Automation Acceleration

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DYKSTRA-MCCARTHY: 2020 has been a year when our relationship with technology became more of a glaring dependence. From the first days of social distancing and quarantine, our lives—professional and personal—moved online; as we move into the year's twilight, this is hardly a novel observation. It has, however, transformed the workforce, and I don't mean whether or not people are coming into work; but rather whether they need to come into work at all.

Faced with restrictions on their workers' movements, industries across the world have seen the long-term benefits of automation. Global supply chains, caught by obstacles around the world have needed automation to

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deliver food, manufacture masks and medical supplies, and reconfigure how to use Artificial Intelligence (AI) to handle customer service. And for those industries that have been unable to capitalize on the advantages of robotics to remove workers from the equation, the question is more pressing than ever: could we go autonomous? Enormous projects, like from factories to open-pit mines, could employ a fraction of their current workforce and could have remained open throughout the pandemic, insulating them from systemic shocks stemming from human vulnerabilities. The motivation and the momentum are now stronger than ever.

None of this would be possible without recent technological advances; many of the vaccines furthest along in their trials have been developed with machine learning tools to predict which parts of the virus's structure will provoke an immune response and track COVID-19's possible genetic mutations. Many pharmaceutical companies have been using AI technologies to monitor possible side effects of their COVID-19 treatments and vaccines. Some vaccines, such as the Pfizer model, rely on a stunningly hard-to-operate cold supply chain of minus seventy degrees Celsius. Whether or not the others require the same (the Moderna vaccine already does not), it is an indicator of how much the world will rely on automation for the roll-out of any vaccine.

Already, this may be setting off alarm bells. If only a fraction of the workforce is needed, where would the rest of the workers go?

ASTRID KRENZ: This industrial digital revolution is different from the tech revolutions that we've seen before, many of which made workers more productive. As a consequence, workers made higher wages, and living standards were rising to a higher level. But this revolution is about new technologies and machines replacing workers more and more. And if more workers are replaced, there are less productivity gains left for human beings, as they will be finally only machines left at work.

What we see is a large rise in automation in terms of industrial robots of the past years. And figures from the International Federation of Robotics reveal that while automation was almost an unknown phenomenon in the 1970s, with fewer than 3,000 robots worldwide, the operational stock of industrial robots nowadays has reached over 2.7 million—and this trend has continued to increase.

DYKSTRA-MCCARTHY: *In the last fifty years, robots have been used to increase production and reduce costs in industries as varied as the automobile industry, garment production and brewing. In Western economies, the number*

of robots in use increased fourfold between 1993 and 2003. In developed economies, the impact hasn't caused negative effects on employment – at least not yet, according to a recent International Labor Organization study. However, in developing economies, increased use of robots has led to a 14% drop in employment between 2005 and 2014, mostly because it allows firms to avoid offshoring to developing countries for their lower cost of labor. In other words: if it's cheaper to use robots in developed countries, it directly takes away from jobs in developing countries where these would historically have been offshored to. In Bangladesh, automation had been slowly taking the place of garment workers since before 2018; by 2030, it is expected to gut 60% of all garment jobs. Nor is this trend likely to stay narrow or slow down. Before the pandemic hit, the World Bank estimated that 57% of all jobs could be automated in the next twenty years.

KRENZ: It is mostly in factories where we have low-skilled labor working. And these are the workers that are at the highest risk of being replaced by robots. So, we already see this replacement taking place in various industries and workplaces worldwide. And low-skilled workers will not benefit any more. Rather, it is capital, or those who own capital, as well as high skilled workers that are complementary to production, such as managers or engineers, who will benefit.

DYKSTRA-MCCARTHY: *And it isn't just the manual laborers who lose their jobs, or the factory owners who earn more money. There are wider implications across industries and the global manufacturing sector as a whole. As we just noted, offshoring is reduced with more automation, but the reverse is also true: automation has led to an increase in a practice known as "re-shoring," where big firms like Adidas move their manufacturing activities from areas with cheap labor costs, like Southeast Asia, back to places like Germany and the United States. Robots and AI eliminate the need for cheap labor abroad, especially due to their efficiency gains and the lowered cost reductions of producing domestically.*

KRENZ: "Re-shoring" can be defined as the return of production processes back to the home country—those production processes that had been previously transferred abroad or offshore. Firms are driven by the motivation to maximize profits and to produce with the cheapest input factor.

