

AI and the Agile Workplace

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ABSTRACT

The new work environment will support a global marketplace, exchanging goods and services and exploiting the integration of AI, which has the potential to bring benefits and challenges of unlimited scope. The path of adaption will certainly reward those willing to take entrepreneurial challenges and utilize the benefits of AI. This will provide vast opportunities for new products and services and enormous improvement in productivity and efficiency, as well as increase potential revenue and competitive positioning. The revolution will not come without trials including the possibility for enormous wealth inequalities, skyrocketing unemployment, and dangers and disadvantages. Those in positions where the work is cognitively or task repetitive are the most vulnerable. In this research we will investigate and provide insights on the various considerations that will shape the adoption and the acceptance of the change that AI introduces into the workplace and our personal lives. And based on our investigations, we will extend that vision of AI as an accepted “partner” to our future of what we believe will be logical extensions of improving our work and life balance, raising the thought that this could open up an evolution and revolution of for society.

Keywords: Artificial Intelligence, AI, Agile, Workplace, Redundant cognition, Redundant tasks, Revolution

1. INTRODUCTION

Business need will advance the integration of the new AI technology. Adoptions will occur when workplace economics converges with technological opportunity. Jobs that are repetitive either in terms of process, service or cognition have the greatest possibility of being replaced by AI in some form: robots, chatbots, vocally activated AI or a variation of integrated “things”. AI has the potential to provide vast improvement in productivity, set people free from boring repetitive work and improve the quality of lives [12]. AI will have a fundamental disruptive effect on the labor market around the globe. In the 1940s AI began to creep into the landscape and language understanding and translations have moved AI closer to providing humans with non-human conversant assistants. Most of AI today, like it was in the 1960’s is based on semantic

information processing. Language, understanding and translation were always thought to be the cornerstone of AI because of the computer’s ability to store and retrieve huge amounts of verbal data, phrases and massive dictionaries. Gradually, understanding semantic logic has been replaced with deep learning, algorithms that the machine uses to learn from what it already knows.

Knowledge based systems have overtaken logic-based paradigms. Slowly since the 1960’s MIT, IBM, CMU, Stanford and many other think tanks have helped move AI forward. Today AAI, the American Association for Artificial Intelligence, is a thriving association serving the AI community.

AI has been on the horizon for decades. A long conversation on understanding the nature of intelligent thought laid the foundations for information processing, challenges and fantasy have been mixed with influence and with ideas from many disciplines. AI has always held the promise of imagined possibilities, infinite promise and defining what it means to be human. Philosophers from Gottfried Wilhelm Leibniz to Blaise Pascal, very early on reflected on the design of intelligent machines. Jules Verne, Isaac Asimov, Frank Baum (who wrote the Wizard of Oz) and many others imagined responsive devices capable of communication with human beings and supporting and challenging our deepest concerns on being human [2].

Nobert Wiener’s work on cybernetics, W. Ross Ashby, Warren McCulloch and Walter Pitt’s work on neural networks, contributions from communication theory, mathematics and statistics, logic and philosophy, linguistics and of course John Von Neumann and Oskar Morgenstern in game theory have left their mark on AI and ML (Machine Learning). Both these fields have grown well beyond any of the individual contributors. The landmark paper in *Mind*, 1950 which lead to the landmark imitation game, known as Turing’s Test was a major turning point in this evolutionary journey. The name AI was actually given at the 1956 Dartmouth conference on Artificial Intelligence. However, as this discussion unfolds over the decades, when AI is described, at the core of intelligence is always the concept of continued learning.

The term AI and intelligent human behavior is not easily defined. Generally, AI describes the process of machines doing work that would require human intelligence. The term generally includes investigating intelligence, problems solving and creating computers systems that are intelligent. Sometimes AI is described as weak or strong. Weak AI implies a computer is merely mimicking cognitive processes and simulating intelligence. Strong AI implies computers are self-learning and duality. Success in AI has always been accompanied by increased responsibility, social responsibilities, educational challenges and impact that decision makers and the general public vaguely understand. Considerable progress has been made in understanding the how and what of AI, including common modes of reasoning. Research shows, that combinations of deductive, case based, inductive, uncertainty, and default reasoning are just a few of the aspects of intelligence that need to be incorporated into successful AI systems. The duality between the role of humans in the universe and what role machines will play is only beginning to play out. AI offers humans benefits, including less boring repetitive workplaces, safer manufacturing, better travel, increased security, and smarter decisions that may help preserve knowledge in a way that makes working with computers easier and more helpful.

