THE COVID PANDEMIC AS CRISIS AND CATALYST: FUTURE ROLES, SKILLS AND TASKS OF INFORMATION PROFESSIONALS

Thomas Mandl[1]

Introduction

Challenges resulting from the COVID pandemic

The COVID pandemic has led to a dramatic crisis for many sectors of society. In addition to the threat to the health and the well-being of all, there are also many other consequences. Lockdowns and limitations of social contact have been the most visible and notable effect. Restrictions of personal meetings were the most serious limitation for libraries and other information centers. There was a need for unseen physical restrictions. Academic libraries were also affected by the extension of online teaching in higher education. The increase of online classes resulted in a need for the dissemination of digital material.

It is difficult to find another crisis which brought such dramatic changes for library routine work in such a short time. The necessity to rapidly adapt to the situation and create new ways to serve clients comes at a time of change and development in libraries.

Furthermore, the pandemic has led to a change of information behaviour and of the information demand of citizens. People permanently required information regarding new restrictions and changing rules. They were frightened about health and vaccine issues and showed great interest in much more information. These changing patterns were visible not only in social network platforms but also amongst information professionals. Unfortunately, the crisis has also led to a rise of false and biased information. An enormous demand for high-quality information has become obvious.

Many libraries are re-thinking their traditional role. They consider themselves much less an institution for keeping and indexing material but rather, strive for becoming service centers for supporting information work. The changing attitude toward users and the trend of digitalization in the entire society are the main drivers of this potential ongoing shift in the field. Many of the new considerations follow the trend and lines of the demands during the COVID crisis. Many library and information (LIS) professionals perceive that the crisis is accelerating several of these existing trends.

This paper summarizes several scientific lines of development, which appear to be related to these trends. First, the concrete effects of the crisis on libraries are revised. Then a section sheds light on the demands of citizens during the crisis. The selection of information products and documents are of special interest leading to quality issues of information products and content. They are a major concern during the crisis, something which has led to a surge of misinformation. Information professionals are skilled in selecting authoritative information. However, they need to

1   *University of Hildesheim, mandl@uni-hildesheim.de, Universitätsplatz 1, 31141 Hildesheim, Germany*

be aware of the new developments in automatic quality assessment in order to use tools adequately and integrate them into their processes. The following section deals with information literacy. The concept needs to be reframed under these new conditions. Advanced tools for information centers are needed so that the challenges of information overload and widespread misinformation can be properly dealt with. These include artificial intelligence tools e.g. for content rating and recommendation. A further section summarizes consequences for LIS degree programs and briefly revisits recent innovation in the education domain.

Immediate effects of the COVID crisis

The lockdowns have led to the closing of libraries as physical spaces in many places. This was the most immediate effect of the crisis on libraries and on other information services. Needless to say, this inability to offer physical services led to a push of digital services. This chapter briefly shows some exemplary research which discusses consequences of the COVID crisis. An overview for the EU is provided by Sobral et al. (2021).

National lockdowns forced libraries to close. Many public libraries have reacted by flexibility. For Italy, agility and an expansion of existing digital strategies has been observed (Mercurio 2020). Another analysis for Italy shows how they focused on how to support information supply on COVID-19 considering these circumstances (Ponzani & Maiello 2020).

Libraries had to adapt and several case studies document some efforts, e.g. one for a library in the US (Mehta & Wang 2020). During the COVID crisis, access to digital resources, issues related to online education and digital literacy of clients have been a focus for libraries (Martzoukou 2021). Bangani has analyzed the role of library professionals for fighting misinformation around COVID (Bangani 2021). For the example of South Africa, the author shows how academic libraries contribute to the dissemination of quality information and shows the resources they use. For the case of India, Chakraborty and colleagues also explored the role of libraries. They analyzed the material on COVID published by libraries on their websites and found that they emphasize the reliability of information (Chakraborty et al. 2020).