DYKSTRA-MCCARTHY: *Nor is it just companies seeking to make the biggest bang for their buck; the idea of re-shoring appeals to recent trends in trade*

rhetoric of nationalizing jobs—the "Made in Britain" or "Made in USA" style policies. Politicians can appeal to their blue-collar base, galvanizing them with pledges of rejuvenating industries and job creation and restoring those jobs lost to offshoring. Governments might try to force firms to re-shore through tariffs on goods from competing countries, but this doesn't pan out as neatly as expected.

KRENZ: What we do in our research at the "Digital Futures at Work" Center is to show that re-shoring is influenced and reinforced by higher protectionism, or tariffs that are imposed on imports. This makes the transport of products or components from offshore destinations too expensive.

> *And importantly, our model shows that protectionism increases the speed of re-shoring, but it does not improve the lot of low-skilled workers and it worsens the lot of high-skilled workers.*

The other thing is, higher wages in foreign countries that were previous offshore destinations, and in particular about the higher productivity of automation. So, when the productivity of automation increases, which means that the machines, robots, or automation capture become cheaper over time, more firms were re-shoring production processes and could produce at home using cheaper robots instead of workers. And importantly, our model shows that protectionism increases the speed of re-shoring, but it does not improve the lot of low-skilled workers and it worsens the lot of high-skilled workers.

DYKSTRA-MCCARTHY: *In 2016, the shoe giant Adidas re-shored some of its manufacturing to Ansbach, Germany and Atlanta, Georgia. These so-called "speedfactories" were supposed to use automation at all steps of the process to manufacture shoes in five hours, as opposed to almost a month, with shipping included, at their Asian plants. But while it returned production to these countries, re-shoring did not create new jobs in Germany or the United States.*

KRENZ: For many years, the production of sport shoes had been offshored, mainly to China, Indonesia, and Vietnam. But then Adidas added the new factories for trainers in Germany and in the United States. And now in these factories' productions lines, many tasks are performed by automated processes, like robots, or by 3D printers. Whereas previously in Asian factories, 1,000 or more workers were employed, there are now only about 160 workers that were said to be employed in the new factories in the United States or in Germany.

The machines are able to conduct a lot of tasks that lower-skilled workers would have done in traditional factories in developing countries, but there is also very low-skill type of tasks that are not yet be able to be replaced by machines, such as putting laces into shoes, for example. This is a very complicated and very detailed task that the machines are not yet able to do.

DYKSTRA-MCCARTHY: *Garments also operate on shorter timescales. Given that fashion changes from year to year, each task a machine is required to do would need to shift as well. At the moment, the machines in garment manufacturing aren't yet able to adapt this quickly– or at least the cost of designing and producing such machines doesn't compare to the cheap human labor.*

Adidas's experience with re-shoring was ultimately unsuccessful. In 2019, Adidas announced it would close its two speedfactories and would instead apply some of the technologies they used to their factories in Asia. The automation they used was only able to produce a small number of shoe models, failing to meet its ambitious goal of producing one million shoes per year.

KRENZ: The phasing out of low-skilled workers due to automation can also be true for a developing country—it depends. We already see increasing labor costs in Asian countries, like China, and I think this trend is likely to continue. The trend of decreasing prices for automation capital for the robots is also increasing over time. So, what's going to happen is that more and more robots will take the places of workers in those countries' production processes as well, because we also have many Asian countries that have highly-developed technologies.

