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Automation, Jobs, and Employment

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Abstract
Technology has advanced many aspects of the workforce from accounting functions to life-saving medical wonders. Many employees will need to increase skills to keep employed (Jahn, 2017) but who will ensure that current workers get this new knowledge? This paper reviews the impact of recent technologies and artificial intelligence (AI) that is anticipated to cause massive unemployment for the under-skilled and even threatens some white-collared workers such as financial analysts (West, 2017). The other aspect of improved technologies can be the new opportunities it offers. A brief historical view of automation in the workplace depicts some of the past occurrences. The authors will determine that automation can allow workers to have enriched lives and will charge organizations with Corporate Social Responsibility (CSR) to prepare workers for new employment methods. A survey of business students assesses their perceptions of any anxieties about job displacements and expectations of CSR to ensure job positions.

Keywords
Automation, CSR, employment, robots, workers, artificial intelligence

1 Introduction

In the early 1930's, economist John Maynard Keynes noted in his essay, *Economic Possibilities for our Grandchildren*, the likelihood of technology replacing human labor faster than we discover new jobs. He described this outcome as "technological unemployment," (Wolcott, 2018). Keynes predicted this transformation would occur around 2030 (Arthur, 2017).
The 1940's witnessed the rise of 'mechanization' and concerns by unions, manufacturers and even radio advertisers that human jobs would be lost (Hunt, 1940; Marx, 1941; Neilson, 1942; Taylor, 1940; Welch & Miley, 1945). The evolving role of employers and employees as a result of task automation has redefined worker roles, increased product and services output, and traditional demand for workers. As automation changes our work environment, it also significantly influences our private lives, leisure, and social relationships. The following describes some theories and historical examples of the later decades.

2 The Fifties – IBM in the Office

In the 1950's, Hannah Arendt, a noted philosopher and journalist, presented a summary of human activity in The Human Condition and described three distinct levels. Labor produces necessities such as food to sustain life. Work creates physical artifacts and infrastructure such as homes and artworks which can outlast us. Lastly, Action is characterized by interactive, communicative activities between people and contribute to our unique nature. (Wolcott, 2018). Arendt argues that if automation increasingly contributes to Labor and Work, individuals will have more time to pursue societal activities related to Action. Recognition of automation's growing influence in our professional lives and its impact on the value added role of workers was also evident in popular culture. In the mid-twentieth century film "Desk Set", Katherine Hepburn's character, Miss Watson, relates her impression of the new electronic brain that frighteningly could "do everything" and that "maybe people were a little bit outmoded" (Ephron & Ephron, 1957). Her colleagues were fearful of job loss, but all ends well when it is promised that the new IBM machine will only help workers and add more job s. This, however, is not always the outcome when advances in automation entered the workplace.

3 The Sixties – Technological Disruption

The sixties had many fears of 'technology's job-killing effects' (Akst, 2013). This did have some reality in manufacturing when 6.3 million jobs were lost. During this time, the National Commission on Technology, Automation and Economic Progress, launched by President Lyndon B. Johnson in 1964, was comprised of intellectuals who considered that just as technological changes had increased manufacturing and agriculture, it also threatened to eliminate office jobs. However, it did correctly note that much of the unemployment due to technology was among workers with little education or skills. Many had doomsday predictions, even notable economists, such as Ben B. Seligman's 1966 book, *Most Notorious Victory: Man in an Age of Automation* (Akst, 2013). Also in the early sixties, fear of computerized typesetting provoked the I.T.U., International Typographers Union, to shut down the presses of seven N.Y. papers. 'Technological disruption' was blamed when a computerized typesetting machine replaced the old Linotype. The strike lasted for 114 days from December 8th, 1962 to March 31st, 1963 with 17,000 newspaper employees. Later, four of the seven papers were forced to close due to costs (Sherman, 2012).

Although many from the sixties had erroneous predictions including good ones such as futurist Herman Kahn's four day work week (a compressed option of 10 hour days for some today) and 13 weeks of vacation, the need for increased skills was accurate.

