 2020.

Table 2 An overview of the COVID-19 textual data from the Bangkok Post in 2020

Months	News	Words
January	10	2,176
February	32	22,356
March	60	31,129
April	34	17,615
May	17	11,979
June	20	16,773
July	21	13,385
August	26	15,239
September	22	17,804
October	22	16,486
November	25	23,517
December	14	10,226
Total	**303**	**198,685**

In addition to the data preparation, these COVID-19 English online news were firstly recorded in complete webpage (.html). These html files were then converted into text files of wich captions, bullet points, and irrelevant information such as online advertisements were removed as these factors may result in the data visualization. Figure 1 provides the procedure how the data obtained from the Bangkok Post were prepared before being processed. Finally, the data were analyzed descriptively to link the COVID-19 situation and Thailand measures.

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

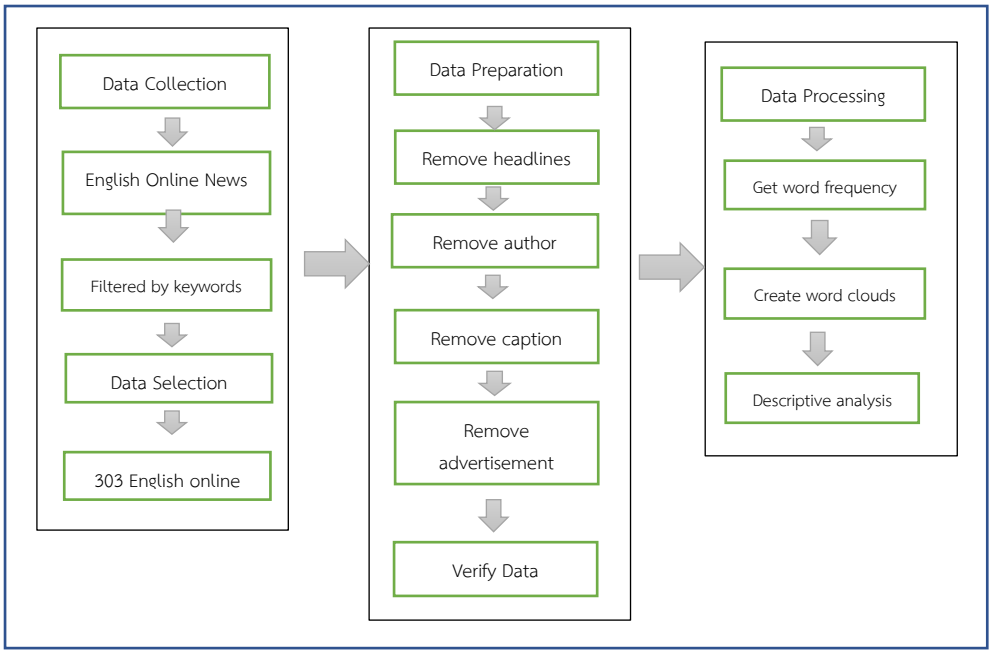

Figure 1 A summary of data collection and data analysis

Previous research heavily has heavily focused on utilizing word clouds as one of qualitative data analyses, converting textual data into graphical visualizations such as research topics (Kalmukov, 2021) and social media trends (Giannoulakis & Tsapatsoulis, 2021). Some studies have also developed algorithms and the system reliability (Dong et al., 2022). However, using this technique for analyzing qualitative data, the results were very restrictive, and might lead to subjective research (e.g., Heimerl, Lohmann, Lange, & Ertl, 2014). Other studies have then suggested using word clouds together with different research methods, for example, word frequency (e.g., Yamacharoen, 2019), and sentiment analysis (e.g., Saleh et al., 2021) to provide in-depth understanding of collected data. In this paper, we intended to see whether word clouds and word frequency could be used to preview the COVID-19 pandemic in Thailand.

In addition to the selection of Word Cloud Generators, Table 3 summarizes the specific features of each website. In this paper, Wordsift (https://wordsift.org/) was selected due to keyword representation, user's familiarity, text length, word frequency count, as well as sorting keywords, for example common words, rare words, alphabetical words, and academic words.

