Impediments to Optimum Workplace Automation

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Automation is a constant in daily life, ranging from coffee makers to fully robotic factories to Artificial Intelligence. Two major forms of automation are considered to exist, those that physically interact with their surroundings and purely software operations, and this paper will consider both automation categories as a single form. Many tasks done manually today may be easily automated as technology continues to improve. Automation can improve health, comfort, and safety. Crash avoidance systems in automobiles may reduce vehicle accidents by up to 32 percent (Yue et al, 2018). However, according to Lee (2017), human dependence on machines can have unanticipated consequences, such as excessive reliance on automated warnings. Understanding the relationship between people and automation is necessary for a safe and effective merging of new systems.

Many repetitive and labor-intensive workplace tasks have been automated. Automation can reduce workplace injury, which remains a major public health problem. The Bureau of Labor Statistics reports 2,811,500 nonfatal and 5,147 fatal injuries and illnesses for 2017 (BLS, n.d). The top injuries resulting in days of lost work include overexertion, contact with objects and equipment, and falls (NCS, 2019). Automation can improve safety, efficiency, and productivity. However, workplace automation can displace workers, introduce new hazards, and stress mental health (Horton et al, 2018). It has implications for employees, companies, governments, health

professionals, insurance companies, automation developers, and communities. Both critics and promoters of workplace automation influence its extent, often in ways that limit its efficacy.

Review of Research

Horton (et al, 2018) examines "megatrends on work and health safety (WHS) and workers' compensation over the next 20 years." They identify their trends in terms of advanced automation cost falling with widespread deployment, a rise in stress affecting mental health with use of digital technologies, and a blurring boundary between work and home. The trends lead them to contend four scenarios for the future of WHS: business as usual, enabled, restructured, and transformed. Business as usual is defined by limited impact of work by automation with future employment similar as today. Enabled has employment models similar as todays but with many tasks now performed with automation. Restructured has a drastic difference in the business to worker relationship, with small business being primary in job offerings and large companies contracting freelancers with a net job loss. Transformed examines a new model of staff engagement and the way work is done, with most task preformed by automated technology. Horton predicts a safer workplace with a decline in manual task employment opportunities while explaining how jobs will transition more towards a gig, or freelance, economy. Little is discussed on how particpants will influence which future scenario is most likely to occur.

Wagner (et al, 2018) discuss the impact that overtrust of automated systems has on user's decision-making ability. They define this overtrust as an "extreme version of automation bias, which is a tendency of people to defer to automated technology when presented with conflicting information." In scenarios where test participants were fleeing a dangerous situation, a robot would intentionally mislead them in direct contrast to the emergency evacuation signs. When

ask, the participants responded, “they felt the robot knew more than they did, or that it would not or could not be programmed to lead people astray.” Wagner explains how “overtrust influences people to tolerate risks they would not normally accept and may exacerbate problematic material,” and how autopilot systems in vehicles incline the drivers to watch a movie, eat and drink, or otherwise be distract when their attention should be focused on the cars performance. They discuss recommendations for mitigating the overtrust, such as robots behaving more human like to instill a measure of distrust or better transparency of a robot’s capabilities and how they may fail. Wagner does not discuss how these, and similar dilemmas slow the adoption of automated technologies.

Ramaswamy (2017) analysis the affect of automation implementation on employment levels. They find the average loss of employment due to the increasing adoption of robots and automation is not affected. Ramaswamy argues that a demand for new forms of skilled workers with new specializations will increase but acknowledges “low skilled workers in routine jobs are more likely to suffer job losses.” Between 1979 and 2012, a period Ramaswamy contends workers found their jobs being replaced by automation, was populated with “a significant fraction of less-educated adults in the US … unable to find gainful employment at prevailing wages” and found that the “demand for less skilled workers has substantially declined.” They claim, “there always remain large classes of occupations not amenable to automation,” and “it is possible for the introduction of new tasks in which labor has a comparative advantage,” though not detailing examples of those occupations. Ramaswamy states a rise in high skilled labor positions will continue to occur, but “new developments on technologies … greatly add to the uncertainty of labor market outcomes in terms of employment.” They do not discuss how the labor market will impact automations implementation into the workplace.