Academic libraries are confronted with the amount of digital teaching at their institutions. Most universities have switched to some online teaching mode (Czerniewicz et al. 2019) and the involvement of libraries varies greatly. The role of the teaching personnel has been researched in several studies and their perception of the online education has been assessed. For one university in the USA, the perceived stress of faculty was emphasized (Chierichetti & Backer 2021). Work pressure and concerns regarding the own well-being dominated. Online teaching in general was perceived positively, but strong worries remained as far as testing and engagement of students. Faculty used opportunities offered for training for using digital tools (Chierichetti & Backer 2021).

The perception by students has also been analyzed. Most students seem to prefer face-to-face teaching and their performance and satisfaction depends much on their self-efficacy and motivation. Their ease of use of the technology also plays a relevant role (Aguilera-Hermida 2020). However, the satisfaction with online classes is not below that of regular classes, as Baber showed in a comparison study between India and South-Korea during the first year of the crisis (Baber 2020).

Online working and digital learning are core activities of higher education institutions which libraries need to support. Lectures are frequently video recorded and are delivered by

learning management systems to students for asynchronous learning. In the study about a particular American university, the authors found that over 90% of the teachers used online video conferences and over 70% video tutorials (Chierichetti & Backer 2021). These recordings are educational resources and pose several challenges for information dissemination. On the one hand, recordings need to be created first. In particular, teaching staff who had little exposure to the use of videos (or other electronic teaching assets) needs support for creating adequate material and managing access to them. In a case study for the University of Barcelona, the difficulties for faculty were carefully analyzed. Questions from faculty members which reached an expert offering his advice to teaching staff, formed a pool of issues. Some of the teaching staff members were also interviewed (Boté-Vericad 2021). It was obvious that many technical, didactic and practical questions were limiting the production. These issues were mostly not perceived as separate problems but mixed ones. Any technological support and any recommendation for tools need to be accompanied by methodological and pedagogical advice (Boté-Vericad 2021).

On the other hand, the recordings are records or documents which should be stored and made accessible. They could be combined with other electronic resources. However, common practice seems to be that they are not typically available outside the learning management systems. The involvement of information specialists seems to be limited. Few systems allow secure citations of even parts of a video. An exception is the AV portal of the TIB (https://av.tib.eu).

Currently, portals for open educational resources (OER) are created and many commercial systems for courses are available (e.g. Udemy, Coursera). Nevertheless, it remains difficult for students to find adequate courses and more support is necessary (Anderson & Leachman 2019, McGowan 2019).

Overall, the services discussed above seem to find little use in common teaching practices at universities. Especially, OER represent a great resource for many students and teachers; therefore, they could be exploited for improving education (Abeywardena et al. 2021).

Currently, the limitations and barriers for acceptance need to be explored in more detail. One effort within the EU is the project Digital Education for Crisis Situations (DECriS, https://decris.ffos.hr).

Information demand during the COVID crisis

Disasters and crises always change human information behavior, no matter whether they are natural or human made. The information consumption due to needs of people is growing. In our times, especially digital information is of great importance when seeking relevant information during a crisis. Questions in connection with the provision of information during the COVID-19 pandemic are of genuinely interdisciplinary nature. Numerous disciplines are necessary to approach them. In addition to LIS, this includes, for example, linguistics, media studies, public health, but also technical disciplines such as data science. The response of libraries in particular in providing genuine information has been noted above (see also Martzoukou 2021, Bangani 2021).

In Italy, the scientists Rovetta and Bhagavathula (2020) analyzed the search query behavior with Google Trends in regard to the so-called infodemics. As a result, four infodemic attitude groups were built. The most frequent searches in the query logs were related to disinfectants, face masks, health news and COVID-19 symptoms. There were regional variations regarding search term use and the spread of misinformation according to Rovetta and Bhagavathula (2020).