DYKSTRA-MCCARTHY: *The question then becomes: where will these jobs go? What are the geopolitical implications of this movement of jobs and industries? The answers here are more conjecture than fact, but a certain direction of travel can be seen—namely, the East Asian powerhouse is firing up as the automation engine. China is predicted to automate a whopping 12.5 million jobs by 2030, with one out of every three robots being installed therein.*

And what does this mean for the world's supply chains? Global supply chains been under scrutiny like never before, especially during the era of COVID-19. Pasta and toilet paper were stockpiled, and medical supplies were shuttled from continent to continent and seized by manufacturing states, and the shocks from the Sino-American trade war sent ripples through tech supply chains—and the vaccine rollout will be an additional test for supply chains. Further, the logistical vulnerability of these supply chains is now clearer than ever. If globalization is the heart of the modern economy, supply chains are its

arteries, and they are susceptible to the slightest shock—shocks that by their very nature come when least desired. Before 2020, China had been producing approximately half the world's face masks, but when COVID-19 swept across the country, they were unable to export necessary medical equipment like face masks in the quantities needed, and that was before we got into the political wrangling of face masks in transit seized by various governments worldwide.

KRENZ: So, robots and machines, they are not vulnerable to the virus. We already see that digitalization has accelerated during COVID-19. And COVID-19 is likely to change production processes of the future, implying an increased degree of automation and strong benefit of the machines as they are not vulnerable to a pandemic or virus. We have seen that people have to stay at home, they have to work in home office, and if there are lockdowns in an economy, the people will not work in the factories. If you have machines working instead, the production can continue. This is something we saw last year, especially in the automobile industry. For example, for Volkswagen's main automobile producer in Germany was in lockdown for a couple of weeks, but if they had a highly auto-mated production processing set, the production would have been able to continue, right? This is something that you learn from the pandemic. So obviously, in terms of a pandemic, it is beneficial to have to have machines doing the production.

DYKSTRA-MCCARTHY: *There go those alarm bells again. If Volkswagen factories in Germany or miners in Chilean copper mines aren't needed, and if their industries transition to require a select number of higher skilled automa-tion operators and site managers and only a few of the hundreds or thousands of lower-skilled workers, will this lead to mass unemployment? Certainly, this has been the fear.*

> *As long as we properly train and educate workers so that they can cope with the new demands and tasks at the workplace, there will be no mass unemployment.*

KRENZ: As long as we properly train and educate workers so that they can cope with the new demands and tasks at the workplace, there will be no mass unemployment. However, we do have to begin early with education and training. We have to teach our children how to work with computers, how to write software programs, how to understand these digital technologies and how to use them.

DYKSTRA-MCCARTHY: *But where might these jobs come from? It sounds like they're disappearing but not re-appearing.*

KRENZ: There will be new jobs that will be created, because there's so many new technologies that emerge, and there are highly computerized technologies and jobs that demand knowledge in handling these technologies. I think for the short and medium run, no one should not be worried about mass unemployment. But how much do we really just want to depend on the machines, and Artificial Intelligence? This is a decision that we must make.

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DYKSTRA-MCCARTHY: *The "Rise of the Robots," the idea of a robot apocalypse which drives large swathes of workers into mass unemployment, has floated around the peripheries of labor scholarship. This new technological revolution, this "Fourth Industrial Revolution," can sound alarmist, as it may transform the labor forces, social structures and the future of work as we know it. But many hearing the alarm bells have also often felt protected from the danger themselves. When these conversations began, we might only have envisioned automation as the roll-out of robots on factory floors, mass producing manufactured goods like automobiles: faster, safer, and controlling for human error. We might even have thought of driverless cars bruising driving industries, but the automation acceleration won't end there. As Artificial Intelligence, robotics and automation technologies become faster, more capable of tackling complex problems, and—most importantly—heaper, these technologies will permeate into more and more industries, making jobs, careers and entire workforces obsolete. Few sectors will be invulnerable to these changes and many, which might have seemed "un-automatable" will fall prey to more efficient, computerized solutions.*

Think about travel agents. Twenty-five years ago, there were 34,000 travel agencies and 124,000 agents in the United States alone. Each transaction would have cost around $30 and involved both travel agents and the agencies' support staff. Now, the world of travel has been revolutionized. I can search for my own flights on my phone, compare prices on different platforms, search for hotels on Booking.com or Airbnb, compare prices, check reviews, see photos and book. Now its estimated there are 66,000 travel agents in the United States, largely limited to esoteric destinations or luxury bookings. An industry decimated, some might say. Travel isn't the first, nor will it be the last. Pharmaceuticals may well be the next; but we'll talk more about that later.

