Leading Organizational Change in the New Age of Automation

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LEADING ORGANIZATIONAL CHANGE IN THE NEW AGE

Abstract

This paper outlines how to lead organizational change in the new age of automation. Automation, artificial intelligence (AI) and technological advancement are not inherently malicious; however, improper management of the transition to increased technology can create devastating consequences. Technological advances are increasing exponentially, workers are not being retrained, and hiring practices need rethinking. No one is immune to technological advances, and this is a global issue. The paper covers a brief introduction to the current situation of accelerating technological unemployment, a short history of automation, and looks at why the pace of change today is unprecedented and requires special consideration. Then, the paper looks at current underlying trends that are also impacting industries in the United States, including labor shortage, changing demographics and new job/wage distribution. Following these trends, the paper discusses the issues that will ensue with automation and technological unemployment, including social, cultural, physical, and mental impacts. Finally, the paper offers four recommendations for leading organizational change, which are fostering technologically literate employees, redesigning jobs to complement existing and future technologies, adjusting hiring expectations, and developing practices of continuous learning and education for all employees. Because the pace of change will affect countries and regions differently, the author included additional information on the United States and the U.S. state of Wisconsin.

Keywords: automation, technological unemployment, organizational change leadership
Leading Organizational Change in the New Age of Automation

Many defining characteristics of modern-day life are made possible because of the automation, technological advances, and artificial intelligence (AI) developed in recent years. These innovations are generally beneficial to society. However, these innovations create havoc on organizations and employees when implemented poorly. Furthermore, improper management of the transition to increased automation, technology, and AI can create huge repercussions throughout society. Organizational change leadership is critical to organizations, their employees and society as a whole to mitigate these repercussions. Understanding how to manage the transition into the new age will determine the success, or the failure, of the organization and those who work for it.

McKinsey Global Institute’s analysis predicts that 75 million to 375 million workers will have to change their occupations due to automation, and all workers will feel their professions evolving to some degree in partnership with increasing machine capabilities (Manyika et al., 2017). To put that into perspective, the United States has 162.9 million workers in its entire workforce. Imagine the impact if every single worker in the United States had to switch careers or be forced out of the job market (“Midwest Economy - Labor Force Statistics,” 2019). Nearly half of all work presently done in the United States can be automated with the already-available technology. The majority of U.S. jobs should have at least 30% of their tasks automated (Manyika et al., 2017). Almost all jobs are going to experience a degree of automation, or in other words – no job is safe from automation and technological redundancy. If workers are reluctant to learn new skills, and companies are unable to fill their skill gaps, the results will include bankrupted companies and widespread technological unemployment. Effective
organizational change leadership will need to understand, predict and prepare for these changes to ensure continued business success.

**Lewin’s Field Theory as a Framework**

To understand these trends and concerns, consider Lewin’s field theory classification of driving forces and restraining forces. Both forces act on the current, stable, quasi-stationary equilibrium of the organization. For change to take place, emphasize reducing the restraining forces. In today’s environment, the driving forces affecting the organization may include increased technological advances, labor shortages, pressure to increase profit through automation, changing demographics, and wage/job redistribution. Restraining forces may represent themselves as concern about job loss due to technology; ignorance to the current environment and declining business dynamism; unwillingness to adjust current work processes and practices; and general reluctance to change given historical precedents. For lasting change, pull strategies that reduce restraining forces will be the most successful, because pull strategies may create more buy-in to the change process (Hayes, 2014, p. 23). A pull strategy example is when a change leader talks about the value of implementing change and then waits for the employees to become self-motivated and seek help from the change leader. A push strategy would be where a change leader creates training and forces all employees to complete the training. The following analysis will help give the organizational change leader information to reduce the restraining forces, increase the significance of the driving forces, and ultimately move the current culture and organizational structure to a level that can better compete with this new age of automation.

Of all the jobs in the United States economy, 47% are at risk of complete automation by 2030. See Table 1 in the appendix. Comparatively, Thailand has 72% of their jobs at risk of
automation by 2030, Nigeria has 65%, China has 77%, India has 69%, and Ethiopia has 85%. The United Kingdom is in the safest position because only 35% of its jobs risk elimination from automation (Frey, Osborne, & Holmes, 2016). All of these countries are in trouble. These percentages denote jobs with easily-automated work activities that have more opportunities to be automated and eliminated. For example, the three categories of work activities most likely to be automated are collecting data, processing data, and predictable physical work; and these activities can be automated today with technology currently available. When examining the composition of these activities within the overall time spent on work in the United States, employees spend on average 17% of time collecting data, 16% of time processing data, and 18% on predictable physical work. These work activities equal 51% of the total working hours in the United States for all occupations. That work also represents $2.7 trillion in earned wages (Frey, Osborne, & Holmes, 2016). Eliminating these tasks through automation, artificial intelligence, and technological advancement will free up employee time to do different work. However, reducing these tasks can expose the employees that do not offer additional insight or value. Those now-redundant employees may be let go from the company and have difficulty finding new employment as other companies automate similar functions.

Declining business dynamism also adds to a lack of new opportunities for employment (Alder, 2019). Stagnation happens when firms reach greater maturity, and the firms look to automation as a way to stay relevant. Automation is increasingly seen as the solution when disruption threatens many traditionally-secure organizations and occupations. For example, the Institute of Management Accountants’ 2017 survey found that 42% of accountant respondents are worried that emerging technologies will replace their jobs (Thomson, 2018). AI is changing the way that companies are organized, and refocusing work from easily automated tasks to more
human-adapt skills that are not yet mastered by algorithms, including empathy, communication, and complex problem-solving (Lindzon, 2017). However, technology is already entertaining these roles, as demonstrated by the world’s first AI news anchor in China (Kuo, 2018), and the first songs written by artificial intelligence neural networks are taking on pop, hip hop and country music (Greene, 2019). The implications to organizations and their employees will be staggering, and the responsibility of preparing for the impacts of these technological advances falls on the shoulders of management and organizations.

**Brief History of Automation and the Current Speed of Change**

Technological advances are increasing in speed and scope. As much as it is comforting to look back on history and think that this technological revolution will repeat its previous iterations, this current trend differs from past technological revolutions due to the significantly faster speed of change. Frey et al. emphasized that the scope of technological changes has increased (Frey et al., 2016).

Compare household market adoption of landlines versus smartphones – it took at least five decades for the landline telephone to reach 50% of U.S. households, versus around five years for 50% consumer adoption of the smartphone (McGrath, 2013). While the pattern of automation and technological change may be the same, the speed at which the change is occurring sets this age apart because it will completely reform the way society exists, as opposed to the gradual changes seen in the 20th and early 21st centuries. Furthermore, “There are few precedents in which societies have successfully retrained such large numbers of people,” (Manyika et al., 2017, p. 9). Many organizations currently utilize emerging and current technologies to improve efficiency, streamline workflow and increase profits. However, employee professional development and education demand equal effort and investment.
Similarities exist between today and how vastly society changed during similar ages of uncertainty when previously agrarian societies shifted to powered mass-manufacturing. The use of new materials and energy sources sparked many of the innovations that led to that transition. Improvements to transportation, communication, and the invention of new machines and organization workflows also facilitated the move from farm fields to factories (Akst, 2013). The mechanization of the textile industry in Britain triggered the fourth industrial revolution, followed by electricity and the electric motor ushering in mass production, and then in the late 1960s with the programmable logic controllers paving the way for automation of production processes. The fourth evolution centers around cyber-physical systems, the oceans of data at our disposal, and analytic processing that will increase the interconnectivity between the digital and physical world. During the third revolution, the U.S. President Lyndon Johnson created the Blue-Ribbon Nations Commission on Technology, Automation, and Economic Progress to study and report on the nature of the issues at a time when the country was experiencing a seven percent unemployment level. The findings are still valuable today even though the U-3 seasonally adjusted measure of unemployment is at three percent unemployment as of March 2019 (Bureau of Labor Statistics, 2019). One conclusion drawn from the commission’s research was that technology destroys jobs, but not work (M. Taylor, 2018). Akst’s review of 1960s literature on the anxiety of automation highlights that “Automation did not upend the fundamental logic of the economy [but] some of its most important effects were felt not in the economic realm but in the arena of social change,” (Akst, 2013, para. 12).

Organization workflow developments included the factory system, division of labor, and specialization. The advancements ultimately created new opportunities and shifted workers from individual in-home production to factory work. Additionally, workers learned new ways to
advance alongside their evolving tasks. Today’s employees also need to adjust their relationship to their tasks, and it is the role of the change agent to help leaders, employees, and companies navigate this new dynamic.

Akst adds that automation was disproportionately more harmful to workers in less-skilled professions in the past. Throughout history, the adoption of new technology made low-skilled workers in manual labor capacities lose employment. Machines then replaced high-skilled workers, such as weavers in England, thus creating more low-skilled jobs to run the weaving and loom machines. However, automation will impact professions today more broadly. One of the challenges of this age will be to retrain mid-career workers (Manyika et al., 2017). While many positions will be lost and gained, the newly-created jobs will not be sufficient enough in quantity and quality to replenish the lost job opportunities.