A study on information behavior in Germany was able to demonstrate the general increase in media use during the pandemic (Dreisiebner et al. 2021). The data collected from April 2020 to May 2020 in an online survey and during interviews focused on the selection of information sources and the criteria both during the pandemic and before. The results also show a change in the consumption of information in terms of quantity and quality of the participants respectively. It was found that traditional media plays an important role, but that most users had already came into contact with incorrect information on different channels. Many public and official information providers are represented on social media, and are there next to content which has been generated by users (Dreisiebner et al. 2021).

The most widely used media are public television, and both international and local printed and online newspapers. The most remarkable change in the level of use in pre-crisis times was seen in the increased use of information pages by public organizations. Many participants were regularly confronted with false news and reacted differently to them. Several of the interviewees stated that they became more aware of the issues of false information during the COVID-19 crisis. The majority of the participants was satisfied with the information received during the crisis.

Although the satisfaction with the information supply was high during the crisis and a shift in the usage intervals from irregular to regular was evident, participants in the study also reported a feeling of information overload. This resulted in reduced media usage (Dreisiebner et al. 2021).

Quality of Information and its Assessment

The creation of misinformation and its diffusion are serious problems for society and especially during crises. There are many different forms of problematic forms of information (Bawden & Robinson 2009) and it is often distributed due to economic interests. In particular during a health crisis, which requires appropriate behavior of the citizens, it is crucial that correct information is spread not to delay reactions. The Corona crisis has seen much misinformation and the challenge and efforts to fight it.

Accepting social media as a preferred source for COVID-19 information, people are more likely to believe in conspiracy theories. In believing these conspiracy theories, individuals tend to adhere less to COVID-19 specific health-protective behaviors (Allington et al. 2020). On the contrary, a study conducted in China found a positive relationship between the consumption of digital media such as social media, mobile social networking apps, online news media, and social live streaming with preventive behavior such as washing hands. Digital media was used to educate citizens about preventive behavior to control the situation (Li 2020).

However, the quality of information products available should be considered from a broader perspective and should also include recent technological solutions. Many definitions for the quality of information products have been discussed in the literature. The user interface and the content are inseparable on the Web and as a consequence, their evaluation cannot always be separated easily. As a consequence, content and interface are usually considered to form two aspects of quality and they are jointly assessed for Web pages. A helpful meta model for quality definitions is provided by Huang et al. (1999) and is shown in the table below.

Research has also focused on the automatic quality assessment. Most authors agree that an objective notion of quality cannot be found. Nevertheless, quality can be treated as independent of relevance. Relevance describes the situational value of e.g. a result in a search setting. Quality describes aspects to products independent of any current information need.

Table 1. Categories of information quality (IQ) (Huang et al. 1999)

IQ Category	IQ Dimensions
Intrinsic IQ	Accuracy, objectivity, believability, reputation
Contextual IQ	Relevancy, value-added, timeliness, completeness, amount of information
Representational IQ	Interpretability, ease of understanding, concise representation, consistent representation
Accessibility IQ	Access, security

Link analysis is the approach most frequently discussed for automatic quality assessment in information retrieval (Mandl & Womser-Hacker 2015). Link analysis applies well-known measures from bibliometrics to the Web. The number of references to a scientific paper has been used as an indicator for its quality. For the Web, the number of links to a Web page has been exploited as the main indicator for the quality of that particular page.

Many lists of criteria for the quality of Web pages have been developed from the perspective of library and information science. They contain criteria at the meta data level and high-level definitions of quality. These criteria are typically also used in information literacy education. They are not always available for automatic assessment. These lists were intended to support the user during quality decision processes (e.g. Becks 1997). From the standpoint of automatic quality assessment, however, these lists are of little help. Their criteria are often vague and it is often not clear whether a rule indicates high or low quality.

