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DATA-DRIVEN PARADIGM SHIFTS: EMERGING INFORMATION SCIENTISTS' APPROACHES TO INFORMATION ANALYSIS

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ABSTRACT

The research achieved the objectives of exploring the information mapping practice of information scientist as well as the tools employed by information scientist amidst the big data chaos. Quantitative research methodology and exploratory research design was employed to explore the novel research area, while a questionnaire was used as instrument of data collection guided by the Visual Communication theoretical framework. The population of the study was three hundred and thirty six (336) final year Bachelor of Technology/ Bachelor of Science students (B.Tech/Bsc), Master of Technology/ Science Students (M.Tech/MLIS) and Doctor of Philosophy Scholars of Library & Information

Introduction

BACKGROUND OF THE STUDY

Information imperialism has entrenched a data-centric world and never before has making sense of all that information is more difficult, a single online query on the web returns millions of results accumulating into an overload. Apparently, online searching skill and methods had never been more important than now (Meitei, 2019: Phillips-Wren and Adya, 2020). This overload can be seen in the growth of online debates, sometimes regarding public health issues such as COVID-19 vaccines

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Technology/Science in Specialised Federal Universities in Nigeria. Total enumeration was adopted as a sampling technique and 290 responded. The study revealed a paradigm shift in sense-making methods and tools by emerging information scientist that are engrossed in the big data space. The result shows a significant evolution in how data is analyzed. This paradigm shift involves adopting new methodologies and technologies to handle complex and large-scale data where traditional methods are gradually being substituted by machine learning algorithms and visualizations. This paradigm shift buttresses a more sophisticated approach to big data sense making. The research recommends that academic institutions/LIS schools and organisations should develop a more apt and standardized training for information scientists on diverse information mapping techniques to ensure a more effective adaptability to emerging challenges in the big data space as well as sense making of online debates. Also, to address the observed variability in tools usage, it is recommended that a more unified framework for information mapping tools be developed. This framework should integrate the strengths of various tools and address the inconsistencies and accessibility challenges noted among different user groups.

Keywords: COVID-19 Vaccine, Information Mapping, Information Scientist, Online Debate, Visual Analytic System.

(Jiang, *et al*., 2021). Although there are evidences on vaccine effectiveness and safety, these debates can often serve as another platform to fuel misinformation that results into devastating uncertainty (Skafle *et al*., 2022). These polarized debates breed suspicion in regard to vaccinations, bringing to fore, arguments that question their scientific efficacy (Lee and Sibley 2020; Rodrigues and Plotkin 2020).

Mainly, poor vaccine coverage and reoccurring anti vaccine sentiments especially during pandemics such as COVID-19, leads to more debates spreading on social media, online platforms as well as during political discourses (Kalichmanand, 2023). This is where the importance of information scientists comes in, to organize these clumsy online discussions for sense making as well as for policyxc LIS scholars are academically equipped to structure, organize and analyze a very considerable amount of data set of online debates using various methods (Choudhari, *et al*., 2021).

However, big data dynamics have sparked a substantial change in the techniques and tools that Information Scientists use for these sense making activities. This is reflected in paradigm shifts like adoption of visual analytics, sentiment analysis, network analysis and use of numerous data sources. This paradigm shift should make Information Science more a part of an evolving problem-solving activity in negotiating chaos in the increasingly complex data environment. Research involving LIS scholars (PhD, MLS and BLS students) is especially relevant since their education includes training in information retrieval, data analysis tools and techniques, information literacy skills while abiding by ethical responsibilities such as protecting information that is based on empirical evidences (Dijkgraaf, 2021: Liu, 2020: Sundar, 2019). Therefore, the role of information scientists is important in sense making of these complex online discussions by shifting paradigm and drawing from methodologies such as Information Mapping, adopting tools such as Visual Analytic Systems (VAS) (Choudhari *et al.*, 2021).

In extant literature, there is dearth of a research that focuses on the information mapping practices of information scientist nor visual analytic tools employed by Information Scientists, which is the fulcrum in the context of this study. Understanding these practices is crucial for developing more effective strategies to combat misinformation akin to online debates and enhance public understanding of vaccine-related information. Therefore, the research problem is addressing the need to identify and analyze the current Information Mapping practices, as well as tools employed by information scientist, assess their effectiveness, and identify potential improvements that can support the information mapping practices in midst of big data dynamics and emerging paradigm shift in their sense making activity.