4 The Seventies – Mechanical Frankensteins

Workers in chemical unions imagined "mechanical frankensteins taking away their jobs" (Beach, 1971, p.149). In the cement industry, cutting-edge productions could produce 4 million barrels with 120 men. At traditional plants, it would take 500 men. The transitional losses of 380 jobs were referred to as 'silent firings.' From 1974-1977, 88,000 telephone jobs were lost. American Telephone and Telegraph had SIPP, Supplemental Insurance Protection Plan to pay workers for up to two years at 50% or less. Communications Workers of America and United Steel Workers negotiated for SUB, Supplemental Unemployment Benefits, to maintain out of work members. General Motors exhausted the SUB plans twice in 1975. However, job security was not attained (Rosenstiel, 1977). Columbia professor of sociology, Herbert J. Gans (1977), posited a method "to solve the unemployment problem" with "a system where more work is done by people and less by machines" (p. 41).

5 The Eighties – Reduce Labor

The Institute for Economic Analysis in the eighties anticipated that although automation could diminish job numbers it would increase the professional and technical jobs. It purported that although there would be less need for clerical workers, manufacturing employment should remain the same (Scientific American, 1984). Analogies were made that advancement with automation and robotics would reduce labor as tractors eliminated the need for horses (Leontief, 1983). Not a very attractive correlation with lower skilled workers. Granted, some job losses of the seventies, eighties and onward were and are due to manufacturing and, more recently, service jobs to overseas workers.

6 The Nineties – Lost Jobs

In the first three years of the nineties, 1.6 billion U.S. manufacturing jobs were lost. Secretary of Labor Robert Reich suggested that new jobs were in the 'human dimension of automation'. Government and industry should promote "a new class of middle level technical workers" who can be educated and trained through post-high school apprenticeships or on-the-job-training. However, investment in 'human displacing automation' was already progressing in automobile, electronic and printing plants. Labor unions that had traditionally protected workers against automation were shrinking and losing power. Only 12% of the private-sector workforce in the U.S still had unions (Barnet, 1993).

7 This Century – Robotics and Artificial Intelligence

Automation "could herald a golden age of personal service" (Kaplan, 2017). Does that include riding in your driverless car? According to the Bureau of Labor Statistics' job outlook for cashiers, the occupation will be declining because of "advances in technology, such as self-service checkout stands in retail stores and increasing online sales" (Occupational Outlook, 2017). Within the next two decades, economists predict over 55% of city workers will be replaced by automation (Semuels, 2017).

Even duties of lawyers can be replaced with Blockchain technology, a distributed database, which reduces the need for jobs in the legal field (Fenwick, Kaal & Vermeulen, 2017). Autonomous vehicles equate to fewer jobs for cargo and mass transport drivers. Automation of banks and markets, such as Amazon's Go stores (Statt, 2017) extended by the takeover of Whole Food Markets by Amazon, instills fears of jobless masses (McAfee & Brynjolfsson, 2017; Paquette, 2017; Shukla & Rebello, 2017).

Recently, Shake Shack robots replaced cashiers in an East Village N. Y. fast food store (O'Neill, 2017). Grocery store Amazon Go in Seattle, Washington has its "just walk out" technology with algorithms and sensors monitoring the virtual shopping cart (Scotti, 2018). No need for grocery clerks; another job replaced by automation. Interestingly, although only 6% of corporate leaders in the U.S. "believe increasing automation will have a significant impact on workforce planning and shifting the talent needed" (Ranstand, 2017), more than 70% of workers fear a loss of jobs from automation (Anderson, 2017) (see Fig. 1).