Design aspects have also been brought into the automatic assessment of quality. In an interesting study, six features of Web pages were manually derived and compared to usage data. The initial hypotheses was, that pages which follow popular Web design guidelines might attract more viewers than other pages. The judges looked for the dominant color, the presence of advertisement, logos, animations and frames and the frequency of links and graphics. Some of the features were better predictors for the high usage of the pages than others (Chakrabarti et al. 2002). These results indicate that atomic features which can be extracted automatically may be useful for the quality assessment.

Machine learning approaches are identified as the most promising methods to determine the quality of Web pages. Features for the most appropriate characterization of e.g. Web pages need to be found for such models. In a study, Mandl developed an experimental quality-oriented search engine comprising a holistic definition of quality including content as well as design features (Mandl 2006). This quality model was developed based on human judgments about quality taken from a large link collection (clearing house, web catalogue). The model was integrated into a meta search engine which assesses the quality of all results at run time. Evaluation results showed that quality-based rankings lead to better results concerning the perceived quality of Web pages presented in the result set (Mandl 2006).

Recent research is focusing on text features to model quality aspects of content. Especially deep learning has been applied for the realization of this task. Based on text messages, aggressive messages in social networks have been identified. Due to the large amount of online hate, it is not possible to solely manually monitor message streams for illegal or inappropriate content. Rule based systems and simple lexical applications which check for suspicious keywords are not able to solve this task, due to the complexity of language. In order to train machine learning systems

for this task, benchmarks of data need to be provided (Modha et al. 2020). Based on that, systems learn from examples. The same is done for the truthfulness of messages. Collections of claims or news reports which are either right or wrong are also assembled into benchmark collections (Nakov et al. 2021). Systems are then trained to identify fake news based on examples applying advanced machine learning methods like deep learning (Modha et al. 2021).

Information literacy in the light of new developments

The concept of information literacy refers to a "set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" (ACRL 2016). There is no definition that is commonly agreed upon and a study has shown that experts in the field support different conceptualizations of information literacy (Griesbaum et al. 2021).

Various studies have identified fundamental deficits in IL skills of students and called for intensified Information literacy training. The training of clients has been a traditional task of libraries. Student often have a different perception about information literacy than academics. In particular they do not consider all part of typical information literacy education as relevant for themselves. (Kuttkat et al. 2021). The trainings are often moving online and need to be adopted to specific target groups regarding content as well as delivery format.

Obviously, LIS professionals need excellent information literacy skills and should have further skills. LIS professionals as experts needs to understand and shape the digital environment for the users. They should understand advanced interfaces for digital libraries (e.g. Heinz et al. 2003). They should have control of modern AI tools like recommenders or systems which lead to a personalized experience with search services (e.g. Mandl & Womser-Hacker 2004).

The section above showed the potential of rating tools which deliver automatic quality ratings of content. The amount of information is growing. Meanwhile, computers can generate texts themselves (Gatt & Krahmer 2018) and it becomes harder and harder to distinguish human and computer written texts. For example, online reviews or posts on social media platforms might not all be genuine. Users will need more orientation and tools to find reliable reviews.

Rating tools will become integral part of information services in the coming decades. Users develop their mental models of artificial intelligence tools which might not always be correct. Professionals need to be able to understand AI and machine learning, explain decisions and educate about their use. Machine learning is a technology based on approximation and a small amount of errors is typical. The tools might not include all features that a user considers relevant and expects to be included for decision making. Often machine learning tools reinforces biases e.g. for popular content. All of this can lead to issues in acceptance and adoption.

In addition, these tools have effects on the perception of users that are not expected. LIS professionals should be prepared for them and able to find solutions. For example, a study showed the so-called Implied Truth Effect. When warnings were given for a subset of fake news headlines and others were left unchecked, this increased the perceived truth of headlines without warnings. Although the warnings were shown to be effective, they stimulate trust for un-labelled items which is misleading and potentially dangerous (Pennycook et al. 2020).

