Robot doctors, online lawyers and automated architects: the future of the professions?

Advances in technology have long been recognised as a threat to manual labour. Now highly skilled, knowledge-based jobs that were once regarded as safe could be at risk. How will they adapt to the digital age?

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Technology is set to challenge traditionally safe professions. Photograph: Alamy

Last year, reporters for the Associated Press attempted to figure out which jobs were being lost to new technology. They analysed employment data from 20 countries and interviewed experts, software developers and CEOs. They found that almost all the jobs that had disappeared in the past four years were not low-skilled, low-paid roles, but fairly well-paid positions in traditionally middle-class careers. Software was replacing administrators and travel agents, bookkeepers and secretaries, and at

alarming rates.

Economists and futurists know it's not all doom and gloom, but it is all change. Oxford academics Carl Benedikt Frey and Michael A Osborne have predicted computerisation could make nearly half of jobs redundant within 10 to 20 years. Office work and service roles, they wrote, were particularly at risk. But almost nothing is impervious to automation. It has swept through shop floors and factories, transformed businesses big and small, and is beginning to revolutionise the professions.

Knowledge-based jobs were supposed to be safe career choices, the years of study it takes to become a lawyer, say, or an architect or accountant, in theory guaranteeing a lifetime of lucrative employment. That is no longer the case. Now even doctors face the looming threat of possible obsolescence. Expert radiologists are routinely outperformed by pattern-recognition software, diagnosticians by simple computer questionnaires. In 2012, Silicon Valley investor Vinod Khosla predicted that algorithms and machines would replace 80% of doctors within a generation.

In their much-debated book The Second Machine Age, Erik Brynjolfsson and Andrew McAfee argued that we now face an intense period of creative destruction. "Technological progress," they warned, "is going to leave behind some people, perhaps even a lot of people, as it races ahead … there's never been a worse time to be a worker with only 'ordinary' skills and abilities to offer, because computers, robots and other digital technologies are acquiring these skills and abilities at an extraordinary rate."

So where does that leave the professions, whose hard-won expertise is beginning to fall within the power of computers and artificial intelligence to emulate? The efficiency of computerisation seems likely to spell the end of the job security past generations sought in such careers. For many, what were once extraordinary skillsets will soon be rendered ordinary by the advance of the machines. What will it mean to be a professional then?

"We'll see what I call decomposition, the breaking down of professional work into its component parts," says leading legal futurist professor Richard Susskind. Susskind's forthcoming book Beyond the Professions, co-authored with his son Daniel Susskind, examines the transformations already underway across the sectors that once offered jobs for life. He predicts a process not unlike the division of labour that wiped out skilled artisans and craftsmen in the past: the dissolution of expertise into a dozen or more streamlined processes.

"Some of these parts will still require expert trusted advisers acting in traditional ways," he says. "But many other parts will be standardised or systematised or made available

with online service." In a previous book Tomorrow's Lawyers, he predicts the creation of eight new legal roles at the intersection of software and law. Many of the job titles sound at home in IT companies: legal knowledge engineer, legal technologist, project manager, risk manager, process analyst.

"Many traditional lawyers will look at that and think: 'Yes, they might be jobs, but that's not what I went to law school for. And that's not what my parents' generation did as lawyers.'" That, says Susskind, is not his concern: whether we call these new positions lawyers or not, the legal sector will survive.

"What I often say is that the future of law is not Rumpole of the Bailey, and it's not John Grisham," explains Susskind. "It's not a version of what we have today slightly tweaked. It will be people working in the legal sector but offering legal services and legal help in new ways." It may be the end of the profession as immortalised in courtroom dramas, but as software eats the old jobs it will have to create new ones too.

"Those professions that do not change will render themselves obsolete," says Dr Frank Shaw, foresight director at the Centre for Future Studies. "Those that are able to transform themselves – and I mean 'transform' – will thrive and prosper."

No one knows for sure what the careers of the future will look like. But the people at the cutting edge are already watching old jobs disappear – and experimenting with the technology that has begun to create new ones. Here's how three of the professions – medicine, architecture and the law – could be transformed, according to the people helping to reinvent them.

THE LAW

'The future of the legal profession is not Rumpole of the Bailey and it's not John Grisham.' Photograph: Alexander Kozachok/Getty Images

Five years ago, entrepreneur Charley Moore founded online legal services provider Rocket Lawyer. It now boasts 30 million users. Subscribers pay a monthly fee for instant access to pre-prepared documents and tutorials, as well as online legal advice from experts at participating firms. The work lawyers on the network do has already begun to resemble the streamlined, one-to-many roles Susskind predicted.