These jobs are those that we would traditionally consider protected from

the onward march of the machines—white-collar jobs. The truth is, as any automation expert would tell you, that any part of your job that is remotely repetitive can be automated. And rather than pay multiple humans to do a repetitive activity, where error might come into play; if there is enough demand, a machine can do it instead. Travel, pharmaceuticals, copy writing, mail delivery, traffic enforcement, legal writing, or retail—the list goes on. And it may include industries you'd least expect.

MAYA MARKOVICH: "Legal technology," is a nascent industry still, and it is early in the disruptive cycle of the legal industry, which the legal tech industry is a subset of.

The legal industry has been much slower to adopt and benefit from technology than many other industries. When Nextlaw Labs was founded five years ago, as a legal tech-focused innovation catalyst, many people didn't really even know what we were talking about. Since then, things have progressed quickly. But the legal industry is still behind, and the legal space is uniquely challenging, because in many ways, it really hasn't changed since the time of the Magna Carta. Changing the way that things have always been done requires selling a 13th century guild on the benefits and mandates of the 21st century, and "future-proofing" a tradition-rich industry designed to stand on precedents, where the prevailing view is a lawyer's work is always bespoke, can be very challenging.

DYKSTRA-MCCARTHY: *This might sound familiar. The legal industry is far from the only one to be slow in adapting to and adopting new technologies, especially those which might endanger their jobs. But this is a train you either hop on or get hit by.*

MARKOVICH: There was a McKinsey study a few years back that found that across all industries, something like 60% of occupations have at least 30% technically automatable activities, but I'm sure that's shifted a bit now. The World Economic Forum predicted automation specifically would create kind of a net increase of fifty-eight million jobs by 2022, which is, of course, beyond white-collar, but that's still a significant number, and tasks that professionals perform that are high-frequency but low-risk can be found across most other industries, such as insurance, accounting, and financial services. And we see these types of trends across the globe, as Denton's clients worldwide are looking at the same types of issues. Also, of course, as automation capability gets better, jobs involving higher skills will probably be automated at increasing rates. I say this not as an endorsement

of automation, necessarily, but to make it clear that automation is a very real and rapidly advancing phenomenon that's going to impact all sectors and often faster than we think.

DYKSTRA-MCCARTHY: *And workers, or those who benefit from their industries, have often resisted change. In 1589, William Lee invented a stocking frame knitting machine to relieve workers of hand-knitting. Upon viewing the machine, Queen Elizabeth I refused to grant him a patent, claiming that: "Thou aimest high, Master Lee. Consider thou what the invention could do to my poor subjects. It would assuredly bring to them ruin by depriving them of employment, thus making them beggars." But it also might sound hard to imagine—what technologies could prove highly disruptive in the legal field?*

MARKOVICH: So, multiple tech products can quickly identify key data to conduct analysis, draw inferences, and flag terms for additional scrutiny. Some technology is really planned to go even further by rendering recommendations and judgement calls, but then a lawyer interprets those findings, incorporates context and nuance and provides better informed legal service faster. Another example I would give is the area of "smart contracts"—and that is a big deal. Right now, there are many ways in which contracting and the practice of law that involves contracts—which is most law in some form or another—are very manual, with things like wet signature, and faxes back and forth. It's ripe for disruption, and the kind of the next level, beyond automating potential.

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DYKSTRA-MCCARTHY: *Well, let's keep the example to 2020 and the kind of problem which may plague the rollout of a COVID-19 vaccine.*

MARKOVICH: In terms of COVID-19, this would look something like if a pharmaceutical company, as a requirement of shipping, is required to ship their products within a certain temperature range. The contract specifies that if they don't do that—if the temperature falls below or above that range within the course of the shipping—then it will engender either: the contract is null and void, you don't have to accept the delivery; or, conversely, a fine will be levied.