Consequences for LIS education

Information services and organizations are undergoing changes as societies are developing into information societies. The global crisis caused by COVID has accelerated several developments. Both companies and people's private life rely more and more on digitally available information. A trend in society which has been driven by technology. As shown above, the access to the growing amount of knowledge requires additional skills for LIS professionals. They are confronted with many challenges related to the growth of knowledge. Only a few of them can be mentioned here (see also Krtalić & Mandl 2019).

- Diversity of sources: data gains importance compared to other digital sources and especially compared to physical collections. The diversity includes several other aspects which information professionals need to consider: among them are languages, quality and formats.

- Specialization of domains: information management requires special domain knowledge including for information professionals. The continuing specialization of science poses new challenges for LIS education (e.g. Robati & Yusuf, 2016).

- Diversity of consumers of information: the internationalization of science and the business world requires more international thinking when providing access to information. The demand to serve academically and socially heterogeneous groups is permanently increasing.

- Technology-supported learning is a trend in society. There is large potential for offering meaningful online digital learning experiences, which can be more socially inclusive, more individualized, more flexible and more specialized. The information manager has a dual role when it comes to e-learning. Professionals should be able to learn about new developments and access to content for other learners should be made available.

The above should lead to the question on how the LIS community is reacting to these great changes. How are they reflected in the curricula of schools? There are many current virulent trends, which can be observed in LIS education as the result of the developments sketched above. The future of LIS education and current trends have frequently been discussed. Most authors favor the role of IT and digital aspects in LIS degrees.

Education on technologies requires the active application of systems by students and as such, goes side by side with the discussion of the more active role presented above. Within LIS programs, the need to include more ICT skills has been discussed intensively. Many have argued for integrating more technological skills (e.g. Mole et al., 2016). The need to integrate more ICT has also been noted during the specific situation in India (Ramasamy, 2017) and South Africa Raju (2013).

Data Curation is certainly another growing area in the LIS profession. Data curation supports the entire life cycle of research. Research information systems and research infrastructures have been developed and can strengthen the productivity of researchers. They provide data as well as adequate tools for processing it. For this task, librarians need to focus additionally on data in various forms. There is a growing demand for re-use of data and for scientific communication beyond texts. Apart from the research context, data curation and digital curation are in general of core value to all areas of information institutions, allowing for long-term access and use of digital content (Corrado & Moulaison Sandy, 2017). New terms for professionals managing these issues have been developed, e.g. Data Librarian, Data Services Specialist, and E-Science Librarian.

It is nevertheless crucial to maintain the core of the discipline, and adhere to the traditional competences of LIS professionals. These need to be brought to the next generations. The LIS profession needs to embrace the digital world but it should not transform into a pure IT domain.

Audunson has made a strong case for the need for multi-disciplinarity in LIS education as professionals need to enable access to knowledge in many disciplines (Audunson, 2018). Ramasamy has noted the relevance of a global view for LIS education in India (Ramasamy, 2017).

LIS education needs to attract students from different domains and needs to enable a smooth entry into LIS topics. These students can bring in additional perspectives and can become information professionals for the domain that they had previously studied. Recent studies show that this is difficult even within the European Higher Education Area (EHEA) and the issue has been addressed with an intensive teaching event (Bosančić et al. 2017).

Conclusions

The COVID crisis has led to an increased pressure toward digital solutions. Remote clients and students have demanded guidance, services and information. Libraries have often needed to improvise and have often been successful. In the future, citizens will continue to ask for such services and the expectations for professional services will continue to grow.

Even if some AI tools may seem out of scope for libraries today, they will continue to shape the next generation of information services. Libraries will need to embrace such technology and make good use of it. Professionals who were trained recently will still need to continuously update their skills in order to meet the requirements of future complex digital environments for information services. Education will have to stay tuned in order to catch up with many developments. Still, the core of the profession needs to be safeguarded and information professionals need to be aware of their competitive advantage.

