Professional Computing Practice

COSC1147 Assignment 2

Automation: How it affects the Australian Job Industry

Solomon Claringbull: s3663489
Kurt Invernon: s3663139
Susanna Huang: s3609812
Duncan Do: s3718718

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Introduction

Over the years, the use of technology has been widespread across the globe. The way individuals live their lives has changed immensely due to technology, with both positive and negative effects on us all. Though people may initially think of automation of jobs as a dystopian future where manufacturing plants would be filled with humanoid robots taking over the world, the fact is that the technology has advanced automation in ways unimaginable before. The issue of automation effects on the job industry has been one that has been in development for many years now, only to be exacerbated by the sheer speed that technology has grown and flourished. Therefore it is now more important than ever to identify and address the issues that automation has caused in different job industries, particularly as individual livelihoods are being threatened through the automation of their jobs.

Automation is defined as the introduction of 'labor-saving technology', where automatic equipment and technology is used to make processes run with minimal or no human assistance. In the context of the job industry, automation is referred to as systems or machinery that have either replaced the need for humans altogether, or greatly reduced the number of human staff onboard. The scope of the effect of automation spreads over many industries, including (but not limited to): transport, manufacturing, utilities, defense, mining and facility operations.

Background Analysis

As our society becomes more technologically advanced, we move closer and closer towards a completely automated society. When compared to a human worker, automation tends to be much more efficient and effective when completing tasks and does not need to be paid a wage, therefore it is extremely cost-effective for businesses to administer automation. Implementing automation means the initial workers must be supplanted and it is estimated that 44% of Australian jobs are at risk of automation, leaving many Australians at the risk of losing their jobs [1].

Figure 1 indicates the Australian occupations with the highest and lowest susceptibility to automation as of 2014 [2]:

Table 3.2: Top and bottom 20 occupations by automation susceptibility, 2014

20 highest automation scores		20 lowest automation scores	
Occupation	Automation score	Occupation	Automation score
Telemarketers	99.0	Dietitians	0.4
Bank workers	97.8	Hotel managers	0.4
Bookkeepers	97.7	Education advisers	0.4
Accounting clerks	97.2	Psychologists	0.5
Product quality	97.0	Dental practitioners	0.5
Payroll clerks	97.0	Speech professionals	0.6
Checkout operators	96.9	Education managers	0.7
Other clerical workers	96.7	School principals	0.7
Insurance investigators	96.6	ICT business analysts	0.7
Library assistants	96.3	Secondary teachers	0.8
Other sales assistants	96.2	Podiatrists	0.8
Switchboard operators	96.1	Occupational therapists	0.8
General clerks	96.0	Chiropractors	0.8
Inquiry clerks	95.9	Special educ. teachers	1.1
Secretaries	95.4	Agricultural scientists	1.1
Product assemblers	95.2	Pharmacists	1.2
Keyboard operators	95.1	Ministers of religion	1.3
Jewellers	95.0	ICT trainers	1.4
Debt collectors	95.0	Training professionals	1.4
Garden labourers	95.0	Office managers	1.4

Note: Official occupation names have been condensed in some cases

Source: Department of Industry, Innovation and Science analysis (2015)