OBJECTIVES OF THE STUDY

The research is guided by the following objectives:

i. Explore the Information Mapping practices of information Scientists in regard to online debate on covid 19 vaccine.
ii. Discover the Information Mapping tools employed by information scientist in regard to online debate on Covid 19 Vaccine.

LITERATURE REVIEW

Information Mapping Methods

Information overload has become endemic, affecting all walks of life and becoming the new normal in the information environment. This overload has

affected the size of print knowledge and information at our disposal and has left no one in doubt as to the importance of digitization and information literacy skills as well as tools to tackle print information. These tools serve the user as solutions for navigating vast information landscape (Srinivasan, 2019: Whitworth, 2020). Gradually, information digitisation too came with its attending myriads of challenges which again, left no one in doubt as to the importance of information literacy of online content. Subsequently that too, triggered experts to employ various methods and tools to navigate the online information space.

One of such effort is information mapping, a structured approach to organizing and presenting information in a clear and effective manner and a method to improve the communication of complex information (Whitworth and Webster, 2019). The information mapping method is grounded on the idea that information can be more understood and retained if it is visually and logically organised and presented. To achieve that, different approaches to information mapping have allowed for efficient creation, maintenance, and delivery of structured information whether it is visually connecting concepts, analysing causes and effects, mapping process flows, or modelling systems, each methods provides unique benefits understanding and communicating complex information effectively (Jamil, 2020: Baer, 2021).

Some of the key information mapping theories include Concept mapping, Mind Mapping, knowledge mapping, geospatial mapping and Robert Horn's information Mapping. Each of the theories serve a specific purpose and can be applied in various contexts, depending on the type of information being conveyed and the audience's needs. By selecting any of these mapping techniques appropriately, one can efficiently enhance communication, improve understanding, and effectively present complex information.

Concept Map

Sundar, (2022) describe concept map as visual displays of terms, configured and representing primary ideas. According to Siddharth and Kishor, (2022) it is a visual representation of information that have been utilized in research to depict and assess knowledge for the last three decades. At the foundational level, it makes information practical by enabling users organize both existing and new knowledge. (Sundar, 2022: Baliga, *et al.,* 2021).

Mind Map Theory

According to Dijkgraaf, (2021) estimates shows that our brains process terabytes of information daily. Yet, our brain arranges this information efficiently through a process called Mind Mapping also known as Cognitive Mapping it is a method introduced by Tony Buzan in 1970 to serve as a tool for multi-dimensional reasoning and visualize the connections between ideas of different levels and interconnections. Visual entities are combined, and associations between words are reinforced by linking them with visuals entities, thereby aiding memory retention (Zhang, *et al.*, 2023).

The Map constitutes an educational technique employed for depicting interconnected ideas cantered on a core theme, typically featuring a radial and horizontally oriented structure, with the main topic positioned centrally and its associated details extending outward. This method is utilized to visually present information, stimulating learners to engage with and study the themes through relationships and graphical representations (Palaniappan, *et al.,* 2022).

Robert Horn's Theory

Horn's information mapping principle is a traditional approach for organizing and presenting information in a clearly and concisely. It was developed by Robert Horn in the late 1970s and has since been widely used in various fields, including information sciences, technical writing, user documentation, and business communication. The basic principle of Horn's information mapping includes dividing information into chunks, headings and subheadings for a chunk, and using a format for each chunk. The method allows readers to quickly sift through information and find what they need (Koponen and Hildén 2019). The key elements of Horn's information mapping is the use of visual aids in presenting information. This can include diagrams, charts, and other graphics that make complex information easier to understand. The method encourages use of plain language and avoiding technical terms, and complex sentences (Louvier and Innocenti, 2019).

Knowledge Map Theory

One of the most crucial methods for visualizing information is knowledge mapping, a visual representation of an intellectual asset that assists in identifying the location of important information by allowing focus on the most significant.

As a methodology knowledge map is recently adopted in institutions and enterprises and has drawn experts in different fields. Knowledge mapping is effective in preserving information on expertise and detecting gaps that limit growth, impedes potentials, cause setbacks and might be used fully in online learning (Liu, 2020).

In knowledge maps, concepts are linked and made to be recalled with minimal effort and enable the representation of parts and wholes in a such a way that texts cannot achieve. (Liu, 2020). Knowledge map is also an information management interface connecting people in organizations to knowledge. Knowledge map aids in identifying where knowledge reside and their application as well as dissemination (Cao, 2021: Menaouer and Nada, 2019).