The impact of AI on living has the potential to meet and or exceed the impact of any prior technologies. Exploring psychology, reasoning, decision science and behavior a few of the aspects of intelligence that need to be incorporated into successful AI systems. The duality between the role of humans in the universe and what role machines will play is only beginning to play out. AI offers humans benefits, including less boring repetitive workplaces, safer manufacturing, better travel, increased security, and smarter decisions that may help preserve knowledge in a way that makes working with computers easier and more helpful.

AI from its beginning has been plagued with duality. Success in AI has always been accompanied by increased responsibility, social responsibilities, educational challenges and impact that decision makers and the general public vaguely understand. Considerable progress has been made in understanding the how and what of AI, including common modes of reasoning. Research shows, that combinations of deductive, case based, inductive, uncertainty, and default reasoning are just a few of the aspects of intelligence that need to be incorporated into successful AI systems. The duality between the role of humans in the universe and what role machines will play is only beginning to play out. AI offers humans benefits, including less boring repetitive workplaces, safer manufacturing, better travel, increased security, and smarter decisions that may help preserve a volatile habitat [2]. Since the beginning, AI has been concerned with creating intelligent machines that formalize reasoning and understanding in all areas of the human experience. The direction has always been toward formalizing knowledge in a way that makes working with computers easier and more helpful. The impact of AI on living has the potential to meet and or exceed the impact of any prior technologies. Exploring psychology, reasoning, decision science and behavior puts AI in the position to solve intellectual problems, control robot motions, interpret human language, learn new skills and acquire knowledge by continually analyzing data.

2. FUTURE DIRECTONS

Both AI and ML are terms that ascribe to a variety of meanings. The near-term future indicates that a technology that has been coming for decades and has finally tipped, will continue to grow. Fueled by the very familiar Moore's Law, which states that the capacity of computer chips will double every year while the costs decrease by half, along with new innovations such as quantum computing, assures the continued exploration and integration of AI and ML in many workplaces.

Fueled by rapid expansion in computing power, the IBM 360/75, the mainframe computer of its day, in 1969 helped to land our first astronauts on the moon. It had 6 megabytes of computing power. Today that equates to 10% of the computing power needed for the game Candy Crush. On the factory floor, robots are likely to replace humans in redundant tasks and repetitive jobs. This relative fast grow in an expansion of power has led to the factory floor being populated by robots and not just at Tesla. Apples' supplier Foxconn replaced 60,000 workers in a factory in China with robots in 2017. Amazon continues to rollout robot staffed warehouse and distribution centers and most of the shipping from ports like Los Angeles to Baltimore is now conducted by robots. Even law enforcement has gone robotic. Knightscope security robots patrol the parking lot, while high speed bots, like the Cheetah, chase down criminals at speed in excess of 28 MPH. Robots are building houses, aiding the military, delivering pizza and making meals at McDonalds. They are helping to drive cars and soon trucks, play music and turn lights off and on.

Smart chatbots and vocally activated technologies are everywhere. Some good, some not so good but always more prevalent and getting better. These devices are helping hire babysitters and acting as lawyers. They are and will continue to take the jobs they can take. They present a massive impact on jobs, the workplace and employment. Although they offer the potential of opening up new positions and roles, what and how this will all play out has yet to be determined. Undoubtable there will be upheaval and redefinition of workplace performance. Certainly, it is the agile workplace that will have the best chance of surviving and thriving into the future [9].

The evolution of AI has been an interesting exploration in discovery. AI generally takes on many areas of human capabilities including knowledge representation and articulation, learning and adaption, deliberate planning and acting, speech and language processing, image understanding, manipulation and locomotion, robotics, multi-agent systems, cognitive modeling and mathematical functions [5].

The practical applications of AI continue to expand every year. Fueled by the incremental availability of digital data in all fields of endeavor, models of process and processing have caused major shifts in linguistics, psychology, philosophy and organizational theory. Chatbots and vocally activated technologies have found their way to help desks, consumer service websites and service centers. These technologies are having immediate commercial impact. The new systems learn quickly from experiences and adapt to changes in the new environment. To interact with human collaborators these systems must be able to engage in dialogue and model rationality. Robots, chatbots, and vocally activated smartbots are all examples of the continuing evolution of integrating computer interactions to support human life. We are recognizing the power of the Internet of Things (IOT) of

connecting AI driven processes to physical machines to replace humans in the “turning of a knob or pushing a button”. The extension of this will be the network of AI processes and objects interacting, refining, and learning our human habits and needs and anticipating and acting on them.