The manufacturing sector is a natural example of technological advances and the struggles that followed. The Great Recession heavily damaged the industry, and while manufacturing production returned to a healthy level, employment stagnated. Human labor became less necessary to hit production goals. Hicks & Devaraj discussed the jobs not filled due to productivity statistic in their recent report on the state of manufacturing (2017). This statistic refers to the number of jobs that are intentionally unfilled because the positions are no longer creating value for the organization (Hicks & Devaraj, 2017). In other words, the growth in production per worker increased so fewer workers were necessary.

The taxi industry is also suffering from technological disruption. Mobile apps offer more technologically smooth hailing practices, and tech investors made mobile apps the dominating force in the taxi industry. Robo-taxi developments have also been challenging the market. Uber developed a robo-taxi service in 2018, but the plans stalled when a self-driving Uber SUV killed
a pedestrian in Arizona (Marshall, 2019). Waymo also offers their commercial self-driving service in Arizona, but a human employee sits at the wheel in case something goes wrong. In late April 2019, Elon Musk announced that Tesla plans to have one million autonomous robobots on the road by 2020 (Rapier, 2019).

Increased technological development is also disrupting the real estate industry. AI and chatbots answer online house searchers’ questions at all hours of the night. Virtual touring options and decreased importance of traditional office space impact real estate organizations all around the world. Traditional real estate companies had been reluctant to embrace technology, and venture capitalists wanted to capitalize on that reticence. Venture investors gave $5 billion to develop real estate technology in 2017, which increased 150-fold from the $33 million invested in 2010. Real estate commissions are continuing to fall due to disruption by alternatives (Snider & Harris, 2018). Desperate for any commission, real estate agents continue to discount their services. Of 2,000 people surveyed by Redfin that bought or sold a home in 2016, most sellers paid a discounted commission payment, and nearly half of the buyers also paid discounted commission. In comparison, only 37% of buyers paid discounted commission the previous year (Richardson, 2016). A survey by real estate service organization, JLL, highlights that real estate CEOs need to make strategic decisions that encourage workers to both embrace and create disruption (Nair, 2017).

Seventy-five percent of insurance industry executives predicted in 2017 that artificial intelligence would utterly transform the industry within three years (“AI Will Transform Insurance Industry, Execs Say,” 2017). Insurance experts foresee artificial intelligence augmenting human decision. Executives also believe that they will rely more heavily on third-party platforms in developing more ecosystem-like databases, increase the use and dependency
on freelance digital workers, and design more jobs to complement artificial intelligence’s abilities.

W. Brian Arthur summarized the current technological changes affecting industries as *third morphing*. The first morphing in the 1970-80s created integrated circuits; the second morphing in the 1990-2000s was the connection of digital processes. The third morphing, which started in the 2010s, created sensors (Arthur, 2017). These sensors created oceans of data that have allowed for external intelligence (2017). “Intelligence external to human workers” is similar, Arthur argues, to the printing revolution that “took the information housed internally in manuscripts in monasteries and made it publicly available,” which resulted in the modern world (Arthur, 2017, “The Coming of External Intelligence,” para. 5). Arthur states that this current shift’s consequences are not easily predicted but will certainly create “new structures [that] will bring in the future,” (Arthur, 2017, “The Coming of External Intelligence,” para. 6). Gold posits that digitization and artificial intelligence are revolutionizing how processes are occurring and therefore putting middle-level jobs at risk (Gold, 2016). Middle-level jobs have not been at risk to this level before (2016).

Berman and Dorrier assert that technology is an evolutionary process and the exponential gains experienced in technology mirror other evolutionary processes, like biology. (Berman & Dorrier, 2016). In 2001, Kurzweil made many predictions about what he termed *the law of accelerating returns* that will ultimately lead to *the singularity* or “technological change so rapid and profound it represents a rupture in the fabric of human history,” (Kurzweil, 2001, Abstract section, para. 1). Kurzweil’s law of accelerating returns states that the rate of technological progress doubles every decade, so “a century of progress at today’s rate [will be achieved] in only 25 calendar years,” (Kurzweil, 2001, “The Intuitive Linear View Versus,” para. 2). Many
academics were skeptical of Kurzweil’s predictions at the time, but now, eighteen years later, many of his projections materialized. The takeaway is that the law of accelerating returns and technology’s evolutionary ability to increase exponentially is doing so at a rate never before seen or experienced by modern-day society. These advances are going to impact all aspects of work across all industries.

Luddites, named after a potentially fictional person by the name of Ned Ludd in 19th century England, have become emblematic of those against radical technological changes (Akst, 2013). Society is changing. How humans interact, think and work is drastically altered from a mere twenty years ago. Technology is part of human identity. For instance, a defining characteristic of the millennial generation is the way they embrace technology and have fused themselves with it (Pew Research Center, 2010). However, the deeper one looks into automation, the possibility of technological unemployment, and all of the repercussions that are beginning to surface, it becomes evident that this shift is something monumentally challenging to predict.

Now, more than ever before in the history of modern society, leaders need to fully embrace the covenants of organizational change leadership if there is going to be any hope of making it through this. Some argue that societies are entering a distributive era – others say this is the same song that new technology advancements have always been singing. However, this next development will require that organizational change leaders fully understand the benefits and the drawbacks of these new developments. Change leaders need to comprehend the displacement these changes will cause to the less-skilled workers and that education in work can be a solution to avoid total societal collapse. This topic inherently and unfortunately becomes a political one, because, without the right leadership, scores of people will become unable to provide for their
families. Because technology is going to keep advancing at faster and faster rates, proper organizational change leadership is the best way to ensure jobs are available.

**Driving Force Trends**

The following current trends are the driving forces impacting the transformation in this age of automation, including labor shortages, changing demographics, and wage/job redistribution.

**Labor Shortages**

In the medium-to-long-term range, labor shortages across the U.S. should increase productivity, lower costs to consumers, and develop higher demand for labor throughout the economy (Lotito et al., 2018). However, Lotito et al. caution that in the short-term, displacement from automation is going to make hundreds of millions of workers transition to different occupations in the next decade. The current workforce shortages, despite the unemployment numbers, are creating the perfect excuses to increase automation implementation and replace human workers. Sheffield (2019) predicts the labor shortage will get much worse in the healthcare industry if the current job growth rate is sustained. Forty-five percent of health provider executives surveyed by HRI said that their current workforce’s capabilities are hindering their organization’s ability to pursue successful organizational change, but they are unable to hire the talent with the appropriate new skills (“Your company’s new, upskilled health worker of the future is you,” 2019). The manufacturing sector struggles to attract workers with the necessary skills. The trucking industry is unable to recruit and retain drivers (Long, 2018). These labor shortage problems are significant because the industries will combat the lack of human labor with machine labor when needed. For example, the trucking industry depends on using driverless vehicles to make up for these losses to continue facilitating the majority of the
U.S. economy’s commerce. By lobbying for driverless vehicles, the trucking industry creates a dangerous precedent. Driverless trucks are far more efficient than truck drivers. Driverless vehicles can have devastating consequences, like the fatal crash between a driverless SUV and pedestrian in 2018. However, driverless vehicles will continue to be tested to fill the labor shortage. This disruption by driverless vehicles will expand into the railroad, shipping, automotive transportation, and airline industries.

Already, the embattled taxi industry struggling with disruption from Uber, Lyft, and competitors is faced with the dilemma of having driverless taxis. Many traditional taxi services offer lucrative employment opportunities with a low barrier to entry due to not requiring significant education credentials. A majority of these workers will be forced to work for lower-paying jobs in other occupations should driverless taxis become the norm.

Other industries impacted include the landscaping industry and the home health care industries. Landscaping companies are strapped for labor and can turn to alternatives like autonomous lawnmowing machines. The aging population is creating opportunities for personal care and assistive robots to provide support, companionship and medical oversight where an in-home care provider may prove too costly (Goher, Mansouri, & Fadlallah, 2017). Research has shown that these assistive robots can improve quality of life and autonomy in senior citizens while minimizing readmissions to health centers and allowing for in-home care.

The new age of automation is not being questioned with the same rigor as previous labor transformations. In the Industrial Revolution, government leaders temporarily protected jobs because the leaders were concerned about the loss of employment. In contrast, this new age is welcomed with open arms by government leaders. Some groups are so excited about these changes and the worker shortages that they want to celebrate (“Worker shortages could heal
America’s economy - Labour party,” 2018). While these innovations may have the potential to heal the economy, progress may come at the cost of widespread unemployment. In general, concerns over human employment in many fields are being either celebrated as a good sign or redirected into a dialogue about worker shortages and the need for automation. The worker shortage discussion is going to open the floodgates for more automation and less human employment.