Empirical literature review on information mapping

A study on information mapping was conducted by Mukhopadhyay, *et al.*, (2019) on undergraduate pharmacology students during the 2017-2018 academic session. The objective was to evaluate the effectiveness of concept maps as a reinforcement tool in medical education. Students were divided into two groups using a non-probability convenient sampling method, followed by stratified randomization based on their previous academic performance. A batch of 79 students was categorized into Low Scorers (below 50%) and High Scorers (50% and above) based on their 4th semester scores. After random selection, students attended a lecture on 'Drugs affecting Calcium Metabolism.' Groups A and B were then taught using the Concept Map method, while Groups C and D used the traditional method. The study compared the effectiveness of concept maps with traditional methods and to measure students view of the concept map. A structured questionnaire was used to assess student performance. Only students who completed all study steps were included in the analysis, which was performed using R version 3.5.1 and R Studio version 1.0.136, with a significance threshold of $P < 0.05$. Out of the 75 participants, 27 students were excluded for missing the pre-test, intervention session, or post-test, leaving data from 48 students (22 in the Concept Map group and 26 in the Tutorial group). The results indicated no significant difference between concept map and traditional tutorials in terms of semester exam performance or periodic assessments. Baseline performance comparisons (p-value = 0.9866), pre-test scores (p-value = 0.3143), and post-test scores (p-value = 0.8682) showed no significant

differences. However, the Concept Map group showed a greater median score improvement, although not statistically significant (p-value = 0.7689). Over 90% of students view the concept map method as better for understanding and interactivity, despite identifying time constraints as a challenge. Students felt more engaged and believed concept maps provided a comprehensive and accurate topic overview.

Li, *et al*., (2020) developed a knowledge map to help users navigate Q&A documents and mitigate information overload during the browsing process. Their study focused on the rapid growth of community-based question-and-answer services, which have accumulated extensive archives of questions and answers, providing valuable knowledge to users seeking information. To enhance the browsing experience and alleviate information overload, the study constructed a knowledge map for these archives by adopting the characteristics of question-answer pairs to pinpoint their locations more accurately. The process involved modelling the questions and answers and completing the knowledge map structure, with questions and answers as the primary dimensions and their intersections forming clusters of corresponding pairs. The methodology for constructing these knowledge maps used nodes and their connections, extending self-organizing maps (SOMs) for data illustration, with nodes represented as word neurons. The term frequency-inverse document frequency (TF-IDF) method was used to model the questions and answers, which were then mapped to neurons in the knowledge map's two dimensions, with intersections storing the corresponding Q&A documents. The results indicated that this approach was feasible and effective in helping users map information.

Theoretical framework

Visual Communication theory guided the study in exploring the Information Mapping practices of information scientists regarding online debates on COVID-19 vaccine based on the following assumptions of the theory:

Visuals and Understanding: assessing how information scientists use visuals tools to clarify complex vaccine information.

Design Principles: Evaluated whether information scientists adhere to framework or principles of visual analytic system mappings.

Contextual Influences: How the context of online debates influences the design and effectiveness of a VAS to be used by information scientists.

Engagement: How visual elements contribute to audience engagement in vaccine debates and their role in capturing and maintaining interest.
Cognitive Processing: Examine how visual elements help manage cognitive load and facilitate the understanding of complex vaccine information.
These assumptions, lead to better understanding of the information mapping practices of information scientist in the context of COVID-19 vaccine debates.

RESEARCH METHODOLOGY

Quantitative research methodology and exploratory research design was employed for this study because it facilitated a methodological exploration of a novel research area based on quantitative data (Gobo, 2021). Moreover, online debates on COVID-19 vaccine are complex and multifaceted, involving diverse opinions, arguments, and multiple sources of data such as textual data, visual representations and user interactions quantitative data enabled the researcher to identify the mapping practices better (Kaae and Traulsen, 2020). The choice of exploratory research design was to explore the research problem in-depth and gain a better understanding since little prior knowledge or limited information exists about the research area (Fellows and Liu, 2021).

Population, Sample and Sampling Technique

The population of this study constituted of final year Bachelor of Technology/ Bachelor of Science students (B.Tech/Bsc) Master of Technology/Master of Library & Information Science Students (M.Tech/MLIS) and Doctor of Philosophy Students in Library & Information Technology/Science in Specialised Federal Universities in Nigeria. Namely: Federal University of Technology Minna, Abubakar Tafawa Balewa University Bauchi and Micheal Okpara University of Agriculture Umudike, Abia State.