All five major areas of AI that currently exist, can be expected to grow. The categories include deep learning, robots, dematerialization, the Gig Economy and autonomous driving. Each will be disruptive, and each will accompany the next industrial revolution of the Internet of Things (IOT). Deep learning refers to a series of connected machines and algorithms modeling and extracting data. Connected machines, learning from each other and designed to outperform human experts. Robots can range in design and size and shape but basically, they are designed to replace human workers by doing a task or tasks. Dematerialization replaces back office activities by recording and processing data. It is the idea of replacing traditional services, like getting tickets to a show with technologies. The Gig Economy is about more self-employment and more independent contractors. Autonomous driving is taxis, cars and trucks that, with the help of intelligent sensors, drive themselves [6].

The more AI situates artificial agents and people in a common environment the more opportunities there are for collaboration, sharing knowledge, and discovering new knowledge. Rationality is another way that AI supports intelligent processes and economic problem solving. This application has been extended to performance and learning and adaption, especially in the areas of learning process, preference and utility. With collaborative systems on the horizon and approaching quickly, areas of research including planning, multi-agent learning, language, speech, understanding and communications interact to form collaborative agents [7].

Even rudimentary systems, carefully limited in scope and domain, can collect, codify and correct knowledge. As the amount of human labor involved decreases and the ability of computers to construct bodies of knowledge increases, the work processes build on statistical methods and neuro networking models. Practical applications which will continue to make computer systems easier to access, interface with and use will use AI. Automated tutors, smart workplaces like design organizations and factories that improve themselves, as well as more routine and data intensive commercial, industrial and scientific are areas AI will continue to grow. This will impact the workplace by making workers more independent and collaborative [5].

Successful organizations use technologies to improve both organizational and employee performance. The business need advances the integration of new technologies. An area of risk for most organizations is too much focus on the technologies and not enough focus on the application and integration of those technology into the business process. Real benefits come to the organization when processes are improved, amplified or scaled because the technology supports the business need. The focus needs to be on the business solution, not on the technologies.

This integration of new technologies has far reaching implications in developing countries as well countries like Thailand, China and India because of the lack of social security systems. Jobs with low or medium qualifications will certainly be replaced or eliminated. Although about 47% of US workers are at risk, about 70% of workers are at risk in Thailand and

India. Replacing humans with robots makes economic sense because the cost of human labor is higher than robots. Chinese companies are already replacing 90% of human workers with robots and Mexico may follow suit by 2025 [6]. There will be little or no need for workers that do simple tasks or repetitive work.

3. DRAMATIC CHANGES in the WORKPLACE

There is no question that dramatic change is coming very quickly to the workplace as a result of the integration of AI. AI will bring vast improvements in productivity, freedom from boring repetitive work and improved quality of life. The idea that an entire occupation will be replaced by AI is probably overstated. Certain activities within occupations may be automated and the result may cause the entire business process to be transformed. In the United States this translates to about two trillion dollars in annual wages. Even professionals like physicians, financial managers, CFOs, CEOs and senior executives have parts of the job that can be automated. Research suggest that nearly 45% of activities performed in the workplace can be automated [12].

Companies will be leaner and have less hierarchy because every person between decisions and decision makers' costs money. The impact on the organization of work will depend not so much on physical versus cognitive tasks, but rather on routine versus non routine work [6]. Companies will focus on core competencies and outsource other areas of work. Data analysis will continue to be strong field fueled by “Big Data” and data science. More traditional specialists and support personnel may be outsourced. Companies will focus on professional connections and a support structure outside the company that will be the basis of success in the digital work environment. The IOT will offer direct connections between customer and suppliers. There will certainly be more autonomy for the worker and this will require more training and ongoing skill development. Matrix structures are already here and more companies may be using them to support both technical and human employment. One of the big questions is the sharing of economic risk between employee and employer. The “Gig” Economy offers freedom and autonomy but the work on demand culture shares risks differently. Entrepreneurial risk has shifted with the independent contractor which has advantages and disadvantages for both parties [6].