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Table 3 Overview of WCGs

WCGs	User's familiarity	Word frequency	Word length	Keyword representations	Others
Wordsift	✓	✓	3 MB file size	Users can set the total number of word clouds.	Users could get word frequency, examples, and parts-of-speech. Users can also design and export word cloud images.
TagCrowd	✓	✓	500 kb file size	25-100 words	Users could not select the fonts and the graphic design.
WordItOut	✓	✖	N/A	Users can set the total number of word clouds	Users could design only word cloud images.
Voyant Tools	✓	✓	100,00 words	500 words max	Suitable for corpus analysis, concordances, type-token ratio, vocabulary density and word clouds.

Results

Table 4 shows twelve word clouds and the top-ten frequent words occurring in the text. These visualizations were presented and described according to the first outbreak in Thailand through English online news from January to December 2020.

Table 4 The results of word clouds and word frequency

Word clouds	Keywords		Situations
 January 2020	1. Health (30) 2. Chinese (25) 3. New (22) 4. Thailand (20) 5. Tourist (19)	6. Disease (19) 7. Wuhan (18) 8.Coronavirus (18) 9. Year (17) 10. Virus (17)	**- Coronavirus** was from **Wuhan**. - The first case in **Thailand** was from **Chinese** passenger on taxi. **- Health officials** started monitoring and inspection at airports for the **new virus** from China.

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Word clouds	Keywords		Situations
 February 2020	1. Thailand (147) 2. Coronavirus (104) 3. China (99) 4. Outbreak (96) 5. Case (91)	6. Virus (80) 7. Year (79) 8. Thai (73) 9. Health (68) 10. country (67)	- Tourists started wearing masks when going out to protect themselves from **Coronavirus**. - The COVID-19 **outbreak** resulted in **Thailand** tourism. - There were 42 **cases** infected with **Coronavirus** in February 2020.
 March 2020	1. Covid (210) 2. Person (147) 3. Hospital (138) 4. Thailand (136) 5. Thai (127)	6. Health (119) 7. Government (101) 8. Patient (99) 9. Measure (98) 10. Coronavirus (94)	- **Hospitals** needed support medical staff's preventive **COVID-19** treatment. - **Thai government** issued strong **measures: disease outbreak** prevention, medical care, and compensation**,** to prevent the spread of the **COVID-19** and to assist Thai Economy.
 April 2020	1. Covid (106) 2. Thailand (80) 3. Thai (78) 4. Person (68) 5. Country (67)	6. Case (67) 7. Government(66) 8. Food (64) 9. Bangkok (60) 10. Patient (56)	- Hotels offered quarantine facilities for **Covid-19 patients** and foreign tourists. -**Thai government** established the measures that all shopping malls, **shops** in **Bangkok** and **food** stalls must close from midnight to 5 am.

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Word clouds	Keywords		Situations
 May 2020	1. Government (61) 2. Covid (56) 3. Country (56) 4. Person (52) 5. Mask (52)	6. New (42) 7. Health (41) 8. Bangkok (40) 9. Thai (38) 10. Public (36)	- No new **cases** of COVID-19 announced by the Ministry of **Public Health of Thailand (MoPH).** -Medical staff followed strict disease control protocols because vaccine has been found. - The **government** launched a new phone app to facilitate disease control.
 June 2020	1. Covid (98) 2. Thailand (85) 3. Person (83) 4. Government (69) 5. Country (62)	6. Business (61) 7. Food (57) 8. Travel (45) 9. Energy (42) 10. Tourist (42)	- **Energy** prices and renewable **energy** fell down. -**Thailand** is facing **food** insecurity due to the **Covid-19**. -An anti-**Covid-19** measure has been relaxed.
 July 2020	1. Covid (93) 2. Thailand (63) 3. App (63) 4. Government (54) 5. Robot (52)	6. Thai (49) 7. Country (48) 8. Tourist (45) 9. Tourism (45) 10. Datum (41)	- **Thai** Chana **app** was launched to provide information (**Datum**) about **COVID-19** - Robots were used in **Thailand** for many purpose e.g., meals, medicines, and tickets delivery.
 August 2020	1. Thailand (89) 2. Government (75) 3. Covid (68) 4. New (64) 5. Country (56)	6. Job (52) 7. Person (49) 8. Bangkok (46) 9. Year (45) 10. Pandemic (44)	-**Persons** lost their **jobs** caused by the **COVID-19**. - Business and education in **Thailand** switched to online. -The **government**'s lockdown measures

