The Next Industrial Revolution and the Advancing Technology: Will it be different this time? How Does the Advancing Technology Contribute to the Increasing Unemployment and to the Rising Inequality?

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Abstract

Technological advancements in the past decades have greatly accelerated along with the capacity of the wider economy to absorb the new technologies. The demand for human labour substituting technologies have increased and this imposes a threat on employment. A number of studies illustrated the escalation of technological unemployment due to the increased pace of implementation of automation and AI across different job sectors. This research aims to investigate the main reasons why the emerging technological revolution could escalate the concept of technological unemployment and therefore present a different outcome than the previous ones. While employment security provides income stability and wellbeing for households, a deprivation of household income resulting from the labour absorptive nature of technology also has an aggregate impact on the economy. The empirical evidence illustrates the impact of labour absorption due to technology on economic activity as well as on the rising inequality. This research identifies that in terms of the impacts, the rise in unemployment rate, economic activity and the rising inequality have positive relationship. Furthermore, the study embraces the significance of a highly developed national education system that provides the necessary skills needed for workers and the importance to introduce a form of universal basic income to boost the economic activity.

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Chapter 1: Introduction

Considering the impacts of the previous technological revolutions such as the industrial revolution it becomes evident that technology has the potential to decrease the demand for human labour. During the past technological revolutions, the arrival of the labour substituting technologies into the workplace was slower and the wider economy also needed more time to absorb the new technologies. The increased time at hand allowed workers to adopt to the changes caused by technology. The more time at hand to adopt and in line with that the increased ability of workers to upskill or to move into an emerging sector contributed to reaching the equilibrium between the supply and demand of jobs in different countries (Wilson, 2018). However, the increased pace and capacity to absorb labour substituting technologies is on the rise and this raises the assumption whether the emerging technological revolution will present the same outcome as the previous ones. Carlisle (2017) illustrates that human labour costs per hour have increased steadily since 1960 while over the same period, costs of robots per hour have declined below the cost of Chinese labour rates. Recent achievement in automation and AI further elevates this issue. Apart from that, infrastructure enabler such as 5G and broadband expanded the geographic reach of these technologies and thus providing further opportunities for business to invest in technology (Doyle and Jacobs, 2018). Under such circumstances potential additional labour force (PALF) decreases and labour becomes costlier and more difficult to source. During this process, the relative cost to invest in technology by businesses improves. In turn investing in technologies becomes a more economical choice for businesses and this further escalates the concept of technological unemployment mentioned in this study (Zhou, 2019). Acknowledging the level of labour absorption caused, a significant number of workers in economies will encounter loss in disposable income. The loss in income will contribute to stark inequalities as the owners of capital will be able to accrue a greater share of income as technology replaces workers. The need for universal basic income (U.B.I.) emerges as a solution to address the issue around the rise in inequality and to boost the economic activity in economies. Kingma (2020) and Lu (2020) express that Alaska and Finland have already proven the benefits of U.B.I. on improving employment, as well as boosting the recipients' financial and mental wellbeing. Walter Reuther a US labour leader in the 1900's said that technology cannot be stopped, and it would

be silly to try if we could. However, Reuther explained that, the implementation of the new technology through effective management may reduce the unpleasant side effects of job losses (Wartzman, 2017). His words affirm the need for government intervention to introduce important fiscal stimuli such as universal basic income to address the rising inequality and to tackle the consequential economic inactivity.

1.1 Research Aims

Since the effects of emerging technological revolution will spread worldwide, this research will aim to acknowledge a broader picture, and spread generic consequences that will affect most economies around the world. The purpose of this research is to elaborate on why the emerging technological revolution will present different outcomes than the previous ones. To capture a larger picture of the consequences of the advancing technology on economies, this research will aim to connect the technological unemployment with the corresponding economic impacts and the rising inequality. The study also aims to draw the attention to the need for increased government interventions to address the issue raised by the increased implementation of labour substituting technologies. The introduction of a form of universal basic income according to Alaska and the study conducted in Finland has the potential mitigation power to tackle the consequences of the increased labour absorption derived from the advancing technology (Kingma 2010); (Lu 2020).

1.2 Research Question

This study is triggered by the research question 'The Next Industrial Revolution and the Advancing Technology: Will it be different this time? How Does the Advancing Technology Contribute to the Increasing Unemployment and to the Rising Inequality?' The complex research question is derived from the positive relationship between the advancing technology, the economic impact from it and the rising inequality. The research question reflects that the positive relationship between these different elements makes them inseparable in this context to gain a deeper understanding about why the impacts might differ from what economies experienced during the past technological revolutions.

1.3 Research Hypothesis

The research hypothesis states that the capacity to innovate outgrows the capacity to develop new skills and this reflects that the impact of the emerging technological revolution will escalate the concept of technological unemployment (Change, 2017). The increased implementation of labour substituting technologies reflects an increase demand and a more economical choice for businesses to invest in technology. As the pace of implementation accelerates it leaves less time for the labour force to adopt to the changes and thus their competitiveness in the job market is affected (Vermeulen, Kesselhut, Pyka, Saviotti, 2018). This supports the research hypothesis and affirms that the effect of labour absorption due to the advancing technology will further escalate in the future. Furthermore, the hypothesis states that the consequential stagnation of income and the ability of capital owners to accrue a greater share of wealth as automation replaces workers will initiate stark inequalities. In line with that redistribution of income presents an opportunity through which these negative consequences can be mitigated. Universal basic income (U.B.I.) is a proposed solution that involves the redistribution of taxation income (capital taxation, taxation of natural resources, the VAT system) to households in the economy.

Chapter 2: Literature Review

2.1 Technological Revolutions in The Past

"Technological unemployment occurs when developments in technology and working practices cause some workers to lose their jobs" (Economicshelp, 2020). It is historically evident that technological advancements in the past have caused changes to the labour market and affected the unemployment rate. In the 1900s economist, John Maynard Keynes conceptualized the term 'Technological Unemployment' and defined it as the "unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour" (Floridi, 2014, p. 144). He also stated that "The increase of technical efficiency has been taking place faster than we can deal with the problem of labour absorption" (Keynes, 1963, p. 358). Keynes thoughts back in the 1960s shows that the issue around the fact that technology is taking jobs was also relevant. This also signifies that humankind have already experienced technological revolution in the past, with the accompanying effects of both social and economic disruption. Despite the temporary disruption, the demand and supply in the labour market seemed to move forward to the equilibrium and this often resulted in achieving full employment.

2.2 The Emerging Technological Revolution. Why is it Different this Time?

Suggestions arose that the pace at which the technology races ahead might cause the AI and automation fuelled emerging technological revolution to have different effects this time. The current achievements in the development of these labour disruptive technologies show a rapid evolving capacity. Many businesses welcome the opportunity to implement these to reach important business goals. What does this mean for workers? Industries where technology will dominate over the workforce will require less need for human labour to complete certain tasks. In this scenario, it becomes evident that some of the affected workforce would encounter periodical or even long-term unemployment. This is predicted to happen on a large scale, and it is known to lead to technological unemployment (Change, 2017).

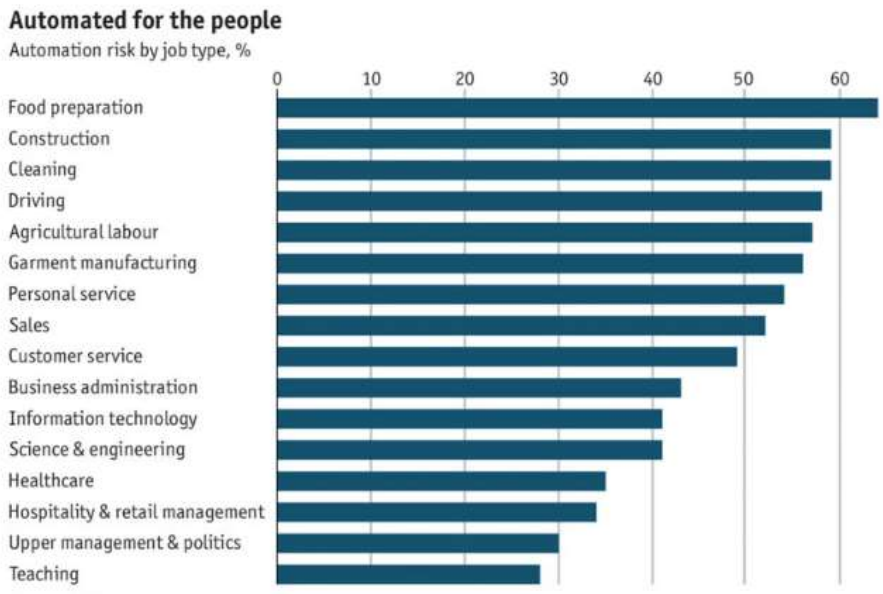

Figure 1. Automation Risk by Job Type. Source: Change. (2020).

Swab (2016) explains why the effects might differ from the past technological revolutions. The author signifies that in most industries technology runs its course of transformation approximately in the same timeframe. This is known to magnify or sharpen the issue around technological unemployment. Furthermore, the racing technology causes systematic changes and, in many cases may even replace the old ways of producing goods and services (ibid).

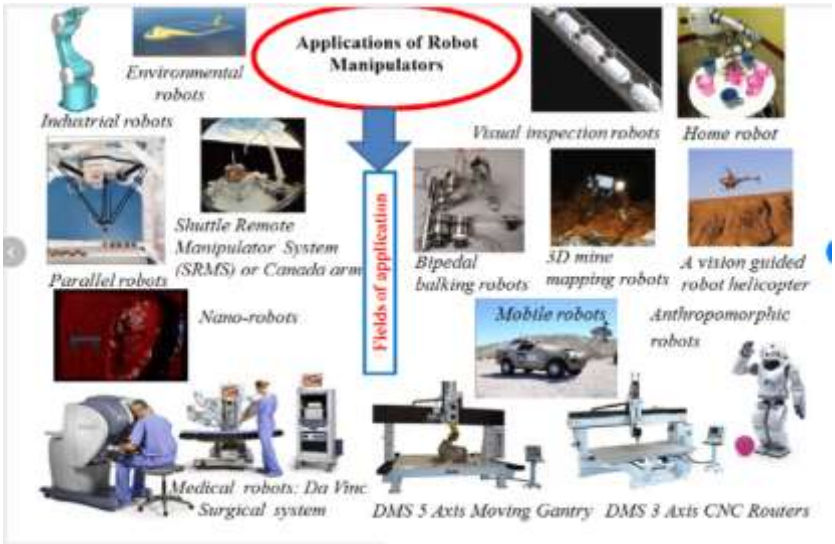

Figure 2. Applications of robot manipulators. Source: Jovanovik M. (2015, p.26).