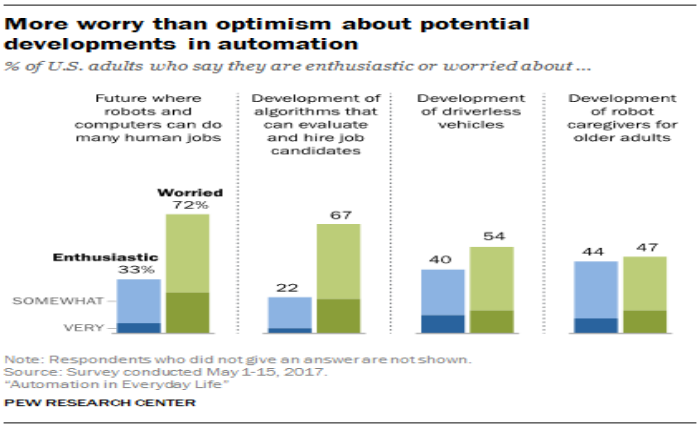

Figure 1. Concern of automation developments: Source Pew Research Center

Dr. Timothy Bickmore and his team from Northeastern University - including doctors and chaplains - created a tablet based Chatbot that could assist people making their end of life decisions, particularly those who are socially isolated and would not be having those uncomfortable conversations at all (Moncher, 2017; Reynolds, 2017).

There is always a change in employment caused by business failures, mergers, or from people advancing to higher positions or, perhaps, their own enterprises. The ATM may have displaced some bank tellers, but it made banking easier for the consumer, banks made profits, and IT workers were hired. Technology can create as well as replace jobs.

Recent history offers a caution that many jobs will not be fully replaced. Many workers affected by "technological unemployment" do become unemployed due to an inability to transfer existing skills sets to new job requirements. Other workers are driven to low-paying positions, part-time jobs, or short-term contract employees (Arthur, 2017). A study by Intuit predicted that 40 percent of American workers would be independent contractors by 2020 (Intuit, 2010).

Given the interrelated nature of the increasingly automated work environment with our professional, private lives, and social relationships, management should recognize its impact on human capital. Corporations should embrace this transition and accept a significant role in society's redefined work environment.

8 Corporate Social Responsibility

Employers can affect a noteworthy transformation such as GE, L'Oréal and Cisco retraining workers by funding up to $1200 per employee and creating positions of Directors of Employee Experience (Greenberg, 2017). General Electric has a "Brilliant Learning" Program and will train workers for jobs of the future.

BNY Mellon, Boston Consulting Group, Axis Bank, & L'Oréal are providing employee courses in Coursera corporate learning from more than a hundred universities, including Yale, Stanford, & Princeton, topics from chemistry to fashion merchandising. Online corporate learning to reach $30 billion by 2020 (Wang, 2016).

Dr. Joshua M. Pearce, an academic engineer at Michigan State, suggests methods for coal workers, a declining industry, to be retrained as solar workers, an expanding job market area (Pearce, 2016).

9 Research Study

For this small case study, a survey was distributed by e-mail to the business students in a small private university in Spring 2018 courses. Was there concern of job displacement? Items from previous studies of perceptions of automation and employment were adapted and some Pew Research items were duplicated (Anderson, 2017). Additionally, students were ask about any accountability of organizations for continued employment of workers. A phenomenological research approach (Creswell, 2013) was used as students' perceptions were assessed through an inquiry in SurveyMonkey.

10 Results

Responses from the 91 completed surveys were assessed for any apprehensions of employment changes due to automation. The trepidations about changes increased according to length of time as there was only 5.5% of very concerned for any changes in the next 3 months compared to 36.3% for after 3 years (see Table 1).

	Not Concerned	Somewhat Concerned	Concerned	Very Concerned
In the next 3 months	68.1%	16.5%	9.9%	5.5%
In the next 6 months	53.9%	29.7%	13.2%	3.3%
In the next year	34.1%	41.8%	22.0%	2.2%
In 2 years	26.4%	33.0%	30.8%	9.9%
In 3 years	22.0%	28.6%	33.0%	16.5%
After 3 years	13.2%	13.2%	37.4%	36.3%

Table 1. Do you have any concern for job loss/reduction from automation?

Regarding the responsibility of organizations to assist workers in the case of automation, the majority of responses indicated that employers would be accountable (see Table 2).