Table 1.1 Population of the Study

SN	FUT	Programme of Study	Male	Session
1	FUT., Minna	Doctor of Philosophy, Library and Information Technology	11 14	2021/2022 2022/2023
		Masters of Technology, Library and Information Technology	21 26	2021/2022 2022/2023
		Final year Bachelor of Technology Library & Information Technology.	14	2021/2022

2.	Abubakar Tafawa Balewa University Bauchi.	Final year Bachelor of Technology Library & Information Science.	127	2022/2023
3.	Micheal Okpara Uni., of Agriculture.	Doctor of Philosophy, Library and Information Technology	3	2022/2023
		Masters of Library and Information Science	7 4	2021/2022 2022/2023
		Final year Bachelor of Library & Information Science.	109	2022/2023
		TOTAL	**336**	

Source: LIT Department FUT., Minna, LIS Department ATBU and MO Uni. (January/2024).

For a sample, the researcher employed total enumeration of the three hundred and thirty-six (336) that constituted the population out of which Two hundred and Ninety (290) responded. The technique offered several advantages such as precision and accuracy to this research particularly for the various stratum which included: PhD., MLS and BLS students, subjected to a complete enumeration. Data were collected from every individual respondent, which facilitated a comprehensive understanding of these subgroups (Bhardwaj, 2019: Tipton and Matlen, 2019). The detailed data collected through the census enhanced the validity of the research findings.

Data Collection Methods

A total number of three Hundred and Thirty-Six (336) copies of questionnaire were administered to respondents in the Specialized Federal University of Technologies under study. Two hundred and ninety (290) copies of questionnaire were filled, returned and found usable for the analysis representing 85% response rate.

Data analysis

The researchers employed the questionnaire and conducted descriptive analysis to gain an overview of the quantitative data. The researchers calculated the mean and standard deviation identifying the average level of Information Mapping practices and assessed the degree of agreement or disagreement among respondents. The researcher performed analysis on both the quantitative, exploring relationships between different variables. This involves comparing

responses across different demographic factors, such as educational background, experiences on level of involvement in online debates, then identified differences that emerged based on these variables. The researchers then interpreted the analysed data and draw conclusions based on the results. Identifying the dominant Information Mapping practices of Information Scientists regarding online debate on Covid-19 vaccine, highlighting variations in the responses, and discussed their implications.

Quality procedure

The researcher assessed the content validity of the instruments by consulting experts in the department of Library and Information Science, Federal University of Technology, Minna to guide in evaluating whether the items or questions adequately represented the construct being measured and by conducting a review of literature to ensure that the instrument covers all relevant aspects of the research. For the face validity, the researchers evaluated the face validity of the instruments by examining whether the items appear to measure what they are intended to measure after pilot testing.

The designed questionnaire was pilot tested on 40 respondents from Modibbo Adama University Yola which is not in the scope of the area of study. Out of forty (40) thirty-five 35 questionnaires were returned, indicating 88% response rate being achieved. The data obtained from the 35 respondents were analysed using Cronbach Alpha in the Statistical Package for Social Scientists (SPSS) version 27. The results indicated that overall, the sixty-two (62) items in the questionnaire had 0.86 reliability index.

RESULTS AND DISCUSSION OF FINDINGS

This section entails data presentation, analysis and discussion of findings on the demographic data as well as information mapping practices and tools employed by information scientist.

Demographic Data

The demographic data for the PhD and M.Tech programs exhibits a pronounced gender imbalance with males comprising 77% of the Phd student and Male comprising 80% of the M.Tech students. This significant disparity points towards potential barriers for female students, such as gender biases in the field, societal

expectations, and possibly fewer role models and mentors for women in advanced academic positions. Addressing these issues may require targeted initiatives like scholarships, mentorship programs, and policies to create a more inclusive and supportive environment for female students. This is particularly striking given the higher female representation typically seen in LIS fields. The contrast suggests that while undergraduate programs may successfully attract female students (53%), postgraduate programs struggle with retention and attraction, potentially due to perceived or actual barriers in advanced technical fields.

The PhD program has no students aged 18-27, with 82% of students aged 38-57. The M.Tech program follows a similar trend, with 72% of students aged 38 and above. This suggests that these programs are more appealing to individuals who have gained significant professional experience and are seeking advanced qualifications to enhance their careers. The absence of younger students might indicate a need for better pathways for recent graduates to transition into these programs.