Figure 2 exemplifies the magnitude of how technology impacts different industries and how it has changed how workers perform their jobs. For example, as per figure 2, it impacts factory

workers where industrial robots cause structural changes and displacement of human labour. Also, hospitals got filled with machines that assist medical staff in performing their job. The structural change derived from the implementation of such technologies in industries was often accompanied by the reduced need for human labour.

2.3 Ability to Learn VS Capacity to Innovate

Another reason why dealing with labour absorption is different this time is because the shift in balance between the ability to learn new skills and the capacity to innovate. During pervious technological revolutions technology developed at a slower pace and this helped the labour force to easier adopt to changes caused by technology in the labour market. In simple words capacity to learn was a lot higher than society's capacity to innovate. As the space of possibilities and skills expanded, the workforce's ability, capacity to learn and developing new skills was much faster than technological innovation's ability to feel that space. This is directly supported by Andrew McAfee in a speech about 'What future jobs will look like?' (Ted, 2013) McAfee emphasized that the world that technology creates, will present more and more things that look like science fiction and fewer things that look like jobs. As recent development proves, cars will shortly start to drive themselves. The impact of that alone is already huge. This will affect delivery drivers, truck drivers, taxi drivers, bus drivers etc. Furthermore, Siri the voice-controlled personal assistant will soon be connected to Watson. IBM have successfully debuted the Watson Assistant which will act as an AI enterprise assistant. Watson will power numerous companies' in the form of a digital assistant that can be implemented in cars, appliances and even hotel rooms. Furthermore, it will also present the ability to interpret and respond to the users' requests. The impact of this will cause a significant hit on jobs currently undertaken by customer representatives, trouble shooters etc. Many warehouses already employ machines to stack shelves hence reducing the need for human labour (Ted, 2013). A good example here is Amazon where warehouses are mainly operated by robots (Boyle, 2016). McAfee further explains that for about two hundred years, the fear of labour absorption due to the advancing technology gave rise to the concept of technological unemployment. However, that fear was less relevant. Mainly because the advancing technology especially in developed economies often initiated full employment.

Many would ask, why would be different this time? McAfee explains that the reason why it could be different this time is because, just in the past few years machines and computers developed skills at a pace never seen before. Machines, computers are capable of understanding, speaking, hearing, seeing, answering, writing and they are still in the process to further develop these skills. According to McAfee "The day is not too far at all, when we're going to have androids doing a lot of work that we are doing right now" (Ted, 2013). Looking into the future, we are creating a world where there will be more technology that will make everyday life easier, and a less and less jobs (ibid).

2.4 Skill Shift Required due to Automation and AI

Automation and Ai develop in quick steps and this means that some functions in productions will be better, more efficiently executed with machines. Figure 3 illustrates capabilities of automation and AI. Characteristics of jobs due to the increased abilities of AI and automation will alter the skills required by human labour.

<table>
<tr><th colspan="2">Types of automation and AI</th><th colspan="2">What they can do</th></tr>
<tr><td colspan="2">Robotic process automation</td><td colspan="2">Repetitive; Rules-based work.</td></tr>
<tr><td rowspan="3">Artificial Intelligence (AI)</td><td>Applied AI</td><td rowspan="2">Judgement-based processing</td><td>"Thinking"</td></tr>
<tr><td>General AI, machine-learning</td><td>"Learning"; improves over time. Example: natural language processing to understand human communication.</td></tr>
<tr><td>Synthetic, computer-based ("runaway") AI</td><td colspan="2">Decision-making; learning; doing; independent creation and improvement of AI without a need for human intervention.</td></tr>
</table>

Figure 3. Key Differences Between Automation and Artificial Intelligence. Source: Department of Economic & Social Affairs. (2017, p.9).

Hazan and Bughin (2018) state that in the near future automation and AI will affect most of the jobs that are currently undertaken by humans. They estimated that about 70% of existing jobs will require skill shift as automation and AI will transform the required skills to perform certain work.

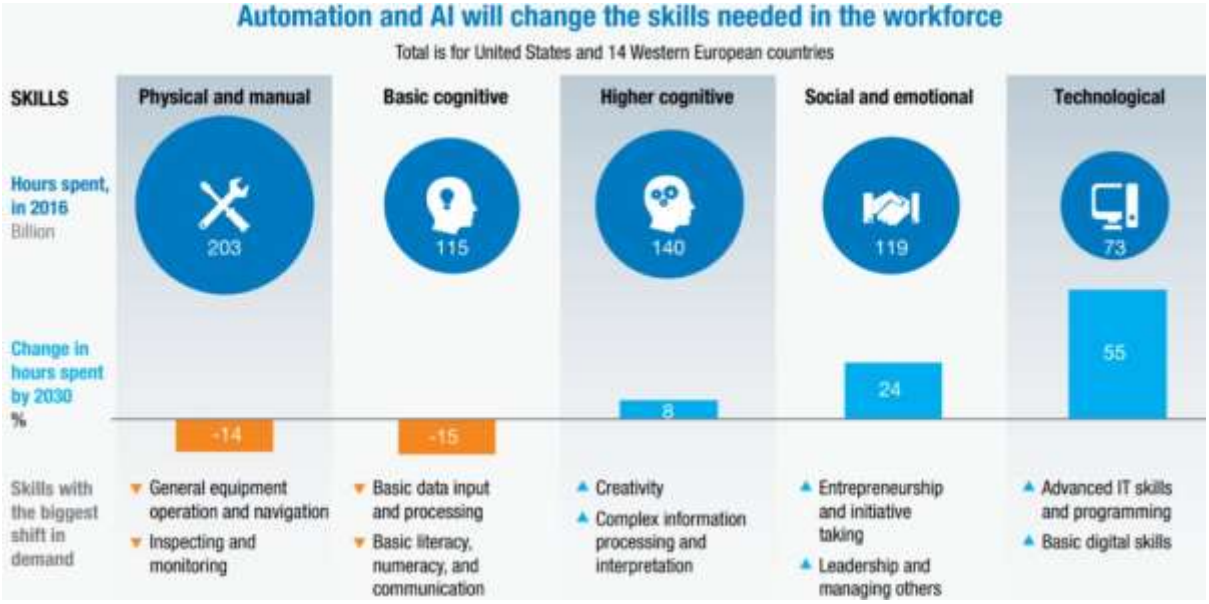

Figure 4. Automation and AI will change the skills needed in the workforce. Source: McKinsey (2018, p.5).

Hazan and Bughin (2018) further estimated that by 2030 AI will alter the nature of most jobs, it will make 20-30% of jobs obsolete and about 45% of jobs will require jobholders to acquire new skills to remain competitive. The new skills required will be the resultant of the structural changes caused by automation and artificial intelligence. Banking and the Insurance sector will rely more on AI fuelled technology especially for forecasting and evaluating risks as well as promoting products/services to consumers. Furthermore, the energy and mining sector will also require skill shift when technology will further dominate the sector. The skill shift will be required in the process of allocation of resources as well as for the increase of extraction capacity and production efficiency. In the healthcare sector, future technology will change the interaction between health care professionals and their patients. While the demand for healthcare professionals will be on the rise, in the same time a lot of hospital administration tasks will be replaced by technological means. The manufacturing sector according to Hazan and Bughin (2018) will be among the worst hit. The impact of automation and AI will cause disruption in the production function for factories. The skill shift required will be better analytics and increased collaboration between machines and humans. Retail is another important sector where skill shift will become necessary. Related jobs for example, driving, stocking shelves, packing will continue to decline while customers service, technology deployment and managerial jobs will be on the rise (ibid).

Hazan and Bughin (2018) explained that the advancing technology initiates the need for advanced, higher skills, that may not yet be possessed by the workforce. Since the changes are happening at an accelerated pace, this may result in market polarization, where routine, low- and middle-income jobs are likely to face a decreased demand for human labour. This signifies that the need for jobs that require highly skilled labour will be on the rise. However, it must be taken into consideration that a large proportion of the current labour force does not fall into this category. As previously mentioned about 45% of the jobs will require new skills and thus will affect the unemployment rate (ibid).

2.5 Automation and Sustainability

A study on sustainability directly affirms the research of Hazan and Bughin. This study examines the effects of automation on employment rate. Vermeulen, B., Kesselhut, J. Pyka, A. Saviotti, P.P. (2018) emphasizes that the negative consequences of the evolving technology will appear in the form of mass unemployment and greater inequality. Furthermore, this study illustrates a formation of a gap between “end of the work” and “rebound of work” as consequence of technological revolution driven by automation and AI. The “end of the work” conceptualizes the loss of jobs due to automation and the inability of the affected workforce to find new uses in the revolutionized job market. On the other hand, “rebound of work” captures the time frame in which affected workforce upskills themselves to become competitive again in the job market. Within the gap this research situated mass unemployment due to the greater implementation of automation and AI (Vermeulen, B., Kesselhut, J. Pyka, A. Saviotti, P.P. 2018).

2.6 The Trade Off Between Achieving Economic Growth and the Increasing Unemployment

Previously it was defined that in the destructive process in which human labour is substituted by machines, there may be maladjustment in the labour market as the affected workforce fail to catch up with the skills required to remain competitive in the 'age of machines'. On the positive side, the research by Wilson (2018) highlights that after a short-term spike in unemployment, the supply and demand of jobs will find its way back to the equilibrium (ibid). However, this positive statement might not reflect reality about the emerging technological revolution. Machines create efficiency. Over time technological means are cheaper to employ than human labour. The increase efficiency allows businesses to experience greater competitiveness while leaving workers with inadequate skills left behind, with possibly less disposable income in hand that is used to purchase goods and services in the economy. This concept directly relates to the conversation between Walter Reuther and Henry Ford II, where Ford asked Reuther. "How Will You Get Robots to Pay Union Dues?" and then Reuther asked Ford "How Will You Get Robots to Buy Cars?" (Ford, 2015, p. 53). These questions seem to be more relevant in the new age of technology. To gain competitiveness in today's business world, innovation and technology opens the gate through which businesses may experience increased productivity paired with higher cost efficiency. It seems to be a rational decision for businesses to employ technological means to reach such important targets. However, the fact that they replace human labour with machines has a destructive effect. Recognising the speed at which the technology races ahead, the destructive impacts on employment will likely take different measures this time. This, however, indicates that the consequence of technological unemployment could outweigh the benefits of the creation of new opportunities and new jobs.