Promoters

Promoters of automation often face skepticism, and automation vendors must manage such skepticism. Midwest Engineered Systems (MWES, n.d.) and Rockwell Automation (RA, 2019) offer classes to teach employees how to safely interact with the systems they sell. Their websites publicize automation's production and revenue, in terms of graphics from prior cliental. To employees, they emphasize safety and relief from work burdens. McKinsey, a consultancy, often recommends automation to its clients as a method to reduce injuries, thus reducing the cost of insurance and worker compensation (Chui et al, 2016).

Some automation systems have more features than a company may need, with implications for initial cost, maintenance, and production (Thompson et.al, 2005). Processing time is a major factor in production cost, and individual customizations in automation adoption is important in effective performance. Feature creep is a performance hinderance, with hundreds of threads on Reddit.com discussing issues such as the removal of unwanted programs on operating systems and smartphones to free storage space and improve processing speed. A user named Cmoney61900 posted benchmark comparisons of before and after program removals and found a 20 second reduced boot up speed and one to two second operating response improvement (2019). Similar concerns arise in workplace automation solutions. Everett and Slocum (1994) contend that a robotic solution for construction is not equal to those in manufacturing. They explain many construction tasks, like in manufacturing, are easily automated; such as speed, strength, repetitive motion, and hostile environment operations. Everett and Slocum argue, "Machines designed to replace human craft workers are too complex [and] too expensive." While most tasks don't require a craftsperson, a "human craft worker [is] still more productive and cost effective than

machines and computers for the information-intensive basic tasks." Automation capable of high functioning tasks and operating those tasks infrequently is cost ineffective.

Zealous promoters of automation adopt solutions into the workplace before actual needs are understood and the most effective options are located, decreasing the maximum benefits and profits. Grizzaffi (2019) claims “we should seriously consider automating any task where that automation would provide appropriate value…regardless of when in the application’s lifecycle we start that automation.” He does not state what the “appropriate value” is or offer a method of estimation. In the TESLA first quarter call of 2018 Elon Musk stated, “we did go to far in the automation front and automated some pretty silly things” (FiJutor, 2018). Musk continues saying the process they automated was not needed in the final product of the TESLA battery. The cost expenditure implementing unnecessary automation serves as a warning to more budget conscience companies. Drapella, the founder of SaunaGrow, warns “there are few major reasons why you should not consider automation to early …, cost of automation, incl. planning & IT development is extremely high when compared to manual work, … lack of full knowledge of the process means also that the resources invested in automation are simply wasted …, automation often means increasing the distance between you and your customers” (2019). Companies not prepared for the intricacies of automation implementation will struggle to achieve results. According to EY, a global leader in advisory services, “we have seen as many as 30 to 50% of initial RPA [Robotic Process Automation] projects fail … there are some common mistakes that will often prevent an organization from delivering on the promise of RPA” (2016). They claim several of those mistakes include targeting the wrong processes, automating too much, and assuming proof of concepts will reflect results. Premature adoption of automation, without proper understanding of workplace needs or process implications, will limit its effectiveness.

Policy and Law Considerations

Regulations and on-site space optimization affect implementation of workplace automation. The National Institute for Occupational Safety and Health issues recommendations to prevent worker injury and illness from workplace technology (NIOSH, 2019). NIOSH reports 26% of injuries are due to contact with objects and equipment and recommends minimum safe distances from automated machinery (2019). Cages around swinging, rotating, or articulating machines occupy premium floor space, often more space than the maximum range of the machinery. According to ANSI/RIA R15.06-2012 in reference to safety requirements of robotic systems the perimeter guard dimensions must cover the area for the full range of capable motion (ISHN, 2018). OSHA (n.d.) refers to these ANSI regulations during enforcement and investigations and states, “a worker can be hit by one robot while working on another, trapped between them or peripheral equipment.” Though installation of automated systems occupies valuable real estate, specialty firms are available to maximize space efficiency. FM:Systems (2020) “can help your organization streamline existing processes for space management,” and AssetWorks (2020) “offer a fully integrated, purpose-built solution specifically designed to manage the entire real estate.” The additional cost of space optimization due to mandatory regulations impedes successful automation deployment.