References

1. Abeywardena, I. S., Dhanarajan, G., & Chan, C. S. (2012). Searching and locating OER: Barriers to the wider adoption of OER for teaching in Asia. In *Proceedings from the Regional Symposium on Open Educational Resources: An Asian perspective on policy and practices.* pp. 19-21.
2. Anderson, T., & Leachman, C. (2019). Strategies for supporting OER adoption through faculty and instructor use of a federated search tool. *Journal of Librarianship and Scholarly Communication*, 7(1). https://doi.org/10.7710/2162-3309.2279
3. ACRL (2016). *Framework for Information Literacy for Higher Education*. Association of College and Research Libraries, Chicago. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/framework.pdf
4. Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, 100011. https://doi.org/10.1016/j.ijedro.2020.100011
5. Allington, D., Duffy, B., Wessely, S., Dhavan, N., & Rubin, J. (2020). Health-protective behaviour, social media usage, and conspiracy belief during the COVID-19 public health emergency. *Psychological Medicine*, 6. https://doi.org/10.1017/S003329172000224X
6. Almusharraf, N., & Khahro, S. (2020). Students satisfaction with online learning experiences during the COVID-19 pandemic. *International Journal of Emerging Technologies in Learning (IJET)*, 15(21), 246-267. https://www.learntechlib.org/p/218355/

7.   Asif, M., & Singh, K. K. (2020). Trends, opportunities and scope of libraries during Covid-19 pandemic. *IP Indian Journal of Library Science and Information Technology* 5(1) 24-27. https://doi.org/10.18231/j.ijlsit.2020.005

8.   Audunson, R. A. (2018). Do we need a new approach to library and information science? *Bibliothek – Forschung und Praxis,* 42(2) https://doi.org/10.1515/bfp-2018-0040

9.   Bawden, D. & Robinson, L. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies. *Journal of Information Science*, 35(2) 180-191.

10. Bangani, S. (2021). The fake news wave: Academic libraries' battle against misinformation during COVID-19. *The Journal of Academic Librarianship*, 47(5) 102390.

11. https://doi.org/10.1016/j.acalib.2021.102390.

12. Beck, S. (1997). *Evaluation Criteria: The Good, The Bad & The Ugly: or, Why It's a Good Idea to Evaluate Web* Sources. https://lib.nmsu.edu/instruction_backup/evalcrit. html

13. Bosančić, B., Badurina, B., Tanackovic, S. F. & Mandl, T. (2017). EINFOSE project: Stimulating diversity of students and teachers' engagement in the European higher education area. *Proceedings of the Association for Information Science and Technology*, 54(1), 627-629. https://doi.org/10.1002/pra2.2017.14505401093

14. Boté-Vericad, J.-J. (2021). Perceived barriers for distance teaching in higher education during the COVID-19 crisis: "I never did a video before". *Education for Information*. 1-21. DOI: 10.3233/EFI-200418

15. Byström, K., Heinström, J. & Ruthven, I. (2019). *Information at work: information management in the workplace*. Facet Publishing.

16. Chakrabarti, S., Joshi, M., Punera, K. & Pennock, D. (2002). The Structure of Broad Topics on the Web. In *Proc. International WWW Conference* http://www2002.org/CDROM-refereed/338/

17. Chakraborty, K., Kureshi, P., Gajbe, S., Upadhyay, N. & Devi, D. (2020). Role of LIS Professionals to provide authentic information sources during COVID-19 a Pandemic crisis. *Library Philosophy and Practice* (e-journal). 4180.

18. https://digitalcommons.unl.edu/libphilprac/4180

19. Chierichetti, M., & Backer, P. (2021). Exploring Faculty Perspectives during Emergency Remote Teaching in Engineering at a Large Public University. *Education Sciences*, 11(8), 419. http://doi.org/10.3390/educsci11080419

20. Corrado, E. M. & Moulaison Sandy, H. (2017). *Digital preservation for libraries, archives, and museums*. Lanham, Maryland: Rowman & Littlefield Publishers.