2.7 Moore's Law and The Technological Unemployment

According to Vermulen, Kesshelhut, Pyka and Saviotti (2018) the major effect of future automation and AI will be the disruption in the labour market. As businesses further automate existing employments at a pace never seen before, Moore's law starts to show effects. AI and machine learning, automation accelerates at a fast pace and allows machines to complete a wider range of task that were previously completed by human labour. Moore's Law is a well-known computing term that is based on the observation of Gordon Moore in the year 1965. The simple version of the law states that computer/machines ability to become faster and more powerful is known to double every second year. Looking at the law, it just confirms what John Maynard Keynes stated in 1930, "the increase of technical efficiency has been taking place faster than we can deal with the problem of labour absorption" (Keynes, 1963, p. 358). However, it seems that in our lifetime this is becoming more relevant than ever. The accelerated speed of advancing technology will make some human skills obsolete. Based on that, the impacts of the emerging technological revolution highlight the issue around the increasing unemployment.

2.8 A Solution for Maintaining Spending Level from Households. Universal Basic Income (U.B.I)

According to Kingma (2020) the increasing unemployment rate due to an increased implementation of AI and automation will influence a number of macro economical components such as spending from government and households. To further signify the possible consequences of an increase in unemployment, (AD) aggregate demand and GDP may also be affected due to the positive relationship with aggregate spending. The solution around maintaining spending level from households give rise to a significant question. Who will carry the consequences, burden of the emerging technological revolution? Will it be companies? The state? Or Taxpayers? Suggestion regarding the introduction of a universal basic income has been discussed as a solution to address the issue around the economic activity. U.B.I (Universal Basic Income) ensures a guaranteed minimum income for citizens and has been widely suggested as the solution to ensure that the increased production from

robots will meet adequate demand from consumers. This basic income provided by the government intends to provide basic financial support that would cover cost of living and provide citizen with a degree of financial security (ibid). In recent years U.B.I. started to receive more attention as result of the increased job losses due to the advancing technology. The concept however isn't new. In the 1950s, GAW or Guaranteed Annual Wage was introduced by US unions to provide financial support for employees whose jobs, skills became obsolete due to automation (Booth, 2006). Furthermore, Martin Luther King Jr in 1967 emphasized that a guaranteed basic income could be an effective mean to tackle poverty and to reduce inequality as well (Weissmann, 2013). So far is clear that U.B.I would come from the government, but where the funding would come from remains unclear.

2.9 Taxing Robots and Deadweight Loss

Suggestion arose that funding could initially come from taxing productions where robots are used instead of human labour (Bowcott, 2017). The argument against this suggestion manifest an economic term called Dead Weight Loss due to an imposition of tax. According to Kagan 2018, Dead Weight Loss derived from taxation refers to an economic harm accompanied by economic inefficiency that causes a reduction in consumer and supplier surplus. In simple words dead weight loss from taxation causes changes in cost of production due to the change in average total cost, which in turn may initiate a higher price level (ibid).

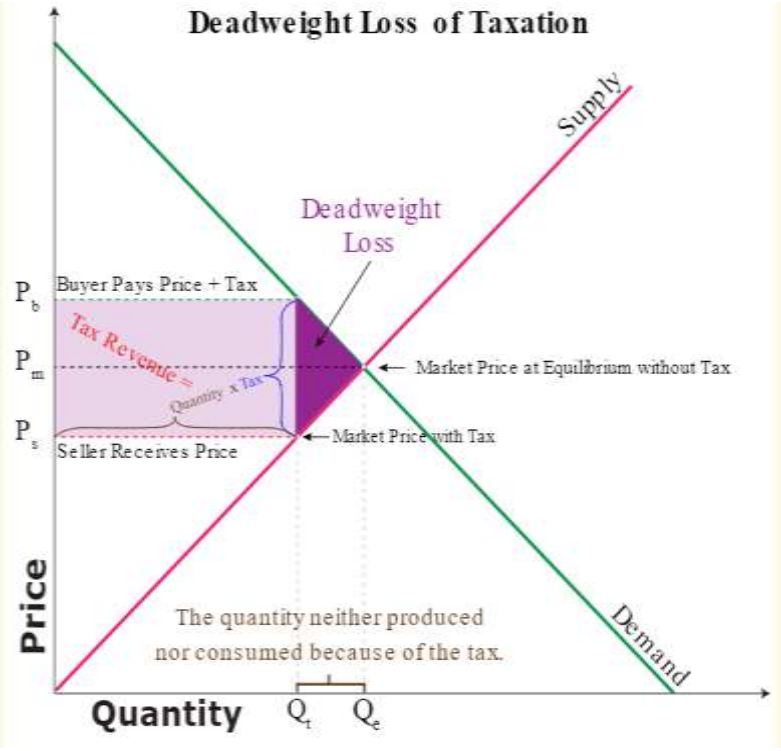

Figure 5. Dead Weight Loss of Taxation. Source: Kagan J. (2018).

The Graph illustrates the generic consequences post imposition of a tax. The diagram illustrates that after the imposition of tax, Consumer Surplus and Supplier Surplus reduces by the area of 'Tax Revenue' and the 'Dead Weight Loss' as shown on the graph by the shades of purple. As this happens affected firms may encounter an increase in total costs that could slightly impact the benefits that firms initially anticipated from automation. Furthermore, depending on (PED) the price elasticity of demand of the product, that determines quantity demanded (QD) when there is a change in the price level, manufacturers will try to ease the cost burden by transferring some of the costs to consumers. In addition, the area shaded dark purple represents the loss in market efficiency as between Qt (quantity with tax) and Qe (quantity equilibrium, prior tax) there is no output whatsoever. According to the illustration of Kagan (2018), this can have an impact on the incentives to invest.

2.10 Other Possible Sources to Fund U.B.I

Others have suggested that the funding should come from return on government investments, carbon taxes, income tax from the top 1% and wealth funds. Alaska for example has already employed such means to tackle inequality and to boost consumption. Alaska implemented Permanent Fund Dividend in 1982. The funding came from the return on Alaska Permanent Fund. It was noticed that during the period when dividends were paid out to citizens, household consumption greatly increased and resulted in creation of new jobs and a growth in economy (Kingma, 2020). This directly leads to the next discussing point that emphasizes the benefits of universal basic income.

2.11 U.B.I Marginal Propensity to Consume and The Fiscal Multiplier

The argument for U.B.I is Increased (MPC) Marginal Propensity to Consume as result of the increase in disposable income. MPC measures the tendency of consumers in the economy to alter their spending level on goods and services when there is a change in disposable income. Kingma (2020) directly affirms that marginal propensity to consume has increased as result of the increase in disposable income from the Alaska Permanent Fund.

Figure 6. Marginal Propensity to Consume (MPC) Formula. Source: Wallstreetmojo (2020).

In the case of Alaska, the increase in disposable income resulted in job creation and an increase in GDP also referred to as economic growth. This implies the economic theory called Fiscal Multiplier. The theory originates from 1936 and was developed by John Maynard Keynes. The Keynesian Multiplier explains that an increase in private consumption as well as an increased investment expenditure will initiate a growth in total (GDP) Gross Domestic Product which is a distinctive objective of economies (CFI, 2020).

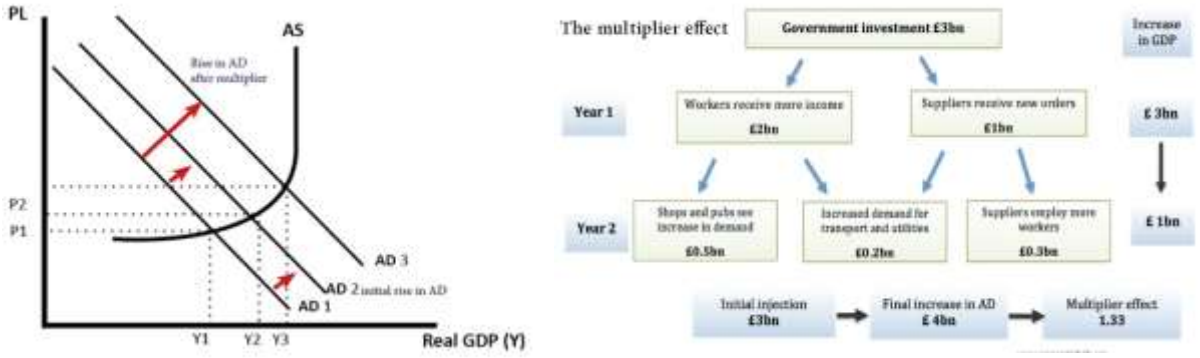

Figure 7. Expansionary Fiscal Policy and The Multiplier Effect. Source: Pettinger T. (2018).

The graph and the supportive diagram above illustrate the consequence of the multiplier effect on the level of economic output. As the government increases investment level or spending in the economy, AD1 will shift to AD2. This represents that Aggregate Demand for products and services that are produced in the economy will increase and causes output (GDP) to increase from Y1 to Y2. Furthermore, a beneficial cycle will show presence that will affect household spending, business owners and employment in the economy as well as taxation income. As disposable income increases through U.B.I, households will spend more on purchasing goods and services. In turn Businesses will experience an increase in profit margins. As profit increases business owners will have the opportunity to further expand their businesses and therefore create employment. At the finish line of the cycle the government also benefits from increased taxation income. This however signifies that the introduction of U.B.I other than solving the issue with decreased disposable income, it would also initiate a growth in economic output (Pettinger 2018).

2.12 The Next Industrial Revolution and Inequality

The past testifies, approves the consequence of technological progress on the level of inequality. According to Keeley Brian (2015), technological advancements are known to be key contributors to the rising inequality. As previous studies explain, workers have failed to receive a fair share from past economic growth and this raises the question, will it be different this time? Keeley Brian (2015) 'Why Income Inequality is Rising' explains that the global economy has become more integrated through technology. Technology just like in the past destroying old jobs and creates new ones. This will make high skilled workers more valuable while it will destroy the jobs for some middle and low skilled worker. The progressing technology according to this theory can also be blamed for shifting the balance between labour and capital. This again signifies that a larger share of the income/wealth will go toward the owners of capital and unfair, smaller proportion of income/wealth will be distributed among the people who work for them (ibid). In simple words, this explains that elevating the use of automation and AI will further increase the level of inequality.

2.13 Income Inequality is on the Rise. Lorenz Curve, China and the US

It raises questions that despite the advancements in technology in economies where automation and AI played a key role, why has income inequality been on the rise? And if it did, will further elevating automation and AI will present the same consequences? In order to raise assumptions about the possible effects, we can take a look at the Lorenz curve of US and China and observe the differences, deviations of the curve of each country between the years 1980 and 2014. Both the US and China are appropriate examples to illustrate the effect of technology on inequality. They are both hugely significant economies, with strong industries and manufacturing plants that greatly benefited from the developing technology.