	Not Responsible	Somewhat Responsible	Responsible
Training	5.5%	34.1%	60.4%
Internal Transfer	1.1%	48.4%	50.6%
Job Placement	6.6%	37.4%	56.0%

Table 2. How much responsibility do you think organizations have to ensure employment of workers when automation becomes an option?

Survey participants were queried on the possibility of certain jobs being replaced by automation. Fast food workers were evaluated to be the most likely and their own profession (business) and nurses to be the least likely to be affected (see Table 3).

	Not at all likely	Not very likely	Somewhat likely	Very likely
Fast food worker	1.1%	4.4%	38.5%	56.0%
Insurance claims processor	5.5%	37.4%	38.5%	18.7%
Legal clerk	8.8%	50.6%	37.4%	3.3%
Construction worker	14.3%	38.5%	35.2%	12.1%
Own job or profession	22.0%	49.5%	19.8%	8.8%
Nurse	23.1%	47.3%	27.5%	2.2%

Table 3. How likely do you think the following jobs will be replaced by robots or computers?

When asked if participants had been affected by automation in a job, 12 Generation Z students indicated he/she had lost a job and 13 had hours reduced (see Table 4).

	18 - 24	25-29	30-34	35-39	40-44
Lost a job	12	0	1	0	1
Pay or hours reduced	13	0	1	0	0
None of these	85	1	1	1	1

Table 4. Have you been personally impacted by your employer replacing your position (or some aspect of your job) with a machine, robot or computer program?

As displayed in Table 1, survey respondents demonstrated increased concern for job loss/reduction (Item 3) as the time frame grew from a few months (in the next three months, six months) to several years (after one, two, or three years). Regression analysis showed a strong correlation at a 95% confidence level with an adjusted $R2 > 0.092$ and a p-value $< .01$.

Similarly, a link between levels of concern over automation's role in the areas of personal data records and personal relationships from Item 5 (see Table 5) was also noted given artificial intelligence's increasing role in employment, loan and parole qualifications. Analysis indicated a statistically significant correlation at a 95% confidence level between increasing levels of concern and a series of daily life and relationship indicators with an adjusted $R2 > 0.87$ and a p-value $< .01$.

	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED
For employment	11.0%	9.7%	42.9%
Personal transactions	13.2%	27.5%	40.7%
Personal safety	11.2%	22.5%	37.1%
Personal health (records, tests, etc.)	15.4%	22.0%	39.6%
Robotic caregivers for elderly/ disabled	11.0%	27.5%	29.7%
Impact on personal lives & relationships	6.6%	22.0%	35.2%

Table 5**.** As some Artificial Intelligence, AI, is now deciding on employment, loan and parole qualifications, as well as driving are you concerned about the use of automation?

11 Discussion

Productivity improvements that sustain our lifestyles by automation bring us closer to Keynes' prediction of "technological unemployment" by 2030. Nonstop advancements in automation technologies including artificial intelligence change the nature of the workforce and may create different impacts on various demographic groups. Low level, routine work will continue to be replaced, but automation will also increasingly benefit professionals' non-routine tasks (Rayome, 2017).

According to a Gartner Research report, by 2022 one in five workers will be assisted in these tasks by automation technology (Poitevin, et al, 2017). This creates a social responsibility challenge for corporations and society. If full-time employment patterns change due to obsolescence of certain skill sets, there will be a need for people to get supplements for healthcare, pensions, disability, and income (West, 2015). Providing benefit incentives for lifetime education, retraining and volunteerism may be an alternative (West, 2015). Business students' perceptions about the effect of automation on employment increases as time passes. They do not fear automation in the immediate future of three – six months, but the concern trends upwards as the employment time frame expands to one, two and three years. The survey results and the regression analysis demonstrate this relationship.

References

Anderson, M. (October, 2017). 6 key findings on how Americans see the rise of automation. *Pew Research Center*. Retrieved from http://www.pewresearch.org/fact-tank/2017/10/04/6-key-findings-on-how-americans-see-the-rise-of-automation/

Akst, D. (2013). Automation anxiety. *Wilson Quarterly, 37*(3), 66-78.

