Work and Education in the Age of Automation

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Introduction

A majority of experts predict that by 2025 automation will dominate vast areas of our daily way of life. In the work environment, the main impact of this automation will be on "health care, transport and logistics, customer service, and home maintenance" (Smith and Anderson 2014: 5). Although most experts agree on the key areas of evolution in automation and the future meaning of work, they are divided on its impact on economics, labor and education.

The Growing Automation of Work

Harvard University's Berkman Center for Internet & Society Fellow Justin Reich sees automation progressively supplanting repetitive types of labor —"even the complex routines performed by artisans, factory workers, lawyers, and accountants" (Smith and Anderson 2014: 11). A network scientist for BBN Technologies noted that "in terms of the large-scale, mass-produced economy, the utility of low-skill human workers is rapidly diminishing, as many blue-collar jobs (e.g., in manufacturing) and white-collar jobs (e.g., processing insurance paperwork) can be handled much more cheaply by automated systems" (Smith and Anderson 2014:14). And a data programmer and data analyst foresees that,

> Automated vehicles yield the elimination of school bus drivers, truck drivers, taxi cab drivers, the purchase of cars themselves (as opposed to Uber-style access and 'pay for time used'). This, in turn, impacts police forces (no speeding or parking tickets) as their revenue streams diminish, fewer ER doctors and nurses (as the number of accidents decline), massive change in the auto insurance companies and mechanisms. 3-D printing of structures (houses, apartments, boats, cars, etc.) yields massive layoffs in the construction and manufacturing industries. 3-D printing itself dramatically reduces the need for factories in China, Korea, etc., which in turn reduces the need for freighters plying the oceans (and the ones that are left will be autonomous with little to no crew). Nano-drones and robotic support for farming will dramatically modify (reduce) the number of people employed in the agriculture sector (Rainie and Anderson 2017: 1).

However, Chief Economist for Google Hal Varian envisages a future with less "dull, repetitive, and unpleasant work," and with a more just balance between work and leisure (Pew Foundation 2014: 6). Retired computer software engineer from IBM, Francois-Dominique Armingaud, agrees and adds that this will "allow people to spend more life with their loved ones instead of spoiling it with overtime while others are struggling in order to access work" (Smith and Anderson 2014: 6).

A Positive View on the Impact of Automation on Work

According to the Pew Foundation's 2014 canvassing of experts in the field of economics and technology, 52% predict that automation "will not displace more jobs than it creates by 2025" (Smith and Anderson 2014: 5). Although, like many naysayers, they expect that many jobs will be automated and thus disappear, they also believe that new types of jobs will be needed and created to interact with the new technologies (Smith and Anderson 2014: 5). They also argue that the resourcefulness of human ingenuity to adapt when there have been paradigm shifts in the labor market in the past — not to mention that many will react to automation itself— has been demonstrated and will encourage the development of new types of activities that will market quintessentially human skills (Smith and Anderson 2014: 5).

PhD and Director of the Media Psychology Research Center Pamela Rutledge explains that "advances in AI and robotics [will] allow people to cognitively offload repetitive tasks and invest their attention and energy in things where humans can make a difference" (Smith and Anderson 2014: 3). Chief scientist for Salesforce.com J.P. Rangaswami argues that the impact of automation will vary according to the different economies: "Some classes of jobs will be handed over to the 'immigrants' of AI and robotics, but more will have been generated in creative and curating activities as demand for their services grows exponentially while barriers to entry continue to fall. For many classes of jobs, robots will continue to be poor labor substitutes" (Pew Foundation 2014: 2). Moreover, retired European Union official, board member for EURid.eu, and Internet Society leader, Christopher Wilkinson, sees the impact of automation by 2025 to be limited mostly to banking, retailing, and transportation (Smith and Anderson 2014: 3).

These experts' expectations are based on several assumptions held by those who hold a positive view on the impact of automation on work. These experts maintain that history, since the First Industrial Revolution, has shown that revolutions in technology need and generate innovative occupations while substituting older or obsolete ones. Also, certain jobs or skills can only be performed by humans: tasks that require "empathy, creativity, judgment, or critical thinking" to name a few (Smith and Anderson 2014: 3).

Although these "positive-outlook" experts are concerned that our present-day financial, governmental, and scholastic institutions are not capable of giving a positive spin to the future of automation, many of them believe that these institutions are capable enough to minimize its most negative aspects (Smith and Anderson 2014: 3). Finally, even those who predict the fast and unavoidable automation of work believe that the advances of automation by the year 2025 will not be substantial enough to significantly impact the labor market —the 10-year time-frame is simply too short.

A Negative View on the Impact of Automation on Work

In the same 2014 canvassing of experts, 48% predict that a large amount of manual and managerial occupations will disappear (Smith and Anderson 2014: 5). This will exponentially increase income inequality, unemployment, and disrupt the current social, political and economic order.