Figure 1: Top and bottom 20 occupations by automation susceptibility
Source: D. Edmonds and T. Bradley, (2015), Mechanical Boon: Will Automation Advance Australia, Office of the Chief Economist
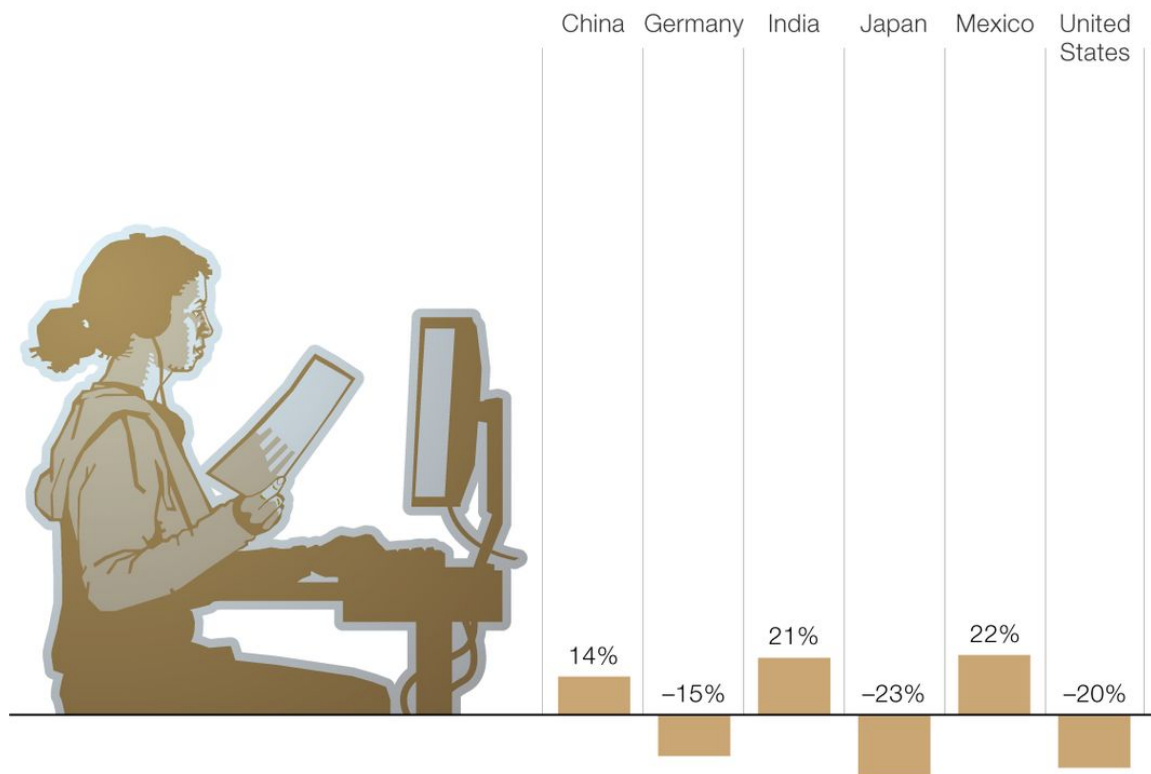
Figure 2: Employment Growth and Decline of Office Workers Worldwide, % change and labour demand
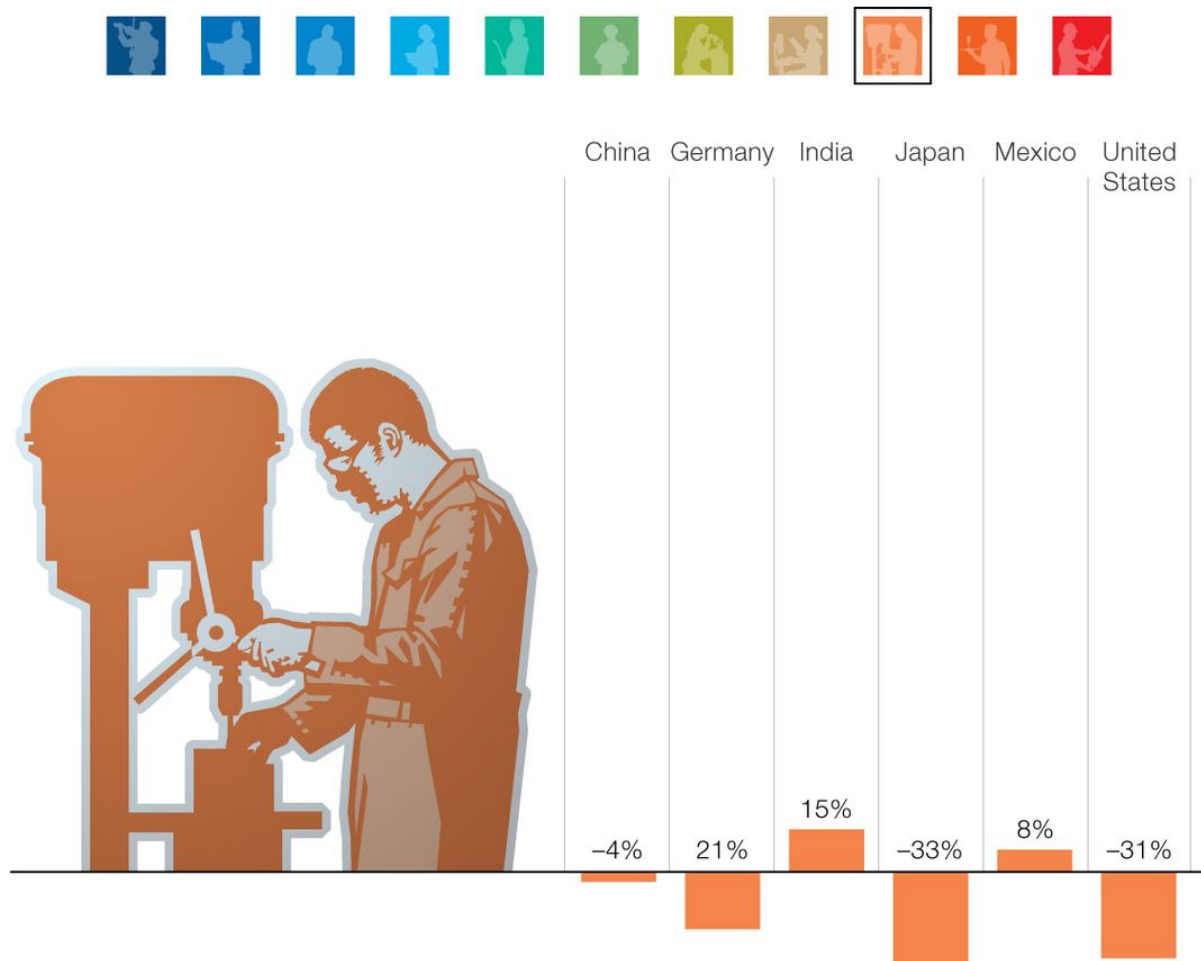*Source: Mckinsey & Company, (2018), What will automation mean for wages and income inequality, Mckinsey Global Institute*