Arthur, B. W. (October, 2017). Where is technology taking the economy? *McKinsey Quarterly*. Retrieved from https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/where-is-technology-taking-the-economy

Barnet, R. J. (1993). The end of jobs. *Harper's Magazine*, *287*(1720).

Beach, E.F. (1971). Automation in perspective. *Applied Economics*, *3*, 147-152.

Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Ephron, H. & Ephron, P. (1957). *Desk Set* movie script. Retrieved from http://www.script-o-rama.com/movie_scripts/d/desk-set-script-transcript-hepburn.html

Fenwick, M., Kaal, W. A. & Vermeulen, E. P. M. (2017). Legal Education in the Blockchain Revolution. U of St. Thomas (Minnesota) Legal Studies Research Paper No. 17-05. Retrieved from http://dx.doi.org/10.2139/ssrn.2939127

Ford, M. (2015). *Rise of the robots*. Basic Books: NY, NY. Retrieved from http://ebookcentral.proquest.com.ez-salve.idm.oclc.org

Greenberg, S. (October 10, 2017). "Your next job." Retrieved from http://newyork.cbslocal.com/audio/your-next-job-with-steven-greenberg/

Hunt, S. B. (1940). Mechanization in the lumber industry: a study of technology in relation to resources and employment opportunity. *American Economic Review, 30*(3), 608-609.

Intuit 2020 report: 20 trends that will shape the next decade. (2010). *Intuit.* Retrieved from https://http-download.intuit.com/http.intuit/CMO/intuit/futureofsmallbusiness/intuit_2020_report.pdf

Jahn, U. (2017). Calming fears about automation. *Modern Machine Shop.* Retrieved from https://www.mmsonline.com/columns/calming-fears-about-automation

Kaplan, J. (2017). Don't fear the robot. *The Wall Street Journal*. July 22-23. C3. Retrieved from https://www.wsj.com/articles/dont-fear-the-robots-1500646623

Leontief, W. (1983) Technological advance, economic growth and the distribution of income. *Population and Development Review, 9*(3), 403-410.

Marx, W. (1941). *Mechanization and culture: The social and cultural implications of a mechanized society*. St. Louis, Mo., and London: B. Herder Book.

McAfee, A. & Brynjolfsson, E. (June, 2017). Why "How many jobs will be killed by AI?" is the wrong question. *LinkedIn.* Retrieved from https://www.linkedin.com/pulse/why-how-many-jobs-killed-ai-wrong-question-andrew-mcafee?trk=eml-email_feed_ecosystem_digest_01-hero-0-null&midToken=AQHplTH8nET8xg&fromEmail=fromEmail&ut=3kYcEydjbF5TQ1

McCloskey, D.N. (2017). The myth of technological unemployment. *Reason, 49*(4), 8-9.

Moncher, F. J. (October 10, 2017) Death is not comfortable. *Culture of Life Foundation.* Retrieved from http://www.cultureoflife.org/2017/10/10/death-is-not-comfortable/

Nielsen, A. C. (1942). Trends toward mechanization of radio advertising. *Journal of Marketing, 62*, 17-228.

Occupational Outlook Handbook (2017). U.S. Department of Labor Bureau of Labor Statistics. Retrieved from https://www.bls.gov/ooh/sales/cashiers.htm?view_full

O'Neill, N. (October 2, 2017). Robots are replacing fast food workers at new Shake Shack. *New York Post.* Retrieved from http://nypost.com/2017/10/02/robots-are-replacing-fast-food-workers-at-new-shake-shack/

Paquette, D. (June 2017). People are worried Amazon will replace Whole Foods workers with robots. *The Washington Post.* Retrieved from https://www.washingtonpost.com/news/wonk/wp/2017/06/16/people-are-worried-amazon-will-replace-whole-foods-workers-with-robots/?utm_term=.3c9f1b67f754

Pearce, J. M. (2016). What if all U.S. coal workers were retrained to work in solar? *Harvard Business Review.* Retrieved from https://hbr.org/2016/08/what-if-all-u-s-coal-workers-were-retrained-to-work-in-solar

