BEYOND THE TECHNOLOGICAL FIX: A PERMANENT INFRASTRUCTURE APPROACH TO AUTOMATION-RELATED UNEMPLOYMENT

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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The Effects of Automation

Negative Impacts

Automation poses a threat to the general public by replacing workers resulting in an increased automation rate which has profound negative impacts. As the fourth industrial revolution boosts productivity and efficiency through automation, the labor market is jeopardized as, "47% of people employed in the US are at risk of being replaced by machines" (Gray, 2017, p.3). Additionally, it has been previously shown that, “Automation is significantly positively related to unemployment (that is, it reduces employment)” (Anakpo & Kollamparambil 2021, p.8). Widespread automation could lead to higher corporate profit margins at the cost of an increased unemployment rate, which has real-world consequences and could wreak havoc unless mitigating countermeasures are implemented as only a, "1 percent increase in the unemployment rate will be associated with 37,000 deaths" (Crudele 2020, p. 3). Many of these deaths are preventable and could be avoided if an offset to the increased unemployment rate was considered by a multinational group of actors such as NATO or G7. Additionally, of these 37,000 deaths, 20,000 are caused by heart attacks and 920 are from suicide (p. 3).

A Promising Countermeasure

One mitigating candidate that appears promising is Universal Basic Income (UBI). UBI in its simplest form is, "a government program in which every adult citizen receives a set amount of money regularly" (Peters 2021, p.1). UBI is not a new concept and dates back to Ancient Rome where Julius Caesar, " distributed his wealth to the people of Rome, leaving 300,000 sesterces to each citizen" (Fife 2012, p.1). If implemented, a UBI would mitigate the negative consequences stemming from automation by bringing those unemployed as a result of

automation above the poverty line until they could acquire the skills and training necessary to become hirable again. One major advocate for UBI is 2020 presidential candidate Andrew Yang who campaigned on the promise that, "Every American over 18 would receive a payment from the government for $1,000 a month, or $12,000 a year" (Jacobson 2019, p.2). While Yang did not become president, he helped to raise awareness and boost public acceptance of UBI. Despite this, many experts argue about how effective UBI would be as well as what unintended consequences implementing UBI might have on society and the labor market.

By examining the different positions for and against UBI held by various researchers in the field, a better understanding of the discourse surrounding UBI will be formed and other mitigating candidates for automation related unemployment will be found. Additionally, by these candidates through the sociotechnical framework of Technological Fix, the impact of these measures can be established. This paper argues that in order to solve the issue of automation-related unemployment a permanent infrastructure must be created and maintained by a multinational group of actors such as NATO or G7. This infrastructure will include multiple mitigating candidates explored below and will also include citizens in its social construction.

Current Discourse Surrounding UBI

The discourse surrounding whether or not UBI should be implemented and the effect it would have thereafter is splintered with experts and researchers on both sides of the issue. When examining the arguments used for and against UBI, common patterns and themes arise. In a review article on the current state of the UBI Debate, (Afscharian et al., 2022) explains, "UBI debates can be largely organised along seven themes (social justice and equality; freedom and the individual; business and consumption; labour, work, and employment; welfarism and the welfare state; taxation and public expenditure; democracy and citizenship)" (p.18). Of these

seven themes, the three main categories these themes fall into are related to core principles, capitalist society, and the government (p.18).

Core Principles Arguments

The core principles category includes social justice and equality, in conjunction with freedom and the individual. Examining poverty through the lens of social justice, supporters claim that UBI would decrease poverty, while skeptics refute that stating, "...poverty is not just a monetary issue, so it is not something that UBI could fully solve" (p.9). This is important because it conveys that an issue such as poverty is a multidimensional problem. Applying this analytical framework to automation-related unemployment it can be seen that unemployment is a multidimensional problem as well. This is due to the fact that unemployment can be related to mental health issues, physical health issues, stage of life, and many more factors. UBI is inherently presupposing that all of the negative consequences resulting from unemployment are due to a person not getting paid or being able to afford what they need to live. While this plays a large role, there are other factors at play such as individuals feeling a lack of purpose and community after being laid off, an issue that UBI would not address.