Automated monitoring of workers for safety and work quality can reduce risk of injuries, increases production and profits, and ensure proper procedures. Concerns over privacy laws limit implementation of monitoring software. A team at the University of Washington is developing computer monitoring with deep learning software to assess worker ergonomics which reports activities that put joints and muscles at risk of injury (Parsa et al, 2019). Their ergonomic risk

assessment model captures real time video of worker movement for deep learning compassions to existing benchmark datasets. Detailed video can be shared with the workers to improve ergonomics. According to Workplace.org (2020), “if the recording is done by visible cameras, federal law seems to allow videotaping of individuals in the workplace, even without their consent or knowledge, as long as it is not done to commit a crime.” Eva Sage-Gavin (Sheng, 2019), the Senior Managing Director of Talent & Organization Consulting at Accenture, reported in an interview with CNBC that “92% [of workers] said they would be open to it helped them improve their performance.” The remaining 8% potentially uncomfortable being recorded and needing only one complaint to cause legal ramifications.

As automation continues to permeate the workforce, new policies and guidelines will be made to ensure worker rights and safety. These will impact the rate and efficiency of automation implementation. The Society for Industrial and Organizational Psychology “provide evidence-based support to policymakers” about how workers react and respond to new technologies and automation (SIOP, 2019). SIOP suggest several challenges with automation changing the workplace, such as “require[ing] employees to develop new routines, skills, and competencies to better work alongside automated systems” and “a disconnect between educators and employers in developing new programs.” They advocate supporting policy makers to intercede and develop methods to “address the various challenges and opportunities related to the future of work.” There is a demand for law and policy makers to intercede on automation, both in workplace and public spaces. Policy makers are aware of the demand and automations impact on workers, with Barack Obama stating in his farewell address “The next wave of economic dislocation won’t come from overseas. It will come from the relentless pace of automation that makes many good, middle-class jobs obsolete” (2017). In an interview with Inverse, John Frank Weaver, a lawyer

who specializes in A.I. law, states “there should be some federal commission, or entity, that has some role in organizing a large picture regulation of A.I. and autonomous technology” (Knefel, 2017). A federal entity specializing in automation would provide the needed expertise to make better informed decisions and, Knefel claims, “for officials to go to get advice not only about the state of the art technology, but what its impact on society could be” (2017). What impacts the policies will take is unknown, but they can affect company’s ability to automate optimally. A potential future may include a tax on robots in production. Bill Gates suggest “if a robot comes in to do the same thing (a dollar amount worth of work), you’d think we’d tax the robot at a similar level” (Quartz, 2017). The additional tax cost of operating automation would contribute to a company’s decision of their automation extent.

Health and Safety

When automated systems and people are put together there is opportunity for injury or worse. Incidents causing bodily harm historically prompt legislation to regulate future operations. Donald Megge was killed by a stamping machine while cleaning a wastewater trap (Williams, 2015). It was determined the “root causes included disconnected presence- sensing devices, faulty circuits and working alone” (UAW, 2016). Regina Elsea was killed in 2016 attempting to clear a sensor fault when the machine unexpectedly restarted (Briquelet, 2017). The article states that proper energy control procedures where not followed to prevent the machine from restarting. Though the results of lawsuits from both cases were not released and any direct policy or laws resulting from those investigations could not be found, the Kansas City Accident Injury Attorneys report that OSHA fined both facilities for not following NIOSH safety standards (Roswald, n.d.). Death and injury incidents caused by automations such as Megge and

Elsea are frequent enough to need law firms like Kansas City Accident Injury Attorneys to represent those affected. As more like these reach the public, outcry forces policy makers to consider new legislation and public voice is effective in producing results. Outcry can achieve powerful results demonstrated when anti-abortion groups have prompted the adoption of "a bill that would establish criminal penalties of up to 99 years in prison for doctors performing abortion at any stage, with the only exception being a threat to the mother's life" in Alabama and conflict with women rights (Kaneya, 2019). New laws and policies impact workers and companies in different ways, and those impacts contribute to automations use.