The implication for organizational dynamics and leadership are enormous. Leadership will need to align and redefine positions and performance to include automated potential and the economics of automation. The benefits can be much greater than the costs and the magnitude suggests that the ability to transform, staff, lead and manage automation will become a competitive differentiator. AI will support the automation of activities within occupations and cause the redefinition of parts of the job and business processes. In most cases this automation will meet or exceed the current level of human performance. The impact of AI on occupations from retail sales people, to food and beverages servers, to teachers and healthcare practitioners will be significant. Although less than 5% of all occupations will be fully automated, the influence on business and the workplace in general will be enormous [12].

What the agile workplace offers workers is the ability to generate a greater amount of meaningful work. As AI replaces more redundant and boring tasks, and routine and repetitive

services, employees will be able to focus on creativity and human emotions. Clarity comes to the new workplace by focusing on activities rather than entire occupations. As business intelligence continues to unfold, it is important to develop agile work environments that support evolving business processes. Organizations will become more service oriented, replacing fixed operations with integrated agile and intelligent solutions. This will always be derived from cost benefit analysis and business need [11]. And as organizations leverage not only internal innovation, but also their ecosystem of vendors and distributors, the organization structure fades away to be a more amorphous enterprise of sequential outcomes leading to a business objective, regardless of who or where it is being performed. We are already using customer feedback in form of surveys to gather the results of a process (product sale, customer experience, enjoyable interaction), but with AI, we can make more instantaneous process changes that will directly affect the successful outcome of a transaction.

All types of business skills and situations will be practiced with AI apps. Even the highest paid occupations will be supplemented by AI. Positions like lawyers, professors, physicians, sales and many others will be supplemented. AI will be used for text mining and lead generation leaving the professionals to assume higher cognitive roles. The shift in focus will be toward work of higher value. These shifts will not be without challenges. Soft skills, from running meetings to coaching, to interviewing and providing feedback will be able to be practiced in a safe environment with the intent of teaching human to human interactions. The knowledge domains will expand and include diagnosis if you are a doctor and selling skills if you are a salesperson. The workplace will be influenced by multiple convergences of technologies, not one single technology. This will advance when business needs line up with technological possibilities. The workplace trends to watch for integrating AI, are the convergence points between business needs and redundant cognitive skills and services. Talent development will have the opportunity to create new processes, applications and solutions as technologies change the roles and interactions of employees [6].

An agile workplace is one that moves quickly and easily, adapts to varying situations and is perceptive and fluid. It is a workplace that adapts easily to changes. Everything is different, every day and that's the way it flows. It welcomes change. It supports collaboration and interaction. It is built around motivated and intelligent humans who should and can be trusted. It adapts to regularly changing circumstances. The ability to automate job tasks has less to do with high wage vs low wage occupations and more to do with redundancy and change. Home health care worker, landscapers, maintenance workers, social workers and other occupations that deal with an environment of constant change and challenge are less likely to be influenced by AI. The ability to create and interact with human emotion is difficult to automate. Creativity and spontaneity are currently required in only 4% of activities across the US economy. Only 29% of activities require sensing human emotion [12]. Both blue collar and white-collar workers will be affected. The faster the process steps can be described in detail and are repetitive, the sooner the employee can be replaced with AI [6].

Agility in the workplace means both flexibility and configurability. Flexibility is the organizations ability to make adjustments to the customers' needs and configurability is the

ability to adjust to changing demands. Agile work environments can and usually do support multiple intelligent agents in the supply chain. These agents can be involved in one or more activities but are flexible enough to adjust and reconfigure based on changing circumstances [17].

Agile, which originally applied mainly to manufacturing environments, now encompasses all types of workplaces. It describes the enterprise in terms of the collection of business processes. These time ordered sets of activities or tasks, are combined to produce desired results. Many organizations have virtual partners in their supply chain because of the agility and flexibility involved. An agile work environment moves forward in terms of production of goods and services but also feedback relevant information and data. Practices common to agile work environments include JIT (just in time), TQM (time quality management) information sharing, decision support systems and other practices normally associated with a "lean" organization [13].

Agile organizations are required to react or respond to what is happening in the game and also be flexible enough to rewrite the long term playbooks. It has to accept the premise of continual improvement. This implies that the business process has to be flexible enough to allow change and reaction to specific situations. This is supported by a continuous improvement in business processes and the use of datamining technologies and AI [18].

