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Beyond Information Organization and Evaluation: How Can Information Scientists Contribute to Independent Thinking?

Abstract: The current coronavirus disease 2019 (COVID-19) pandemic is making fundamental changes to our life, our society, and our thinking. The substantial influx of information on disease updates, case analysis, suggestions, and recordings leads one to contemplate what information professionals and information scientists can contribute to shorten the pandemic, improve human lives, and build a more impactful profession. This viewpoint examines concepts related to misinformation and discusses the responsibilities of information scientists, especially in the context of independent thinking. It suggests that research on and education in information science could help to develop independent thinking and train independent thinkers.

Keywords: COVID-19, misinformation, information research, information science education

1 The Pandemic and Information-Related Problems

On April 24, 2020, I was watching a local report while the news anchors were discussing how local businesses, such as restaurants and salons, could recover after the coronavirus disease 2019 (COVID-19) pandemic. The online media reported that the number of cases with positive test results is increasing. On social media, such as Facebook, people have been sharing their feelings and their live experiences while they are staying at home. It seems there is a consensus that this pandemic will fundamentally change many people’s lives, economics, ways of thinking, and our relationship with the environment. So far, there have been 4,664,486 confirmed cases, and global deaths have reached 312,327 (as of May 17, 2020. Source: https://coronavirus.jhu.edu/map.html). There are people who have lost their loved ones or their jobs and, in some cases, both. We all now have been feeling the pains, sorrows, frustrations, and devastations. These thoughts and feelings about the pandemic make me, as an information scientist, to think about the relationship between the pandemic and information, especially some of the information-related problems in the context of the pandemic.

Among the many definitions of information, I consider information as what is conveyed or expressed by numbers, texts, images, or other media. Information is no doubt important to people’s daily life. As information professionals, we are committed to the collection, organization, management, and evaluation of information, as well as the provision of assistance for accessing information to information users who may be students, professionals, or the general public. In recent years, we have witnessed impressive advances in computing technologies, especially in the growth of big data and data science, which helps information professionals to perform the aforementioned tasks.

I consider myself an information scientist who is dedicated to the conduct of research and education in Information Science, a multidisciplinary field that draws theories, principles, and methodologies from other disciplines, such as mathematics, computer science, sociology, and the humanities.

As information professionals and information scientists, we have discussed for several decades, especially after the creation of the Internet, the concept of information explosion. While claiming the arrival of the digital age, we have mainly worried about how individuals and organizations are able to handle too much information. As too much information usually creates
challenges for people to read and digest, information professionals are called on to help in the organization and evaluation of information.

We, as information professionals, are good at organizing information, using thesauri, ontologies, and classification schemas. And we are also proficient at using computer technologies, such as full-text retrieval systems, databases, data mining, and machine learning, currently, to store, classify, understand, and provide access to information.

There has been extensive research on evaluating information, i.e., determining the quality of information, based on different views and measures (Lee et al., 2002; Smith, 2017). In practice, we mainly check the source, the content, and the citations of an informational object to evaluate its accuracy and reliability.

In general, we are good at organizing information and evaluating information. Or, at least, we consider these to be the major parts of our jobs, and we are continuing to explore effective ways to improve information organization and evaluation.

However, we have often found that we actually do not have enough information to satisfy user needs. In particular, just presenting users with a source of organized information might not help them to make a specific decision in their life. For example, in early March 2020, Americans did not think that wearing facemasks was necessary to combat the coronavirus. As the COVID-19 pandemic spread further, people have started to realize that the coronavirus is a new type of virus about which we do not have much knowledge. Below is a statement from Bloomberg Opinion (https://www.bloomberg.com/opinion) dated April 18, 2020:

The one constant of the Covid-19 pandemic has been its ability to surprise all of us — including the experts — at every turn. The more information we gather, the more we discover about the virus, and the more we realize we still have much to learn.

It occurred to me that we are in a time of history facing all kinds of information-related challenges or problems: misinformation, disinformation, duplicate information, and, simultaneously and surprisingly, a lack of information. Under such situations, how do we expect information users to react or to deal with the information? Especially, when a pandemic happens, what can we, as information scientists, do to help?