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

Word clouds	Keywords		Situations
			also led some businesses to lay off workers resulting from **COVID-19 pandemic.**
 September 2020	1. Thailand (129) 2. Covid (87) 3. Country (74) 4. Health (70) 5. Tourist (64)	6. Person (63) 7. Medical (60) 8. Case (57) 9. Business (57) 10. Year (56)	- The suicide **cases** resulting from **COVID-19** increased 20%. - Thailand was opening a **medical tourism** for foreign **tourists** visiting to Thailand.
 October 2020	1. Thailand (114) 2. Covid (74) 3. Country (66) 4. New (63) 5. Year (56)	6. Business (52) 7. Company (49) 8. Thai (49) 9. Tourist (47) 10. Person (47)	- **Business** models need changing to handle the **Covid-19** situation in **Thailand**. - The government was called on to relax measures to screen foreign **tourists.**
 November 2020	1. Thailand (131) 2. Year (115) 3. Person (91) 4. Business (91) 5. Vaccine (73)	6. New (69) 7. Country (67) 8. Covid (67) 9. Company (58) 10. Travel (53)	- Some small **businesses** shut down due to the **COVID-19**. - **Thailand** ordered 26 million doses of **vaccine.**
 December 2020	1. Covid (94) 2. New (56) 3. Year (56) 4. Worker (54) 5. Person (51)	6. Myanmar (42) 7. Infection (49) 8. Province (44) 9. Market (41) 10. Tourism (36)	- **New Year** festival cerebrations were canceled. - The spread of **Covid-19** was from Central Shrimp Market by **Myanmar workers.**

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

The data were also analyzed descriptively to see the linkage between word clouds, word frequency, and the first wave of COVID-19 situation in Thailand. In the first quarter (January – March 2020), the coronavirus was found, then Thailand declared a state of emergency. In the second quarter (April – June 2020), Thai government launched national curfew, easing lockdown restriction in May and June. During the third quarter (July – September 2020), Thailand tourism industry plummeted and ranked the fourth for highest loss of revenue. In the last quarter (October – December 2020), Thai government extended the policies and reduced the quarantine to attract foreign tourists before the second wave of outbreak starting in January 2021.

Discussion and Conclusion

The overall results examining the use of word clouds and word frequency to preview the COVID-19 English online news during the first outbreak from January to December 2020. The results show that word clouds and word frequency can be used to quickly summarize the data. When considering the results obtained from descriptive analysis, word clouds and word frequency found in English online news were consistent with other studies (e.g., Chancharat & Meeprom, 2022; Jindahra, Wongboonsin, & Wongboonsin, 2021) reporting the timeline of the Covid-19 outbreak in Thailand.

Our results using word clouds and word frequency for previewing qualitative data were in accordance with several studies (e.g., DePaolo, & Wilkinson, 2014; Rungruangthum, Hongsachat, & Wangkaewhiran, 2022) supporting that word clouds could be used as one of alternative tools for a large collection of text data. This study, by contrast, reveals some limitations that needed to be addressed beforehand:

The limitations found in this study were data preparation, the total number of keyword representations, advantages and disadvantages of using word cloud generators, and limitations of our data analysis.

Firstly, the data preparation may result in text visualizations, such as, contractions (’d = had, or would), abbreviation (PM = Prime Minister), spoken and written languages (e.g., Collins, Viegas, & Wattenberg, 2009). For example, our study show that word could not display plural nouns (e.g., “cases” in original text “case”)

Secondly, there has been no research indicating the ratio of keyword representations in word clouds, while most prior studies (e.g., Yamacharoenn, 2019) used the most frequent words occurring in the text. Our results present word clouds consisting only 20 words in each month. Thus, it might not be sufficient to summarize the whole data.

Thirdly, our study shows both advantages and disadvantages of using word clouds in previewing qualitative data. In terms of data preparation, word clouds enable

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

researchers to summarize literature review and results summary (e.g., Brooks, Gilbuena, Krause, & Koretsky, 2014). Nonetheless, one obvious disadvantage of word clouds is that the difference in frequency between terms, measured by their font size, can mislead the actual frequency (e.g., Miley, & Read, 2014). In other words, if there are slight differences in keywords, the font size and color of word clouds may not show a clear picture. In this study, Wordsift was utilized to create word clouds; however, different word cloud generators might provide different graphic data presentations.