As can be seen by Figures 1 and 2 automation typically affects clerical workers [3], such as:
- Telemarketers
- Checkout operators
- Bookkeepers
- Office workers [4]

However, automation does not exclusively affect this work, it also affects:
- People working in mines
  - Studies performed have estimated that the workforce of Australian mines would be reduced by 30-40% due to fully autonomous equipment [5].
- Factory or assembly line workers
  - Over 1 million Australians were employed in this industry as of 2005, and by 2015 this number had dropped to 930,000, and continues to deplete [1].

Figure 3: Employment Growth and Decline of Predictable Physical Work Worldwide, % change and labour demand
Source: Mckinsey & Company, (2018), What will automation mean for wages and income inequality, Mckinsey Global Institute

When we factor in the data from Figure 3 along with the stats regarding Australian factory/assembly line workers, the decline of employment in Predictable Physical Work is a worldwide trend [6]. This is due to these positions involving routine work, which has the highest susceptibility to becoming automated, as it tends to follow explicit rules which can be easily implemented into code [1, 4].

Automation also breaks a multitude of ethical values [7]:
- Workers do not have **equality**, as when automation is introduced to their workplace our current laws do not protect them from losing these positions (extrapolated in Legal Recourse).
- Businesses are lacking **fidelity** by not being loyal to their employees and choosing automation over them.
- Automation breaks **integrity** by not adhering to all ethical principles.

Automation is unsustainable in the Australian workforce due to a multitude of factors. This is particularly evident in:
- The enforcement of upskilling, despite some lacking the capabilities to do so;
- The elimination or reduction of sources of income (the introduction of automation in a workplace results in a 2% reduction to annual income for employees) [8];
- And how it decreases job opportunities and negates the education for certain fields eg. training for manual labor [5, 9].