These experts' negative view on the impact of automation on work is based primarily on the fact that we are already experiencing higher unemployment due to the automation of some economic sectors and that this can only worsen in the near future. These higher rates of unemployment and job displacement will only increase the already widening breach between the haves and the have-nots at the national and international level (Smith and Anderson 2014: 11).

Internet law and policy expert Robert Cannon expects that "everything that can be automated will be automated" (Smith and Anderson 2014: 10). *The Economist*'s digital editor Tom Standage points out that today's automation revolution is happening at a much faster pace than previous revolutions, due to its versatility and growing capabilities; whereas "previous technological revolutions happened much more slowly, so people had longer to retrain, and [also] moved people from one kind of unskilled work to another" (Smith and Anderson 2014: 10).

Founder of the Relationship Economy eXpedition (REX), Jerry Michalski, shares the view that the robotizing of most human work is years, not decades away; and that the lone services spared will be jobs that "require local human effort (gardening, painting, babysitting), distant human effort (editing, coaching, coordinating), and high-level thinking/relationship building" (Smith and Anderson 2014: 10). In consequence, Justin Reich anticipates that non-routine jobs will increase in the service market, which can be done by most anyone, but "these will not pay a living wage— and there will be some new opportunities created for complex non-routine work, but the gains at this top of the labor market will not be offset by losses in the middle and gains of terrible jobs at the bottom" (Smith and Anderson 2014: 11). Consequently, Tom Standage concludes that the "income gap between skilled workers whose jobs cannot be automated and everyone else will widen, [becoming] a recipe for instability" (Smith and Anderson 2014: 5).

As a programmer and data analyst stated, "The combination of nanotechnology and AI will actually reduce the number and type of jobs (as we currently understand the term). I foresee significant economic, social, cultural turmoil over the coming 10 to 20 years, with millions of people thrown out of work –with little to no 'of-

ficial' jobs available for them" (Rainie and Anderson 2017: 1).

Changing Meaning of Work

Both those who predict a positive as well as a negative impact of automation on work agree that automation will change humanity's connection to work itself "by returning to a focus on small-scale or artisanal modes of production, or by giving people more time to spend on leisure, self-improvement, or time with loved ones" (Smith and Anderson 2014: 14).

Many of these experts also envision that the meaning of work itself will change with the automation of work. Architect of the evolution of the World Wide Web and professor of computer science at Rensselaer Polytechnic Institute, Jim Hendler, states that "the notion of work as a necessity for life cannot be sustained if the great bulk of manufacturing and such moves to machines" (Smith and Anderson 2014: 6). Internet pioneer and technology innovator Bob Frankston concurs and sustains that "we'll need to evolve the concept of a job as a means of wealth distribution" (Smith and Anderson 2014: 13). Thus, according to Senior Fellow at the Center for a Stateless Society, Kevin Carson, "the concept of 'jobs' and 'employment' will be far less meaningful, because the main direction of technological advance is toward cheap production tools… that undermine the material basis of the wage system" (Pew Foundation 2014: 14). This will lead, according to Carson, to an "increased employment in small shops, increased project-based work on the construction industry model, and increased provisioning in the informal and household economies and production for gift, sharing, and barter" (Smith and Anderson 2014: 14).

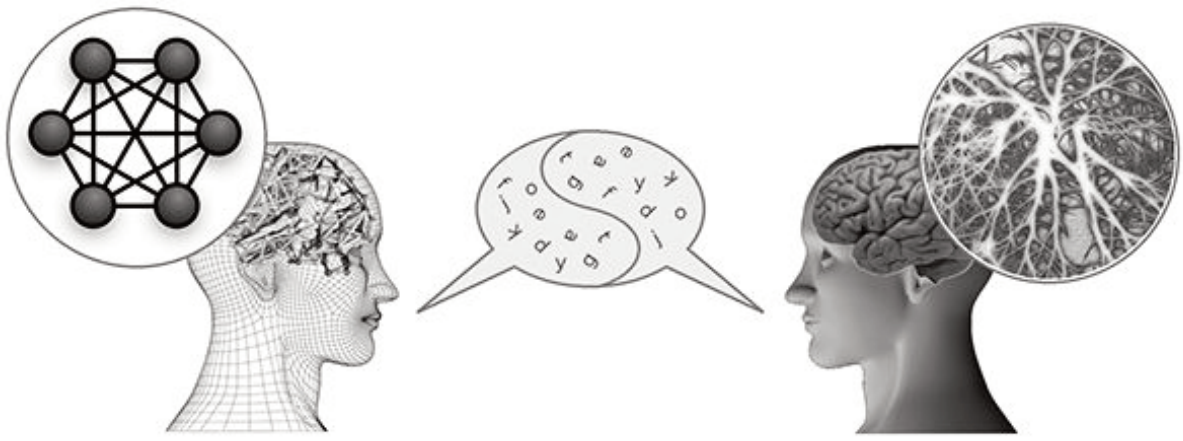
As a network scientist for BBN Technologies explains,