Capitalist Society Arguments

The capitalist society category includes business and consumption and labor, work, and employment. Examining social incentives to work through the lens of labor, work, and employment, supporters claim, "the policy [UBI] would enhance workers' bargaining power, ultimately strengthening the power of labour relative to capital. This will result in better working conditions and reimbursement for hard work" (p.12). Alternatively, skeptics assert, "UBI or

some of its elements by themselves would create a negative work incentive, thus not only failing to solve but even worsening unemployment, resulting in a society in which nobody would continue to do hard but essential jobs" (p.12). This counter-argument can be addressed by considering that UBI would bring people below the poverty line to the poverty line but leaves them without any disposable income. Santens (2017) argues that we all desire to be in the top section of Maslow's Triangle, as seen in Figure 1 below, but the majority of people who are below the poverty line are stuck in the first and second quadrants.

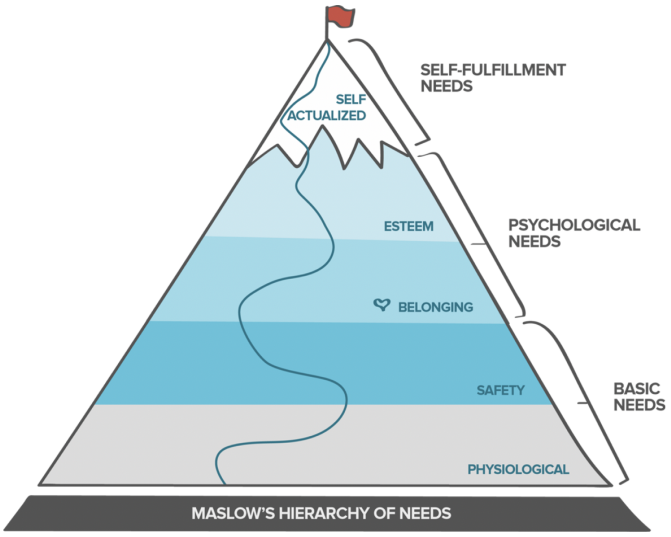

Figure 1: Maslow's Hierarchy of Needs. A five tier model of human needs with the most essential for life being the bottom tier (Santens 2017, p.8).

If a UBI were implemented, many people who are currently stuck in a loop in the first and second quadrants would be lifted to the third quadrant, giving them more autonomy and the ability to climb the rest of the triangle (p.8). In order for the recipients of UBI to have any disposable income, they would need to find a job. As the majority of humans want to have a higher quality of life than just surviving and satisfying their basic needs, this would provide a positive work incentive.

Government Related Arguments

The government category includes welfarism and welfare state, taxation and public expenditure, and democracy and citizenship. Examining the effects of UBI on social programs through the lens of welfarism and the welfare state, (Afscharian et al., 2022) posits, "supporters of UBI consider the scheme necessary because targeted benefits ultimately lead to exclusions and individual deprivation over time, implying that the state fails its duty of public assistance" (p.14). Alternatively, skeptics believe, "UBI might replace it [existing welfare programs] with insufficient flat-rate payments, either actively or indirectly via incentives for governments to do less in terms of social policy" (p.14). While both of these trajectories are plausible, they assume that UBI replaces existing welfare programs. UBI could be layered on top of the pre-existing welfare programs in order to minimize 'exclusions and individual deprivation'.

Overarching Trends

(Afscharian et al., 2022) then gives an overarching view of the general arguments used by the supporters and skeptics explaining, "An underlying pattern that cuts across the different themes is that many of the most popular arguments in favor of UBI are comparatively idealistic, while arguments against the scheme often use pragmatic and functional claims" (p.17), which Afscharian describes as an 'Argumentative Deadlock'. In order for the discourse surrounding UBI to be productive, it is imperative for skeptics and supports to find common ground.

Mitigating Candidates and The Technological Fix

In addition to UBI, many other mitigating candidates have been introduced. The two most common alternative mitigating candidates are expanding existing social welfare programs,

and a negative income tax. Both of these come with unique pros and cons and house great potential to mitigate automation-related unemployment.

Expanding Existing Social Welfare Programs

In comparison to UBI, the impact of existing social welfare programs has been thoroughly studied and researched. It has been previously shown by researchers that social welfare programs have many positive effects including that, "The welfare state contributes to human well-being. Simply stated, the less people are forced 'to behave as commodities in order to survive' the greater their satisfaction with life tends to be" (Pacek & Freeman 2017, p.15). This demonstrates that the welfare state has enormous potential to boost human livelihood. As there are many different types of social welfare programs that serve different purposes, this research will use a case study focusing on one specific welfare program. While it may be argued that one case study is not representative of all social welfare programs in America, this case study can serve as an example of what social welfare programs could look like if they were improved, redesigned, and expanded.