Better education will help the adaption of AI but only under certain circumstances. Education itself will undergo a major metamorphosis. Qualifications will be connected to the work and jobs like accountant will surely be done by intelligent software. As long as education teaches and promotes creativity and flexibility it will still be important. Expectations of employees will be greater but less rigid. Availability expectations will be much higher. Flexible hours and stand by duties will be the rule, not the exception [6].

4. BUSINESS PROCESS: COGNITIVE and TASK AGILITY

When AI and other intelligent technologies enter the workplace, many jobs that are based on production or industrial processes will be eliminated. Big changes will need to be made to move from the mentality of controlling a process to meet a goal, to facilitating flexible design with the aim of delivering value. Although agile started as a retaliation to inflexible and ineffective practices in the software industry, it has gone far beyond those limitations. Changing corporate or organizational culture is hard. The change from a control process to a collaborative process involves including people in a whole new light. The shifts in workplace paradigms will be anything but painless. Almost every job that requires an individual to process transaction data in front of a screen will be at risk. The critical criteria will be the level of redundancy and routine. Machines will replace humans where the job process are repeated regularly and where the individual tasks can be made to be independent [6].

Distributed cognition is a way of looking at the workplace and determining how work is performed. New work practices influenced by the integration of technologies causes an examination of distributed cognition between people, objects and other people. When cognitive agility is referred to in the

workplace, it usually encompasses both the individual's interactions with self and others and the collective interactions of groups of people. Both individually distributed cognition and collectively distributed cognition combine to create the extended cognitive system. The individual system is a single actor and can include multiple other people and objects. Collectively distributed cognition involves multi-person activities, objects and resources. Examples of this include systems of one variety or another, either well-structured and functional or ill structured and sloppy, which tends to include processes, participants or objects that are either under or over specified. Both of these concepts come from classic cognitive science which provides a framework to examine intelligence and problem solving.

Distributing work across groups or involving collaboration requires breaking the work up into parts so that individuals or agents can bring their expertise to sub tasks within a larger business objective. This examination of how information is represented in the workplace and then transformed, combined and disseminated is, theoretically, in alignment with business and performance goals. Problems solving then can be reliant on one individual or distributed throughout the system with various degrees of reliability and efficiency. Intelligence then sits at the systems level in distributed cognition and can and does include AI or any other technologies that can and does support the idea of problem solving and attaining business goals [16]. Understanding this is key to the functioning of the work organization, both for the individual and for the collective organization. So both knowledge and skills combine with the organization of those individuals and subgroups to support the work environment.

Agile environments support a continuous adaption of new tasks to support business processes that allow for flexible reactions in specific situations. In this way each case, each order, each customer has the ability to remain unique and be treated, at least for the most part, to accommodate that distinctiveness. KISS (Knowledge Intensive Service Support), is just one of many acronyms use to try to qualify dynamic and agile tasks. There are always exceptions, unforeseen events, unpredictable situations, variations and complex tasks. "A task is a definition of a particular item of work that specifies the requirements and the goal of that work" [18]. Different resources can be used to accommodate different tasks. In an agile environment, the approach is initiated to shorten the gap between the initial process design and the process execution. The most important principle of the agile enterprise is to learn and adjust along the way [14].

Many organizations will be faced with change or die scenarios and many workers will become unemployed. This will be exemplified where control and respective cognition and services have been the norm and where there is a resistance to adopting new ways of implementing business processes. Agile workplaces promise to be more people focused, more flexible and more unique. This AI revolution is already here. The pace of adoptions it is accelerating and the availability of opportunity to use and deploy technologies to support the workplace is speeding up. Agile paradigms have found their way into a multitude of workplaces alongside new supportive technologies changing roles and processes. From hospital emergency rooms to educational assessments, to budgeting and banking, sales calls and food processing, AI and new technologies are causing organizations to reinvent themselves. Big shifts have started to

play out in industries as diverse as energy, healthcare, manufacturing, and apparel and more upheaval can be anticipated. Innovation and responsiveness will thrive while redundancy and predictive process will be replaced, at least in part by new ways of working [15].

5. INFRASTRUCTURE and OBSTACLES

The pace of transformation is quickening and the speed at which new technologies are being developed and deployed is also accelerating. It is imperative the organization get a plan for adopting and adapting to new technologies including redefining business processes and employee roles. There are and will continue to be considerable concerns in the new workplace including privacy and security because of the enormous amount of data collected and shared. The quality and safety risks are still largely undefined. The legal and regulatory prospects could be substantial. Transformation to the agile workplace will not be easy. There will be tradeoffs and the cost and benefits of automating activities will vacillate between augmenting and replacing different activities. The impact of intelligent machines will have implications for the development of human skills and training. The pace of change requires organizations to embrace these priorities. It will determine the competitive position of the companies moving forward [12].