Several examples of labor shortage causing massive adoption of technology can be found in the farming industry. Farmers are unable to find enough help, so they look to robots for assistance (Jordan, 2018). Of the 7,700 milk-cow herds in the state of Wisconsin in 2018, 700 went out of business due to economic struggles, partially due lack of cheap labor (Quirmbach, 2019). Wisconsin dairy farmers like Bacon’s Rolling Acres in Columbus implement robotic milking technology to increase production and decrease paid farm labor, while also benefitting from increased cow satisfaction, milk production, and pregnancy rates (Magnuson, 2017). Wisconsin soybean farmers use unmanned aerial vehicles (UAV’s) to collect data on fields and locate struggling crops with infrared technology. UAV’s cut the time a farmer takes to cover an acre on foot from one hour to ten minutes (“Technology helps Wisconsin soybean farmers,” 2019). Farmers in Ireland and New Zealand use drones to herd sheep through steep, difficult terrain. U.S. farmers bought over 300,000 tractors with autonomous driving capabilities in 2016 alone. Other farming vehicles can autonomously follow a human-driven tractor to collect the grain harvested by the previous vehicle. Automated solutions are widely available for sowing seeds at nurseries, seeding crops directly in the field, and monitoring field crops with the help of sensors, geomapping technologies, ground robots and drones (Owen-Hill, 2017). This increase in
farming technology implementation correlates to the falling percentage of employment in agriculture in the United States (see Figure 2 in the appendix).

**Changing Workforce Demographics**

One demographic element that would be remiss to overlook are the changes in the U.S. labor force itself. A significant trend is the increasing average age of employees and the increasing number of employees delaying retirement. The average age of the American worker has steadily increased across all groups, genders, and ethnicities since 1996. See Figure 3 and Table 4 in the appendix. This trend has implications on the change process. There will be fewer opportunities for promotion due to senior management retaining their positions and less business dynamism because the senior executives may be unwilling to adopt new directions for the company.

The *in-and-outs* are another demographic trend affecting the workforce. Coglianese studied the working population and found a decline in the labor force of prime-age men that take “an occasional short break of less than or equal to six months in between jobs but are otherwise attached to the labor force,” (Coglianese, 2018, p. 1). Coglianese details how the growth of cohabitating partners’ wages and changes in household structure account for the majority of this segment. The main change in household structure is that young men are choosing to live with their parents longer, either by moving back in later in life or staying in the parents’ households from birth. The ins-and-outs also may perceive that their employment opportunities have diminished and chose not to settle for less-than-perfect working conditions (2018). The frequency of in-and-outs might also increase when advancing technology absorbs previously-available job positions.

Employers are also seeking out freelance or digital employees instead of traditional employees, and this creates issues. Digital employees have different needs in terms of remote
work, management, rewards, and engagement strategies (Fordham, 2017). In many cases, digital workers are more affordable than traditional workers, due to digital workers requiring less overhead and fewer benefits. The downside to digital workers is that they may be less productive because they feel like outsiders, and they do not share the same organizational culture as the traditional employees (Fordham, 2017)

**Job and Wage Redistribution**

Another driving trend impacting change is the redistribution of jobs and wages throughout industries. The reason for concern is that more jobs are being lost at higher-paying positions, while new job creation is primarily in lower-wage positions. For example, accounting positions are increasingly automated due to increased computing capacity. Accountants can spend less time collecting and processing data thanks to technological advances. Unfortunately, accounting is susceptible to automation because many accounting tasks are repetitive, redundant and predictable. Accounting positions are traditionally and continue to be well-paying jobs. In contrast, customer service jobs that require empathy, personability, and human interaction are increasing in number. However, these positions have traditionally and continue to be at lower salary levels, or have base pay supplemented with tips, as is the case in many food services operations. This juxtaposition illustrates that higher-level pay jobs are decreasing in number, but lower-level pay jobs are increasing in number.

The Bureau of Labor Statistics highlights more examples of this redistribution of jobs and wages. There are forecasted to be 11,518,600 new jobs created by 2026. Keep in mind that this information does not include household workers, non-farm wage and salary workers, or self-employed, owners and partners in unincorporated firms. Table 5 shows the employment by major occupational group. For 2016 and projected 2026 employment, the job segments
forecasting the highest employment increases are healthcare support occupations, and personal care and service occupations, with a percentage increase of 23.6% and 19.1% respectively. The median average wage for healthcare support occupations is $28,710 and $23,610 for personal care and service operations as of 2017 data. To compare, the average median annual wage when considering all the major occupational groups is $37,609. Thus 19.5% of the newly created jobs by 2026 will be based on 1,019,600 new healthcare support occupations and 1,227,600 new personal care and service occupations. That means the two fastest-growing jobs are offering salaries significantly below the median annual income.

These two fastest-growing jobs are also rapidly becoming high-risk for automation. For instance, consider a nursing home, like the one where the author’s grandmother lived. The nurses were extremely concerned that she would fall in the shower, so she was no longer allowed to shower alone. Going forward, she had to be assisted by a large staff member strong enough to hold her up to shower. Now consider her basic desire for privacy and how uncomfortable it would be for an elderly woman to shower in the company of a stranger. If the option were available, she would have wholeheartedly chosen a personal care robot to assist her. Personal care robots are rapidly improving so that they will soon participate in tasks like these, and “older adults benefit from assistive robots and devices to retain their autonomy, diminish health-care needs, accomplish daily tasks, and increase social communication,” (Goher, Mansouri, & Fadlallah, 2017, p. 2). This development illustrates that even though many jobs will be created in the future, the jobs will not be secure from automation for long, particularly like the healthcare support occupations.

On the higher wage end, management occupations had the highest median annual wage of $102,590. These management position opportunities are forecasted to increase by 8.5%,
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corresponding to 873,000 new jobs. Management occupations jobs traditionally have higher-than-median wages (U.S. Department of Labor Statistics). To help put these individual incomes into perspective, the median annual wage for all occupations according to U.S. Census data for 2017 is $37,690 (“Employment by major occupational group,” 2019). There is a strong possibility that the implementation of these new technologies could decrease the quality of life for a large number of individuals because of lowered income. Those individuals will be forced to change occupations and accept a smaller-than-accustomed salary to have gainful employment.

Highlighted in orange are the three largest occupational groups by employment, which are: food preparation and serving related occupations, sales and related occupations, and office and administrative support operations. These three categories account for total employment of 53.875 million U.S. jobs in 2026. The median annual wages for these occupations are $21,910, $27,020 and $34,740 respectively, which are all below the aforementioned median wage of $37,690 for all occupations. This statistic, in combination with the fastest growing occupational categories, shows that these five groups will make up 39.89% of all jobs in 2026. All of that 39.89% of jobs will be below the median wage. That large percentage of the U.S. labor population may struggle to provide for their families.

These numbers show that the new jobs created are at lower income levels than the jobs lost. For more information on the occupations with the most significant declines in employment, see Table 6 in the appendix. A cursory glance of the occupations shows that the jobs are being lost due to technological unemployment. One can quickly think of the technological equivalents such as Alexa, Siri, and other personal AI assistants, that replace the need for secretaries and administrative assistants. See Table 7 in the appendix for more examples.
Skills gap. Workers are not being retrained, and they need to be. When employees become redundant in their primary jobs, they may not be able to be hired again in their original work field. Though there will be more jobs available, these other jobs are not necessarily attainable due to lack of skills, knowledge, and training. Additionally, these new jobs have a potentially higher risk for automation. The Littler report about the anxiety about the skills gaps in the market from both the human resources and job candidate sides of the conversation, and that organizations already struggle to fill jobs with qualified candidates, in part due to the accelerating technological change. Furthermore, the speed of change is going to make finding new jobs for the millions of displaced workers even more complicated, and predicting where labor demand will be in the future will be immensely challenging (Lotito et al., 2018).

In the healthcare industry, 55% of executives say that new hires must be skilled in informatics and data analytics (“Your company’s new, upskilled health worker of the future is you,” 2019). Traditional healthcare job qualifications have not previously required this type of expertise. The move toward more service care in the telehealth realm is also shifting the nature of the health industry. The study also found that sixty-three percent of U.S. health workers say that their work requires a significant amount of time dedicated to manual data entry and analysis (2019). With technological advances, this workload will be decreased or eliminated with robotic process automation and artificial intelligence. The caveat is that the positions that interact the most with data entry will likely be lost (“Your company’s new, upskilled health worker of the future is you,” 2019). Epic Systems, based in Verona, Wisconsin, is attempting to meet this need through their mission to help its healthcare provider customers manage their patient data more efficiently, and they currently hold 54% of U.S. patients’ medical records, which comes out to more than 127 million patients (Koffie, 2016). As Epic aims to revolutionize the health records
business, they create new digital jobs in their organization while eliminating medical record keepers in their clients’ hospitals and clinics. This example illustrates how this current age will change workers’ relationship to their work, and how jobs need to adapt to complement the existing and future technology to remain secure. This changing relationship will be addressed later on in the paper.

**Identity gap.** The pink-collar job boom, which took place following the Great Recession, should be viewed as a prediction of what many are going to face when technology eliminates entire occupational groups. Jobs that fall under the pink-collar category are those traditionally held by women and include nursing positions, aides, dental assistants, and teachers. As jobs increase in the healthcare industry due to the large population of aging baby-boomers, and automation absorbs more blue-collar manufacturing jobs, there will be a disconnect between both skills and identity (Miller, 2018). This disconnect is neither good nor bad and serves to show that some workers will never fit into particular jobs. The workers should seek out occupations that are naturally similar to their original employment as opposed to wildly contrasting jobs. For example, a smoother transition would exist between a manufacturing position to a technology equipment position, instead of a manufacturing position transitioning into a healthcare customer service position.