21. Czerniewicz, L., Trotter, H., & Haupt, G. (2019). Online teaching in response to student protests and campus shutdowns: academics' perspectives. *International Journal of Educational Technology in Higher Education*, 16(1), 1-22. https://doi.org/10.1186/s41239-019-0170-1

22. Dreisiebner, S., März, S. & Mandl, T. (2021). Information Behavior During the Covid-19 Crisis in German-Speaking Countries. *Journal of Documentation*. https://doi.org/10.1108/JD-12-2020-0217

23. Gatt, A., & Krahmer, E. (2018). Survey of the state of the art in natural language generation: Core tasks, applications and evaluation. *Journal of Artificial Intelligence Research*, 61, 65-170. https://doi.org/10.1613/jair.5477

24. Griesbaum, J., Çetta, D., Mandl, T., & Montanari, E. G. (2021). What Is Information Literacy and How to Improve It?. In: *Information between Data and Knowledge - Information Science and its Neighbors from Data Science to Digital Humanities. Proceedings*

of the 16th International Symposium of Information Science (ISI 2021) Regensburg, Germany, 8th–10th March. pp. 24-43. http://doi.org/10.5283/epub.44935

25. Heinz, S., Mandl, T. & Womser-Hacker, C. (2003). Implementation and Evaluation of a Virtual Library Shelf for Information Science Content. *Proceedings of the fifth National Russian Research Conference* (RCDL) St. Petersburg. 20.-31. Oct. pp. 117-123.

26. Huang, K.-T., Lee, Y. & Wang, R. (1999). *Quality Information and Knowledge.* Upper Saddle River, NJ.: Prentice Hall.

27. Krtalić, M. & Mandl, T. (2019). Didactic trends in LIS education and their reflection in curricula design. *Education for Information* 35.2. pp. 65-86.

28. Kuttkat, F., Mandl, T. & Dreiseibner, S. (2021). Student Perception of Online Information Literacy Training through a Massive Open Online Course. In: 7th *European Conference on Information Literacy* (ECIL) Sept. 21-24, Bamberg, Germany.

29. Liu, P. L. (2020). COVID-19 Information Seeking on Digital Media and Preventive Behaviors: The Mediation Role of Worry. *Cyberpsychology, Behavior, and Social Networking*, 23(10), 677–683. https://doi.org/10.1089/cyber.2020.0250

30. Mandl, T. (2006). Implementation and Evaluation of a Quality Based Search Engine. *Proceedings of the 17th ACM Conference on Hypertext and Hypermedia* (HT '06) Odense, Denmark, August 22nd -25th. ACM Press. pp. 73-84. https://doi.org/10.1145/1149941.1149957

31. Mandl, T. & Womser-Hacker, C. (2004). A Framework for long-term Learning of Topical User Preferences in Information Retrieval. *New Library World*, vol. 105 (5/6) S. 184-195.

32. Mandl, T. & Womser-Hacker, C. (2015). Information Retrieval. In: *Encyclopedia of Information Science and Technology*. Idea Group Reference: Hershey et al. pp. 3923-3931.

33. Martzoukou, K. (2021). Academic libraries in COVID-19: a renewed mission for digital literacy. *Library Management* 42(4/5) pp. 266-276. https://doi.org/10.1108/LM-09-2020-0131

34. McGowan, V. (2020). Institution initiatives and support related to faculty development of open educational resources and alternative textbooks. *Open Learning: The Journal of Open, Distance and e-Learning*, 35(1), 24-45. https://doi.org/10.1080/02680513.2018.1562328

35. Mehta, D., & Wang, X. (2020). COVID-19 and digital library services–a case study of a university library. *Digital library perspectives*. 36 (4), pp. 351-363. https://doi.org/10.1108/DLP-05-2020-0030

36. Mercurio, F. (2020). The post-Covid-19 in public libraries in Italy: Several trends, some fear and a hope. *Alexandria* 30, no. 2-3. 256-263.