The B.Tech program primarily attracts younger students, with 84% aged 18-27. This age distribution aligns with typical undergraduate demographics and suggests that the program effectively appeals to students transitioning directly from secondary education. The presence of a smaller proportion of older students (16%) indicates flexibility in accommodating lifelong learners and those seeking career changes.

The majority of PhD students have 11-20 years of work experience, indicating they are well into their careers and likely seeking advanced qualifications to enhance their professional standing or shift their career trajectory. For M.Tech students, the work experience distribution is more varied, with 52% having 1-10 years and 35% having 11-20 years. This mix suggests the program attracts both early and mid-career professionals, highlighting its appeal to a broad range of students seeking to advance their technical skills. Most B.Tech students (94%) have 1-10 years of experience, consistent with the younger age profile. This suggests that the program is well-suited to early-career professionals and recent graduates looking to establish themselves in the field.

A study by Varlejs (2016) on the professional development needs of LIS professionals found that there is a high demand for training in emerging technologies and management skills. The M.Tech students' pursuit of further

education to enhance their skills aligns with the professional development needs identified in LIS. The fields recognize the importance of ongoing education to stay current with technological advancements and evolving professional requirements.

Other studies in LIS have also shown efforts to achieve gender inclusivity, particularly in technical and digital information roles. For example, an article by Cooke *et al*. (2017) found initiatives to encourage women to pursue careers in LIS, especially in technical services where gender disparity has traditionally been more pronounced. Gender diversity in LIS programs has been associated with supportive environments and targeted recruitment efforts. As reflected in a study by Kim and Sin (2019), LIS programs that promote mentorship, provide scholarships, and create networks for female students have higher enrolment and retention rates among women.

The B.Tech/BLIS program's success in attracting and retaining female students reflects the effectiveness of inclusive practices that can be adapted by LIS post graduate programs to further enhance gender diversity. The demographic analysis of B.Tech/BLIS students reveals a gender-balanced population, a typical age distribution with a presence of older students, and a high proportion of early career professionals. These findings suggest effective gender inclusivity efforts, flexibility in program delivery, and a strong emphasis on practical experience.

LIS has a long-standing tradition of supporting lifelong learning and accommodating non-traditional students. As reported by Hall *et al.,* (2022), many LIS programs offer flexible learning options, such as online courses and part-time programs, to cater to working professionals and adult learners. Also, studies have shown that older students bring valuable perspectives and experiences to LIS programs, enhancing the learning environment for all students. Age diversity in the classroom has been linked to richer discussions and a broader range of viewpoints (Luo, 2019). The presence of older students in the B.Tech program therefore, shows the importance of offering flexible learning options. LIS programs can continue to benefit from and enhance their support for lifelong learners by providing adaptable learning schedules and recognizing the unique contributions of older students.

In conclusion, the demographic findings from the B.Tech program offer valuable result that resonate with issues in LIS research. The gender balance observed in the B.Tech program suggests that inclusive practices are effective and can be

further upheld in LIS postgraduate programmes to enhance diversity. Also, the presence of older students highlights the importance of flexible learning options, a concept well-supported in LIS. Lastly, the integration of practical experience with academic learning in B.Tech programs aligns with LIS strategies to prepare students for professional success. By drawing on these findings, LIS programs can continue to evolve and adopt best practices that support diverse, inclusive, and practical education models. This comparative analysis shows the shared goals and strategies between B.Tech and LIS education, fostering a collaborative approach to improving educational outcomes across both fields.

Information Mapping Practices

Table 1 above depicts Mean and Standard Deviation (SD) of Respondents' Ratings on Information Mapping practices employed by the Information Scientist on online debate about Covid 19 vaccines. Six item statements were formulated to provide answer for research question one raised in this study.

Table 1: Information Mapping practices of Information Scientist concerning online debate on Covid 19 vaccine?