Information is related to nearly everything in modern society. The COVID-19 pandemic is considered an information crisis (Xie et al., 2020) because it reflects all kinds of information problems, such as information transparency problems, false information problems, and lack of information problems. The ways in which different types of information are developed and disseminated significantly affect the effective control of the spread of the virus, as well as people’s behavior. Moreover, the pandemic has brought a number of serious challenges to information science research and education. Xie et al. (2020) specified these challenges and the roles that we as information professionals could play and how.

I was curious about the thoughts of our doctoral students, who are the next generation of information scientists, so I asked them this question: “What can information scientists do to help individuals and societies as a whole to survive global health crises like COVID-19?” When asking a group of Information Science doctoral students in an information issue seminar class at the University of North Texas, I encouraged students to provide their perspectives based on (i) their background and experiences and (ii) what they have understood of the field of Information Science. In other words, I wanted them to think independently about the roles of information scientists in a global crisis. In Section 2, I would like to summarize the important concepts and viewpoints repeatedly mentioned by my students.

2 Students’ Perspectives on What Information Scientists can do to Help Individuals and Societies as a Whole to Survive Global Health Crises Such as COVID-19

About 14 students responded to the question. Students were provided with the research paper by Xie et al. (2020) as reading material, which served as a background reading for their assignment. However, they were encouraged to think beyond that paper. The interesting concepts and associated tasks for information scientists or information professionals, as gleaned from the students’ responses, are listed as follows.

2.1 Misinformation or Fake News

The term misinformation was mentioned by most of the students. Misinformation refers to information that is not truthful or not based on facts, but which was expressed or shared as factual. A student emphasized that all types of units, namely, individuals, governments, and groups, can provide biased information. Students were especially
concerned about social media, such as Facebook, Twitter, WhatsApp, and WeChat, which are widely used but contain misleading or confusing information. Not surprisingly, students suggested that the best way to fight against misinformation is to be cautious regarding where it came from. Fighting against misinformation and disinformation is considered a key responsibility of information scientists. We should help with the continued study and investigation of misinformation and disinformation, as well as develop useful methods for their identification, in order to stop the spread of harmful misinformation. One such study was conducted by Sullivan (2019), and it provided suggestions for librarians and information professionals to combat misinformation.

2.2 Collaboration

Collaboration is considered important for an information scientist to fight against misinformation. Students realized that information scientists might not have the domain-specific knowledge that is necessary to fight against misinformation. For example, medical knowledge may be needed to judge virus- or medicine-related information, or a media background might be needed to limit the spread of misinformation; therefore, it would be more effective to work with public health professionals to disseminate accurate health information, especially to disadvantaged communities. The importance of collaboration across disciplines to examine problems that blur disciplinary boundaries cannot be emphasized more. Under the current COVID-19 circumstances, information scientists, in collaboration with research institutions, such as the Centers for Disease Control and Prevention (CDC), can use big data to better understand the mechanisms and effects of newly developed drugs through big data analytics (Hong et al., 2018).

Other fields mentioned by students that information scientists should collaborate with included linguistics and psychology. Linguists can work with information scientists on several tasks, such as how to digitally archive COVID-19 information on social media platforms and how to help information and resources reach vulnerable populations. Collaborating with professionals in the field of psychology will help to better understand how and why people react in certain ways during global health crises in the future.

2.3 Information Behavior

Research on information behavior during crises could help information professionals to better assist information users. Students noticed that at the beginning of a global crisis, people seek as much information as they can. However, as time goes on, people start to become tired of information. They face severe information overload. Duplicate information also increases people’s cognitive load. Important information might be missed when people stop reading information. Research on information behavior helps to develop solutions to information issues that arise from extraordinary circumstances such as quarantines.