Automation's impact on the environment has yet to be measured, as it has only emerged as a recent technology [10]. However, the operation of autonomous equipment will be similar to that of machining industrial robots, as both are robotic technologies [11] and their operation requires large amounts of power, detailed in Figure 4 [12].
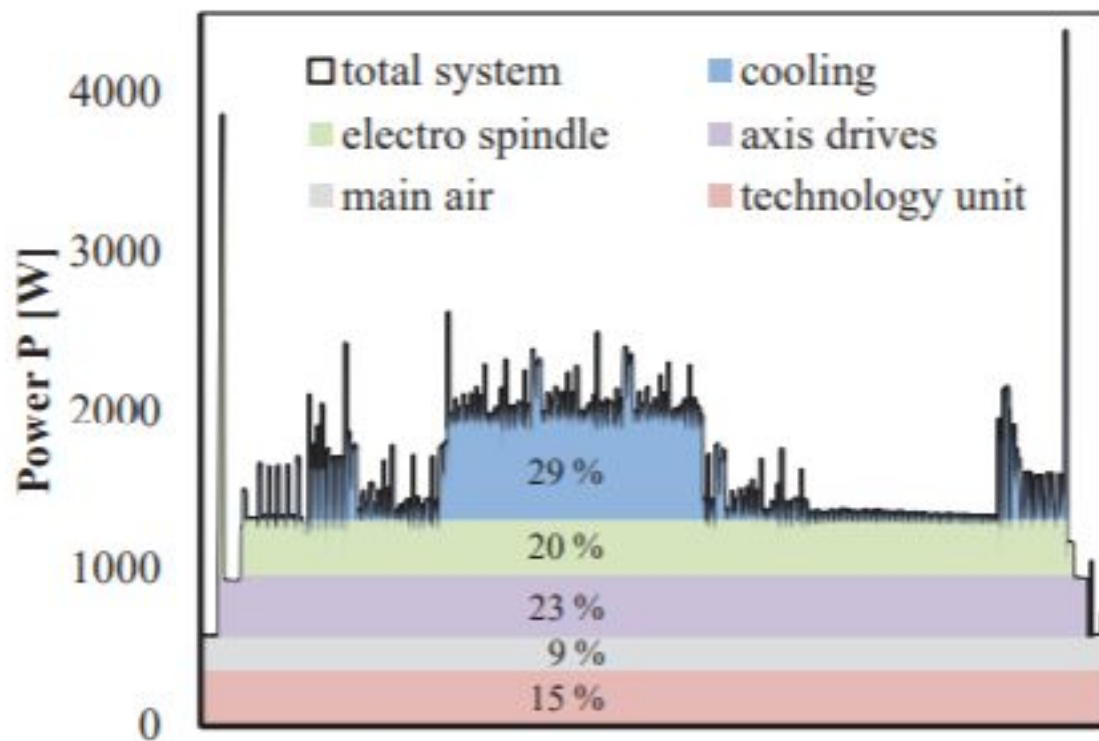

Figure 4: Power Profile Milling Test of Machining Industrial Robots
Source: E. Uhlmann, S Reinkober and T. Hollerbach, (2016), "Energy Efficient Usage of Industrial Robots for Machining Processes", Procedia CIRP

This power source is typically:
- Electricity
- Fuel [13]

Both are often created from fossil fuels, which have an adverse impact on the environment and are not viable sources of sustainable power. Therefore, until autonomous equipment can be operated without utilising these unsustainable resources, automation will continue to have a detrimental environmental impact [14].

Legal Recourse

In Australia, the current legal recourse available to employees losing their job due to automation is very limited [15]. This is largely in part due to the exponential growth of technology and automation in various industries coupled with the slow nature of introduction and implementation of legislation both statewide and federally.

This is shown through the fact that there are no specific laws around automation in Australia. Currently, the best protection that exists is the set of redundancy laws outlined in the Fair Work Act, 2009. These state that in the case of redundancy the employer must first consult with the employee and if reasonable and available, they must offer them another position within the organisation. However, these rules provide very little definite protection to the employee beyond where the employer has unfairly dismissed them, in which case the employee has 21 days to lodge a case with the Fair Work Ombudsman [16]. Australia is not alone in its lack of legal protection in this scenario, as the US and many other countries have even less protection available [17].