**Eliminating Opportunity for Human Error**

Technology is advancing at a pace that humanity may have difficulty matching. On a small scale, many fast-food restaurant chains are already eliminating the need for human labor. McDonald’s recently rolled out automated ordering at a third of its locations with plans to expand into other areas of their business (Schweitzer, 2018), which eliminated the need for cashiers and customer service front-line employees. As some U.S. states mandate minimum
wage increases, the number of workers an employer can afford to hire decreases, and fewer people earn employment. For example, former McDonald’s CEO Ed Rensi said that it is more cost effective to invest in a $35,000 robotic arm than it is to hire an inefficient $15-an-hour employee for the same task (Limitone, 2016). McDonald’s goal and niche are to make fast-food as cheaply as possible. If a customer wants a fancy, handcrafted meal at a sit-down restaurant from a five-star chef, then the customer will pay more money for that experience, and that restaurant will be willing to pay for the fancy chef. McDonald’s acts in its best business and strategic interests, and organizational change leaders need to understand their company’s market and competitors, or else all changes will be fruitless. In line with the Bureau of Labor Statistics’ information, some legislative policies are further encouraging the adoption of technology to replace human labor, including minimum wage policies. Other restaurants are using front-facing apps on customers’ mobile devices to take care of table reservations, orders and payment processing. According to a recent Oracle survey done in partnership with Barron’s, 59% of restaurant, food and beverage executives say disruption from more-technology-enabled competitors threaten their organization (Oracle, 2019). Also, the Oracle survey found that 93% of the restaurant executives say guest-facing apps promote loyalty, experience and repeat business. Guest-facing apps remove the necessity of hostesses, cashiers, and other restaurant staff.

Amazon is another example of cutting out the middle man or worker. Amazon is currently enjoying the success of its latest potential retail disruptor – Amazon Go, an automated grocery store with machine learning. Sensors, computer vision, and deep learning work together to tell when items are picked up off the shelf, and then purchases are automatically charged to customer’s account when they walk out of the store, with a receipt emailed automatically. The
technology has absorbed the traditional cashier and stocking roles. In Amazon warehouses, computer systems monitor every move made by factory employees. Workers that do not meet quotas are automatically flagged for performance issues by Amazon’s computer system. Amazon’s system also generates terminations without input from supervising employees (Lecher, 2019). In other words, Amazon’s employees are continuously monitored, managed, reprimanded and fired by artificial intelligence.

Google OffShoot’s drones, a package and parcel delivery branch of Google, are the first drones to receive approval from the U.S. Federal Aviation Administration to operate as an airline. This designation gives Google OffShoot the ability to deliver packages at homes and offices via drones (Levin, 2019). Privacy issues also arise because the drones navigate through video, and that sparks questions about surveillance, access to those videos, and other privacy concerns, such as flying over neighbors’ home for delivery and the noise it causes. There are endless possibilities with delivery drones. This type of disruption also impacts current parcel delivery organizations like the USPS, FedEx, and UPS and may change the entire delivery industry.

Ecosystems like healthcare supply chain management are moving towards extreme automation, which is large-scale automation that can work without human input. In order to win market share, healthcare systems management needs to be taking place in “highly dynamic, fast-moving environments,” (Fiaidhi, Mohammed, & Mohammed, 2018, p. 66) Electronic data interchange (EDI) is the universal language for business-to-business (B2B) and business-to-consumer (B2C) supply chain management, and with the use of blockchain, is getting to the point of allowing successful extreme automation. Blockchain is not the end-all solution to the healthcare industry’s problem of too much data, but it is offering novel solutions. EDI combined
with blockchain has the potential to reduce transaction costs, increase security and privacy, and enhance scalability, transparency, and collaboration (Fiadhi, Mohammed, & Mohammed, 2018, p. 69). Blockchain is creating opportunities to minimize the amount of human input needed to navigate these complex B2B and B2C delivery systems, and while this does create opportunities for coders and programmers, it also cuts down on the amount of work from other inputs.

**Vulnerability and Technological Unemployment**

Before addressing how to put this information into practice, it is essential to pause and consider what is at the heart of the matter when considering change leadership in the age of automation. Technology is advancing at such an exponentially increasing rate that humans may no longer be needed to carry out work. This concern causing stress and anxiety on everyone’s mind is, namely, what happens when humans are not required, and the jobs are gone? As John Havens put it, “The very nature of AI is to observe our behavior in an effort to increase business productivity. And by definition, humans in this model are temporary,” (Havens, 2016, para. 3). Arthur references that he believes we’ve reached the economist Keynes’ point of **technological unemployment**, wherein Keynes predicted that around 2030 production would be no longer an issue and there would be abundance, but the way one accesses it, through employment or jobs, may be scarce (Arthur, 2017). Keynes defined **technological unemployment** as “unemployment due to our discovery of means of economizing the use of labor outrunning the pace at which we can find new uses for labor,” (Keynes, 1963, p. 3). Keynes goes on to say that this will only be temporary, and that “in the long run […] mankind is solving its economic problem,” (Keynes, 1963, p. 3). Humanity will have a new problem to solve that is no longer squarely based in the principles of economics, business, and supply-and-demand. This new age would become a distributive era, and all that entails (Arthur, 2017).
Lee King Fuei analyzed Singapore’s susceptibility to job loss from computerization and automation. One-fourth of the country is at high risk of computerization, which is one of the lowest percentages for countries. However, of those quarter of employees that fall in the high-risk category, the majority have what Lee calls *non-tertiary educational qualifications* which, in addition to being older employees, makes them very unlikely to be re-employed should their jobs be lost (Fuei, 2017). This information applies to American workers as well. Workers in positions that will become automated often do not have the proper education and training to be rehired in different occupations. Most workers will not have the qualifications for new positions after their organizations implement large automation initiatives. The University of Oxford and Citigroup’s report suggest that up to 85% of jobs are at risk (“The Age of Automation,” 2018). Low human employment will have significant impacts on society, ranging from physical and mental health issues, crime, increased burden on the welfare and government systems, and future losses of societal productivity (Kapp, 1975).

Experts offer entrepreneurship as a solution to these concerns, but Sorgner (2017) found that the majority of individuals electing to enter into self-employment were not originally in positions easily-automated, but instead chose to become self-employed due to new opportunities created in the digital age. Therefore, the increases in entrepreneurial endeavors was not a result of technological unemployment from automation – they were in response to the new opportunities provided by the digital age. One path to avoid automation would be to create a niche position in a self-employed capacity, though there will always be the dangers and risks inherent with being independent (Sorgner, 2017, p. 37).

**Idleness and Busyness**
If so many tasks can be automated, one obvious question is what does one do if there is nothing to be done? If governments implement universal income, what are people supposed to do with all of the increased personal time? One of the most human qualities is the aversion of idleness and the need for justifiable busyness (Hsee, Yang, & Wang, 2010, p. 928). Many have already experienced this in airports. Airports try to increase passenger happiness by locating the baggage carousel further away from the gate, so that passengers have to walk greater distances between the two, thus creating justifiable busyness and avoiding the idleness of waiting for baggage. Hsee et al. found that:

People choose to be idle if they do not have reason to be busy, but that even a specious justification can prompt them to seek busyness. In addition, people are happier when busy than when idle, even if busyness is forced upon them. (Hsee, Yang, & Wang, 2010, p. 298)

Futile busyness is better than destructive busyness when constructive busyness is unattainable. (Hsee et al. 2010, p. 929). People will ultimately choose idleness when they have no reason to be busy. Thus, if people do not need to work for an income, they will choose to be idle. This finding is concerning when combined with early retirement statistics. Tsai, Wendt, Donnelly, Jong, and Ahmed followed Shell Oil employees that retired at ages 55, 60 and 65 between January 1973 and December 2003 in a long-term prospective cohort study. Tsai et al. found that employees who retired early at age 55 had higher mortality rates than employees who retired at age 60 and age 65 (Tsai, Wendt, Donnelly, Jong, & Ahmed, 2005). Employees who retired early were more likely to die in the ten years following retirement than those who retired at 60 or 65. Furthermore, those that retired at age 55 and lived to 65 were also more likely to die sooner than the employees that retired at 65. Ultimately, mortality was highest in employees that retired at
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55. This research shows that employees derive personal worth, meaning and value from work and when they retire, they may lose their purpose. This loss has a profound impact on their survival rate. These findings also suggest to the author that individuals permanently forced out of the workforce may suffer similarly decreased survival rates. The author would be interested in further study on the survival rates following being forced out of the workforce due to technological advances and automation.

   Meaning also dramatically impacts the employee’s success at work as Ariely, Kamenica, & Prelec’s research highlights. Ariely et al. concluded through experiments involving Legos that:

   ![Image](M)eaning, at least in part, derives from the connection between work and some purpose, however insignificant or irrelevant that purpose may be to the worker’s personal goals. When that connection is severed, when there is no purpose, work becomes absurd, alienation, or even demeaning. (Ariely, Kamenica, & Prelec, 2008, p. 676).

Furthermore, this work showed that meaning which triggered recognition and purpose could greatly impact motivation and productivity. This impact on successful change implementation – that if the organizational change leader can connect recognition of purpose with the need for change, those impacted by the change will respond with more motivation and productive labor. Leaders must connect each worker’s responsibilities to the overall vision and goals of the organization to reap these benefits on productivity.

