The Fourth Industrial Revolution

Does It Pose an Existential Threat to Libraries?

Brady Lund

No.

No, it does not. Not any more than any other technological innovation (information systems, personal computers, the Internet, e-readers, Google, Google Scholar) did. However, what is very likely is that the technologies that emerge from this era will slowly (but surely) lead to profound changes in how libraries operate. Those libraries that fail to understand or embrace these technologies may, in fact, be left behind. So, we must, as always, stay abreast of trends in emerging technologies and what the literature (i.e., articles in this journal) propose as ideas for adopting (and adapting) them to better serve our patrons. With this column, my aim is to briefly discuss what the fourth industrial revolution is and its relevance within our profession.

THE "FOURTH" INDUSTRIAL REVOLUTION?

The term "fourth industrial revolution" describes the evolution of information technology towards greater automation and interconnectedness. It includes or incorporates technological advancements such as artificial intelligence, blockchain, advanced robotics, the Internet of Things, autonomous vehicles, virtual reality, 3D printing, nanotechnology, and quantum computing.[1] Imaginations can run amok with idyllic visions of Walt Disney's EPCOT—a utopian world of interconnectedness and efficiency—or dystopian nightmares captured in the mind of Stephen King, George Orwell, or Pixar's WALL-E. If we have learned anything from the past though—and after the last 12 months I cannot be entirely sure of that—it is that reality is likely to settle somewhere in the middle. Some things will improve dramatically in our lives but there will also be negative impacts—funding changes, learning curves, and maybe a bit of soul-searching within the profession (not that that last one is necessarily a bad thing).

The "fourth industrial revolution" is referred to as such because historians of technological and industrial innovation have placed the period as fourth in a line of major shifts in technological innovation (shocking, no?). The first industrial revolution was THE industrial revolution, the one we were taught to call the "Industrial Revolution" in high school: The period from the late-18th to mid-19th century where rapid innovation in the areas of agriculture and manufacturing transformed the economy, created a market for invention and profiteering, and formed a true "working class" of laborers. As idyllic as it sounds in our history classes, it was not a particularly pleasant time for the average laborer. There is a reason why the *Communist Manifesto*, and the whole concept of the social sciences, emerged from this era. But this era also brought us the modern (semi-modern?) library.

Brady Lund (blund2@g.emporia.edu) is a doctoral student at Emporia State University's School of Library and Information Management and a member of the ITAL Editorial Board. © 2021.

The second industrial revolution, the "Technological Revolution," occurred from the late-19th to early-20th century. It was all about the power of electricity and the engine. Here we have the emergence of vast telegraph networks, lightbulbs, automobiles, and airplanes. Very nice stuff. You also had a lot of economic uncertainty that led to a few depressions and wars (but do not focus on that too much, readers).

The third industrial revolution, the "Digital Revolution," is the first revolution that we really have a good record of within library and information science. It is why we have that "information science" part in the name. It is why we have this journal that you are reading now. It was the era of digital computers and computer networks. Yes, it changed a lot—some for the better, some for the worse. If you are a reader of this journal, you would probably say—at least in terms of library services—that this era was full of fairly positive developments for libraries. We gained digital catalogs, electronic databases, integrated library systems, the Internet, and Microsoft Office, all developments the increase the ease and efficiency of our everyday work tasks.

So, that leads us to the precipice that we are on now. The fourth industrial revolution. While uncertainty provokes trepidation, there is much we can do to inform ourselves—much more so than with previous revolutions (we could not very well turn to the Internet to learn about the Internet). There are scenarios on both ends of the spectrum that ranges from utopia and doom—and it's not altogether bad to read about the risks that automation presents, such as described by Andrew Yang and other political and economic figures—but if history and precedent mean anything, it is likely that we will see many things in our economy, and in our libraries, change substantially but certainly not vanish.

THE ROLE OF LIBRARIES IN THE FOURTH INDUSTRIAL REVOLUTION

We have already been adopting many of these fourth industrial revolution technologies for quite some time—whether we were cognizant of it or not. A lot of what could be called "artificial intelligence" already exists in our library systems and more is on the way if current projects being conducted around the globe come to fruition.[2] There are a lot of "pie in the sky" ideas of what the future of libraries will look like with the fourth industrial revolution—some of which were even published in this very journal. It is good to have these perspectives, even if they do seem a bit unrealistic and/or dystopian. We need to consider the possibilities of this era while also understanding the practicalities. Our goal as library technologists—to serve the information needs of patrons to the best of our abilities—should never falter. If this is true of our professional ethics and values, then we must be prepared to sacrifice and adapt to change for the common good.