One welfare program that deals with nutritional assistance has been shown to be effective at raising the quality of life is the Supplemental Nutrition Assistance Program (SNAP). According to the National Institute of Health (NIH), the purpose of SNAP is to, "Increase food security and reduce hunger by increasing access to food, a healthful diet, and nutrition education for low-income Americans" (Caswell & Yaktine 2013, p.1). The main method that SNAP uses to accomplish this is through Electronic Benefit Transfer (EBT) cards, which function similarly to debit cards and can be used at most grocery stores. The social benefit that SNAP has provided is transparent. When examining the effect of SNAP on the male suicide rate, Rambotti (2020) found, "The models predict about 31,612 fewer suicides overall and 24,811 fewer male suicides

for a standard deviation increase in SNAP participation" (p.7). This is a significant impact, as automation-related unemployment increases the suicide rate. This case study shows that improving and expanding existing social welfare programs could be a powerful mitigating candidate for automation-related unemployment.

Negative Income Tax

Another mitigating candidate for automation is a Negative Income Tax (NIT). In an article regarding NIT, Linke (2018) explains that in a NIT people receive a percentage of the difference between their current income and an income cutoff. In this system, both the difference and the income cutoff are set by the government (p.1). To illustrate how this would work, Linke gives a numerical example stating, "For instance, if the income cutoff was set at $40,000, and the NIT percentage was 50 percent, someone who made $20,000 would receive $10,000 from the government" (p.1). One benefit this system has is that logistically it would be very simple to implement. Through using the current IRS tax return system, low-income taxpayers could claim their NIT return. Despite having different appearances, both UBI and NIT are trying to accomplish the same goal of redistributing wealth. The main difference between UBI and NIT lies in who receives the redistributed wealth, as well as the mechanism of redistribution. UBI functions by receiving a set amount of money to all taxpayers in cash payments, while NIT is for specifically low-income families who receive the money through tax returns.

The Technological Fix

Alvin M. Weinberg, an American nuclear physicist who worked on the Manhattan Project, first introduced the framework of a Technological Fix (TF) in 1978. In the introduction of his paper, “Beyond the Technological Fix”, Weinberg (1978) begins by explaining that a TF,

"is a means for resolving a societal problem by adroit use of technology with little or no alteration of social behavior" (p.1). He further clarifies that the social problem could have arisen from a previous technology or may exist outside the realm of technology. Weinberg then states the main focus of this paper: the energy 'problem' - which revolves around how to supply the world's growing energy needs without using up earth's finite natural resources. Weinberg explains that TFs are usually unsuccessful at solving social problems as they do not target the root causes of the issue. He illustrates this by explaining, "Most technological fixes can do no more than help remedy the immediate problems that invoked the fix", going on to clarify that, "In their [said technological fix] wake they leave other problems which, in turn, are amenable to resolution by additional technological fixes" (p.3). Weinberg describes this cyclical existence of problems and fixes which do not address the root cause of the issue as living in a 'band-aid society' (p.3). Weinberg then gives insight into the future of nuclear power, stating that those advocating for the safe use of nuclear reactors are requesting that the nuclear fuel be denatured, which is an example of a TF. Weinberg then argues, "Political and institutional mechanisms will have to be invented if we are to live in reasonable comfort with the Sword of Damocles called Proliferation," referring to the rapid development of nuclear power. Weinberg describes this as ‘going beyond the technological fix’ (p.6).

Following this, Weinberg elaborates on what going beyond the TF means, suggesting that permanent, indestructible institutions need to be formed that ensure that all nuclear reactors are frequently maintained for as long as they are in existence. This permanent infrastructure will ensure that time and money are always dedicated to ensuring the safety of the nuclear reactors in use. Finally, Weinberg concludes his paper by acknowledging the importance of using both technology and social engineering to fix problems explaining, "We have here an example of a

large technological fix, nuclear energy, requiring social adjustments: neither technology nor social engineering alone are sufficient" (p.12), implying that for any complex issue both technology and social adjustments need to be applied synergistically.