2.4 Digital Archiving

Digital archiving is of particular importance, as stated by Xie et al. (2020), because creating archives for such a special time period will allow comparative analyses later by other fields. How to create archives is, of course, an issue that information scientists should address. The questions include what needs to be archived and how to sustain digital archives. Students mentioned that oral histories might be considered a means to add context to traditional archival records.

2.5 Information and Data Literacy

One student provided the American Library Association (ALA)’s definition of information literacy, which refers to the ability of an individual to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ALA, 1989). Students suggested that promoting information literacy to information users and the general public is among the responsibilities of information professionals. Information literacy promotes the critical evaluation of sources and information, which is especially vital during health crises. Data literacy, on the other hand, can be defined as “the ability to process, sort, and filter vast quantities of information, which requires knowing how to search, how to filter and process, to produce and synthesize it” (Koltay, 2016). Similar to information literacy, being able to accurately interpret data during global health crises is of great importance because the general public is being presented with a high quantity of raw data and numbers daily. Misinterpretation of the data can lead to widespread misinformation.
Students shared the same idea, i.e., that improving information literacy education of the public is of great importance in reducing the negative impact of misinformation and disinformation. We especially need to teach the younger generations how to research information. More research needs to be conducted to improve the ways of aiding the public in becoming more information and data literate.

Information scientists, who are mostly also information science educators, have the responsibility to educate information professionals, who can thereafter convey their knowledge and skill on information literacy and data literacy to information users and the general public.

### 2.6 Vulnerable Populations

Several students raised the issue of information access for vulnerable populations. Vulnerable populations are the least quipped and most in need of information resources. Not only older adults, but also children, might be vulnerable. Information scientists may explore how to train older adults to use digital technology, e.g., connecting non-tech-savvy older adults with tech-savvy ones, in order to increase not only their social participation but also their access to information about the health crisis. Regarding helping children to access and understand quality information, scholars in Information Science should develop an appropriate curriculum to train school librarians, who can then work with teachers and parents to provide the appropriate information resources for children to access, as well as teach children to verify the information available on the Internet and the social media.

In summary, the doctoral students believed that information scientists could play important roles at the time of an information crisis in areas such as fighting against misinformation and fake news, improving information and data literacy of the general public (including certain vulnerable populations), exploring and understanding the information behavior of users, collaborating with scientists in other disciplines to gain more useful knowledge, and archiving the important events and movements that happened during the crisis. Most students proposed ideas based on their work experiences and/or specialties.

### 3 Types of Information in an Information Crisis

The concepts discussed and the tasks suggested by students make me think about the different types of information in an information crisis, as well as the appropriate strategies to obtain/avoid/remove it. While staying home and eagerly waiting for this COVID-19 pandemic to end, I have been bombarded, similar to many other professors, with university messages, government reports, and messages from academic associations. These messages contain trustworthy information because they are from authoritative organizations or units. However, there is a lot of duplicate information, especially in the updates from my university. Items are repeated again and again, such as research updates, online teaching, and health-care policies. The information on these items may not be new. It would be helpful to look at the different types of information that we have to handle daily during COVID-19 and other information crisis situations. Table 1 is an incomplete list of the types of information I think are important to understand.

We may want to describe an information crisis using the concepts presented in Table 1. An information crisis happens when we do not have enough information to take actions to, avoid, or get out of the crisis. In other words, in an information crisis, we are in a state where we need sufficient information, which is accurate or new information, to overcome the crisis. A crisis can be characterized by misinformation, repetitive information, and lack of information.

Given an object, an event, or a situation, our goal is to obtain accurate and sufficient information — information that is true and helpful enough for people to understand the object/event/situation and take appropriate actions. However, it cannot always be achieved. In the critical situation where we need information but do not have the correct information, misinformation and disinformation are more likely to prevail.

Scientific research aims to obtain new information, accurate information, and sufficient information so that an information crisis could be overcome. In the meantime, information scientists need to fight, together with other professionals, with misinformation and disinformation.
How Can Information Scientists Contribute to Independent Thinking?