37. Modha, S., Mandl, T., Majumder, P. & Patel, D. (2020). Tracking hate in social media: Evaluation, challenges and approaches. *SN Computer Science*, 1(2), pp. 1-16. https://doi.org/10.1007/s42979-020-0082-0

38. Modha, S., Majumder, P., & Mandl, T. (2021). An Empirical Evaluation of Text Representation Schemes to Filter the Social Media Stream. *Journal of Experimental & Theoretical Artificial Intelligence (JETAI)* 33. https://doi.org/10.1080/0952813X.2021.1907792

39. Mole, A. J., Dim, C. L., & Horsfall, M. N. (2017). Re-engineering LIS education to meet industrial needs for knowledge societies. *Journal of Librarianship and Information Science*, *49*(3), pp. 313-319.

40. Nakov, P., Da San Martino, G., Elsayed, T., Barrón-Cedeño, A., Míguez, R., Shaar, S., Alam, F., Haouari, F., Hasanain, M., Babulkov, N., Nikolov, A., Shahi, G. K., Struß, J. M., Mandl, T. (2021): The CLEF-2021 CheckThat! Lab on Detecting Check-Worthy

Claims, Previously Fact-Checked Claims, and Fake News. In: *European Conference on Information Retrieval (ECIR)* [LNCS 12657] pp. 639–649. https://doi.org/10.1007/978-3-030-72240-1_75

41. Pennycook, G., Cannon, T. D. & Rand, D. G. (2018). Prior exposure increases perceived accuracy of fake news. *Journal of Experimental Psychology: General*, 147(12), 1865-1880.DOI: 10.1037/xge0000465

42. Pennycook, G., Bear, A., Collins, E. T. & Rand, D. G. (2020). The implied truth effect: Attaching warnings to a subset of fake news headlines increases perceived accuracy of headlines without warnings. *Management Science*, 66(11), 4944-4957.

43. Ponzani, V. & Maiello, R. (2020). Questioni di metodo: i comunicati AIB a supporto delle biblioteche e dei bibliotecari di fronte all'emergenza da Covid-19. *AIB Studi*, 60(1), 143-155. https://doi.org/10.2426/aibstudi-12182

44. Ramasamy, K. (2017). What Slows Down the Wheels of Indian LIS Education and How to Make it Move Faster? The Million Dollar Question. *Science and Humanities,* 253.

45. Rovetta, A., Bhagavathula, A. S. & Dhabi, A. (2020). COVID-19-Related Web Search Behaviors and Infodemic Attitudes in Italy: Infodemiological Study. *JMIR Public Health and Surveillance*, 6, 1–10. https://doi.org/10.2196/19374

46. Robati, P. & Yusuf, B. (2016). Coverage of the competencies required by special librarians at three different levels of Library and Information Science curricula. *Journal of Librarianship and Information Science*, *48*(2), 123-136.

47. Raju, J. (2013). The LIS School in the ICT Age: A Casualty, or a Catalyst for a Paradigm Shift? – The Case of South Africa. *Libri*. https://doi.org/10.1515/libri-2013-0020

48. Shastri, D. K., & Chudasma, P. (2021). The perception of ICT skills and challenges of usage of technologies among the library professionals of the Gujarat State during the COVID 19: a comprehensive study. *Quality & Quantity*, 1-28.

49. Sobral, S. R., Jesus-Silva, N., Cardoso, A., & Moreira, F. (2021). EU27 Higher Education Institutions and COVID-19, Year 2020. *International Journal of Environmental Research and Public Health*, 18(11), 5963. https://doi.org/10.3390/ijerph18115963

50. Tammaro, A. M. (2020) COVID 19 and Libraries in Italy. *International Information & Library Review*, 52:3, pp. 216-220, DOI: 10.1080/10572317.2020.1785172