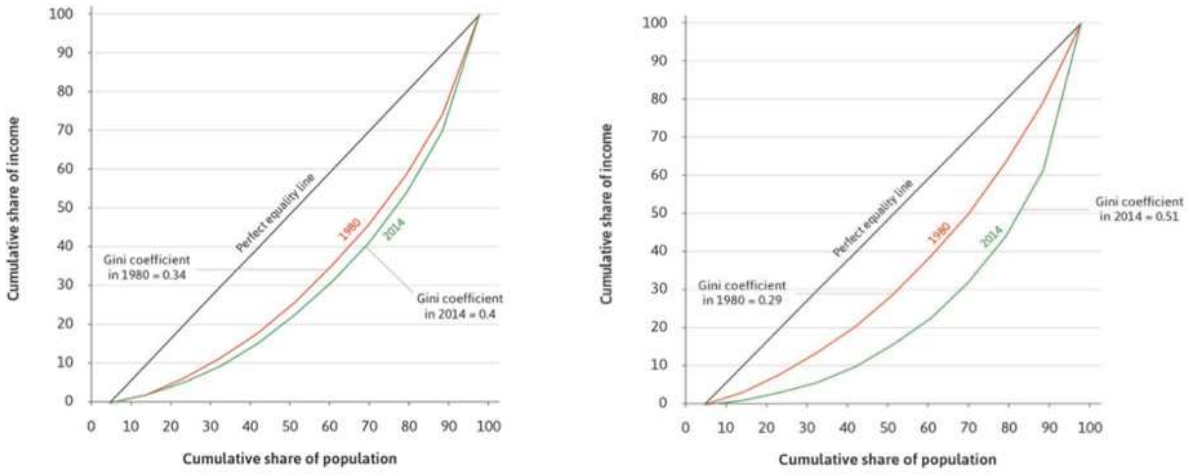

Figure 8. Lorenz Curve for USA and China. Source: Coreecon (2020).

On figure 8, the change in inequality level is expressed by using the Lorenz Curve, which is an economic tool, a graphical representation of income/wealth distribution in an economy. The Y axis illustrates cumulative percentage of income while the X axis shows cumulative percentage of households both in deciles. The graphs Illustrate that despite the technological advancements happening between 1980-2014 inequality rose. It is also worth to look at the difference between the Gini coefficient that condenses that entire income distribution of a country into a single number between one and zero. The lower the number, the lower the level of income inequality is in the economy. Looking at the US Gini Coefficient rate in 1980, is at 0.34 and rises to 0.40 by the year 2014. The very same was experienced by China where the Gini coefficient rate increased from 0.29 to 0.51 by 2014 (Coreecon, 2020).

It is evident that globalization in the past decades boosted the economic wellbeing of countries, However, the graphs above raise assumptions that the increase in economic growth has not been distributed among households in a fair way. Future automation and AI could further contribute to the increasing level of inequality just like we have experienced in the past. The reason why this deserves attention is because the increasing inequality contributes to stagnation and to a slowing economic growth. If wealth is distributed more unequal or simply saying if income inequality rises, aggregate spending will inevitably fall, there will likely be less jobs available and all this will lead to a stagnating, slowing economic growth that we are already experiencing. Unemployment in this scenario would increase structurally higher and the self-supporting cycle of the economy would show weaker activity (Koukoulas, 2015).

2.14 Concluding the Literature

This literature serves the purpose to elaborate on why the effects of the emerging technological revolution might be different this time. The well-known benefits of advancing technology are the creation of new opportunities and new job sectors. The research behind the literature proves that the emerging technological revolution will initiate a rise in technological unemployment. According to Hazan and Bughin (2018) by 2030 about 70% of jobs will be touched by automation and AI. This will affect a massive proportion of the labour force that will experience a drop in disposable income. Universal basic income could act as a solution for maintaining consumption in the economy but what the economy will need is actually increased consumption due to the increased productivity derived from machines. It remains an important question regarding how effectively would U.B.I. solve the issue around the income gap suffered by the affected workforce (ibid).

Looking at the past, technology acted as a contributor to the increasing income inequality and it is likely to present similar outcomes to form for the emerging technological revolution. In the 1950s US Union leader Walter Reuther identified the job taking nature of technology. However, Reuther's idea did not involve resisting or holding back automation. Instead he suggested to manage the implementation of automation through collective bargaining and also by political, government influence. Knowing that technology races ahead Reuther's idea becomes more relevant to the situation that we will face in the near future. Effective government regulation regarding Income distribution will call for a review to ensure that consumption of goods and services in economies will match the productive capacity of machines (Ford, 2015).

Chapter 3: Methodology

3.1 Introduction to Methodology

This chapter will focus on elaborating the methods of data collection that will best serve the objectives of this research. Acknowledging the purpose of this research, philosophical assumptions will be discussed in line with the research paradigm. The process will also be aided by exploring different methods and approaches that were undertaken by other researchers. This research adopts a mixed data collection method. This will allow for a deeper evaluation of the impacts of the developing technology on jobs and inequality from a professional point of view as well as from the general public point of view. This section will also include the methods of data analysis that will serve the purpose to evaluate and measure the collected data. Furthermore, sampling methods and the desired number of sampling size will be further emphasized in line with the desired aim from this research. The methodology section will involve the acknowledgement and identification of limitations encountered as well as the requirements to comply with the ethical consideration of conducting this research.

3.2 Research Question

The information listed in the literature challenges the research question. 'The Next Industrial Revolution and the Advancing Technology: Will it be different this time? How Does the Advancing Technology Contribute to Increasing Unemployment and to the Rising Inequality? The research question implies the assumption that the current effects might be different from what we have experienced during the past. Furthermore, the research question challenges the extent to which technology has contributed to the increasing income gap between households in economies and assumes that developing technology will further contribute to the rising inequality. Therefore, this research will aim to elaborate on how the structural changes caused by the advancing technology elevates the concept of technological unemployment and contributes to the rising inequality.

3.3 Philosophical Assumptions

The interpretivist nature of the study allows this research to examine the subjective experiences of individuals. This is a crucial element that helps to evaluate the impact of the advancing technology on economies as well as on people's lives.

Starr (2012) emphasized that mixed method phased approach in economics research over the past 10-15 years has become popular. To provide a more useful roadmap, studies often involved the combination of qualitative and quantitative data. Starr (2012) also explains that in economics research both qualitative and quantitative data have their own strengths. While qualitative method ensures a deeper, more professional insight into the underlying issues, quantitative methods in a form of surveys can measure how consumers in the economy would react to the changes caused by technology. In line with that, the usefulness of each method will depend on how valuable and how much we can learn from the information gathered. Furthermore, relevancy of information is crucial as it helps to evaluate the issues that arise in the topic of interest (ibid). Therefore, considering the purpose of the research, both qualitative and quantitative data will be used. The mixed method approach will involve collecting information through interviews that will aim to gain a professional opinion, and through a survey that will reflect consumers' perception on the impact of the advancing technology on employment security.

3.4 Data Collection

Starr (2012) argues that a mixed methods approach to economic research can be a more effective form of data collection. The main reason is that the mixed method allows a broad coverage on the topic and ensures that the relevancy of information equips the research with a greater analysis and finding tool. Semi structured interviews will be used to gain information from experts who possess both working experience and knowledge on the research subject. This method of data collection will imply approaching participants with ready prepared questions to gather professional views and opinions on the topic. Secondarily, as part of the data collection process a survey will be circulated with the aim to measure the public's perception about the advancing technology and employment security. The survey will be circulated to various individuals in different job sectors.

Considering the purpose of this study, this method of data collection can capture better the true impact of the advancing technology on individuals' jobs and lives. Apart from that, it also serves the purpose to evaluate the connection between technological advancements and the rising inequality. It is expected that the information presented by the survey will contradict the information gained from professionals. Economists have the tendency to acknowledge a broader picture and therefore conclude that future automation of jobs will initiate an economic growth. Wilson (2018) approves this but while this does reflect the truth, it is also important to consider how equally the economic growth derived from greater automation will be distributed amongst households. In line with that this research will aim to source information from the public in a form of a survey to measure the level of uncertainty regarding future employment security that could contribute to the rising inequality. Based on this a mixed method approach has been identified as the most suitable method for data collection. A mixed methods approach will provide both an expert view on the introduction of technology into the workplace, and a macro view from a wider public on the perceptions this advancement will have on a modernizing labor market.

Crossman (2019) suggested that a pilot study is a real aid to the research and therefore will be conducted to identify and refine both the interview as well as survey questions (appendix 3,4). Conducting a pilot study is beneficial as it can be used for both qualitative and quantitative data collections with the aim reduce the risks of problem occurrence. The analysis of answers gathered as well as identifying emerging questions, by conducting the pilot study will allow the researcher to rectify any issues identified during the process (ibid).

Due to the current situation with the Covid-19 pandemic an alternative interview method was selected. The alternative method involved sending out invitations by email to potential participants and upon approval the interview questions along with the consent form was also sent out by email to the participants (appendix 1,2). High volume of invitations was sent out to economics lecturer, and to economists working in the public sector, however only one respondent approved their participation. Despite the inability to get an opinion from the expected number of interview participants, the quality and reliability of the information gathered from an economist who works for the government provided sufficient information that is required for the analysis of this research.

3.5 Data Analysis

The analysis of interviews conducted through emails involves similar approach to the analysis as a face-to-face interview. Despite the similarity in the step of analysis, Talty (2018) explains that email interviews present several disadvantages. The author further explains that the ability to gain useful information through nonverbal communication is limited due to the lack of interaction between the interviewer and the interviewee. While a plan for interview is designed, one of the benefits of semi-structured interviews is the ability to pick up any interesting lines of enquiry not thought of when designing the interview questions (appendix 3). However, the email interview hinders the ability to observe a reaction, that could emerge a new question from the interviewer. Recognizing the possible disadvantages of the alternative chosen, the pilot study and an in-depth preparation of the interview questions will help to maximize the information needed to suffice the analysis required.

Caulfield (2019) explains that the best suited method to analyse qualitative data is through the thematic analysis method. This method of analysis requires the researcher to closely examine the data to identify topics, ideas as well as patterns of meaning. Furthermore, it involves organizing the information gathered as well as discovering crucial pattern of information that emerge from the initial interview question. The first step in thematic analysis will involve familiarization of the data gathered. This step will involve analysing the responses received from the interviewee. During the process of the thematic analysis the data gained through the interview will require repeated reading in order to allocate meaning, to allow for notation and marking sections and sentences that'll become crucial for the analysis. This is often referred as the coding step of the thematic analysis method where shorthand labels or "codes" are applied to different sections of the answers gained. The codes serve the purpose to organize the information gained from the email interview in a meaningful way. This will involve the annotation of different paragraph that briefly describes relevant data that corresponds to the issues raised in the literature. Among the next steps of the thematic analysis the "codes" given will require accurate interpretation. The interpretation of the codes will help to identify different themes. As codes get combined this will give significance to the different themes identified and this will result in the formation of sub-themes. The

information in different themes could reflect similarity to previously discusses information in the literature and this signifies the importance to find connection or contradiction between the information from the data collected and literature. The next phase of the thematic analysis will require the refinement of the themes identified. During this process the relevancy and accuracy of the data set will be considered. As mentioned previously, revising and repeatedly going over the data set is required to identify new themes or to attach new meanings to the existing themes (ibid).