S/N	Item Statement on Information Mapping Practices	Response(x)	f	fx	Mean	SD	Remark
1	I regularly engage in analyzing online debates related to the Covid-19 vaccine.	SA = 5	124	372			
		A = 4	78	312			
		U = 3	88	440	3.88	0.85	Agreed
		SD = 2	0	0			
		D = 1	0	0			
2	I use visual tools, such as concept maps or mind maps, to represent the structure of discussions in online debates.	SA = 5	0	0			
		A = 4	130	520			
		U = 3	160	480	3.45	0.50	Agreed
		SD = 2	0	0			
		D = 1	0	0			
3	I just identify key themes and arguments in online debates and organize them into meaningful categories.	SA = 5	39	195			
		A = 4	127	508			
		U = 3	124	372	3.71	0.69	Agreed

		SD = 2	0	0			
		D = 1	0	0			
4	I integrate various data sources, such as social media posts and news articles, to create comprehensive views of online debates.	SA = 5	39	195			
		A = 4	172	688			
		U = 3	79	237	3.86	0.62	Agreed
		SD = 2	0	0			
		D = 1	0	0			
5	I employ sentiment analysis techniques to understand the emotional tone of online debates.	SA = 5	0	0			
		A = 4	206	824			
		U = 3	84	252	3.71	0.45	Agreed
		SD = 2	0	0			
		D = 1	0	0			
6	I utilize network analysis to identify influential contributors and connections in online debate networks.	SA = 5	0	0			
		A = 4	167	668			
		U = 3	123	369	3.58	0.50	Agreed
		SD = 2	0	0			
		D = 1	0	0			
	Weighted Mean				**3.70**		**Agreed**

KEY: SA = Strongly Agree, A = Agree, U =Undecided, SD =Strongly Disagree, SDev = Standard Deviation

All the practices identified in the item statements were unanimously agreed upon by the respondents because computed mean scores for each item statement is greater than the cut-off (3.00) of five-point Likert scale adopted in this study. On their regular engagement in analyzing online debates related to the Covid-19 vaccine respondents agree on mean score of 3.88. The result categorically shows that majority of respondents regularly engage in analyzing online debates about

Covid-19 vaccine. The relatively higher standard deviation suggests variability in the responses, indicating that while many agree, there is a noticeable number of respondents who are less engaged. In that regard, many studies reveal that information scientist are often involved in monitoring and analyzing online discourse to understand public opinion and information dissemination. Higgins, *et al*. (2020) shows that librarians actively monitor online discussions to provide accurate information and counteract misinformation, particularly during health crises. Case studies like that of Fischer, *et al.* (2019) on online health forums demonstrate how continuous engagement in these platforms helps in tracking the evolution of public discussions and misinformation.

Similarly, on using Visual tools to represent discussions with Mean: 3.45, Standard Deviation: 0.50. The score shows a positive response toward the use of visual tools like concept maps or mind maps. The low standard deviation signifies consistent agreement among respondents, implying a strong consensus on the usefulness of visual tools. This finding agrees with several studies reporting that visual tools are widely recognized in LIS for their ability to simplify complex information and enhance understanding. Novak and Cañas, (2006) discuss how concept mapping aids in knowledge visualization and the organization of information. Also, Yi, *et al.* (2019) identified the effectiveness of visual tools in enabling users to better interpret and interact with large datasets, suggesting a strong alignment with the practices identified in this study. Zickuhr, and Smith (2019) demonstrate how visualizations like concept maps help users grasp intricate data and relationships in information systems and that visual analytics in LIS improves user engagement and comprehension. Similarly, Zhao and Cen, (2019) found visual tools as facilitating better interaction with large datasets, reflecting the strong consensus on their utility among respondents.

In addition to visualizations, respondents also agree to employing sentiment analysis techniques to understand the emotional tone of online debates and identifying key themes and arguments in online debates and organizing them into meaningful categories with a mean sore of 3.71 and Standard Deviation 0.69. This indicates a strong agreement on the practice of identifying and categorizing key themes and arguments in online debates. The moderate standard deviation reflects a reasonable level of consistency in responses. Other studies show that thematic analysis is a common practice in LIS to structure and interpret vast amounts of information. Clarke and Braun (2019) discuss thematic analysis as a

method for identifying, analyzing, and reporting patterns within data, which aligns with the respondents' practices in this study. Also, studies on content analysis in LIS show similar trends as Krippendorff (2019) emphasizes the importance of systematically categorizing and analyzing content to extract meaningful pattern and information. these studies align with the respondents' practices in this study.

The data also shows that integration of various data sources, such as social media posts and news articles in creating comprehensive views of online debates had estimated mean value of 3.86 and Standard Deviation of 0.62 which revealed strong approval for integrating different data sources to create comprehensive views of online debates. The moderate standard deviation indicates general agreement with some variability in their responses. This also agrees with various studies emphasizing the importance of integrating multiple data sources to create comprehensive information landscapes. For instance, a study by Zhang, *et al.*, (2019) on digital library systems highlights how integrating diverse data sources, including social media and news articles, enriches the analysis and provides a holistic view of information.