> We can already see some hints of reaction to this trend in the current economy: entrepreneurially-minded unemployed and underemployed people are taking advantages of sites like *Etsy* and *TaskRabbit* to market quintessentially human skills. And in response, there is increasing demand for 'artisanal' or 'hand-crafted' products that were made by a human. In the long run this trend will actually push toward the re-localization and re-humanization of the economy, with the 19th- and 20th-century economies of scale exploited where they make sense (cheap, identical, disposable goods), and human-oriented techniques (both older and newer) increasingly accounting for goods and services that are valuable, customized, or long-lasting (Smith and Anderson 2014: 14).

The Director of the Institute for Communication & Leadership IKF David Krieger concludes that "labor is a creature of the industrial age and will disappear with automation of production in all areas. Humans will no longer be divided into capitalists and workers, but will need to find a new self-definition based on creativity and meaning instead of labor and management" (Rainie and Anderson 2017: 3).

Education in the Age of Automation

Most of the experts canvassed in 2014 by the Pew Foundation agreed, despite their different views on the impact of automation on work, that "our existing social structures —and especially our educational institutions— are not adequately preparing people for the skills that will be needed in the job market of the future" (Smith and An-



derson 2014:5).

Pamela Rutledge underlines that "there will be many things that machines can't do, such as services that require thinking, creativity, synthesizing, problem-solving, and innovating" (Smith and Anderson 2014: 8). In simple terms, only the most uniquely human-skilled persons will survive automation. However, pioneering Internet sociologist and self-employed writer, consultant, and educator, Howard Rheingold, laments that the "education systems in the U.S. and much of the rest of the world are still sitting students in rows and columns, teaching them to keep quiet and memorize what is told to them, preparing them for life in a 20th century factory" (Smith and Anderson 2014: 12). J. P. Rangaswami warns that "driven by revolutions in education and in technology, the very nature of work will have changed radically —but only in economies that have chosen to invest in education, technology, and related infrastructure" (Smith and Anderson 2014: 5).

According to the experts canvassed, education itself will have to evolve in the near future. Education will have to take place mainly on-line either as "self-directed… offered or required by employers… [or] hybrid online/real-world classes" (Rainie and Anderson 2017:7). The best 21st century curricula will provide the skills to be permanent learners. Traditional universities will still play a role but they will have to diversify and differentiate focusing on hard-to-teach human skills such as "emotional intelligence, curiosity, creativity, adaptability, resilience and critical thinking" (Rainie and Anderson 2017: 4). This type of "institutional" education will need to be enhanced by some exploitation of "augmented and virtual reality elements and gaming sensibilities" (Rainie and Anderson 2017: 4).

Even though by 2025 corporations and businesses will still tend to give more credence to traditional college degrees, more and more they will accept "alternate credentialing systems as self-directed learning options and their measures evolve practical, experiential learning via apprenticeships and mentoring" (Rainie and Anderson 2017: 7). In a few words, the true test of an employee's knowledge will be their real-work resumes (Rainie and Anderson 2017: 7).

Professor in the department of sociology at the University of Nevada, Las Vegas, Simon Gottschalk, believes that the types of skills that will be valuable in the higher paying jobs will be "the ability to efficiently network, manage public relations, display intercultural sensitivity, marketing, and generally what author Dan Goleman would call 'social' and 'emotional' intelligence. [This also includes] creativity, and just enough critical thinking to move outside the box" (Rainie and Anderson 2017: 4-5).

Professor emeritus of communications and longtime distance-learning expert from the University of São Paulo, Fredric Litto, notes that "we are now in the transitional stage of employers gradually reducing their prejudice in the hiring of those who studied at a distance, and moving in favor of such 'graduates' who, in the workplace, demonstrate greater proactiveness, initiative, discipline, collaborativeness –because they studied online" (Rainie and Anderson 2017: 5).