Finally, our results rely on word clouds, word frequency to preview the first wave of COVID-19 pandemic in Thailand. After that, these data were analyzed descriptively to represent the overview situation in Thailand. Our study, therefore, supports some previous studies (e.g Douma, Steverink, Hutter, & Meijering, 2017). indicating that word clouds should be used with other research approaches so as to provide in-depth data comprehension. For example, corpus-based approach, in-depth interview, longitudinal analysis, and thematic analysis

To sum up, our study provides a guidance on how to use word clouds with other research approaches to preview numerous qualitative data associated with the COVID-19 pandemic situation in Thailand. For further studies, using word clouds for qualitative data enables researchers to get a quick review of the data. However, some problematic issues involve the appropriate number of keywords whether word clouds truly display the situation, keyword representations (e.g., only content words or overall grammatical features occurring in the text), as well as data analysis. This study shows that the researcher could not solely rely on using word clouds since other insightful data might be overlooked from the study.

References

Bromley, K. (2013). Using word clouds in the classroom. *The Utah Journal of Literacy*, *16*(1), 39-41.

Brooks, B., Gilbuena, D., Krause, S., & Koretsky, M. (2014). Using word clouds for fast, formative assessment of students' short written responses. *Chemical Engineering Education*, *48*(4), 190-198.

Chancharat, S., & Meeprom, S. (2022). The effect of the COVID-19 outbreak on hospitality and tourism stock returns in Thailand. *Anatolia, 33*(4), 564-575.

Collins, C., Viegas, F. B., & Wattenberg, M. (2009, October). *Parallel tag clouds to explore and analyze faceted text corpora*. In the Proceeding of 2009 . IEEE Symposium on Visual Analytics Science and Technology, 91-98.

Received: Apr 10, 2023, Revised: May 08, 2023, Accepted: June 13, 2023

DePaolo, C. A., & Wilkinson, K. (2014). Get your head into the clouds: Using word clouds for analyzing qualitative assessment data. *TechTrends*, *58*(3), 38-44.

Dong, M., Lu, J., Wang, G., Zheng, X., & Kiritsis, D. (2022, April). *Model-based systems engineering papers analysis based on word cloud visualization*. (In the Proceeding of 2022). IEEE International Systems Conference (SysCon*)*, 1-7.

Giannoulakis, S., & Tsapatsoulis, N. (2021, 25–27 June). *Topic Identification via Human Interpretation of Word Clouds: The Case of Instagram Hashtags*. In the Proceeding of Artificial Intelligence Applications and Innovations: 17th IFIP WG 12.5 International Conference, AIAI 2021, Hersonissos, Crete, Greece, 283-294.

Heimerl, F., Lohmann, S., Lange, S., & Ertl, T. (2014, January). *Word cloud explorer: Text analytics based on word clouds.* In the 47th Hawaii international conference on system sciences, 1833-1842.

Jindahra, P., Wongboonsin, K., & Wongboonsin, P. (2021). Demographic and initial

Kalmukov, Y. (2021). *Using word clouds for fast identification of papers' subject domain and reviewers' competences*. PROCEEDINGS OF UNIVERSITY OF RUSE - 2021, 60, book 3.2.

McNaught, C., & Lam, P. (2010). Using Wordle as a supplementary research tool. *Qualitative Report*, *15*(3), 630-643.

outbreak patterns of COVID-19 in Thailand. *Journal of Population Research*, *2022*(39), 566-568.

Roman, D., Thompson, K., Ernst, L., & Hakuta, K. (2016). WordSift: A free web-based vocabulary tool designed to help science teachers in integrating interactive literacy activities. *Science Activities*, *53*(1), 13-23.

Rungruangthum, M., Hongsacha, N., & Wangkaewhiran, T. (2022). An Analysis of Students' Attitudes by Using Word Frequency and Word Cloud Visualization. *ECT Journal Education and Communication Technology Journal*, *17*(22), 63–77.

World Health Organization (WHO). (2022). *National authorities in China reported to WHO an additional 139 new cases of novel coronavirus (2019-nCoV) infection*. Retrieved 10 Feb 2022, from https://www. who.int/news/item/30-12-2022-who-meets-with-chinese-officials-on-current-covid-19-situation

Yamacharoen, R. (2019). Keywords Analysis in Word Cloud for Supporting Library Information Services. *PULINET Journal*, *6*(2), 69-84.