3.6 Research Limitations

The limitations presented by the sample size is a distinctive drawback, especially because this study also aims to measure the public's reaction to the impact of technology on employment security. It is acknowledged that a small sample size would hinder the ability to find a significant relationship between issues raised in this study. Ideally, a larger sample size with individuals from different job sectors would be needed to ensure that the information gathered represents a generalized view of the public about the effect of the advancing technology on employment security (Moura, 2017). The lack of available or reliable data from interview participants may limit the scope of the analysis and therefore may reduce the ability to measure the statements and the information listed in the literature. This limitation directly refers to the decreased ability to access data. This is considered a major drawback as more information would ensure a clearer picture about of how the technology affects the supply and demand of jobs. Apart from that, additional data would provide the much-needed quality and quantity of data required that would be necessary to analyse this complex research topic. The current situations with the pandemic yield a preference for an email interview. This, however, hinders the ability to recognise or translate reactions of the individuals derived from body language or facial expressions to the set of questions that are presented. Apart from that the ability to raise emerging questions during the email interview is also very limited and therefore the ability to gain additional useful information at some degree remains limited. Limitations also initiate from the lack of funding. In line with that, information sourcing and adequate coverage can affect the research findings (ibid).

3.7 Ethical Consideration

The ethical consideration that will flow through the research process will prioritize the respect for dignity of all participants. Furthermore, all respondents will be provided a consent form in which they express their willingness to participate and formally agree to the rules of participation. The respondents will have the opportunity to ask for additional clarification, to refrain from answering question as well as to terminate their participation at any stage of the process. Along the process, the privacy of participants will be protected, and adequate level of confidentiality will be ensured. In addition, anonymity of respondents and the organizations that they represent will be prioritized. The survey circulated will also embrace the ethical considerations. On the top of the survey a consent blurb will be included that'll explain the purpose of the survey along with the explanation of basic terminologies (automation and AI) to ensure that all participants possess the understanding to accurately answer the questions listed. Apart from that the consent blurb will state that the survey is completely anonymous meaning that any answers given will not be traced back to any one individual. Participants will also be provided the freedom to opt out at any time during the survey. Furthermore, contact details of the researcher will also be listed in the consent blurb. As part of the ethical consideration this research also aims to ensure the avoidance of exaggeration about aims and objectives. Throughout the process all communication in relation to the research will be characterized by transparency and honesty. Furthermore, prioritising the avoidance of any misleading information as well as representing a biased way based on primary data will be ensured.

Chapter 4: Analysis and Findings

4.1 Introduction

This chapter involves the analysis of the information and data gained through a semi-structured interview and through the data set presented by the survey constructed. Both the interview and the survey questions will serve the purpose to analyse why the emerging technological revolution might present different outcomes than the previous ones. Furthermore, the information gained is important in explaining how the empirical evidence obtained supports the labour absorption derived from the advancing technology. The analysis of the participant's answers presents a strong evidence that advancing technology will act as a major contributor to a rise in unemployment rate. In line with that, the effect on employment security and on the soaring inequality, will be embraced in this chapter.

4.2 The Increased Capacity to Innovate VS Workforce Adaptation Ability

Considering the ability of the workforce to adopt to the changes caused by technology, according to the interviewee, the increased threat of labour absorption is the result of the increased capacity to innovate that in turn affects workers' adaptation ability. This directly corresponds with the information from Swab (2016) and Andrew McAfee (2013) presented in the literature. In addition, it also answers the research question about why the effect of the emerging technological revolution might differ from the previous ones. Both sources in the literature explain that technology causes systematic changes in a similar time frame in most industries and this drives the increased demand and capacity to innovate.

The interviewee explained that "*The pace of technological innovations, maturation of key technologies such as robotics an AI are important factors that contribute to the increased capacity to innovate"* (Interviewee). *"In addition, infrastructure enablers such as broadbands and 5G have expanded the geographic reach of these technologies, opening new opportunities for businesses to invest in technology"* (Interviewee). The interviewee's words directly refer to the increased demand for labour substitute technologies. In addition, the information gained from the interviewee explains that when measuring the effects of labour absorption

in the context of technological changes, *"it's worth noting the pace of change really matters"* (Interviewee). This affirms the information presented by Change (2017) in the literature that explain that the rapid evolving capacity of labour substituting technologies increases the level of disruption in the labour market. The interviewee further affirms this by stating:

"Previously, such as in the industrial revolution, the arrival of technologies into the workplace was slower and the wider economy was less developed. It took more time for the wider economy to absorb the new technologies allowing more time for displaced workers to re-allocate into new and emerging industries"

(Interviewee).

According to the participant, the increased time at hand facilitated better the 'creative destruction' with the effect of less significant socio-political disruptions. In line with that Change (2017) puts the emphasis on the consequential technological unemployment that is affirmed by the interviewee by stating. *"Over time the pace of technological change and absorption has accelerated leaving less time for society to adapt to the changes. Therefore, structural unemployment and economic inactivity is likely to increase in the long run"* (Interviewee). The interviewee's answer supports the research hypothesis and also answers the research question by assimilating the effects of the increased capacity to innovate and the higher demand to implement new technologies with the previous technological revolution. As Wilson (2018) argues, after a short period of time the disequilibrium in the labour market will initially find its way back to the equilibrium. However, the research hypothesis along with the interviewee explains that while this theory was relevant in the past, the increase capacity to innovate will cause this theory to become less relevant, for the emerging technological revolution.

The interview participant explained that, looking at the current situation the effect of the advancing technology on the supply and demand of labour could differ from what humankind experienced during the past technological revolution. Considering the emerging circumstances, the cost of labour is on the rise while (PALF) potential additional labour force shrinks. From here the scenario becomes evident when the relative cost to invest in human labour substituting technologies improves while human labour becomes more difficult and costlier to source, thus the automation of certain jobs becomes a more economical choice for

businesses. The theory behind this is affirmed by Carlisle (2017) that talks about a steady rise in human labour costs.

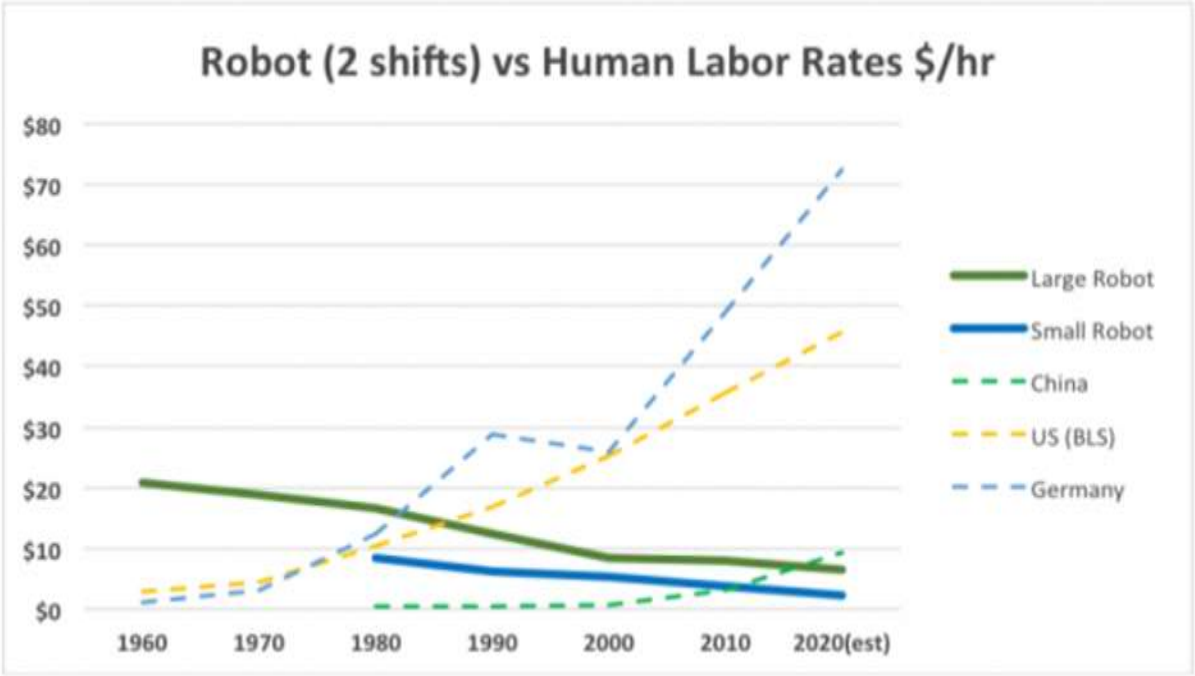

Figure 9. Robot (2 shift) vs Human Labour Rates $/hr. Source: Carlisle B. (2017)

Figure 9 above illustrates that human labour costs per hour has increased steadily since 1960 while over the same period, costs of robots per hour have declined below the cost of Chinese labour rates (Carlisle, 2017). The information mentioned by Carlisle corresponds with the interviewee response about the increasing costs to employ human labour and the decreasing costs to substitute human labour with technological means. Considering the consequences, the respondent expressed that structural unemployment and economic inactivity is expected to increase in the long run. Therefore, to tackle these issues many workers will require a skill shift to remain competent in the job market.

4.3 The Need for a Skill Shift

The research hypothesis states that the emerging technological revolution will escalate the concept of technological unemployment. Hazan and Bughin (2018) explain that 70% of current jobs will be affected by automation. The ability of workers to upskill will be an important determinant of the severity of technological unemployment.

Doyle and Jacobs (2018) published a study on behalf of the Department of An Taoiseach in which they evaluated the risks of automation on different job sectors in Ireland.