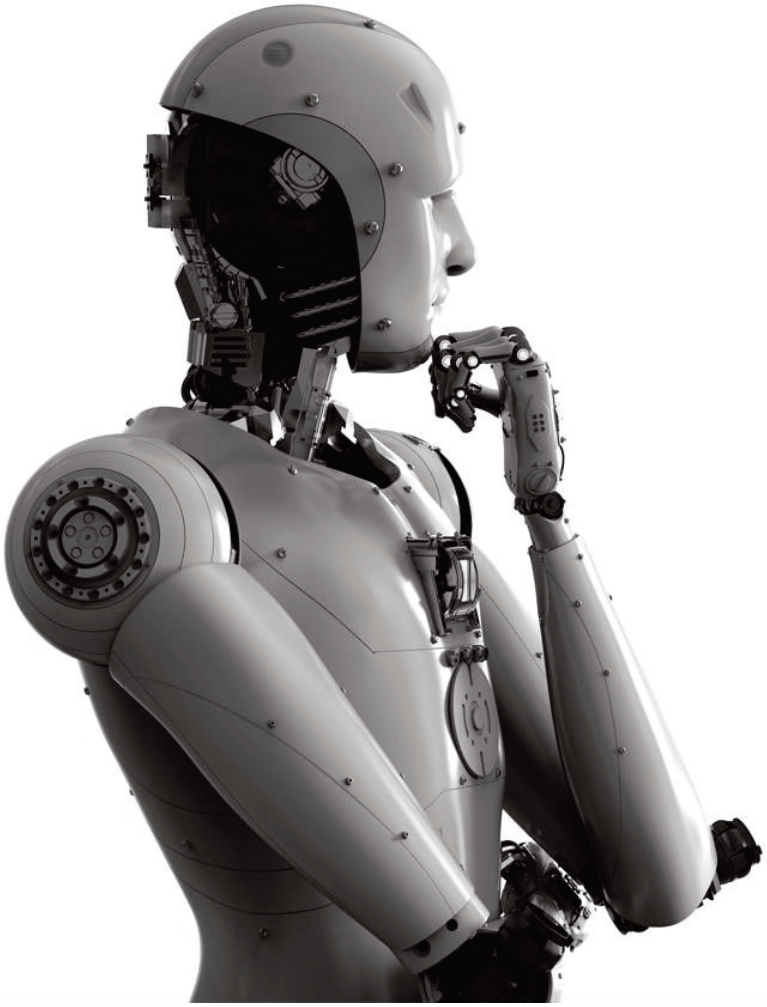
Nevertheless, a data programmer and data analyst cautions that a predicted "60 to 80 million Americans alone will be thrown out of work in the next two decades. There is nothing the vast majority of these people can be trained on that will replace the income/work they do today" (Rainie and Anderson 2017: 1). Systems architect and policy analyst at the Protocol Technologies Group, Miles Fidelman, agrees:

> The trend is pretty clear. We will need less 'workers' in the future. For a long time, science fiction presented us with visions of a world where machines did all the work, and people enjoyed leisure, artistic pursuits, etc. These days, a more dystopian reality is emerging –where a few party, a few more do a lot of work, and growing numbers search for work. We're going to need a fundamental reshaping of our economy, not training people for jobs that are simply not going to be there (Rainie and Anderson 2017: 3).

A current engineering student concurs:

> New job training will be irrelevant, as the transition from labor to automation will be an exponentially accelerated one. The solution will be democratic socialism to redistribute money, as no one will have the buying power to purchase goods as [there] will not be enough jobs. This democratic socialist transition will lead us to the post-capitalism, post-scarcity society… This is not a problem of education –indeed, it is easier than ever before for someone to self-educate– rather, it is an inevitable stage in human civilization that must be managed by vastly increasing state-funded welfare (for example, a Universal Basic Income) (Rainie and Anderson 2017: 1).

Conclusion



Most experts predict that by 2025 automation will be an integral part of our daily lives. This automation may especially eliminate certain jobs in the blue-collar sector but it will also impact white-collar workers –where highly-skilled workers may thrive but the vast majority will end up in lower paying service jobs or permanent unemployment. However, based on historical trends since the First Industrial Revolution, new types of employment will be needed and created. Also, human adaptability and ingenuity, as well as education, will generate new types of occupations that will emphasize distinctively social competences like empathy, creativity, judgment, or critical thinking. This reality will transform the meaning of work in our daily lives mostly in a more encouraging and humanly advantageous way. This will be especially true if today we make the right choices in governmental and social policies and expressly in education. Unfortunately, most experts agree that our present-day financial, governmental, and scholastic institutions are poorly equipped to deal with the current and coming automation to give it a positive and socially beneficial outcome.

A large number of experts likewise remind us that both potentially positive and negative impacts of automation on work are not inevitable. Ultimately, we humans are in control, to a greater or lesser extent, of the final impact of automation on work. As put by the Editor-in-chief and publisher of the *MIT Technology Review*, Jason Pontin, "there's no economic law that says the jobs eliminated by new technologies will inevitably be replaced by new jobs in new markets... All of this is manageable by states and economies: but it will require wrestling with ideologically fraught solutions, such as a guaranteed minimum income, and a broadening of our social sense of what is valuable work" (Smith and Anderson 2014: 15).

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