DYKSTRA-MCCARTHY: *A contract that is directly connected to the technology which monitors the criteria that the contract governs. Not only is it streamlined, but by cutting out multiple steps in the process, bypasses multiple opportunities for human input to become human error. That is typically the added value of tech: less time, greater reliability.*

MARKOVICH: So, what would happen in this very simplistic example is that the contract itself would connect directly to the Application Programming Interface (API) of the nest or the thermostat within the shipping container. And if the temperature goes above or below, it automatically would trigger the reaction within the contract, which, as you can imagine, eliminates just a huge number of back and forth, keeps things moving as quickly as possible, and ensures safety. Because we know how many examples there are of shipments of these kinds of things getting somewhere, only to find that they're not safe, or they're not effective. And being able to have that backstop is going to be critical and a vast improvement over the current situation. Contract review can be extraordinarily time consuming, but it's often written off of client bills.

DYKSTRA-MCCARTHY: *When something like contract review– a repetitive, time-consuming task– is written off of client bills, law firms can justify the poor efficiency by the high value of additional billable hours which it brings them. There is little incentive to change that system. Automation in the legal sector would seek to upend this self-perpetuating, wasteful cycle.*

MARKOVICH: A client is going to think that, let's say, if there's a "Person One" that does a task on behalf of a client in ten hours, and "Person Two" does the same task in five hours, "Person Two" is going to be the favorite person of the client, and "Person One" is going to be the favorite person of their partner. When we talk about how you excel within a career path, in law, traditionally, it's always been defined as achieving a high number of billable hours. And that is not what the clients want or need. Now, they're increasingly demanding a different model, and as a result, tools that automate this kind of lower-level work within law are going to necessitate lawyers to think differently about how they're interacting and collaborating with their clients.

DYKSTRA-MCCARTHY: *This would be a fundamental shift in the legal sector. But it echoes a wider trend around automation, one that might ring true for us more than ever in 2020. As more and more jobs are automated, it*

has highlighted how there are some jobs– teaching, nursing, caring, babysitting, doctoring, police work– where personal connection is something we are willing to pay a higher price for. Teaching can be automated, but we respond better to a human and, given a choice, want our children to be taught by and cared for by people, not machines. In a year where we spend increasingly less and less physical time with each other, the value of live human interaction has earned its premium.

MARKOVICH: I think we're still yet to see the full impact of it. In the case of the legal industry, as it exists today, it is essentially built for lawyers to run as a business—it's not user or client-centric. So, automation trends have been moving toward making lawyers more responsive to clients. I also think there is now also an opening for lawyers to do more experimenting with tools and processes with the psychological safety to do so; whereas before, the profession's constraints really didn't traditionally, didn't make much room for that. I'm optimistic that, at least for some, there will be a real shift in outlook that will make folks more open to that experimentation, and pave the way for the democratization of legal services.

DYKSTRA-MCCARTHY: *Were such legal tech to really take off, and truly transform the legal industry, so that the work would evolve from time-intensive billable hours, to more client focused, the hope is that this might improve the democratization of legal services; by reducing their costs, legal services could become more accessible to wider segments of the population. Legal poverty is a serious problem—ast year, 1.4 billion people had unmet civil or administrative justice needs, and automation could help free up and spread wider the much-needed services of lawyers. This seems an idealistic dream, with a touch of naive optimism perhaps, but certainly a potential outcome. There are a few quibbles with this utopia, though. First of all, reducing the emphasis on billable hours may well reduce how lucrative legal services are.*

MARKOVICH: When lawyers have more free time, because they're freed up from this rote, lower-value work—often heavily administrative work—they will be able to take on more clients. And if you add to that the fact that if a tool is doing much of the front-end intake, for example, for a small family law firm or something like that, that the firm will be able to take on, of course, hopefully more clients, which will probably offset the fact that they probably won't be able to charge quite as much. This would then likely make the services more affordable.