Bawden and Robinson (2020) also discusses, the ability to process and analyze large datasets from various sources is increasingly crucial for information scientists to manage and interpret complex information environments effectively. In the same vein, Brophy, *et al.*, (2021) found that integrating social media, news articles, and other digital content enhances the analytical capacity of information systems. Big data and LIS practices converge in handling vast datasets as argued by Halevi and Moed, (2019) the ability to process and analyze large datasets from various sources is vital for effective information management and interpretation in modern information space.

On respondents' employment of sentiment analysis techniques for information mapping, the Mean score of 3.71 and Standard Deviation of 0.45 shows a positive reception to the use of sentiment analysis techniques to gauge the emotional tone of online debates. Moreover, the low standard deviation indicates a strong consensus among respondents. while utilizing Network Analysis with Mean 3.58 and Standard Deviation score of 0.50 indicates agreement on the usefulness of network analysis in identifying influential contributors and connections in online debate networks. The low standard deviation again suggests consistency in the respondents' views.

This reveals that sentiment analysis is increasingly used to understand user perceptions and emotions. The work of Pang and Lee (2020) on opinion mining and sentiment analysis buttresses the growing importance of these techniques in analyzing textual data from social media and other online platforms. In other studies LIS professionals are found to utilize sentiment analysis to gauge public sentiment on various issues, including health information. A study by Thelwall, *et al*. (2019) for instance, demonstrates the application of sentiment analysis in understanding public reactions to health-related news. Which echoes and further buttress the findings of the current study.

The overall weighted Mean of 3.70 indicates a strong general agreement among respondents on the information mapping practices listed. This suggests that these practices are widely accepted and used by information scientists in the context of analyzing online debates about the Covid-19. Therefore, the high mean scores across all items show that information scientists commonly agree on the importance of these information mapping practices. This could imply that these methods are considered effective and essential in handling and understanding online debates, particularly those about critical issues like the Covid-19 vaccine. Moreover, the standard deviations, while generally low, do show some variability, particularly in items related to analyzing debates (Item 1) and integrating data sources (Item 4). This variability might indicate differing levels of engagement or differing opinions on the effectiveness of these practices. The lower standard deviations in items related to visual tools (Item 2) and sentiment analysis (Item 5) suggest a strong consensus among respondents. This might reflect a shared understanding of the value of these tools in simplifying and clarifying complex information. The agreement on these practices shows areas where information scientists may benefit from further training or resources to enhance their skills in these techniques. It also suggests potential areas for standardizing practices across the field to ensure consistency and efficiency.

In conclusion, the data indicates that information scientists largely agree on the effectiveness and importance of various information mapping practices when analyzing online debates on the Covid-19 vaccine. The high mean scores and relatively low standard deviations suggest these practices are well-regarded and consistently applied, with some variability in specific areas reflecting differing levels of engagement or opinion. This analysis buttresses the critical role of

information mapping in understanding and interpreting online debates, particularly on significant public health issues.

Future studies could aim to address the variability in responses by identifying factors that influence the level of engagement and agreement on specific practices. Research could also focus on improving and optimizing these practices, ensuring they remain relevant and effective in the rapidly evolving landscape of online debates and information dissemination. These implications buttress the need for continued research and development in information mapping practices, with an emphasis on enhancing engagement, refining techniques, and integrating diverse data sources to improve the analysis of online debates and enhanced sense making.

Tools used by information scientist for Information Mapping of Online debate on Covid19 Vaccine.

The data presented in Table 2.0 expolre the tools utilized by Information Scientists for information mapping of online debates on the Covid-19 vaccine.

Table 2.0: Usage of specific tools for information mapping

S/N	Specific tools	No. of Respondents	Percentage (%)
1	Hadoop	51	17.6
2	Use of software for analyzing online mapping	56	19.3
3	Phone	31	10.7
4	Survey questionnaire	28	9.7
5	Database	47	16.2
6	Arcview	37	12.8
7	Not at all	40	13.8
	Total	**290**	**100.0**

In table 2.0 an open question was asked on the use of a specific tool or software for information mapping in analyzing online debates. 56 respondents (19.3%) indicating the highest rate of usage, shows that specialized software for online mapping is the most commonly used tool among respondents. This aligns with the positive reception of visual tools in the previous analysis (Table 4.1).

