THE WALL STREET JOURNAL.
WSJ.com

July 30, 2014, 10:51 AM ET

The Knowledge Work Jobs of 2024

By Thomas H. Davenport

Which jobs will still be around in a decade or so? It's a pretty good bet, as my friends Erik Byrnolfsson and Andy McAfee argue in their book The Second Machine Age, that many jobs requiring medium levels of expertise and dexterity will be taken over by machines. But I'd go further and argue that many knowledge work jobs will take a big hit too. Algorithms and rules are making it possible for many judgment and expertise-oriented tasks to be done as well or better by smart machines than by well-educated humans.

Of course, it's impossible to know how intelligent technologies will develop over the next decade. But even if we consider only technologies that exist today, I think we can make predictions about how likely certain jobs are to be performed by machines in the future. Below is a list of criteria with some examples of threatened jobs that exhibit them. If your job exhibits several of the criteria, you may want to begin exploring another career, or at least a modification of your existing one.

Automated system available today to do some of the work—Perhaps the best evidence that automation will threaten a job is the existence of an automated system today that performs all or part of the job. If I were a radiologist, for example, I'd be worried about the computer-aided detection systems that read images and detect signs of breast or colon cancer. If I were an IT operations engineer, I'd be worried about the systems at Facebook Inc. that let one engineer run 20,000 servers. These systems haven't achieved broad penetration yet, but they probably will in ten years.

Little physical contact or manipulation necessary—If you don't have to touch your work in order to perform it, there's a good chance it will be automated. If you deal primarily in documents (like real estate and many other types of attorneys, for example) or images (again, like radiologists), systems can digest that content and determine its meaning. If you have to wrestle with something physical in unpredictable ways as you do your job, it's probably not going away. An anesthesiologist friend, for example, told me that he often has to move patients around a lot to clear airways, so he doubted that computers or robots would be able to put him out of work.

Content transmission is a key part of the job—If what you do is primarily to transmit existing content to other humans, you may be in trouble. Think about teachers, for example. They figure out what content students need, and transmit it to them through generally manual methods. But there are already systems that diagnose what content a student needs to learn (e.g., Amplify), and many online repositories for educational material (e.g., Khan Academy). There are some

functions that computers can't perform, like maintaining discipline in class, but they don't necessarily require knowledge workers to perform them.

Content analysis is a key part of the job—"Cognitive computing" systems like IBM Watson have already demonstrated that they can do an amazing job of analyzing and "understanding" content. While there will need to be people to program and modify such systems, analyzing vast amounts of content—as, for example, pharmaceutical researchers and medical diagnosticians do—is probably something that will be done by machine

Ability to understand and analyze data is a key part of job—We already know that analytics and algorithms are better at creating insights from data than most humans. They have already replaced some insurance policy underwriters and financial planners. They'll probably replace more, since this human/machine performance gap will only increase. Even many quantitative analysts' jobs will be replaced—or at the least augmented—by machine learning systems.

The task can be simulated or performed virtually—This is another problem for teachers; if a task can be simulated, one of the best ways to teach it is to undergo a simulation. Just ask the few aircraft flying instructors who are left. Now there are also good simulations for training leaders. Perhaps business school professors and executive coaches are at risk too.

Consistency of performance is critical to role—Computers are unfailingly consistent; that's why they already determine who gets credit in financial services, for example. Where consistency matters in other job domains—insurance claims adjusting, financial stress testing, perhaps even judging crimes and issuing punishments—computers will increasingly take on the task.

Content creation is based on data and analysis—As I argued in a previous post, content creation was once the province of humans, but automated systems from companies like Automated Insights and Narrative Sciences are already creating data-intensive content. Sports and financial reporting might well be at risk in a decade.

There are well-defined formal rules for performing the work—The easiest domains to automate have always been those with clear, consistent rules. Now rule-based systems can handle increasingly complex problems. I were training for a career in financial auditing, for example, I'd be concerned. There are already some systems that automate key aspects of auditing.

I hope, of course, that new roles for knowledge workers emerge to replace those that computers take over—but it's difficult if not impossible to anticipate what they will be. And, of course, there are always going to be knowledge work roles that tend and improve these computer systems. Those who will still have jobs will be those who can understand how the systems work, can know their strengths and weaknesses, and can program or modify them to fit new situations. Whatever your knowledge work job, start to work closely with computers if you want to keep it.

Thomas H. Davenport is a Distinguished Professor at Babson College, a Research Fellow at the Center for Digital Business, Director of Research at the International Institute for Analytics, and a Senior Advisor to Deloitte Analytics.