**Most Vulnerable Workers**

   No one is immune to automation. The technological advances are a global issue, but the pace of change and amount of vulnerability will vary based on region and education. For example, non-college jobs are the most at-risk for automation (Muro, Maxim, & Whiton, 2019).
Most newly-created jobs only require a high-school level education. However, college-degree earners often settle for positions where they do not use their college degrees, causing more non-college educated workers to have to look elsewhere for work. Although “automation risk varies across U.S. regions and states[,] it will be most disruptive in Heartland states – the same region hit hardest by IT era changes,” (Muro, Maxim, & Whiton, 2019, p. 37). This risk is reminiscent of Thiede and Monnat’s spatial variation of unemployment following the Great Recession (Thiede & Monnat, 2016).

For example, Wisconsin is in the most at-risk category of 47-48% average automation potential in the country, along with Iowa, Nebraska, South Dakota, Wyoming, Nevada, Arkansas, Mississippi, Alabama, Tennessee, Kentucky, Indiana, and Ohio (Muro et al., 2019). When looking at a more micro level of the data, by counties, the findings are more severe. “Smaller, less-educated communities will struggle relatively more with automation, while larger cities will experience less disruption,” (Muro, Maxim, & Whiton, 2019, p. 40). See Figure 8 in the appendix for the map of average automation potential by county in Wisconsin. The green signifies the areas with the highest risk of technological unemployment due to automation, and the white illustrates the areas with the least risk of technological unemployment from automation. The majority of the counties are shades of dark green, which signifies that 50% - 65% of the jobs in those counties will potentially be automated by 2030. The only two counties that are not shaded green are Dane County (the heavily-populated area where Madison is located) and Menominee County, which an outlier in the data as it is the least populated county in Wisconsin according to the 2010 census. Dane County has 95.6% of adults age 25 and older with a high school degree and 50% with a bachelor’s degree or higher. This county represents the most economically diverse area in the country, thanks to the wide variety of industries in the
area. Ultimately, the companies that are most successful in managing the transition to increased technological advancement will benefit the communities they reside in with higher standards of living.

Devaraj, Hicks, Wornell, and Faulk (2017) discuss the “growing concern that the geographic and education level concentration of labor market shocks have the potential to be far worse in the immediate future than in the past decades,” (Devaraj et al., 2017, p. 2) They go on to state the staggering figure that 50% of the net establishment growth in the United States since the Great Recession happened in less than 1% of the counties (Devaraj, Hicks, Wornell, & Faulk, 2017, p. 2) Moreover, Devaraj et. al. highlight how U.S. population growth in urban areas has come at the expense of the rural regions, and point to the bifurcation of economic experience as the result of the population dynamics between rural and urban areas, in addition to changing household composition, education and marital experience (Devaraj et. al., 2017). These considerations are worth noting when approaching an evolving employee base. See Figure 9 in the appendix for a map of the average automation potential by metropolitan area in Wisconsin.

Even so, the metropolitan areas are still highly at-risk for automation, and the average potential for automation is between 39.1% and 44%. This range means that, though some regions of the country are going to be at a higher risk (some rural communities will be more exposed than some metropolitan areas), those that are so-called lower risk still have the chance of having nearly half of their occupations automated! In other words, technological literacy is going to be paramount to everyone in the United States, regardless of where they live and work.

Devaraj, Sharma, Wornell, and Hicks’ report highlights an interesting trend tied to automation. The regions with the lowest levels of health, education and living standards are also the areas at highest risk for automation, and the areas with the highest levels of health, education
and living standards are the least risk for automation. “The lack of access to broadband technology and/or the poor quality of technology in rural areas exacerbates existing inequality in human development between rural and urban places,” (Devaraj, Sharma, Wornell, & Hicks, 2017, p. 5). This access is significant to retraining and navigating the evolving nature of work because many workers will have to adjust their relationship to their work. For example, the transition from farm work to the automotive assembly line was not a giant leap to the workers because they had been skilled in maintaining farm equipment with the same tools required to assemble the automotive cars. However, the tools that today’s current manufacturing works use are not going to translate into the digital society’s need work needs, such as coders and personal health aides. This mismatch creates a drastic disconnect between the work available and the workers’ skills. In addition, the levels of pay of the new occupations will not be greater than or equal to the previous jobs before automation. Previous industrial revolutions took place because rural workers moved to the cities in search of better work, but in today’s situation, workers will not have the correct set of skills to be hired and do the new jobs, and the new jobs will be below their old pay grade. Consider these concepts when thinking about the long-term impacts of technological change and automation on the organizations and their employees.

**Awareness of Technological Unemployment Possibility**

One caveat to understanding the significance of these technological advances is that the greater awareness one has of the upcoming changes in technology, the more depressed and cynical they become, according to recent research by Brougham and Haar (2018). They have coined the term **STARA**, which stands for **Smart Technology, Artificial Intelligence, Robotics and Algorithms**. STARA awareness is the “extent to which an employee views the likelihood of Smart Technology, Artificial Intelligences, Robotics, and Algorithms impacting on their future
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career prospects,” (Brougham et al., 2018, p. 241). Brougham and Haar conducted research in New Zealand, which like the United States, has shifted from employing large segments in farming and manufacturing to the service industry. New Zealand’s service sector is responsible for 71% of New Zealand’s gross domestic product (GDP). Brougham and Haar found that the more an employee knew about STARA, the lower their commitment to an organization is and the lower their career and job satisfaction is. Employees “with a higher perception of STARA are likely to have higher adverse effects on turnover intentions, depression, and cynicism,” (Brougham & Haar, 2018, p. 252). More senior employees have high levels of STARA awareness, though they do not see STARA as threatening to their positions and career prospects. Most interestingly, Brougham and Haar recommend that organizations go into this new period with open eyes because, “It is important that we prepare adequately, as the overall findings show that employees in general do not perceive STARA to be a threat, despite what well-respected business people, scientists, and academics are predicting.” (Brougham & Haar, 2018, p. 254).

When asked if one believes that automation will lead to significant challenges, such as like employment options and wealth distribution, respondents to Citi Research featured in Frey, Osborne, and Holmens (2016) answered that 64% believed automation would trigger significantly major challenges, 21% said automation would lead to somewhat major challenges, and 11% disagreed saying automation would not lead to major challenges. Employees think automation is concerning on a societal level but overlook that their jobs are at-risk. Though many employees will be oblivious to the level of insecurity that their current jobs face, the effects of experiencing job insecurity are well researched. Dekker and Schaufeli showed that job insecurity is associated with psychological health deterioration, and withdrawal from both the organization and the position (Dekker & Schaufeli, 1995). Furthermore, though support from
management, colleagues, and unions was expected to buffer the effects of stress, their research found that none of the three resources were able to combat the concern created by job insecurity. The way to mitigate the psychological effects of job insecurity on mental and physical health was to deal with the actual job insecurity problem, instead of trying to make it minimize the concern through social support (Dekker & Schaufeli, 1995). Ferrie et al. studied the effects of chronic job insecurity with the results showing that those who have lost their job security self-report more health issues, and an increase in morbidity. These symptoms are not alleviated when job security is regained and often increase with prolonged and repeated exposure to job insecurity. In other words, the more insecure jobs are in the mind of an employee, the worse the employee will be physically and mentally. These individuals’ symptoms will continue to worsen until they find themselves in incredibly-secure employment. Sadly, an employee may never feel entirely secure given the significance of the current technological changes, and in that case their conditions will keep deteriorating (Ferrie, Shipley, Stansfeld, & Marmot, 2002). In this way, it may be a blessing in disguise that many employees are ignorant to the degree at which their jobs may/will be impacted or eliminated by STARA (Brougham & Haar, 2018).

**Recommendations for Leading Change in the New Age**

Keeping the above history, trends, and concerns as groundwork, laying out the organization’s plan for dealing with the upcoming changes can take place. Leading and managing the people issues will be an integral part of the change process and deserves equal amounts of attention alongside other elements of the change process. The standard organizational change process as laid out by Hayes (2014) reinforces the steps as follows: “recognizing the need for change and starting the process; diagnosing what needs to be changed and formulating a vision of preferred future state, planning, implementing the change and
reviewing progress; and sustaining the change” (Hayes, 2014, p. 27). Through each phase, learning will continuously take place, as will the leading and managing of people issues. Developing organizational buy-in as to the need for change is one of the restraining factors to be minimized. The information and statistics provided in the first half of the paper should be helpful to encourage management to recognize the need for change and to start the change process.

As the process moves into the diagnostic phase, it is helpful to keep in mind Spencer’s (2014) general strategies in the face of many unknowns to manage uncertainty: buffer, plan, or adapt. A buffer approach is best when there are abundant resources. A planned approach is best when there is a reasonably realistic idea of what the future will hold. If neither buffering nor planning is an option, the organization must adapt because there is no other alternative (Spencer, 2014). Use this concept when assessing an organizational change strategy. If resources are abundant, the approach can be iterative. Overtrain employees for all potential situations, readjust as more information becomes available, and then retrain the employees as the need arises. If there is an accurate forecast of what the future holds, then the organization can be more specific about training and change plans because there is no need to waste extra resources on unlikely outcomes. However, if neither an accurate model nor an abundance of resources exists, the organization will be forced to adapt to the change, instead of predicting or protecting against it. An adaptive strategy is the least ideal situation to be in, and competitors will likely outmatch the organization. However, this situation is the most common for organizations. Spencer’s project-level defenses against uncertainty can help at the corporate level.