Applying Technological Fix to Automation

TF is ideal to analyze automation-related unemployment as many frequently discussed countermeasures to unemployment are inherently TFs. Additionally, increasing automation is subject to the same proliferation that plagues the rapid development of nuclear power, which Weinberg applies the TF framework to. Finally, if mishandled, automation-related unemployment could have disastrous consequences on society. As automation-related unemployment is analogous to the nuclear power, which Weinberg applies TF framework to, TF is the optimal framework to use for analysis of the countermeasures to automation-related unemployment.

Evaluating Countermeasures to Automation Through the Technological Fix

The Market Will Not Save Us

In order to find the best solution to unemployment, Weinberg suggests that it is important to try to determine the root cause of the problem. In the context of this research, automation is the problem. As this research is dealing with events in the near future, speculation on the root cause is needed. With the fourth industrial revolution and the rise of AI and robotic machinery, many corporations will likely turn to automation in order to decrease their labor-related costs and increase their profit margins to maximize their own wealth and appease their shareholders.

In his book, *Technology Matters - Questions to Live With,* University of Southern Denmark Professor David Nye explores many topics related to technology including if 'the Market' should select technologies. When questioning technologies that have the potential to cause harm to society, such as DNA manipulation and nanotechnology Nye (2007) ponders, "Are such technologies too valuable or too dangerous to be left largely under private control" (p.146). Automation poses a great risk to society, and Nye's question should be asked of automation too. As corporations' profits will be heavily tied to their level of automation in the future, there is a conflict of interest and it would be naive to expect corporations to be able to regulate themselves. One might come to the conclusion that it would be more effective to address the root cause of automation through legislation. The government could enforce a mandate against firing someone because of automation or instead make corporations pay an offsetting tax for automating a job. An offsetting tax could fund a mitigating countermeasure discussed in this paper such as UBI, NIT, or expanding existing social welfare programs.

Analyzing through the framework of TF, Weinberg (1978) disagrees stating that it is easier to affect supply than demand, insisting that, "Demand ordinarily involves individuals actions of many consumers, whereas supply embraces far fewer, but more powerful actors" (p.1). In this scenario, it is far easier for the more powerful actor of the government to implement a solution such UBI, NIT, or expanding existing social welfare programs, than to enforce a mandate against firing someone because of automation or pay an offsetting tax for automating a job.

Band-Aid Society

Examining automation-related unemployment through Nye's framework, a TF alone will not suffice. By attempting to implement a TF such as UBI, NIT, or expanding existing social

welfare programs without attempting any concurrent social engineering more problems will appear. These may manifest in an array of different symptoms ranging from a decrease in labor supply to an increased suicide rate due to those laid off feeling unfulfilled and without a purpose. Attempting to fix these problems with more TFs will lead to further problems as we will be stuck in the cyclical existence of the 'band-aid society'. The 'band-aid' society that Weinberg references can be visualized in Figure 2 below.

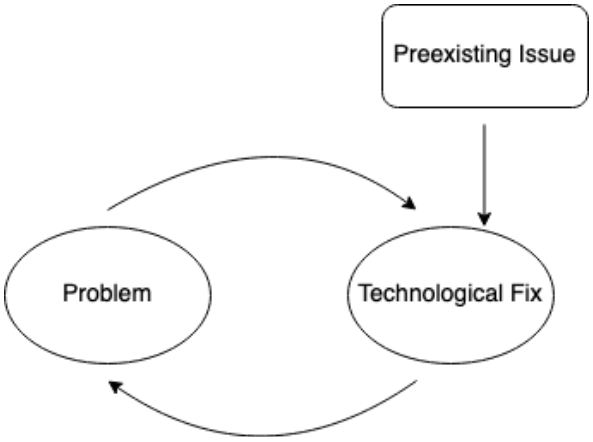

Figure 2: Weinberg's band-aid society. The preexisting issue starts the cycle between problems and technological fixes (Steiner 2022).

A preexisting issue is what starts the cyclic process which continues infinitely with problems leading to TFs, which in turn leads to more problems. Weinberg (1978) further explains that the preexisting issue can arise from either a misused or deficient technology, or may arise from a social issue such as war or overpopulation (p.1). When examining the preexisting issue of automation from a deterministic point of view one could make the argument that the automation of labor is the natural progression of any technologically advanced species and was bound to happen. Contrarily, one could argue that automation is due to corporate greed and the current capitalistic economic system. This paper is not concerned with the cause of the preexisting issue

of automation but is instead looking at the effectiveness of a potential solution or mitigating candidate.