In terms of who exactly is legally responsible for the negative consequence of an employee losing their job, it is not clear cut as there are yet to be specific laws relating to this issue. The act of enacting laws to tackle this issue is not simple either, as the issue is broad and affects many different types of jobs across various industries. At the current stage however, it is up to companies to ensure that they are not unlawfully discharging employees.

Both the companies that create the automation technology and the companies that implement it must ensure that the automation systems and/or machinery does not harm anyone who uses it. The automation technology must be properly tested before deployment so as not to jeopardise the company that implements it. It must be ensured that the automation technology is implemented correctly to protect any staff that may still be around, usually to monitor the automated machinery and ensure that it is working without fault.

As there are currently no laws that specifically tackle the issue, lawmakers must make use of the knowledge of those that develop this technology and industry representatives to implement effective laws. This is particularly important as laws proposed in the past have come with side effects that restrict industry growth [18]. Lawmakers must juggle economic growth in various industries along with the livelihoods of employees working in those industries. However even if laws are implemented, lawmakers may also face issues in keeping up with the rapid change and development of technology and their subsequent effects on the job industry. Implementation of relevant and effective laws around technology as a whole has always been a slow and difficult process, and this is no different for laws relating to automation in the job industry.

Suggested Solutions

The issue of automation affecting occupations has been identified by several nations, each offering their own solution to the issue. Although each nation has their own way of approaching the issue, most fall into 1 of 3 categories:

The first category revolves around "creating new job opportunities through aggressive investment" [19]. This involves diverting a sizable portion of resources into creating occupations that are inoperable by automated machines [20]. These would be occupations that require high level decision making, judgement calls and human empathy, as such jobs are extremely difficult, if not impossible to automate.

The second category is "addressing increased rates of change with more effective education systems" [19]. A refactoring of education infrastructure will be required to prepare people for the rapid evolution of technology, ensuring the current "one-time" education model does not result in an obsolete career prospect.

The third and final category is "enhancing social safety nets to smooth automation impacts" [19]. This solution requires large scale government investment in a safety net for workers who are put out of a job due to automation. Implementing this solution will mean workers are able to survive in the current economic climate while "jobless" during said transition.

These are the most prominent suggested solutions. However, none are without their flaws. These flaws detract from the viability and sustainability of all aforementioned solutions.

The issue with "creating new job opportunities through aggressive investment" is that it does not take into account citizens with lower socioeconomic status. These citizens in routine/maintenance based jobs that are being taken over by automation are the only feasible jobs they can obtain.

As for "addressing increased rate of change with more effective education systems", the automation of mundane/routine work pushes the population to upskill so they can acquire higher skill jobs. Whilst an efficient education system would be highly beneficial for Australian citizens, refactoring the education system is an extremely expensive and time consuming task. Upskilling also takes time, and is slower than the current rate of technological advancement [20].

The final solution of "enhancing social safety nets to smooth automation impacts" is unclear, as it is unknown what level of investment is needed for the government to create a viable safety net. This is applicable as the ease of transition into a feasible alternative differs from individuals. [20]. Underestimate the amount required and it may leave citizens in economic failure, overestimate and it may leave the country in economic failure.

Case Study

Craig Sylvester is a 29 year old man, with a wife and one child. His wife works 3 times a week as a substitute teacher, but spends the rest of the week looking after their disabled, epileptic daughter, Sally. Craig works for BHP as a truck driver in a mine, however the automation of trucks is currently being implemented and is threatening his position.

The company has been unclear about what will happen to workers when the automation is fully implemented, however they have stated that all workers with sufficient training in other areas will be moved to those respective areas.

Craig does not have training in any other position than the one he currently holds, so he fears that BHP will soon make him redundant. If Craig loses his position, he and his wife will struggle to afford their rent and groceries, as well as Sally's anti-epileptic medication, which is a necessity due to her regular fits.