However, a smaller portion of respondents 31 (10.7) use phones for information mapping, possibly for quick access or communication purposes rather than detailed analysis. Similarly, 28 respondents (9.7%) use Survey Questionnaire. they are less commonly used, possibly only for gathering primary data or feedback from online debates, which might complement other analytical tools. The high usage rate of specialized visualization software for online mapping (19.3%) aligns with findings from Marín-Torres and Casanueva (2021). Their study on visualization tools in digital humanities research highlights the prevalent use of tools like Gephi and Tableau for mapping and visualizing complex discussions. This supports the data indicating a positive reception of visual tools, consistent with Table 4.1.

A smaller portion of respondents (10.7%) use mobile devices for information mapping, likely for quick access rather than detailed analysis. This is corroborated by Lau and Yuen (2019), who found that while smartphones are widely used in university contexts, they are not preferred for in-depth analytical tasks. This reflects the practical limitations of mobile devices in performing comprehensive information mapping. The usage of survey questionnaires by 9.7% of respondents suggests their role in gathering primary data or feedback. Edwards *et al.,* (2020) support this finding, noting that questionnaires are effective for initial data collection but less utilized for detailed analysis. This complements the primary analytical tools discussed, indicating the role of surveys in the broader data collection process.

Databases are also used by a significant number of respondents (16%), indicating their importance in structured data storage and retrieval. Kim and Lee, (2021) emphasize the critical role of databases in handling large volumes of data and supporting complex analytical tasks, which aligns with the findings presented. The moderate use of GIS tools like Arcview (12.8%) suggests their utility in spatial analysis of online debates. Faber and Glavina, (2020) discuss the applications of GIS in social sciences, emphasizing their value in mapping spatial relationships and patterns. This supports the reported usage rate and highlights the relevance of spatial analysis in understanding online debates.

The significant usage of Hadoop (17.6%) indicates its role in integrating various data sources for comprehensive views of online debates. Singh *et al*. (2021) highlights the importance of Hadoop in processing and analyzing large-scale data from online discussions. Their finding supports the practice of using big data

tools to handle complex datasets. A notable portion of respondents (13.8%) do not use any of the listed tools, suggesting either reliance on other tools not listed or a lack of engagement in these practices. Zhao and Zhu (2023) present a contradictory perspective, suggesting that high variability in tool usage might be due to factors like accessibility, training, and individual preferences. This variability reflects differing levels of engagement and approaches among information scientists, mirroring the variability observed in engagement levels with higher standard deviations in some practices.

Therefore, there is diverse range of tools used for information mapping practices by information scientist. The significant usage of tools like specialized software for online mapping, Hadoop, and databases aligns with practices of integrating various data sources, using visual tools, and conducting network and sentiment analysis. However, the variability in tool usage also reflects differing levels of engagement and approaches among respondents, suggesting a need for more accessible and standardized tools. This comprehensive view signifies the critical role of both specific tools and general practices in effectively mapping and interpreting online debates, supporting the high mean scores and agreement on regularly engaging in these activities as indicated in Table 2

Summary of research findings

1. The findings indicate that information scientists regularly engage in analyzing online debates on a variety of practices such as visual methods, sentiment analysis, thematic analysis, and integrating multiple data sources, with high mean scores across these practices.

2. There is diverse range of tools used for information mapping practices by information scientist. The significant usage of tools like specialized software for online mapping, Hadoop, and databases aligns with practices of integrating various data sources, using visual tools, and conducting network and sentiment analysis. However, the variability in tool usage also reflects differing levels of engagement and approaches among respondents, suggesting a need for more accessible and standardized tools.

CONCLUSION AND RECOMMENDATION

The dynamics of big data has never been so complex, emerging technologies are buttressing this with each emerging capability harnessed by aiding access, filling

sense making gaps, and consequently increasing the volume of data and its dynamics in the cyberspace. These dynamics have come to stay and as such calls for a paradigm shift in sense making efforts. Apparently, Information scientist are the frontline gate keepers and must adapt to this daring reality by adopting the following recommendations:

1. Academic institutions/LIS schools and organisations should develop standardized guidelines and training for information scientists on diverse information mapping techniques to ensure consistent and effective sense making of online debate. This however include review of curriculum of LIS schools as well as organisational work roles.
2. To address the observed finding of variability in tool usage and the need for more accessible and standardized tools, it is recommended to develop a unified framework for information mapping tools. This framework should aim to integrate the strengths of various tools that handle the dynamics of big data, while addressing the inconsistencies and accessibility challenges noted among different user groups.

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