Some of the changes needing to be considered involve embedded technology within an individual's clothing which is already present as Wellness programs take off. AI has already helped individuals keep track and benchmark their personal progress against others in their same age bracket or lifestyle. But the immense information available across the dimensions of health claims and research may allow us to not only assist a person in their wellness programs, but make continuing suggestions in nutrition, medications, relaying real-time information to doctors or wellness experts. All these culminate in a future of a healthier workforce which translates in to a more productive and more cost-effective business environment.

We also see monitoring of keystrokes and applications used when performing tasks or solving problems. The sources being used continue to be assessed as to their usefulness and whether they were instrumental in providing the information needed. AI will gather that information and may even direct someone to a particular source as a reliable and useful knowledge base.

But these improvements using technology do not come without consideration of the privacy of the individual, the ability to "hold back" on information (opt out) and the need to have that information provided to the business. Legislation will be challenged across a number of fronts to help business to forge into new territory and the rights of the individual, be they employee or contingent worker. And it will not be a simple solution to simply aggregate the information and eliminate the individual identifiers, because it is that individualized information that will allow AI to identify, assist, and recommend actions at the micro-levels of the business to create improvement [10].

AI, if not carefully programmed and monitored has the ability to exasperate inequalities in the workplace, home, legal and judicial systems. Sexism, racism and other unrecognized biases can be built into machine-learning algorithms underlying the intelligence and shape the way people are categorized and addressed. This risks perpetuating an already vicious cycle of

bias that supports systematic inequality among poorer and nonwhite, population. The truth is that most of the programming and data analytics are being created globally by white males. Research by CMU (Carnegie Mellon University) has shown that women are less likely than men to be shown ads on Google for executive jobs. Correlations to unrecognized biases can be subtle and it can be dangerous. From pay scales, to types of observation and surveillance, these algorithmic flaws are not easy to detect. Ingrained bias could easily be passed on to machine-learning systems and be built into the future. Intelligent machines could learn to think in ways that mirror a male dominated, narrow, privileged society which supports familiar prejudices and stereotypes [4].

Far too often executives see only the short run and don't deal with the magnitude of overall change because the scale and scope are too much to handle. Change in small and large organizations can be overwhelming. While leading agile transformations in the workplace may be challenging, trying to compete in a new marketplace with technologies so advanced will be even more prodigious. Leadership needs to take ownership. These technologies offer new challenges and opportunities, and no one is going to get it all right all the time, so learning and adjusting as the organization moves through change and grow will be paramount.

Changes in the workplace will start at the enterprise level with a commitment to continuous improvement in products and services. The first step is to organize and commit to clear business objectives. Next, form a team that will lead the workplace with continuous improvement processes. Employees need to understand the importance of transformation to an agile work environment. They need to be engaged in all aspects of the process and supported with learning and development opportunities [14].

The majority of CEO's, about 71% are sure that the next few years will be more strategically important than the last fifty [6]. Companies already use intelligent systems and this trend will continue to grow. Often there is difficulty in connecting new systems with established systems. There needs to be a greater understanding of the employees' physical and cognitive processes, in the context of a relevant task, so that this can be used when programming the systems. Much work will need to be done to overcome the resistance to AI systems and to equip future workers with the required skills. AI instills fear mostly of a plant or corporate closure because of gross mismanagement. Employees fear massive job cutbacks and lack of retraining. Economics supports that labor is expensive and machines, once the original cost is overcome, are more competitive than humans in the job market. Employees need to be involved in the development and process of change. They need to understand the implications of implementation of the technologies and the future.

This will also cause upheaval in the education system. Future educational directions must support design thinking and encourage creativity. Educational curriculums will be designed to engage with the work and integrate degree programs with the creative work at the company. Adaptability is one of the major challenges humans will face. Those that can adapt to an agile environment will thrive, while those that cannot adapt will struggle. Employees must always be willing to learn new skills. The challenge for schools and colleges will be to teach students soft skills such as: reliability, communication skills, social

interactions, good time management, accepting criticism and always, always continuing to learn [6].