Moore is optimistic about the revolution computerisation has unleashed in his sector. "I don't think of [software] as consuming the industry, as much as I think of it as supporting the industry. So with software, certainly there are mundane, routine tasks that will become more efficient, but by making those tasks more efficient, lawyers will be able to move up in the food chain and serve millions more legal transactions than they currently can."

Even judges, he says, will need to move online. "I think we have to have virtual courts. Australia has been experimenting with them. New York has been experimenting with online parking ticket adjudication. I mean, give me a break, who the heck thinks you should have to go to some government building when you get a traffic ticket? It's incredibly inefficient."

Such changes would mean fewer lawyers were needed to meet existing clients' needs. But there is an upside: as costs fall and lawyers serve more clients, small businesses and private individuals will suddenly be able to afford legal advice. This is the "latent legal market", a disenfranchised horde of potential customers estimated to be worth as much as £27bn. "There's really an unmet demand for legal services," says Moore. "We need

more lawyers, not fewer."

ARCHITECTURE

‘The cloud means a one-man designer can access the same computing power as big multinationals.’ Photograph: Alamy

Software firm Autodesk, founded in 1982, creates virtual design tools used by millions of architects and designers every day. Last year alone, the company produced revenues of $2.3bn. British vice president Pete Baxter is responsible for its architecture, engineering and construction operations in Europe, Asia and the Middle East.

He believes architects have little to fear from artificial intelligence. "Yes, you can automate. But what does a design look like that's fully automated and fully rationalised by a computer program? Probably not the most exciting piece of architecture you've ever seen."

Technology won't destroy the profession, but it will, he says, democratise it. "There's a paradigm shift now: the one-man architect working from home with a bright idea now has access to an infinite amount of computing power in the cloud. That means a one-man designer, a graduate designer, can get access to the same amount of computing power as these big multinational companies. So suddenly there's a different competitive landscape."

Baxter is keen to highlight the many new opportunities software creates for the savvy architect. Collaboration across continents is growing ever easier, opening up projects all over the world. This, in turn, has paved the way for greater specialisation: the expert in the most minute aspect of design can apply their insight in several countries in the space

of a single working day.

"The architectural profession absolutely will still exist," he says. "I think what's happening is we're getting a more collaborative approach. But ultimately somebody still makes the decision."

MEDICINE

'Where this is going is that, eventually, robots will end up doing surgeries on their own.' Photograph: Alamy

Dr Pete Diamandis is the chairman and CEO of XPRIZE, a series of competitions that offer $10m awards for inventors who manage to solve some of technology's most vexing challenges. One such prize will be awarded to the first team to produce a working "tricorder" – the handheld device used by the medical officers in Star Trek – capable of diagnosing a set of 15 diseases without the presence of a medical professional.

He expects someone to succeed in the next five years. After which, it will only be a matter of time before diagnosis is something done primarily by machines. "It's a matter of providing the computer with the data. Once it has the data, it's able to consider thousands or millions of times more parameters than a human can hold in their head." We will still need medical professionals to guide us and provide the human touch – but doctors will have to accept that computers are better at parts of the job than they are.

It's not just software and diagnosis, either: surgeons will have to make way for smarter machines. "I think we're going to see the role of the physician changing significantly

through the use of robotics," says Diamandis. He cites the work of Silicon Valley firm Intuitive Surgical, which has created a "surgical system" named Da Vinci, which an expert surgeon can control online from anywhere in the world. Just as in architecture, such developments will allow specialists to reach wider markets – but unlike with architecture there is no reason to assume they will stop there.

"Eventually, where this is going," says Diamandis, "is that the robot will end up doing the surgeries on its own. I can imagine a day in the future where the patient walks into the hospital and the patient needs, say, cardiac surgery, and the conversation goes something like this: 'No, no, no, I do not want that human touching me. I want the robot that's done it 1,000 times perfectly.'"

Yet, despite the large parts of the role that technology will take from them, he does not expect a collapse in our demand for doctors any time soon – largely because we already need so many more than we have. In the US alone, for example, experts predict a shortage of up to 91,500 physicians by 2020. "And that's low compared to the rest of the world," he says. "Africa, which has 25% of the disease burden, has 1.3% of the health workers. There's no way to ever build enough medical schools or teach enough physicians for the demand that exists even today."

"It's about the economics," explains Diamandis. The software and robots are already here – or well on their way – but this unmet demand will remain until the tech is not only more effective but cheaper than the equivalent doctor. "I call this process the 'dematerialisation of technology'. You used to buy a GPS, you used to buy a camera, you used to buy records. These things which were physical have dematerialised on to your phone, and de-monetised, becoming effectively free. And finally they democratise. Healthcare is undergoing the same process: dematerialisation and democratisation."