Automation shifts the nature of human work. As robots take over physical task and software solves challenging problems, the amount of effort required of the worker is reduced. Work will become less rewarding and impact mental health, and the consequences may impede implementation. According to Hewitt, "work may become less effortful but more tedious and fatiguing" (2017). They argue "effort is associated with improved wellbeing, demonstrating positive associations with enhanced goal-directed behaviour." Workers become bored with the lack of effort and "that remaining bored may be more fatiguing than continuously exerting cognitive effort." Boredom is associated with long term health problems. Studies done on the effects of boredom conclude "those who report being bored are more likely to die younger than those who are not bored" (Britton, 2010). Britton reports the symptoms of boredom match those of the leading cause of boredom death, cardiovascular disease onset from overeating, excessive drinking, smoking, taking drugs, and lack of physical activity. As technology advances more jobs will become automated, anxiety over losing the ability to work cause health concerns and be exacerbated when those jobs are lost. According to a study those "who were in occupations facing greater automation threat reported greater job insecurity, which was, in turn, associated

with self-reported poorer health" (Pankaj, 2017). There is "stronger evidence for the link between perceived insecurity and health," Burgard (2009) finds in their study. Burgard argue "an individual worried about losing a job may experience stress due to anticipation about the problems associated with a job loss, mental strain associated with being in a powerless position, and ambiguity about the future," and a "workers' responses to the stress of perceived job insecurity could be emotional, physiological, and behavioral," with the "accumulation of these responses [resulting] in more permanent and manifest adverse consequences for mental and physical health."

The consequences of shortcoming in healthcare is not tolerated. As automation continues to be implemented in patient care, it is crucial to understand automations limitations. Learning where automation is best implemented and how it interacts with long term diagnostic choices will slow its adoption. Exigo Tech (2019), a consultancy that provides IT solutions to medical establishments, claim the four challenges of "poor data integrity, lack of link between the advanced machines, poor collaboration and misaligned workflows, and privacy and security issues" currently facing the healthcare system can be addressed with the introduction of automation. As companies consider how to use automation, situations arise that challenge its efficacy or necessity. A female patient accidentally stabbed herself with a garden fork, "an emergency room nurse clicked the 'unknown/last five years' tab for the woman's tetanus shot status, and a physician interpreted this to mean she did not need a shot. She had never been immunized. The woman later died of tetanus, said Chicago plaintiff 's attorney Kenneth Lumb" (Walker, 2018). Walker claims that the design of the electronic health record (EHR), an integrated collection of nationwide hospital records, was confusing and often misleading. The many reports of EHR related incidents and lawsuits reveal weaknesses in the system, causing

some healthcare providers to hesitate its use. A surgical robot known as ‘da Vinci’ made by Intuitive Surgical Inc., has been tied to many lawsuits due to surgical errors. According to a case study by the Agency for Healthcare Research and Quality (AHRQ), while there are benefits to robotic surgery, “here potential for human error in operating the robotic technology, but an added risk of mechanical failure is also introduced” (Kirkpatrick, 2016). They claim “the energy source, which is prone to electric arcing, can cause unintended internal burn injuries from the cautery device … risk of temporary, and even permanent, nerve palsies from the extreme body positioning needed to dock the robot … direct nerve compression from the robotic arms can also lead to nerve palsies” as several of the new risk factors. Solutions for these risk can be developed, but its legacy may prevent adoption by facilities concerned by potential lawsuits.

Conclusion

Media, educational institutes, corporations, and many other voices tout the benefits automation will contribute to society. There is little doubt automation will change the world. As software gets better, A.I. gets smarter, and robots become defter, the workload on humanity will decrease. With every innovation, both positive and negative contributions must be considered. Automation should not be excluded in those examinations. While the potential is great, optimum implementation of automation will be limited by unforeseen and unintended clashes with society.

The nature of corporate and personal affairs often obfuscates the true nature of unexpected consequences, especially when monetary assets are at risk. More research into how businesses and workers react after an incident will help in understanding the evolving relationship between man and machine. While a look into automation as a single entity is useful in finding patterns, focusing on a specific form could help to find methods of overcoming

impediments to automation optimization. As more interactions with existing automation occur, better detailed research can be conducted. The future will provide new automation, with new ways of interaction, and lessons learned from past situations should be remembered, adapted, and considered when implementing robots and A.I.

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