6. IMPACT ON EMPLOYEE PERCEPTIONS

From the beginning the concept and then the creation of AI in all its various forms has caused a sense of trepidation and fear in the workplace. Stanley Kubrick's movie 2001, with its evil computer Hal, exemplified the fears expressed by humans, that AI could be a threat to human existence. AI is no longer on the horizon; in many areas it has arrived. In the short term, AI will not rival Hal, but could very easily and rapidly change the shape of the workplace. This has already begun. Clever Machines, robots, chatbots, smartbots and IOT have begun to infiltrate the work environment undertaking tasks done by humans and capable of destroying millions of jobs almost overnight. Elon Musk and Steven Hawkins were just a few of the advanced thought futurists to believe that AI, much like the Internet, comes with challenges [3].

Bill Gates is also among the technology giants to point out, rather vehemently, that AI could cause unprecedented unemployment very quickly. Smart Technology, Artificial Intelligence, Robotics, and Algorithms (STARA) could eliminate one third of the jobs that exist today by 2025. The quickening evolution of these technologies is compounded by significant improvements in robots and inexpensive autonomous units that can easily outperform humans. Examples include retail self-checkouts, smart phone applications, automated accounting, IOT, driverless cars and chatbots taking orders in fast food lines. The cost benefits to business are enormous and makes it difficult to continue to consider humans in some roles moving forward. Many of these jobs are high paying middle class jobs and many of these jobs are in the service sector. Even those jobs that will not be eliminated will be disrupted by STARA. Many of these jobs will not be replaced. The incentive to replace employees in the service sector is the highest, because these account for the great overheads within a given business. It's not just low paying jobs, but any job that can be routine enough to automate and simple enough to codify is susceptible to STARA [8].

This brings to light an entirely new perspective on how employers and educators must see jobs and careers and how learning and development needs to support employment. Careers need to be viewed as dynamic and borderless. We need to educate and train employees not for one organizational setting but for dynamic, ever-changing and evolving work environments. These changes are wide and deep particularly in managing careers. They have huge implications for people at work and how organizations will manage and compensate them. Career satisfaction and turnover are just two of so many issues that will be affected by new technologies. This invasion of STARA will affect younger and older workers. The main impact of the effects will fall on those entering the workforce now and moving forward.

The implications for education are huge. Colleges, universities and training institutions need to understand the costs of education and that it needs to be about employment. As industries and economic sectors go into decline, educators need to focus on employment not on employability at a national and global level [8].

Artificial Intelligence in Education (AIED) has changed and evolved. As AI and other smart technologies move the workplace forward, these technologies need to be embedded in the learners' everyday lives, supporting their culture, practices, objectives and societies. Current classroom pedagogy needs to expand to include a wider collaboration of learners with instructors, diversifying technologies and content domains. The goal of education needs to move away from a definitive body of knowledge towards giving learners the tools to become adaptive experts and on the job learners. The curriculum must expand to include not just soft skills but knowledge application, collaboration and self-regulation.

Assessments too must change to capture learning pathways and processes. Practices must include formative and summative assessments that measure just in time support and authentic work elements. The movement will be toward supporting learning anytime and anywhere, not restricted to a system or a structure. Teachers are no longer sages but are guides to the integration of the technologies and applications for seeking, finding independent, collaborative thought. Learning will focus on the authentic everyday tasks and challenges, context and actions. Embedding the learning in context will make it more relevant and real. Researchers must be bold and willing to take on new challenges, take greater risks and tackle new contexts and domains. Interactive learning environments will be more than just domain knowledge. These environments will be built to support life-long learning growth, peer interactions, and act as intelligent tutors and perhaps mentors or life coaches [22].

Lying in wait is the thought that learning is a skill to be taught, not just to learn a subject, but rather to analyze the environment we live in and find the problems needing solutions. This stretches the learning practice to make us better problem solvers and innovators, not just experts in a discipline. With this comes a need to start training our newest generations in this lifelong learning experience and provide transition to the existing generations to "come up to speed".

It is a closed loop process at its most basic roots; viewing, analyzing, changing, monitoring, and looping back to viewing, continually. We must intersect technology, like AI, into our process to assist in creating a closed loop system that is changing and moving us and our businesses forward, lest it stagnate.

7. AI ENHANCED WORKPLACE TRAINING

It is highly likely that the populace will need new environments for learning, with outcomes that are not geared to a degree or singular mastery of tasks, but rather reshaping what we need to know and how/where to apply that knowledge.