The results from students’ discussion and my own understanding of the types of information in an information crisis lead me to think that we, as information scientists, could do more than just information organization and information evaluation. In an information crisis, there might not be even one correct answer. Or one cannot rely on others to provide a correct answer – even the expert may not have the right solution in the beginning, or the government may not be able to provide appropriate suggestions for handling a crisis. In addition to providing accurate information we have at present, we should instruct and train our students and inform our users that everyone needs to think independently. Independent thinking is much needed for individuals in a society to survive a pandemic or a crisis. Then, how can we – as information scientists – contribute to independent thinking?

Independent thinking, simply put, is to think on your own or make a judgment not affected by the thoughts of others. A related concept is critical thinking, which focuses more on the process used to deal with information (https://philosophy.hku.hk/think/critical/ct.php). Independent thinking comes from critical thinking, which involves carefully evaluating information and making a correct judgment. However, independent thinking is more than critical thinking because it focuses on the courage to dare to have different thoughts from others.

Both critical thinking and independent thinking are desired features of a modern citizen. I consider independent thinking more important because it is the necessary characteristic of innovators who are most able to develop solutions in an information crisis. Furthermore, independent thinking is the important characteristic of a leader who can help the community or the society to confront challenges during a crisis.

In an information crisis, we need critical thinkers who can think clearly and rationally about what to do or what to believe (https://philosophy.hku.hk/think/critical/ct.php). But we also urgently need independent thinkers, who do not just follow others – regardless of whether they are governments, authorities, or their bosses – but who realize that others may not have correct or sufficient information to make wise decisions. The COVID-19 pandemic clearly demonstrates that because the virus is so new and researchers know so little about it, there is limited advice that governments can give to their citizens, especially in the beginning of the pandemic. Misinformation may be caused partly by lack of information.

So how can information scientists contribute to independent thinking?

First, we need to be independent thinkers ourselves. Thinking independently can help us to retain a clear mind regarding what has happened and practice our knowledge and skills to process information. Even though we may make mistakes, we can learn from the mistakes to improve our thinking. The Internet provides some pathways through which one can become an independent thinker, such as to read extensively, question everything, interact with people who are open minded, and do our research (https://thoughtcatalog.com/blythe-baines/2015/07/8-smart-ways-to-become-an-independent-thinker/). But I think the most important element is our attitude – the attitude of following the truth instead of following others.
Table 1, for instance, represents the author’s thinking of the types of information triggered by the current pandemic.

Second, we need to cultivate and promote independent thinking of our students. Our students are future information professionals who will help their users or customers to access and use information. Have we taught our students how to evaluate information? How should they put information in context and be always cautious of any conclusions drawn from current information sources? In our courses, we may need to award students who propose different solutions not found in the textbooks and who argue with us on what we are teaching. Or we can design assignments that motivate students to develop unique solutions. The presentation of the students’ perspectives, earlier in this paper, on the question related to global health crises is a sample assignment that can motivate students to think independently.

One of my students mentioned that a popular method to teach students how to evaluate online resources is the CRAAP test. Developed by the University of California, Chico, CRAAP is an acronym for currency, relevancy, authority, accuracy, and purpose. The goal of this test is to teach students how to evaluate online resources critically while being guided by a set of questions (Smith, 2017). I agree with her that this method is easily accessible and simple to follow. It can be introduced to students first. Then, the students can apply the CRAAP test and, through them, we can teach it to the general public so that our information users are mindful and critical of the resources they are using.

Third, we need to have an open mind and communicate with others to understand different perspectives and to present our independent thinking. On one hand, different perspectives may help us to widen our knowledge and improve our logical reasoning capabilities. An independent thinker may make mistakes. Thinking and learning should go hand in hand. We are frequently adjusting or correcting our thinking based on new information that we learn from others. On the other hand, conveying one’s independent thinking to others with confidence and sound reasoning could facilitate other people to think independently. The communication and interaction among independent thinkers will help those involved to identify facts ignored or biases existed, thus increases the possibility of discovering the truth and developing the solutions. If a society is comprised of more independent thinkers, it could be not only healthier, but also more innovative to overcome information crises.

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