The study identified that there is a significant connection between the risk of automation and the ability of workers to upskill themselves to remain competitive in the job market and thus, have a secure employment. The interviewee supported the importance of the ability to upskill by saying *"In the foreseeable future, focus on skills and retraining are the most effective ways of mitigating the impacts of automation* (Interviewee). Considering that the Irish workforce is highly qualified, the interviewee also explains that the level of qualification of the workforce will determine the level of exposure to the threat derived from automation. In line with that, the threat from labour substituting machines, technologies will depend on the skill profile, the capacity of national education and training systems' ability to supply the relevant skills needed. Taking this into consideration the level of labour absorption will differ across different countries. Nedelkoska and Quintini (2018) also approved that the level and effect of automation are indeed quiet variable across OECD countries. In line with that the interviewee expressed that when thinking about the impact of technology on employment it is important to recognise that the effects will differ from country to country. This research acknowledges that the advancing technology affects most economies. In line with that, the interviewee explains *"It is important to recognise that the impacts are not going to be the same everywhere. Within different countries, the capacity of business to adopt new technologies is going to vary significantly and often be accompanied by significant lags"* (Interviewee). The information gained from the participant mentions that several factors will determine the impact of how the emerging technological revolution will affect the labour markets in economies. However, the findings of Doyle and Jacobs (2018) express that despite the highly qualified labour force in Ireland, about two out of every five jobs will be substantially affected. The productive capacity of the big four and in line with that their ability to absorb new technologies is a distinctive reason why every 2 out of 5 jobs will be affected by the advancing technology. Taking that into consideration a significant number of workers will require a skill shift to ensure employment security.

Looking at the rate of the required level of skill shift Vermeulen, B., Kesselhut, J. Pyka, A. Saviotti, P.P. (2018) emphasizes that such a rate of skill shift presents serious challenges that will ultimately affect the sustainability of automation on the long run. Furthermore, this study also mentions the formation of a gap between "end of the Work" as technology makes workers' current skills obsolete and "Rebound of Work" where after a dip, employment somewhat recovers. The gap between the two represents mass unemployment that further escalates the concept of technological unemployment mentioned in the literature. The interview participant further strengthens the findings of Vermeulen, B., Kesselhut, J. Pyka, A. Saviotti, P.P. (2018) explains that structural unemployment is expected to rise in the long run as technology becomes more pervasive. Furthermore, the interviewee expressed that sooner or later, Governments will find it challenging to equip the workforce with the much-needed skills to succeed in a highly digitised future economy.

4.4 The Contribution of Technology to the Rising Inequality and U.B.I as a Solution

Keeley Brian (2015) emphasizes how the advancements in technology contribute to rising inequality. In line with that, the literature also embraces previous methods that aimed to tackle the income gap between households and the rising inequality due to the increased implementation of human labour substituting technologies (Booth, 2006; Weissman, 2013). The ideology behind the introduction of a U.B.I. (Universal Basic Income) alternative was to maintain the spending level in the economy and to tackle the consequences of rising inequality. The importance of that are also illustrated in Figure 7. Where Pettinger (2018) illustrates and explains the economic impact of the Expansionary Fiscal Policy and The Multiplier Effect on economic productivity. To maintain or increase household consumption in economies and in line with that to experience the benefits illustrated by Pettinger (2018) the introduction of a form of UBI will require more attention in the near future. The participant who is a highly ranked economist in the public sector explained that demand for labour will ultimately decline together with wages, especially for those who are employed in lower skilled sectors. The rise in inequality will be driven by income stagnation and a shift away from labour towards capital. Keeley (2015) supports this line of thoughts when the author emphasises that the implementation of automation and AI will enable the owners of

capital to accrue a greater share of income as technology will replace workers. According to the participant this will initiate a significant risk by creating stark inequalities. In line with that the participant also signified the importance of the introduction of a form of U.B.I to address the issue around spending levels from consumers and the rising inequality.

4.5 The Effects and Source of U.B.I

Kingma (2020) in the literature explains that U.B.I would ensure a guaranteed minimal income for each resident that would help to cover some basic household expenses. Furthermore, the literature also brings up Alaska as an example where a form of U.B.I. was successfully implemented through the Alaska Permanent Fund Dividend (ibid). While Alaska already found a reliable source to fund an alternative version of a universal basic income, many countries are still unsure about the effects and implications that the introduction of U.B.I. would present. The interviewee expressed that U.B.I is a potential solution however the jury is out on its effectiveness. The participant explains that it raises issues of the incentives for people to seek employment which impacts the results sought from U.B.I by the government.

On the other hand, the findings from a universal basic income study conducted between 2017-2018 in Finland presented that the incentives for recipients of U.B.I to seek employment was not affected adversely (Lu, 2020). The study conducted by Finland is considered to be the most robust study that is based on measuring the impacts of U.B.I on households. Apart from failing to prove a negative impact on the incentives to seek employment, the study also concluded that that U.B.I. boosted the recipients' mental as well as financial wellbeing while also contributed to modestly improving employment. 2,000 unemployed between the age 25 and 58 were given €560 per month. These people were not mean tested, and the payment was unconditional meaning that their payments were not reduced when an individual got a job or a pay rise. The results gained were compared with the control group of 173,000 people who were on unemployment benefits. In the duration of a year the results showed that recipients of U.B.I worked an average of 78 days that was 6 days more than those on unemployment benefits. In line with that the study concluded that the additional income through U.B.I does not interfere with peoples' incentives to seek employment (ibid).

4.6 Acceleration of events by the Covid-19 Pandemic

The economic impact of the restrictions and the severe increase in unemployment rate presents a significant threat to economies. The overall consequences of the Covid-19 pandemic and the effects of labour absorption due to the advancing technology reflects a degree of similarity. Each occurrence affects employment security as well as the spending level of the households in economies. Initially, U.B.I was intended to be introduced to tackle the spike in unemployment rate and the rise in inequality derived from the labour absorptive nature of technology. However, the current situation yields the introduction of a form of U.B.I. to tackle the similar impacts. In line with that, the effectiveness of it to solve the issues with the spike in unemployment rate and the rising inequality will be experienced sooner than thought. For instance, Social Justice Ireland (2020) published a plan that outlines the introduction of universal basic income post the Covid-19 pandemic. In simple terms it becomes evident that the occurrence of issues raised in this research are accelerated by the pandemic. This involves an accelerated implementation of technologies in workplaces that will change where and how workers perform their job. Furthermore, the interviewee also expressed that in many cases employers will provide the possibility to work from home and in line with that it becomes evident that other jobs that supports the functioning of the office environment at some degree will diminish. As the pandemic accelerates or increases the demand for technological means to sustain business performance, governments are also in a need to overview education and technological infrastructure and assess the general overview of the Irish economy. Furthermore, as proposed by Social Justice Ireland (2020) the focus on the introduction of a form of universal basic income and to identify the sources of funding should also be prioritized. The research participant explained that the issues with the source of funding will remain controversial, but it is a debate that governments will need to have sooner or later. As the pandemic accelerated the events the ‘sooner or later’ became relevant sooner than thought. For instance, in the case of Ireland, Social Justice Ireland (2020) have already outlined a plan and prioritizes the introduction of a universal basic income to help the economy to bounce back to its productive capacity. Other countries in the EU are also evaluating the feasibility and impacts of universal basic income to tackle the spike in unemployment rate and to provide a degree of income security for households (Theconversation, 2020).

4.7 Sources of Funding for Universal Basic Income

Social Justice Ireland (2020) identifies several sources that will ensure the funding for universal basic income. Capital taxation has been identified by Social Justice Ireland (2020) as component of funding for U.B.I. It implies the taxation of income that flows into wealth at a higher rate. Several ways have been identified to accomplish the increase in capital taxation. Firstly, through increasing the level of taxation on capital by a progressive personal wealth tax. Secondarily, by increasing the level of capital gain tax and thirdly, to increase the minimum effective corporate taxation rate that would be relevant for large corporations who are currently liable to pay a very low effective tax rate. Increasing the rate on inheritance tax was identified as further option to increase capital taxation. Further source of funding identified by Social Justice Ireland (2020) was the taxation of natural resources. Renewable energy is the first type of tax under the taxation of natural resources. This will imply a fee or tax on the use of renewable natural resources that will provide further funding for universal basic income. An obvious approach to this implies an increase in land taxation as well as the taxation of other permanent natural resources such as the broadcast spectrum that is mostly privately owned. Another example of taxing natural resources which are the increase in carbon taxes. This is considered to impose a double positive effect, as apart from funding U.B.I. it will also help protect the environment. Consumption Taxes have been identified as the main funding source for universal basic income. This method gazes the focus on taxation on income when it is spent rather than the time when it is earned. In discussion about the introduction of U.B.I. across Eurozone, VAT has been identified as a major potential funding component of universal basic income. This approach prioritizes the taxation of expenditure with the objectives to eliminate the possibility for high earners to benefit from deductions, tax breaks, and from the loopholes of the system. According to Social Justice Ireland (2020) another sensible and justified way that can contribute toward funding U.B.I. is through the increase in the rate of employer PRSI. Countries where the rate of employer PRSI lags behind other EU countries, increasing the contribution rate would also provide a further source of funding for U.B.I. (ibid).

Considering the identified funding components of universal basic income by Social Justice Ireland (2020) It is evident that some components of the funding could dis-incentivise investments in economies. This is supported by Bowcott (2017) and Kagan (2018) in the literature, where both sources explain the negative impacts of the increase rate of taxation on the level of investments. Kagan (2018) explains the concept of deadweight loss (DWL) where the increase level of taxation causes economic inefficiency. In support to Bowcott (2017) and Kagan (2018) regarding the funding of U.B.I. the interviewee expressed *"The Solution may mean higher taxes on profits and capital but this in turn could dis-incentivise investments"* (Interviewee). However, this research proposes that it is important to note that investing into technology results in achieving competitive advantage for firms and businesses. The fierce competition in turn will encourage businesses to invest into technology and this will positively affect the incentives to invest.

4.8 The Perception of Workers about the advancing technology and Employment Security

The data analysis from the survey expressed a degree of uncertainty from the survey participants regarding their perception about the effect of the advancing technology on employment security. It is important to note that the results are based on the perception of the Irish labour force and their opinion cannot be treated as being a uniformed view and assimilated with other countries. It must be acknowledged that in order to illustrate the public's perception on this topic it is necessary to obtain high number of participants as this would describe more accurately the general view of the public. Acknowledging this limitation, the survey aimed to gather responses from people from diverse age group working in different sectors (see survey question 1 and 2 in appendix 4). The survey results illustrate that majority of the participants had a positive attitude, opinion toward the effects of technology on employment security. In contrast with that participants also expressed a high level of uncertainty regarding a skill shift that would make them remain competitive in their job. While this may reflect a contradiction, Ireland's social justice system and the concept of equity that impacts policy formation could be the reason why the high level of uncertainty is paired with an overall positive perception on the topic from Irish workers.