Peters, M.A. (2017). Technological unemployment: Educating for the fourth industrial revolution. *Educational Philosophy and Theory, 49*(1), 1-6. Retrieved from http://www.tandfonline.com/doi/full/10.1080/00131857.2016.1177412

Poitevin, H. Siular, S. , Lovelock, J-D., Rollings, M., Andrew, W., Roth, C. & Hetu, R. (2017). Predicts 2018: AI and the future of work. *Gartner.* Retrieved from https://www.gartner.com/doc/3833572/predicts--ai-future-work

Pressman, A. (2017). Can AT&T retrain 100,000 people? *Fortune.* Retrieved from http://fortune.com/att-hr-retrain-employees-jobs-best-companies/

Price, R. (2016). Stephen Hawking: This will be the impact of automation and AI on jobs. *World Economic Forum.* Retrieved from https://www.weforum.org/agenda/2016/12/stephen-hawking-this-will-be-the-impact-of-automtion-and-ai-on-jobs

Randstad, US. (July, 2017). 76 percent of U.S. workers do not fear automation, according to Randstad US. *Cision PR Newswire.* Retrieved from https://www.prnewswire.com/news-releases/76-percent-of-us-workers-do-not-fear-automation-according-to-randstad-us-300488077.html

Rayome, A. D. (December, 2017). The 10 fastest growing tech skills of 2017. *TechRepublic*. Retrieved from https://www.techrepublic.com/article/the-10-fastest-growing-tech-skills-of-2017/

Reynolds, M. (2017). End of life chatbot can help you with difficult final decisions. *New Scientist*. Retrieved from https://www.newscientist.com/article/2147691-end-of-life-chatbot-can-help-you-with-difficult-final-decisions/

Rosenstiel, P. (1977). The unions' new tune. *Nation*, 720-723.

Semuels, A. (May, 2017). The parts of America most susceptible to automation. *The Atlantic*. Retrieved from https://www.theatlantic.com/business/archive/2017/05/the-parts-of-america-most-susceptible-to-automation/525168/

Scotti, A. (January, 2018). Amazon's first cashier-less grocery store is finally opened. *New York Daily News*. Retrieved from http://www.nydailynews.com/news/national/amazon-cashier-less-grocery-store-finally-open-article-1.3771675

Sherman, S. (2012). The long good- bye. *Vanity Fair*. Retrieved from https://www.vanityfair.com/culture/2012/11/1963-newspaper-strike-bertram-powers

Shukla, S. & Rebello, J. (May, 2017). Threat of automation: Robotics and artificial intelligence to reduce job opportunities at top banks. *The Economic Times*. Retrieved from http://economictimes.indiatimes.com/industry/banking/finance/threat-of-automation-robotics-and-artificial-intelligence-to-reduce-job-opportunities-at-top-banks/articleshow/58485250.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Statt, N. (2017). Amazon's cashier-free Go stores may only need six human employees. Retrieved from https://www.theverge.com/2017/2/6/14527438/amazon-go-grocery-store-six-human-employees-automation

Taylor, G. W. (1940). Round table on collective bargaining and job security. *American Economic Review, 30*, 223-229.

Wang, A. (2016). The future of staff training is getting employees to train themselves. *Quartz*. Retrieved from https://qz.com/770290/the-future-of-staff-training-is-getting-employees-to-train-themselves/

Welch, F. J., & Miley, D. G. (1945). Mechanization of the cotton harvest. *Journal of Farm Economics, 27*, 928-946.

West, D. M. (2015). What happens if robots take the jobs? The impact of emerging technologies on employment and public policy. *Brookings Institute*. Retrieved from https://www.brookings.edu/wp-content/uploads/2016/06/robotwork.pdf

Wolcott, R.C. (January, 2018). How automation will change work, purpose and meaning. *Harvard Business Review*. Retrieved from https://hbr.org/2018/01/how-automation-will-change-work-purpose-and-meaning