Going Beyond the Technological Fix

In order to break from the cyclical existence of the band-aid society when addressing automation, this research needs to follow in Weinberg's footsteps and look TF. Weinberg argues that in order to ensure safe nuclear power, a permanent infrastructure needs to be established. Tying historical parallels Weinberg (1978) emphasizes, "We can take heart from the existence of certain structures and institutions in our societies that have persisted century after century - the great cities, cathedrals, and universities of Europe, or the Buddhist temples of the East" (p.7). These historical examples show that systems and structures can be preserved for long periods of time if they are carefully constructed and are thoughtfully maintained and updated when need be.

In the case of automation, the most effective solution, looking through the framework of TF, would be creating a permanent infrastructure that is socially valued like the historical examples that Weinberg referred to. This infrastructure would have to function outside of the federal government and would have to be implemented in a way where it could not be affected by external politics or new legislation. This infrastructure would implement a combination of the potential candidates discussed above including UBI, NIT, expanding existing social welfare programs, as well as other countermeasures recommended by economists. This infrastructure would have to be maintained by a multi-national alliance of actors similar to NATO or G7. Most important, however, is that the infrastructure is able to withstand the test of longevity, having the virtue of permanence (p.4). As long as the infrastructure has ample time and money devoted to it and is constantly reevaluated and improved, over time it will continually become more effective

and beneficial to society as, "small incremental improvement, taken as a whole, will lead to happier, more fulfilled people" (p.4). By creating a new infrastructure instead of trying to warp existing policies and social programs to fix the issues automation causes, a more effective system will be forged. Weinberg agrees, suggesting, "A more rational approach is not simply to match the technology to the existing institution but to create the institution that better meets the intrinsic demands of the technology" (p.11).

Construction of Automation-Resistant Infrastructure

Through involving citizens in the social creation process, mental health will improve and the suicide rate will decrease. When discussing the creation of technological systems, Nye (2007) argues, "Ideally, every society should give citizens such an opportunity to influence the construction of technological systems. In the future, citizens are likely to demand more transparency and debate in technological decision-making" (p.146). As the taxpaying working class will be most affected by automation and would be the primary recipient of the infrastructure described above, they deserve a say in the creation of the infrastructure. In order to be more involved in the social construction of this infrastructure, citizens should be polled in order to determine the highest priority needs, as well as what additional resources the infrastructure should include. By involving citizens in the social construction process, the efficiency of the infrastructure will increase as the infrastructure will match the recipient's needs. Additionally, those laid off as a result of automation are less likely to feel disenfranchised or ostracized, but will instead view the infrastructure as a safety net that will help keep them afloat until they can find work again, resulting in improved mental health and a decreased suicide rate for those laid off as a result of automation.

Conclusion

This paper has demonstrated that applying a sole mitigating candidate without implementing any kid of infrastructure will lead to a cyclical existence of problems and technological solutions leading to more problems. I argue that by embracing the virtue of permanence and thoughtfully creating an indestructible infrastructure that combines multiple mitigating candidates and allows those most affected by automation into the social creation process as well as being maintained by a multi-national alliance of actors similar to NATO or G7, the negative effects of automation will be mitigated most effectively. Additionally, by making this infrastructure permanent, it can adapt to change and slowly become more effective over time through persistent incremental improvements.

Although I argue for a permanent infrastructure - combining multiple mitigating candidates - it is important to note that the manifestation of the infrastructure created may vary by region as, "All countries will feel the impact of automation, but at different speeds and in different ways" (Gumbel & Woetzel 2018). As different countries will be impacted differently by automation, the subsequent needs of the people affected will be different. This further exemplifies why polling citizens and allowing them into the social creation process will be beneficial as each infrastructure can be tailored to the specific requirements of the people it is serving. Additionally, some argue that this infrastructure would be too expensive. Looking at one of the mitigating candidates that could contribute to this infrastructure, UBI, "In the U.S… a UBI of just $1,000 per month would cost around $4 trillion per year, which is close to the entire federal budget in 2018" (Acemoglu 2019, p.1). While this raises a valid concern, the infrastructure will be targeted only to those who have been laid off as a result of automation and is only a temporary safety net until those people can become employed again. This will

significantly decrease the cost of the infrastructure. Additionally, the inherent permanence of the infrastructure guarantees that it slowly gets more effective over time, converging on the most effective proportional combination of each mitigating candidate.

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