The positive view of the survey participants reflects a level of trust in the Irish government and its welfare system. This is supported by the high ranked interview participant as well as by Social Justice Ireland (2020). Both reliable sources explain the importance to support people to lift every individual above a certain level with the aid of an effective national education system and with an unconditional income. Majority of the respondent's answers reflected that they would receive support from their employer and the government if a need for a skill shift arises. According to the results gained from the survey, the Irish government shows responsiveness to tackle unemployment and the rising inequality through its developed national education and welfare system. In line with that, the severity of technological unemployment and the consequential rise in inequality will be less significant in Ireland than in other countries where the welfare and education system is less developed. According to the interview participant this should remain an important objective for countries. Mainly because the ability of the national education system to provide the necessary skills will help workers to adopt faster to the changes caused by technology and therefore will help mitigating the impacts of technological unemployment and the rising inequality on economic activity.

Chapter 5: Conclusion

This study was conducted with the aim to investigate how the impacts of the emerging technological revolution differs from the previous ones. The findings of this study support the research hypothesis that states that the accelerated pace of the implementation of human labour substituting technologies will escalate the concept of technological unemployment and in line with that it will create stark inequalities. While the findings acknowledge that the severity of technological unemployment will differ between countries, it is important to mention that the pace of change is a significant contributor. The findings indicate that the arrival of technologies into the workplace over the past decade has accelerated and the capacity to absorb new technologies has increased. During the past technological revolutions such as the industrial revolution the arrival of technology into workplaces was a slower and therefore allowed more time for workers to adopt to the changes. The findings conclude that the pace of technological advancements present a great threat to employment security. The increase level of unemployment adversely impacts households spending that in turn will affect economic activity. The income stagnation and the consequential medium to long-term unemployment according to the research findings will create stark inequalities. To address the issues of the weaker economic activity and the rising inequality, later or sooner countries need to consider the introduction of a form of U.B.I. In line with that, governments are encouraged to step up to protect employment, dignity, and wellbeing of their citizens. In the case of Alaska, the extra income for households resulted in a higher economic activity as during the period when payment from the Alaska Permanent Fund were given out household spending increased. Furthermore, the study conducted by Finland about U.B.I. proven that wellbeing, dignity, and incentives to seek employment were affected positively. Considering the positive effect of U.B.I. it has the ability and potential mitigation power to address the issue with household spending and economic inactivity.

This research concludes that the accelerated pace of technology will increase the rate of labour absorption, where the creation of new jobs will be outweighed by the level of labour absorption. In line with that this research also concludes that that the reliance on effective government policing to tackle the negative consequences will greatly increase.

5.1 Finishing Thoughts

This research identifies that the emerging technological revolution will initiate a greater labour absorption rate and therefore will present different outcomes than the previous ones such as the industrial revolution. The outcome of the study also acts as a recommendation in terms of how the negative impacts from the advancing technology can be mitigated. This deserves attention as a stable economy is needed to provide a quality, stable life for households in economies. In line with that the conduct of this study was also inspired by the importance to build a society where everyone can live a reasonable quality life. Employment security has wide range of impacts on the society. For instance, unemployment and poverty is often linked with increased crime and corruption level and therefore affects the quality of life. It is important to identify, prepare and address any contributing issues such as the technological unemployment exemplified by this study. A spike in unemployment rate causes deprivation of income for households and in turn it will increase the number of people who live in poverty whilst also contributing to economic stagnation.

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List of Appendices

Appendix 1: Request Email

Interview No: _____

Invitation for Interview Participant

Dear **[Insert Name],**

My name is Timot Bocotan**,** I am an undergraduate student at the National College of Ireland. I am currently researching for my dissertation, with my study focusing on why the emerging technological revolution might present different outcomes than the previous ones. Technological advancement in the past decades have greatly increased and the ability to absorb the new labour substituting technologies also increased. The increased pace of technological advancement leaves less time for workers to adopt and this raises the assumptions. Is it going to be different this time? This study aims to identify how the advancing technology impacts on employment security and it also focuses on the aggregate consequences derived from the spike in unemployment. Furthermore, this study also identifies methods that will help to mitigate the impacts of the advancing technology on employment and emphasizes the importance of government interventions regarding investing more into education and to employ measures to boost consumption and improve economic activity.

In line with that I am looking to identify key individuals who may contribute to my research in this context. As a key person in the area of economics, your experience, views and thoughts on this subject would be invaluable in providing a broader context to this dissertation.

The interviews will be conducted ensuring that participant anonymity can be protected if required. While the preference for participant completion will be face to face, these interviews can be conducted via a medium and time that would suit.

On agreement to engage within this process, I will forward a consent form for you to complete prior commencement of the interview.

Many thanks in advance for your time on this matter.

I look forward to your response

Kind Regards,
Timot Bocotan
National College of Ireland

Appendix 2: Interview Consent Form

A study about: The Next Industrial Revolution and the Advancing Technology: Will it be Different this Time? How does the Advancing Technology Contribute to the Increasing Unemployment and to the Rising inequality?

The study aims to explore how the emerging technological revolution might have a different impact on employment and it aims to investigate the relationship between technological advancement and the soaring inequality. Your participation will aid the research in providing reliable information for analysis of data.

Consent to take part in research

I ……. voluntarily agree to participate in this research study.

I have had the above purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.

I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.

I understand that participation involves providing personal thoughts and opinions regarding the effect of technology on labour demand as well as on the rising inequality

I understand that I will not benefit directly from participating in this research.

I understand that all information I provide for this study will be treated confidentially.

I understand that in any report on the results of this research my identity will remain anonymous. This will be done by referring to me as a numbered participant and disguising any details of my interview which may reveal my identity or the identity of any parties or people I speak about.

I understand that anonymised disguised extracts from my interview may be quoted in the undergraduate dissertation carried out by the researcher Timot Bocotan.

I understand that if I inform the researcher that myself or someone else is at risk of harm they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.

I understand that signed consent forms will be kept on file in a secure storage space, and original audio recordings will be retained on a secure, password protected (encrypted) digital storage device owned and accessed solely by the researcher Timot Bocotan for five years from the completion of the dissertation in accordance with National College of Ireland ethics policy.

I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.

I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Primary researcher for undergraduate dissertation: **Timot Bocotan**

School of Business

National College of Ireland

Email: **timo.bocotan@gmail.com**

Appendix 3: Interview Questions

1. During the past technological revolution, many have found labour absorption relevant, but economies often experienced full employment, and the technology played a key part in that. Why do people believe that the effects could be different this time?

2. Automation and AI are present in most Industries their development and implementation have greatly increased. Could this be the reason why many believe that the emerging technological revolution might not result in reaching the equilibrium in demand and supply of jobs?

3. Studies suggest that the capacity to innovate outraces the ability of the workforce to adopt to changes that technology creates in the job market. Is it true and if it is, how does this effect the rate of labour absorption?

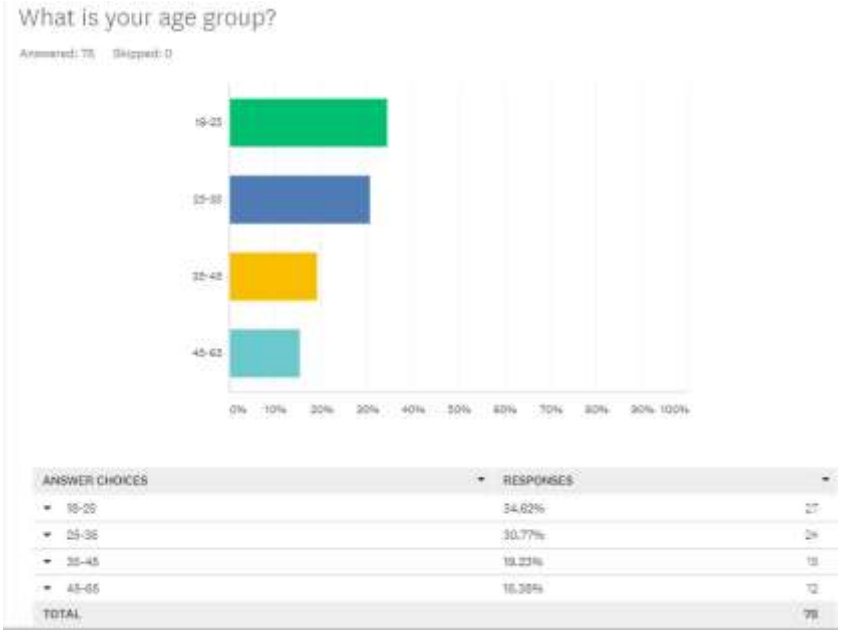
4. Is there a solution that can be suggested to minimize the possibility of increased unemployment? U.B.I. was suggested as a solution. Can U.B.I. contribute to increased consumption, will U.B.I be sufficient to compensate labour market participants whose job/skills become obsolete?

5. Has there been a suggestion regarding the source of funding for U.B.I? Would Taxing production where robots are used not result in DWL? Others have suggested that the funding could come from investing in funds by the government. What are the benefits and disadvantages of the aforementioned sources for U.B.I.?

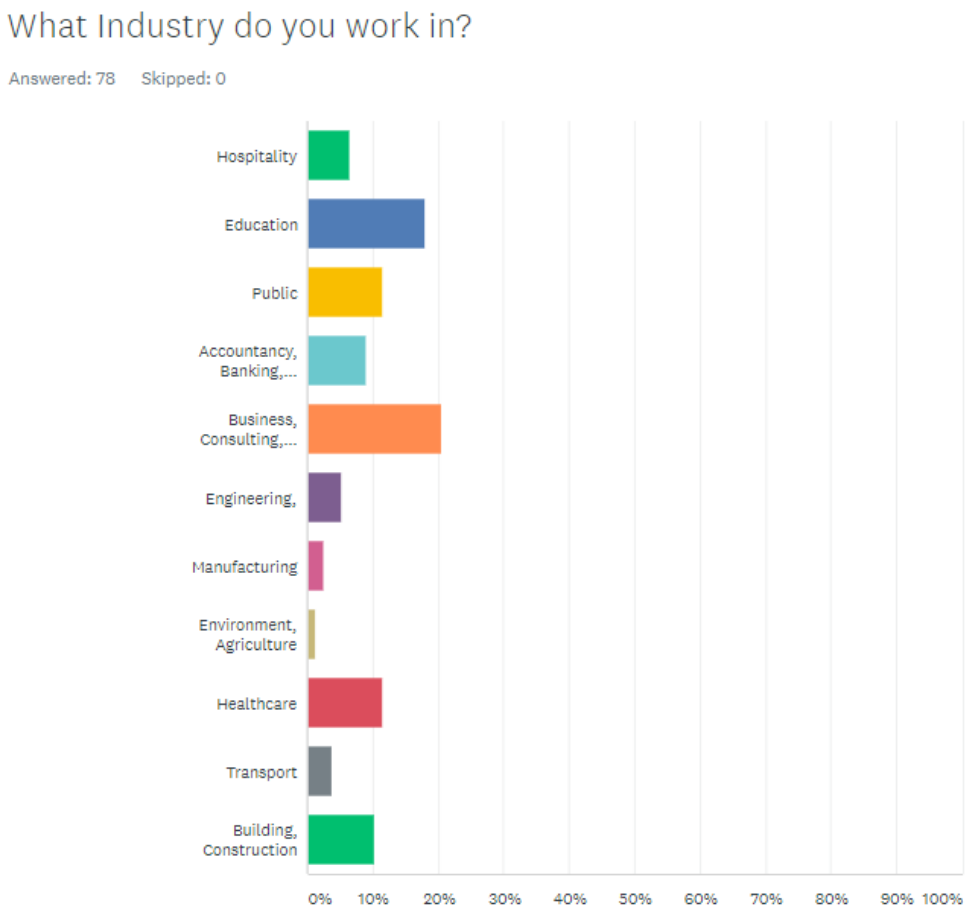
6. Studies have shown a positive relationship between the advancing technology and the soaring inequality. Do you think that technology is significant contributor? Would it be true that while the working class do benefit from the advancing technology, evaluating the benefits may reflect an unfair distribution of wealth from economic growth between the owners of capital and people who work for them?