In this case, the first solution of creating new job opportunities is the most feasible and sustainable, for both Craig and the company BHP. This is because creating new job opportunities upskills citizens and puts them in positions that are less likely to be automated, such as a job that involves human interaction and emotion. This method also allows for the implementation of automation in the company to improve the overall productivity of the company. Furthermore, Craig is able to grow and improve his skill sets, which is beneficial to Craig as not only is he learning, his new skills may also open up new opportunities that will allow him to progress further in his career.

Therefore based on this solution, BHP will not be forced to render Craig redundant, they can just move him to a different sector of the mining industry by training him for another position.. Furthermore, if the government provides funding to companies that choose to implement automation, BHP can invest in creating training programs that focus on moving people to positions that will not be automated for some time, or at all. This also allows BHP to improve their productivity without being forced to lay off loyal staff members.

Through this case study, the implementation of the suggested solution results in a win-win situation for both the company and affected employees. Companies are able to implement automation systems that improve productivity whilst also ensuring that employees are not made redundant by providing training and therefore positions in other areas of the company.

Conclusion

It is clear that the ethical dilemma of automation and the effects it has on the job industry is one that is not easily solved, affecting a wide range of industries across Australia. Whilst it is important to promote productivity and growth in companies in these various industries, it is equally, if not more important to ensure that employees do not suffer as a result of this growth made possible by automation.

Currently this issue has been affecting mainly low-skill workers, such as bookkeepers, telemarketers and checkout operators. However, the number of jobs affected by automation continues to grow and shows no sign of slowing down. Furthermore, the lack of targeted laws in this area exacerbates the issue even more as more and more employees are made redundant with no effective legal recourse available to them.

As the issue is so widespread and broad, there have been several potential solutions identified. This includes upskilling of employees to allow them to move into occupations that are not possible to automate, refactoring of the education of the system to prepare for the inevitable technological advancements and also enhancing social safety nets through government investment.

References

[1] D. Edmonds and T. Bradley, "Mechanical Boon: Will Automation Advance Australia",
Office of the Chief Economist, 1st ed. Canberra, ACT, Australia
July 2015. [Online]. Available:
https://www.industry.gov.au/sites/default/files/June%202018/document/pdf/mechanical-boon
_-_will_automation_advance_australia.pdf?acsf_files_redirect [Accessed: 26 - April 2020]

[2] D. Edmonds and T. Bradley, "Table 3.1: Calculating automation scores — example
occupations", *Mechanical Boon: Will Automation Advance Australia,* 1st ed., p. 8, July 2015.
[Online]. Available:
https://www.industry.gov.au/sites/default/files/June%202018/document/pdf/mechanical-boon
_-_will_automation_advance_australia.pdf?acsf_files_redirect [Accessed: 26 - April 2020]

[3] Mckinsey & Company, "Employment growth and decline by occupation, % change labor
demand, midpoint automation: Office support", *What will automation mean for wages and
income inequality,* Mckinsey Global Institute, March 2018. [Online]. Available:
https://www.mckinsey.com/featured-insights/future-of-work/what-will-automation-mean-for-w
ages-and-income-inequality [Accessed: 26 - April 2020]

[4] Mckinsey & Company, "What will automation mean for wages and income inequality"
Mckinsey Global Institute, March 2018. [Online]. Available:
https://www.mckinsey.com/featured-insights/future-of-work/what-will-automation-mean-for-w
ages-and-income-inequality [Accessed: 26 - April 2020]

[5] S. Holcombe and D. Kemp, "Indigenous peoples and mine automation: An issues paper",
Elsevier vol. 63, 1st e, October 2019. [Online]. Available:
https://www-sciencedirect-com.ezproxy.lib.rmit.edu.au/science/article/pii/S03014207193028
2X [Accessed: 26 - April 2020]

[6] Mckinsey & Company, "Employment growth and decline by occupation, % change labor
demand, midpoint automation: Predictable Physical Work", *What will automation mean for
wages and income inequality,* Mckinsey Global Institute, March 2018. [Online]. Available:
https://www.mckinsey.com/featured-insights/future-of-work/what-will-automation-mean-for-w
ages-and-income-inequality [Accessed: 26 - April 2020]