Factors that undermine support for change identified by Kotter and Schlesinger (1979) are low trust, low tolerance for change, different assessments, and parochial self-interest (Kotter
& Schlesinger, 1979). Education and persuasion, involvement, facilitation and support, negotiation, manipulation and co-option, explicit and implicit coercion, and goal setting are all ways to minimize resistance and increase employees’ motivation to change (Hayes, 2014). Every organization is going to have different factors undermining support and different solutions to minimize their impact, but several universals will exist given the nature of upcoming automation, AI and technological changes. For example, many employees are against change because change is uncomfortable and unknown. Change leaders can help dispel the sense of unknown by inviting employees to learn about why the changes need to take place. Leaders can also persuade employees that the future technological changes are already impacting the organization and the choice is either adapt or die. Through the change process, involve employees to help create solutions, like adjusting current jobs to be more technologically-complementary. Employees will need supporting when they have questions and concerns. Leaders and employees can also work together to set goals, and these goals can be used to benchmark how the change is going, and where the final organization wants to be. When situations become dire and employees are not accepting the change, manipulation, co-option, explicit and implicit coercion can be used sparingly, though these techniques can result in even lower trust in the organization and increased turnover.

When explaining the need for change and the change process to the executive team, it is helpful to explain the progression in terms of Lewin’s Change Management Model (Hayes, 2014). Remind leadership that the process will be ongoing, and once new behaviors are frozen, the diagnosis will continue to ensure that the new behaviors achieve the desired goals and align with the ever-evolving environment. Prepare the organization for the oncoming periods of revolutionary change. Reviewing the organizational change leadership process with the
executive team will be beneficial and reinforce the importance of constant learning. Leading and managing people issues will also be an essential topic to highlight throughout the discussions.

**Recommended Change Goals to Set**

The following goals can serve as overarching themes for an organization to move forward, or suggestions to present in the initial stages of the change plan to get minds into gear. Frey, Osborne, and Holmes (2016) recommend the following policy changes to aid at-risk workers as they lose their jobs. The policies are described from most recommended to least recommended. The most recommended policies are investment and education in workers. Then, Frey et al. recommend policies that encourage entrepreneurship. More government-specific policy suggestions are to create new labor market policies, fund research that boosts innovation to eventually foster more employment, reduce taxes on low-income households, and increase taxes on high-income households. The next policy endorses regulation on automation implementation, in the sense of creating more specific rules and perhaps even taxation on automation machines. The last three policy recommendations are to introduce a basic living income, encourage immigration, and to design new policies that stimulate consumer demand (Frey et al., 2016). However, not all of these policies are within the power of the organization and the change leader.

Based on the author’s research, these four goals will most directly address how to lead change in the new age of automation. Implementing all four goals in the change plan would be ideal, but again, make sure that these align with the specific organization before imposing them.

**Prioritizing the Value of Technological Literacy**

Deliver a message from the top – the CFO or leader of the organization needs to publicly and thoroughly emphasize that the organization is going to strive to be a culture of
technologically literate people. This expectation of technological literacy should be added to the organization’s mission, vision, and values, and become one of the cornerstones of the business practice. Job descriptions need to represent this new cultural emphasis, and all job interviews going forward should highlight the organization’s desire for onboarding and supporting technologically literate employees. When hiring, tell candidates that the company is very future-oriented and that the job description may be completely different a year from now because of technological advances, automation, and AI. Do not hire any job candidate that is unwilling and unreceptive to the possibility of change. On the other side, job applicants should be cautious of any interview process where the company does not discuss plans for dealing with technological advances because that may reveal a lack of strategy and leadership. Rewards systems should reflect the goal of technologically literate people by encouraging employees to hone their skills, embrace disruption, and find creative ways to utilize available technology (Fordham, 2017).

When the leader establishes this new requirement for technological literacy, he or she should bear in mind the advice of Elsbeth Johnson on the significance of sending the right signals as leaders to support change (Johnson, 2017). She highlights the following three signals that leadership needs to make: explicitly tell the organization what one wants, personally live the change that one asked for, and measure the change frequently. Johnson’s three signals are challenging to follow because leaders may have difficulty saying what they mean. It is much easier to deliver a list of tasks than explain the ultimate goals of why those tasks are necessary, but as Ariely et al. concluded, meaning can have a profound impact (2008). The leader should make every effort to become technologically literate themselves, and employees will notice and follow suit.
Additionally, the leader should also deliver very straightforward and blatant messages about the upcoming age of automation to employees and explain how these changes are here to stay. Avoid supporting incremental approaches or “weathering-the-storm” strategies that postpone dealing with the heart of the problem (Jones, 2012, p. 349). As Jones writes, employees “often discount warnings that problems are impending and do not perceive that crises are developing. Even if they notice, the source of the problems is often attributed to temporary disturbances in the environment,” (Jones, 2012, p. 349).

**Redesigning Jobs to Complement Existing and Future Technologies**

All newly-created positions need to be structured so that the human job will complement existing and future technologies. When organizations foster forward-looking and adaptable jobs, the organizations will be better suited to embrace new challenges, minimize redundancy and conserve resources. Leadership should analyze all of the positions at their company. If any of the jobs at the company cannot be adapted to complement new technology, leadership should actively search for ways to change the job. If the job or the employee cannot be made to accept more technological advances, the position should be phased out. Ideally, as it is phased out, the employee should be reallocated to another function in the company and receive training in the new area.

To conceptualize how to develop a position that will have these future-thinking qualities, think about the most secure job positions and copy those tasks. Most secure job positions include functions such as: “management and development of people, applying expertise to decision making, planning and creative tasks, interfacing with people,” and operating in unpredictable environments (Muro et al., 2019, p. 29). To keep jobs relevant that are otherwise antiquated, very routine-oriented, or easily automated, give the people in these positions more
decision-making opportunities. In redesigning positions, employees should be made to feel more valued, more capable, and have more strategic problem-solving functions.

The question of production can also be shifted to one of organizational structure because when failing organization shift to more organic structures, they have more chance of survival than mechanistic structures. Woodward, Perrow, and Thompson all give different ideas about task variability and analyzability, and the managerial implications the tasks have on the structure of the organization (Jones, 2012). Woodward explored how technology affects organizational structure, Perrow focused on how task complexity affects organizational structure, and Thompson looked at how task interdependence affects technology and organizational structure (Jones, 2012). In Woodward’s line of thinking, “The more routine the tasks, the more likely an organization has a mechanistic structure. The more complex the task, the more organic,” (Jones, 2012, p. 266). Perrow labeled four types of technology, or the process by which one functions to complete their job in their department or organization, as routine manufacturing, craftwork, engineering production, and nonroutine research. Routine manufacturing has low task variability and high task analyzability, craftwork has low task variability and low task analyzability, engineering production has high task variability and high task analyzability, and nonroutine research has high task variability and low task analyzability. Therefore, jobs that fall under the nonroutine research category, such as scientific research and upper-level business management often have to plan and forecast strategy, and for these reasons, these will be the most protected of jobs following wide adoption of STARA. After nonroutine research, the next job technology category somewhat secure from immediate automation is craftwork because “a high level of search activity is needed to find a solution to problems” and the employees frequently adapt to new challenges (Jones, 2012, p. 252). Both routine manufacturing and engineering production
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are at considerable risk because these types have high task analyzability, or in other words, easy and straightforward solutions exist to solve the problems that arise. When looking to streamline organizations, routine manufacturing, and engineering production should be the first places to look for efficiency, and the first places to engage workers in reskilling programs so that they can expand their roles and strengthen their job security.

Vasant Dhar published his Decision Automation Map of the Future in the Harvard Business Review in 2016, and this lends an interesting visual to the dilemma of what to automate and what to let humans do (Dhar, 2016). See Figure 10 in the appendix. The chart has the cost per mistake on the y-axis and the predictability on the x-axis, with the frontier for humans and robots splitting the graph on the diagonal. Decisions that have a high cost per mistake and low predictability tend to fall into the human decision-making domain, while decisions with high predictability and low costs per mistake go into the robot decision-making realm (Limitone, 2016). Expanding this concept into the job creation discussion, an employee will consider their job secure when their assigned tasks contain both low predictability and high cost per mistake. Those jobs with the least security are ones with high predictability and low cost per mistake. To minimize the chance of suffering technological employment, one must become so specialized and knowledgeable in their position through vertical and horizontal loading of responsibilities. In other words, an individual should strive to become too costly to replace or become invaluable such that the organization would need several individuals plus automation to fill the original’s role.