One thing I am quite certain of is that these technological innovations will not spell doom for libraries. Libraries are resilient and librarians themselves mean more to patrons than a computer interface. We do not have to go back too far to see how libraries responded to a similar disruptive period: the introduction of the Internet. If you want to read an interesting parallel to this editorial, check out David Raitt's 1994 editorial in *The Electronic Library* (and hopefully not feel too old when you discover that I was born in the year that it was published). The purpose of Raitt's editorial was to answer the question that *considering developments with the Internet*, "will librarians still be around in 2024, and if so what are they likely to be doing?"[3] Boy, I sure hope they are around in three years, or I really made a poor career choice. The ease with which Raitt dismisses any concern about the Internet spelling the end of libraries is delightful to read: "Are librarians so insecure about their profession and future?... (in 2024) librarians will still be doing

what they do now and what they have always done, only they will have more new-fangled technology to help them do it."[4]

You could argue that Raitt's prediction is not entirely correct. Some things about libraries have changed considerably. But have any of these changes been decidedly for the worse? Even the most curmudgeonly postmodernist must concede that libraries serve their patrons better now than before the Internet Age. Libraries, on the whole, are still very much the same. We have not undergone massive upheavals in our professional values and ethics. Some job duties have changed (such as a greater emphasis on instruction in academic libraries) but it has not spelled total doom for our librarians.

So, people, turn and face the strange, because there is nothing too serious to fear with coming changes. And, if my prediction turns out to be less accurate than Raitt's, well, just remember that my name is "John Barron" (and metadata that indicates to the contrary is fake news). The changes that have been clumped under the buzzword of the "fourth industrial revolution" will do a lot to advance the mission of libraries. Right now, a lot of the "How?" can seem a bit hazy, but check out some of these library school programs that are working to answer that very question and I think you will get a good idea:

- Blockchains for the Information Profession (San Jose State University iSchool): https://ischoolblogs.sjsu.edu/blockchains.
  - An IMLS-funded program that examines applications of blockchain in libraries.
- Artificial Intelligence (a program of Stanford University Libraries): https://library.stanford.edu/projects/artificial-intelligence/.
  - A university-supported program that examines applications of AI in libraries.
- The Good Systems Program (University of Texas iSchool, in partnership with a bunch of other departments on campus): https://bridgingbarriers.utexas.edu/good-systems.
  - This program focuses on ethical uses of AI to improve lives. While it does not necessarily focus specifically on libraries, its founding members are connected to the university's library school and many of the program's "products" have direct relevance to libraries.

Library and information technology is one area where academia and scholarly research offer a lot of useful knowledge and ideas for the professional librarian. There are a lot of great ideas from researchers and programs at these schools, in addition to the investments made by industry leaders like OCLC, that suggest libraries are not going to be left behind during the "coming revolution."[5]

Expect the ideas filtering from these programs, and others, to take greater hold in practical library settings in coming years—as the Internet did in the mid-to-late 1990s and social media did in the period of (approximately) 2008–2013. Like with these past innovations, the extent of adoption will likely vary from library-to-library. I will avoid a lecture on Diffusion of Innovations here, though it is one of my favorite "simple" theories (a few suggested readings for those who are interested are Chatman's 1986 article—which is a bit more technical—and Minishi-Majanja and Kiplang'at's 2005 article).[6] What is important to expect is that this will not all just be a "flash in a pan" like we have seen before with some technologies. These technologies in the "fourth industrial revolution" will bring about real change in our world. If we are "ahead of the curve" (to reference a diffusion concept), we will be well-positioned to adapt to the changes to come.

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[4] Ibid.

[5] Thomas Padilla, *Responsible Operations: Data Science, Machine Learning, and AI in Libraries* (Dublin, OH: OCLC Research, 2019), https://doi.org/10.25333/xk7z-9g97.

[6] Elfreda A. Chatman, "Diffusion Theory: A Review and Test of a Conceptual Model in Information Diffusion*," Journal of the American Society for Information Science* 37, No. 6 (1986): 377–86; Mabel K. Minishi-Majanja and Joseph Kiplang'at, "The Diffusion of Innovations Theory as a Theoretical Framework in Library and Information Science Research," *South African Journal of Libraries and Information Science* 71, no. 3 (2005): 211–24.