[7]. Texas Tech University, "Recommended Core Ethical Values" Murdough Center for
Engineering Professionalism. [Online]. Available:
http://www.depts.ttu.edu/murdoughcenter/products/resources/recommended-core-ethical-val
ues.php [Accessed - 27 April 2020]

[8] J. Bessen and J. Kossuth, "Research: Automation Affects High-Skill Workers More Often, but Low-Skill Workers More Deeply", Harvard Business Review, Feb, 2019. [Online]. Available:
https://hbr.org/2019/02/research-automation-affects-high-skill-workers-more-often-but-low-skill-workers-more-deeply [Accessed 28 - April 2020]

[9] H. J. Holzer, "Will robots make job training and workers obsolete workforce development in an automating labor market" Brookings, June 2017 [Online]. Available:
https://www.brookings.edu/research/will-robots-make-job-training-and-workers-obsolete-workforce-development-in-an-automating-labor-market/ [Accessed: 26 - April 2020]

[10] A. Bond and J. Dusik, "Impact assessment for the twenty-first century – rising to the challenge" Impact Assessment and Project Appraisal, vo. 38, no. 2, pp. 94-99, Oct. 2019. [Online]. Available:
https://www-tandfonline-com.ezproxy.lib.rmit.edu.au/doi/pdf/10.1080/14615517.2019.1677083?needAccess=true& [Accessed: 28 - April 2020]

[11] E. Uhlmann, S Reinkober and T. Hollerbach, "Energy Efficient Usage of Industrial Robots for Machining Processes", Procedia CIRP, vol. 48, pp. 206-201, 2016. [Online]. Available:
https://www.sciencedirect.com/science/article/pii/S2212827116305303 [Accessed: 28 - April 2020]

[12] E. Uhlmann, S Reinkober and T. Hollerbach, "Fig.6 Power profiling milling test", Procedia CIRP, vol. 48, pp. 210, 2016. [Online]. Available:
https://www.sciencedirect.com/science/article/pii/S2212827116305303 [Accessed: 28 - April 2020]

[13] J. Dusik and B. Sandler, "What Effect Will Automation Have on the Environment" International Institute for Sustainable Development, January 22nd, 2019. [Online. Available:
https://www.iisd.org/blog/automation-environment [Accessed: 26 - April 2020]

[14] J. Dusik, T. B. Fisher, B. Sadler, R. Therivel, "Strategic Environmental and Social Assessment of Automation: Scoping Working Paper", July 2018. [Online]. Available:
https://www.researchgate.net/publication/326461326_Strategic_Environmental_and_Social_Assessment_of_Automation_Scoping_Working_Paper [Accessed 28 - April 2020]

[15] The Australian Financial Review. "Australia unprepared for automation of its workforce". [Online]. Available:
https://www.afr.com/technology/australia-unprepared-for-automation-of-its-workforce-20170730-gxlwj5 [Accessed 28 - April 2020].

[16] Fair Work Ombudsman. "Redundancy - Fair Work Ombudsman". Fair Work Ombudsman. [Online]. Available:
https://www.fairwork.gov.au/ending-employment/redundancy [Accessed 29 - April 2020].

[17] The Conversation Media Group Ltd. "Worker-protection laws aren't ready for an automated future". [Online]. Available: https://theconversation.com/worker-protection-laws-arent-ready-for-an-automated-future-119051 [Accessed 29 - April 2020].

[18] P. Gahan. "The Future of Work and Labour Law". anzsog.edu.au. [Online]. Available: http://anzsog.edu.au/documents/file/5322-future-of-work-related-article-peter-gahan-wel [Accessed 28 - April 2020].

[19] M. Cerf, R. Burke, S. Payne. "3 Practical Solutions to Offset Automation's Impact on Work." singularityhub.com. [Online]. Available: https://singularityhub.com/2019/03/11/3-practical-solutions-to-offset-automations-impact-on-work/ [Accessed 28 - April 2020]

[20] P. Da Costa. "A solution to job-stealing robots is staring us right in the face." businessinsider.com. [Online]. Available: https://www.businessinsider.com.au/retraining-solution-to-robots-automation-2017-7?r=US&IR=T [Accessed 28 - April 2020]