DYKSTRA-MCCARTHY: *Secondly, as with all technology, increasing automation comes with its own risks, and many of the pitfalls in technology have been ones we have been slow to see.*

MARKOVICH: Automating a manual process that's rife with implicit bias, which many processes frankly are, simply codes in the bias. There are already countless examples of algorithmic bias causing serious issues and concerns, built as they often are by homogenous groups of engineers. We see examples of this in technology like facial recognition, or predictive policing of whom gets a loan. I think that like any emerging technology, if automation is done carelessly abused, or unregulated, or if it's held in the hands of only a few, it can have strong negative repercussions—especially if whoever is using the output from the automated process just takes the output without questioning where it came from or how it arrived at certain conclusions. But you know, if the technology is open and transparent as to how the automated processes are storing and using the information that's being collected, and it's progressively democratized, it has incredible potential. For example, it could be used as a way to monitor and enforce fairness and lending, or quickly review decisions for bias.

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DYKSTRA-MCCARTHY: *So for all of automation's benefits, there are some obvious flaws, which are giving the industry and its drivers some pause for thought. But there is a wider trend at play. Yes, automation is supplanting many jobs. Yes, many more will be created. But the loss of one does not lead workers directly to gaining the other. For one thing, automation isn't a one-stop shop, a zero-sum game between humans and robots. In almost all examples of implementation, we still want the ultimate decisions to be made by people—the robots are the co-pilots, not the captains. In August 2020, American's Defence Advanced Research Projects Agency (DARPA) trialed AI algorithms in a series of simulated aerial dogfights, pitting AI against AI, and AI against human pilots. The AI came out on top, beating an American Air Force pilot in five games out of five. But so far, the ambition has not been to replace pilots, but to redistribute the work from within the cockpit, increasing capability rather than replacing roles. But the roles which support these human decisions are increasing by the day; eventually, a single human might orchestrate a fleet of pilot-free planes. This is but the first step on the road.*

MARKOVICH: While law will never be the same, clients will need lawyers more than ever before—not the "old school" kind of lawyer, but these trusted partners that can think creatively, have deep knowledge of their business, and possess the emotional intelligence to understand their needs. And it's really hard to determine what automation says about the value of work, when ultimately there will always be a need for humans that can apply expertise to decision making, and strategic and creative tasks. I mean, this is just my personal opinion, but I think the value is placed on high-value work. But society is one thing, right? Business is another, and business always skews towards the better, faster, cheaper model—which is nothing new. From the days of the first assembly lines, automation became a forcing factor for labor to become organized against. Societies, individuals, and groups of workers in all professions need to reckon with what their work will mean in the future, and what it will need to mean at the global, national, and local level. It certainly is changing, and I think automation is just one factor.

Business always skews towards the better, faster, cheaper model—which is nothing new.

DYKSTRA-MCCARTHY: *At the most basic level, 2020 has taught firms a swift lesson is maximizing productivity with fewer people present in person and, often, fewer people needed at all. Those lessons are not likely to be unlearned. Automation acceleration isn't one single fork in the road or one pivotal change, it is a journey. If we had previously just opened the door and walked down the garden paths, 2020 has put us squarely on the road.*

The first step to automation is digitization, and 2020 has heralded an age of digitization like never before. Changes in digital and technology adoption are taking place about twenty-five times faster than before the pandemic. We will soon see the consequences of business after business moving online, as more and more shortcuts and functionalities are found to aid and accessorize our online world. Next, these accessories will become increasingly necessary until they begin to supplant—not supplement—human jobs. The full range of automation impacts will not be seen for several years yet, but if our interviewees had one piece of advice, it would be to take action now. Retrain the workers now for the world which will soon exist.

Compounded with this trend are the economic consequences of the pandemic. Whilst automation is not a zero-sum game with jobs, there are certainly some negative consequences. Though there will be more jobs, the kind of jobs will change, and those who lost the jobs might not be the ones who gain

the new jobs—these individuals may well be the "left-behinds," the new "Lost Generation." This is not good news, especially when unemployment rates world-wide are on the rise. And, since the 1980s, in the United States all jobs lost permanently to automation occurred during recessions. Another recent study found that over three recessions in the past thirty years a whopping 88% of job loss took place in "routine," highly automatable occupations—suggesting that automation accounted for essentially all of the jobs lost in the crises.

Robots might not be taking your jobs yet; but don't get too comfortable. Those in the passenger seat might soon be driving the car. Buckle up. ƒ