Job specialization has both created the problem of job insecurity, while simultaneously being the solution to job security. When jobs become too specialized, they become predictable. In today’s society, high predictability should be synonymous with easily automatable. The jobs
that are most susceptible to automation are, without surprise, those with the least unpredictability. These most susceptible occupations with tasks that can be 70-100% automated include production/manufacturing, food service, and transportation (Muro, Maxim, & Whiton, 2019), followed by the medium susceptible group with tasks that are 30-70% automatable are administrative, maintenance, construction, agriculture, personal care, protective, health support, sales, and facilities care. The safest, according to Muro et al. are the occupations of health practitioner, legal, computer, science, management, education, social service, engineering, arts/entertainment, and business, all falling around the 10% to 30% task automation susceptibility range. Note that the author wants to reiterate that no occupation will be immune to automation. Muro et al. suggest promoting a constant learning mindset, by investing in retraining and education, and fostering uniquely human qualities (Muro et al., 2019). Use uniquely human qualities to complement technologies to set the organization apart from the competition. Making one’s self indispensable to the organization is the only way to create job security in this new age.

While manufacturing falls into machines’ wheelhouses, there are other areas where humans should manage. These are areas where machines are currently weak. For example, machines are not easily able to do nonroutinem abstract activities, like perception, manipulation, dexterity, and physical adaptability. Machines also struggle with creative intelligence, like ideation, critical thinking, and problem-solving. The third type of work that machines do not excel at is social intelligence, which includes intuition, teamwork, persuasion, situational adaptability, perceptiveness, and caring for others. (Muro et al., 2019).

Consider task interdependence when analyzing how best to integrate technology in new situations. Thompson characterized how the type of task interdependence impacts the
technology and structure of an organization (Jones, 2012). A mediating technology takes pooled resources and shares them with unrelated parties. This kind of technology is coordinated by standardization and has a low cost to coordinate. Long-linked technology works with sequential task interdependence, where the first task must take place before the second, and so on. Long-linked technology is coordinated through planning and scheduling, and the cost of coordination is higher than through mediating technology. Thompson’s third type of technology is intensive technology. Intensive technology happens when many feedback loops inform other elements in non-sequential patterns. Intensive technology is coordinated through mutual adjustment, and the cost of coordination is the highest of all the three types (Jones, 2012, p. 256). In the discussion on how to best organize the company to adjust to new environmental factors, discuss how task interdependence currently operates to inform technology, and if there is a better way to operate in the company’s ideal structure.

When difficulties or pushback arise, take some of the recent comments from Elon Musk to heart - while addressing a May 2018 earnings call by saying, “We went too far in the automation front and automated some pretty silly things,” (Coren, 2018, para. 2). Musk went on to say, “Yes, excessive automation at Tesla was a mistake. To be precise, my mistake. Humans are underrated,” (Coren, 2018, para. 7). So, cynically, some basic human tasks are best left to humans. Jobs developed to allow humans to excel alongside technology will become the hallmark of successful technological implementation.

**Adjusting Hiring Expectations**

An area for improvement for the organizational change agent is in the hiring practice. Employers need to shift their fundamental beliefs that newly hired employees will be productive with little or no company training upon assuming their new position. Instead, new employees
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need to be expected to undergo some company-specific training before engaging their newly-appointed duties. In the interview process, explicitly ask how the job candidate deals with change. Prepare the candidate to be active in the organization.

Employees should be hired based on attitude, and then trained for the skills that they need. The reality is that many potential hires are not going to have the skills necessary to fulfill job requirements. Adjust hiring expectations need to allow for this, or risk not having enough bodies to fill positions. Hiring based on attitude has been a proven strategy with organizations that have reinvented themselves and their culture, including Southwest Airlines. The hiring practice at Southwest is such that they would prefer to hire someone with a warrior spirit and personal beliefs that align with the company than an industry veteran with bad habits that will conflict with the organizational culture.

Similarly, an executive from ING Direct, now Capital One, said that they would prefer to hire a jazz artist, a dancer, or a veteran than someone in the banking industry because the banker will need to unlearn and then relearn new information, whereas the organization can mold someone new to the industry into the best employee (Taylor, 2011). As previously mentioned, the manufacturing industry and the healthcare industry have cited problems in attracting trained employees. Both industries need to ensure learning opportunities for their employees to make them be able to meet changing needs. Reinventing culture in organizations will come up again and again in discussion for leading organizational change, and it is easier to do that with a properly-stocked bench of employees.

When motivated employees are in the organization, the organizational change leader and management need to ensure that the employees feel involved and impactful in the change process. To assume the employee is so invested in the organization and has automatically
bought into the change is a mistake because organizational loyalty is a figment of the past, and workers today do not have the same longevities at organizations that their parents and grandparents did. This transition facilitates a move away from organizational loyalty and into the boundaryless career of today. Employees that embrace boundaryless careers do not negatively impact productivity, as Jauch, Glueck, and Osborn (1978) found. Their research showed that organizational loyalty was unrelated to productivity, and instead, those with the strongest professional commitment had the most productivity. In other words, employees that are the most committed to their occupation and trade produce more than employees who are loyal to their organization (Jauch, Glueck, & Osborn, 1978). Therefore, it is imperative that when going through these organizational changes in the shift towards the increased implementation of STARA that employees identify what about their jobs they enjoy the most. By connecting their current passions from their jobs to future job opportunities within the company, the organization should suffer less turnover through the change process. Accept that employees are not going to work at organizations for the entirety of their careers, and instead assist them in curating their career puzzle (Goldberg, 2017). When seeking new employees, recruiting, training and securing the right people is going to be paramount in combating the ongoing changes amid labor shortages. Goldberg highlights the need to expand strengths as a talent scout, community developer, life coach, expertise with talent platforms, and advocate for diversity and inclusion. There should be a deliberate effort to hire candidates that reflect the customer base. Also, the HR department should actively recruit talent instead of waiting for qualified candidates to apply. The candidates hired may not meet all the requirements outlined in the job application, but they must demonstrate a willingness and desire to learn continually.
This aspiration to continue learning ties directly the strategy to retain and strengthen the employee base by fostering continuous learning and education opportunities.

**Fostering Continuous Learning and Education Opportunities**

Organizational change leaders must install a program to reteach the current workforce – whether these are called retraining programs, reskilling programs, or continuing education. As part of the strategic change process, visibility is essential:

The most important step is to have clarity on the skills embedded in the workforce today, and how the workforce of the future will look in terms of size, composition and skill requirements. Without this clarity, companies risk offering training and education programs that do not fill the most critical skills gaps. (Lund, 2018, “To Get Training Right,” para. 2).

Seventy-four percent of employees said that they would be more likely to remain with an employer if the organization offered training in emerging technologies such as data analytics, AI and robotic process automation (“Your company’s new, upskilled health worker of the future is you,” 2019). This willingness to learn, whether through upskilling or reskilling, will be instrumental to organizational change leadership strategy, as will the ability to offer such programs.

The manufacturing sector currently uses education to combat shortages, primarily by targeting young high school students. Manufacturers hope to change the stereotypically dirty and routine image of traditional skilled jobs to one that is fun and relevant (Peters, 2013). AT&T offers a different example of creating learning opportunities. AT&T realized that their organization was evolving from a phone company into a data-powered entertainment and business solution company and understood that its current workforce was not equipped to make the transition. AT&T partnered with traditional and non-traditional learning platforms, colleges,
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universities, and online programs to develop courses specific to the new roles the company needed. The AT&T employees were then paid by AT&T to complete the courses. At the start of 2018, employees completed 2.7 million online courses, and more than 50% of the employees had participated.

While Tucker highlights some disadvantages of retraining, in the sense that poorly-designed programs can hinder innovation or delay the growth of the company (Tucker, n.d.), there are numerous benefits, both short-term and long-term, to encouraging current workers to fill the new skills gaps. From the results thus far, AT&T has found that “retrained workers are twice as likely to obtain technology and operations management roles than non-retrained workers,” (Lund, 2018, “Seeking Partnerships Inside and Outside,” para. 5). From a financial perspective, in Virginia, employers can claim tax credits for the training costs associated with offering eligible worker retraining through the Virginia Economic Development Partnership, or VEDP. This Worker Retraining Tax Credit is just one way that companies can make retraining programs more doable. There are similar opportunities available in Georgia, South Carolina, and through the U.S. Federal Government in the form of the Work Opportunity Tax Credit for underserved groups, such as veterans and vocational rehabilitation employees (“Work Opportunity Tax Credit | Internal Revenue Service,” n.d.).

Other Considerations

If the organization can move its physical location, one way to counteract technological uncertainty is by establishing and supporting diversified economies. Diversified economies have lower unemployment rates, recovered more quickly following the Great Recession, were less
volatile in terms of employment changes and the number of jobs, and ultimately support more economic resiliency and growth. The 2018 report by Emsi honored Madison, Wisconsin as the #1 diversified economy and Eau Claire, Wisconsin as #7 in the country (Christopher, 2018). Wisconsin was the only state to have two cities in the top 10. This ranking is significant because Looking at Madison specifically, the top five industries in advanced manufacturing, agriculture, healthcare, information technology and life sciences (“Wisconsin Major Industries - Businesses in the Madison Region,” n.d.).