7. Automation and AI present a number of benefits to businesses. A study has shown that robots can be cheaper to employ over time than Chinese factory worker. What could be the consequences if high developed economies like Germany and USA retract production plants from developing countries?

Appendix 4: Survey Questions



ANSWER CHOICES	RESPONSES	
18-25	34.62%	27
26-35	30.77%	24
36-45	19.23%	15
46-65	15.38%	12
TOTAL		78

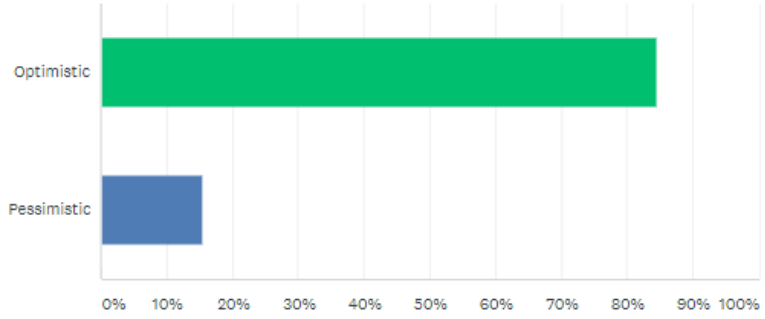


Q3

Customize Save as

What is your view about the effect of technological advancements (Automation and AI) on employment security?

Answered: 78 Skipped: 0



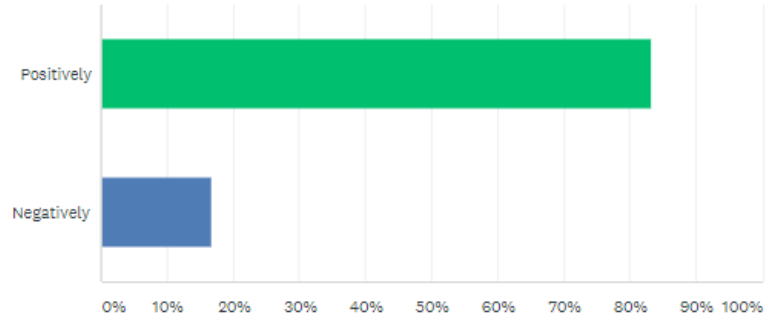
ANSWER CHOICES	RESPONSES	
Optimistic	84.62%	66
Pessimistic	15.38%	12
TOTAL		78

Q4

Customize Save as

How do you feel future technology will affect your job?

Answered: 78 Skipped: 0



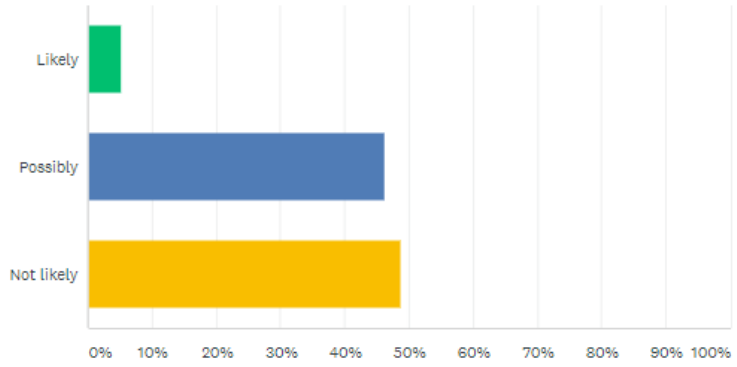
ANSWER CHOICES	RESPONSES	
Positively	83.33%	65
Negatively	16.67%	13
TOTAL		78

Q5

Customize Save as

In your opinion what is the possibility that future technology (automation and AI) will risk your current secure employment?

Answered: 78 Skipped: 0



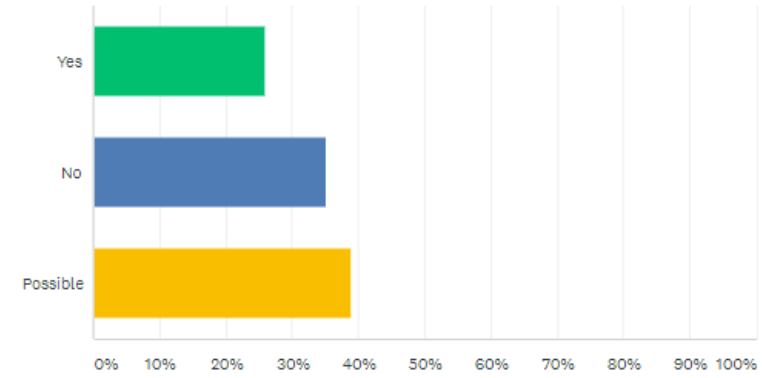
ANSWER CHOICES	RESPONSES	
Likely	5.13%	4
Possibly	46.15%	36
Not likely	48.72%	38
TOTAL		78

Q6

Customize Save as

Do you think that your current skills to perform your job will require an up-skill in the future?

Answered: 77 Skipped: 1



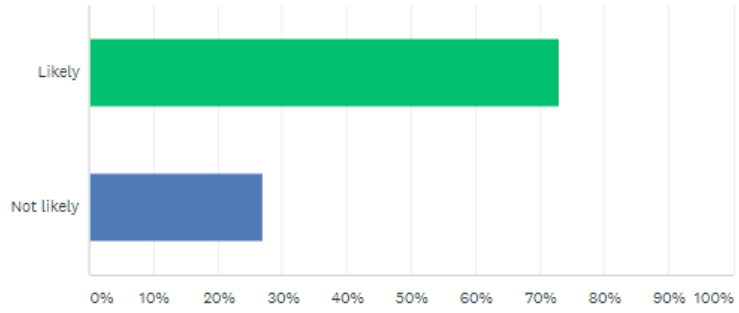
ANSWER CHOICES	RESPONSES	
Yes	25.97%	20
No	35.06%	27
Possible	38.96%	30
TOTAL		77

Q7

Customize Save as

How likely will you receive support from your employer or government in case you will need to up-skill yourself?

Answered: 78 Skipped: 0



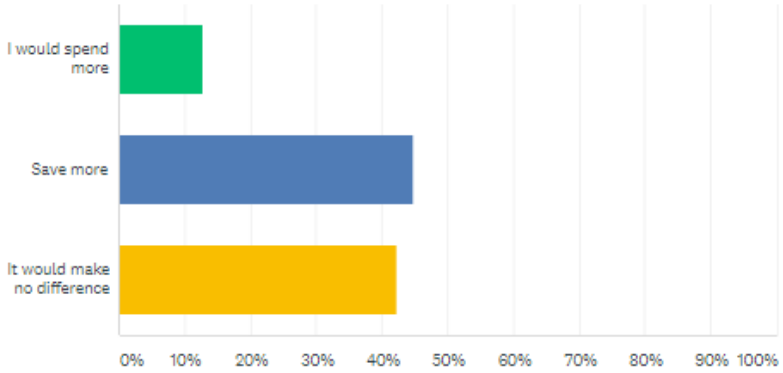
ANSWER CHOICES	RESPONSES	
Likely	73.08%	57
Not likely	26.92%	21
TOTAL		78

Q8

Customize Save as

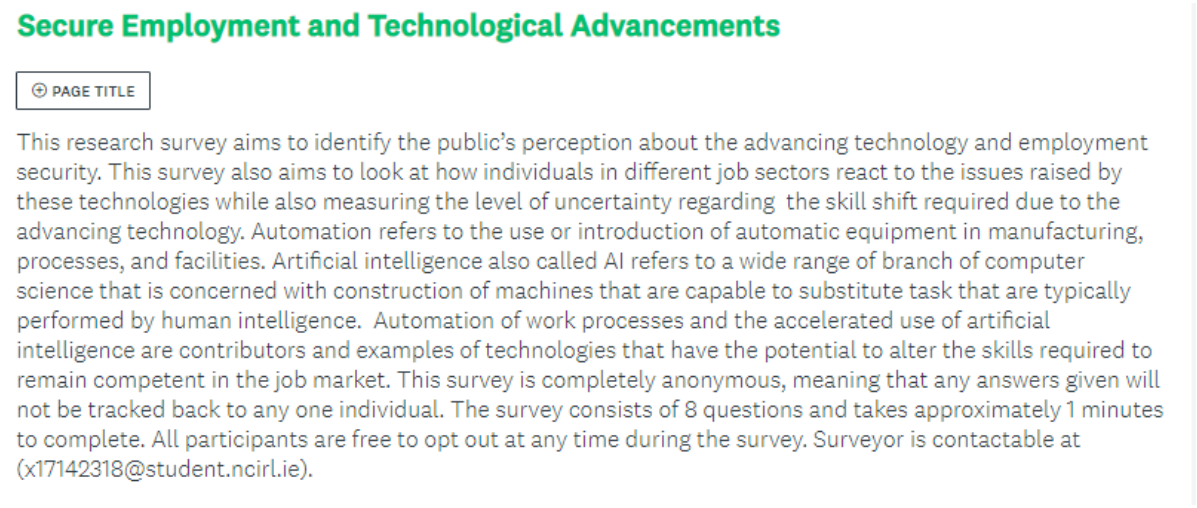
U.B.I (Universal Basic Income) is a suggested method that aims to provide a basic income level and therefore reduce the negative effect of labor adsorption on household consumption. How would U.B.I impact your expenditures?

Answered: 78 Skipped: 0



ANSWER CHOICES	RESPONSES	
I would spend more	12.82%	10
Save more	44.87%	35
It would make no difference	42.31%	33
TOTAL		78

Appendix 5: Survey Introduction



Appendix 6: Link to the survey

https://www.surveymonkey.com/r/W735PD8