Current educational thinking is putting soft skill learning into courses in preparation for the work environment as organizations are recognizing that their senior and high potential employees may not possess the leadership skills needed to move the organization forward. Skills to mentor teams, presentation and business case skills, communication in various media, interpersonal relationship and team building, and innovation/design thinking are examples of what senior executives as finding lacking in the workforce.

But as stated, the introduction of educational information will be enhanced when AI monitors processes and people and can

make recommended changes to the environment to produce a more efficient or valuable outcome. AI will be collecting information from individuals to help recognize the learning styles that produce results [21]. And AI will find a home in the recruitment of staff based on assessments and analysis to hire the most adaptable individuals to fit the new workplace. AI's ability to amass information for the purpose of recognizing patterns and their potential for being successful or harmful provides organizations the ability to let training become self-directed so that organizations can rely that AI will monitor and assess the readiness of individuals, teams, and the workforce in general for change.

We are already seeing AI value in embedded processes in transactional systems that look to a human initiated action and compare it with data of previous human actions and their outcomes. AI can help to make the actions support success or temper the decisions by presenting additional information to refine the knowledge supporting the action/decision [1].

And with mobile apps combined with better voice recognition, workers can now access information that is highly pertinent to when and where they are needing "problem solving" education, be it on the "shop floor", in the field, or even at home. And with the myriad of remote collaboration suites available, bringing the team together through mobile and introducing the AI team member into the mix will result in faster problem resolutions. But the future value of AI and ML will be to propose new "problems" or scenarios that can be taken by humans as "things to think about" and measure the outcomes. Those new scenarios will also be "crowd-sourced" to allow collaboration and innovation to be brought to the problem from all areas of the enterprise. And amassing the solutions and outcomes of those problems to use as benchmarks for future problem solving again will be the domain of AI.

8. WHAT OUR FUTURE MAY HOLD

Introduction of AI, ML, and Augmented/Virtual Reality (XR) will enhance the education process, being very adaptive, faster knowledge dissemination through visualization and more entertaining to future generation of learners. Walmart is using VR for training from on how to stock the produce section to handling the Black Friday crowds [20].

Voice technology will morph into being highly adaptive in recognizing different languages, dialects, and speech patterns. AI can access massive amounts of information to understand better what is being asked and can couple that with individual information gathered from the device to know who they are addressing. As the speech recognition improves, it must also be accompanied by devices that can provide privacy to an individual speaking to and hearing the output of an AI assisted learning situation. Unless this is mastered well, we will only raise the "noise level" of our surroundings and make this a less conducive method of communicating with AI. But the "hands-free" nature of speaking to our devices is a very natural and comforting manner to introduce AI improvements to our lives. We already see the usefulness of such devices as Amazon Echo or Google Home. Many new extensions of these devices, coupled with the IOT capabilities allows us to talk to and gain insights from our devices, with AI sitting behind the scenes [23] [19].

AI can benefit our current processes immensely in areas of data integrity. Over the many years, we have progressively converted our information from one platform and technology to newer platforms and technology that requires us to sometimes GUESS what the converted information really means. As a result, our business intelligence is tainted with erroneous or useless data, not because the need for that information is useless, but the integrity of that information is highly suspect. AI can help to reduce or even eliminate the problem as automation moves input of information into the hands of those MOST directly involved with the transaction. It can ensure that the data is more reliable in comparing in the context it is entered, make or suggest corrections instantly, and create better analysis of interrelated [24].

AI to be at the center of global communities generating ideas that are business, economic and life altering. The crowd-sourcing aspects of multiple sources of information being aggregated into thoughts and shared into the community to stimulate additional innovation put us on a scale well outside of what we envision just for the business uses of AI. And these communities will more than likely exhibit cross thinking in such a way that newer thinking will be borne out of the AI process and broader problem solving with become inherent through cross-pollination. And AI will be at the center of this, making us perhaps better humans. It may leverage mankind to be more holistic in its approaches to solving global problems and provide a stronger approach to the longevity of the entire human race.

9. CONCLUSION

We believe we have shown that the impact of AI in the workplace has enormous implications, with the upside of being one of the most impactful technological advancements in decades, and it is far from being fully felt in our lives. But if not understood by the business environment, if not investing into through the acquisition and implementation of the technologies, and if not monitored and measured in terms of financial and productive gains vis-à-vis the cost in the human aspects of the workforce, AI may well cause more chaos than advancement.

10. REFERENCES

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