Other Wisconsin metropolitan areas listed were ranked out of a possible 382 metro areas from highest diversity to lowest diversity: Wausau – ranked #295, Green Bay – ranked #213, Appleton – ranked #280, Oshkosh/Neenah -ranked #296, Fond du Lac – ranked #218, Sheboygan – ranked #370, Milwaukee – ranked #97, Racine – ranked #307, Janesville/Beloit – ranked #221. On the opposite end of the spectrum, Elkhart, Indiana, had the lowest economic diversity because capital-intensive manufacturing makes up 44.6% of the total employment in the area. In comparison, capital-intensive manufacturing typically represents 4.7% of total employment for a metropolitan area. The Madison and Eau Claire economies recovered better thanks to their wide range of employment opportunities. See Figures 11 and 12 in the appendix. Companies struggling to find labor should seek out communities like Elkhart with complementary labor pools to diversify the industries in said communities when searching to expand. Conversely, companies that are in their early stages may have more luck in diversified economies like Madison or Eau Claire, and then branch out from those areas (Christopher, 2018).
Conclusions and Future Study

Leading organizational change in the new age of automation is an arduous endeavor. Technological advances will continue to increase the already-accelerating rates of change. Workers are not retrained in new skills, but they need to be. When hiring individuals, companies need to enforce the new paradigm that there will be expectations of continuous change. The companies that are most successful in transitioning to the new age will also benefit the communities they operate in with a higher standard of living. Nobody is immune to technological advances. Future jobs do not have as high of a wage base and will fall into repeatable patterns that can be automated, and thus more insecure and automatable. The question of what to with increased personal time will continue to come up, as well as where to find meaning without work. Though technological advances are taking place globally, regions will be affected at different rates. Regardless of the rate, technology is evolving at a pace which humanity may have difficulty matching.

All change leadership initiatives will need to brace for these impacts. By focusing on the change process through the lens of Lewin’s field theory, the different elements that are at play are the driving and restraining forces to the current equilibrium. Successful change implementation will recognize, predict and plan for these trends. Taking into account the history of automation, the escalating pace of change, labor shortages, changes in labor demographics, and the redistribution of jobs and wages will help the organizational leader to convey the need for change to the organization. Understanding the underlying concerns about technological unemployment will also assist in addressing the restraining forces acting on the change’s success. Setting goals to include the prioritization of technologically literate people, redesigning jobs to complement current and future technology, adjustment of hiring expectations and
fostering opportunities for continuous learning and education will create transformational, revolutionary change for the organization to bring it up to speed and beyond the current age of automation.

Future study should look at correlations between employees that elect early retirement and employees that are forced out of the workforce to track and understand survival rates after ceasing work. The author speculates that this research may have incredibly insightful results.
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Appendix

Table 1

<table>
<thead>
<tr>
<th>Country</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>47</td>
</tr>
<tr>
<td>Thailand</td>
<td>72</td>
</tr>
<tr>
<td>Nigeria</td>
<td>65</td>
</tr>
<tr>
<td>China</td>
<td>77</td>
</tr>
<tr>
<td>India</td>
<td>69</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>85</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>35</td>
</tr>
</tbody>
</table>

Note. Data for countries and automation risk from Frey et al. (2016).

Figure 2

Figure 3

![Median Age of the Labor Force](image)


Table 4

<table>
<thead>
<tr>
<th>Group</th>
<th>1996</th>
<th>2006</th>
<th>2016</th>
<th>2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>38.3</td>
<td>40.8</td>
<td>42.0</td>
<td>42.3</td>
</tr>
<tr>
<td>Men</td>
<td>38.3</td>
<td>40.6</td>
<td>41.9</td>
<td>42.1</td>
</tr>
<tr>
<td>Women</td>
<td>38.2</td>
<td>41.0</td>
<td>42.0</td>
<td>42.5</td>
</tr>
<tr>
<td>White</td>
<td>41.8</td>
<td>41.3</td>
<td>42.8</td>
<td>43.0</td>
</tr>
<tr>
<td>Black</td>
<td>36.4</td>
<td>38.7</td>
<td>39.4</td>
<td>40.0</td>
</tr>
<tr>
<td>Asian</td>
<td>37.0</td>
<td>40.1</td>
<td>41.2</td>
<td>42.5</td>
</tr>
<tr>
<td>Hispanic origin</td>
<td>33.9</td>
<td>35.6</td>
<td>37.8</td>
<td>39.3</td>
</tr>
<tr>
<td>White non-Hispanic</td>
<td>39.1</td>
<td>42.4</td>
<td>44.2</td>
<td>44.1</td>
</tr>
</tbody>
</table>

### Table 5. Selection of employment by major occupational group, 2016 and projected 2026

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Employment 2016</th>
<th>Employment 2026</th>
<th>Change from 2016-2026</th>
<th>Median annual wage, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>All occupations</td>
<td>156,063,800</td>
<td>167,582,300</td>
<td>11,518,600</td>
<td>7.4%</td>
</tr>
<tr>
<td>Healthcare support occupations</td>
<td>4,315,600</td>
<td>5,335,200</td>
<td>1,019,600</td>
<td>23.6%</td>
</tr>
<tr>
<td>Personal care and service occupations</td>
<td>6,419,700</td>
<td>7,647,400</td>
<td>1,227,600</td>
<td>19.1%</td>
</tr>
<tr>
<td>Food preparation and serving related occupations</td>
<td>13,206,100</td>
<td>14,438,100</td>
<td>1,232,000</td>
<td>9.3%</td>
</tr>
<tr>
<td>Sales and related occupations</td>
<td>15,747,800</td>
<td>16,206,500</td>
<td>458,700</td>
<td>2.9%</td>
</tr>
<tr>
<td>Office and administrate support occupations</td>
<td>23,081,200</td>
<td>23,230,800</td>
<td>149,600</td>
<td>0.6%</td>
</tr>
<tr>
<td>Management occupations</td>
<td>9,533,100</td>
<td>10,340,400</td>
<td>807,300</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

Table 6

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Employment 2016</th>
<th>Employment 2026</th>
<th>Change from 2016 - 2026</th>
<th>Median annual wage, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total for all occupations</td>
<td>156,063,800</td>
<td>167,582,300</td>
<td>11,518,600.0</td>
<td>7.4</td>
</tr>
<tr>
<td>Secretaries and administrative assistants</td>
<td>2,536,200</td>
<td>2,371,300</td>
<td>-164,900.0</td>
<td>6.5</td>
</tr>
<tr>
<td>Data entry keyers</td>
<td>203,800</td>
<td>160,600</td>
<td>-43,300.0</td>
<td>21.2</td>
</tr>
<tr>
<td>Tellers</td>
<td>502,700</td>
<td>460,900</td>
<td>-41,800.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Postal service mail carriers</td>
<td>316,700</td>
<td>278,500</td>
<td>-38,200.0</td>
<td>12.1</td>
</tr>
<tr>
<td>Cashiers</td>
<td>3,555,500</td>
<td>3,524,900</td>
<td>-30,600.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Fast food cooks</td>
<td>517,600</td>
<td>490,500</td>
<td>-27,100.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Accounting, bookkeeping and auditing clerks</td>
<td>1,730,500</td>
<td>1,705,300</td>
<td>-25,200.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Chief executives</td>
<td>308,900</td>
<td>296,800</td>
<td>-12,100.0</td>
<td>3.9</td>
</tr>
<tr>
<td>Postal service mail sorters, processors, and processing machine operators</td>
<td>106,700</td>
<td>89,100</td>
<td>-17,500.0</td>
<td>16.5</td>
</tr>
<tr>
<td>File clerks</td>
<td>135,000</td>
<td>121,000</td>
<td>-14,000.0</td>
<td>10.4</td>
</tr>
</tbody>
</table>


Table 7

<table>
<thead>
<tr>
<th>Traditional Occupation</th>
<th>Technological replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretaries and administrative assistants</td>
<td>Alexa, Siri, personal AI assistants</td>
</tr>
<tr>
<td>Data entry keyers</td>
<td>Voice-automated data entry</td>
</tr>
<tr>
<td>Tellers, cashiers</td>
<td>Self-service stations</td>
</tr>
<tr>
<td>Postal service mail carriers’ postal service mail sorters</td>
<td>Drones</td>
</tr>
<tr>
<td>Assemblers and fabricators; printing press operators; sewing machine operators, fast food cooks</td>
<td>Automation in various settings</td>
</tr>
</tbody>
</table>
Figure 8

Average automation potential in Wisconsin by county

Data adapted from the Brookings Institution analysis by Muro et al., 2019.

50% - 65%
48% - 50%
44% - 48%
32% - 44%

Figure 9

Average automation potential in Wisconsin by metropolitan area

Data adapted from the Brookings Institution analysis by Muro et al., 2019.
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Figure 10

Note. Figure adapted from Dhar (2016).

Figure 11

Note. Data for the economic diversity in Elkhart, Indiana, from Christopher (2018).
Figure 12

Economic Diversity in Madison, Wisconsin

- Distributive Services
- Finance, Insurance & Real Estate
- Capital-Intensive Manufacturing
- Healthcare
- Engineering-Intensive Manufacturing
- Agriculture & Natural Resource Extraction
- Higher Education
- Knowledge-Intensive Business Services
- Government
- Media, Entertainment & Recreation
- Corporate Management & Administration

Note. Data for the economic diversity in Madison, Wisconsin from Christopher (2018).
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