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Olympic Boycott by Audrey Tai

When flipping through the latest issue of *Vogue* or skimming the recipes in *Bon Appetit* As China continues to commit human rights violations against minority populations like the mass imprisonment of Uighur Muslims, the elimination of democracy in Hong Kong, and the feigning ignorance over the Tiananmen Square massacre, the world is complicit and seems to take no action. The Chinese government's crimes of repression, hate, and violence call for economic and political action by other countries, but fear of retaliation results in silence. The Beijing Winter Olympics provided a perfect opportunity for the US to make a clear political statement and take action to protest China's repressive policies. However, on December 6, 2021, President Biden announced a US diplomatic boycott of the Beijing Olympics to signal disapproval of China's human rights abuses. Biden did not send an official US delegation but stated that the athletes competing for the US have full support from the White House and are "beyond politics" (Shesgreen, Schad). Rather than take a weak stance through a diplomatic boycott, the US and other countries should make a stronger political statement separate from the Olympic games. There is a long history of political conflicts in the Olympics, and it is the responsibility of the IOC to ban countries from hosting the Olympics who have committed large-scale human rights violations.

The boycott from the beginning was unsuccessful; human rights groups in the US called for a full boycott that would include the athletes, but the US Olympic and Paralympic Committee (USOPC) declined, determining that it would be detrimental to athletes. The president of the USOPC said, "while we would never want to minimize what is happening from a human rights perspective in China, we do not support an athlete boycott. We believe such boycotts have not been effective in the past... those boycotts only hurt athletes who have trained their entire lives..." (Cancian). Australia, Canada, Japan, and the UK joined the US in the diplomatic boycott by not sending officials to the Olympic games. However, other allies of the US criticized the boycott as "insignificant and symbolic" and said the "administration has fumbled an opportunity to organize a wider and more influential diplomatic boycott that lacks even a single participant from Africa, Latin America, and Southeast Asia," with even fewer countries that supported the boycott of the 1980 Soviet Olympics (Kine). Though the International Olympic Committee (IOC) said they respected the US's decision, the China Foreign Ministry warned that the boycott would result in firm countermeasures.

Biden's approach to the boycott was minuscule compared to the atrocities committed by the Chinese government in censorship, restricted education and ethnic cleansing throughout the nation's history. As the Tiananmen Square protests were gaining momentum, gathering around one million protesters, army troops surrounded the city, killing an estimated 10,000 people ("Tiananmen Square Incident"). The massacre is still completely omitted from the history curriculum at Chinese schools, and patriotic programs, such as the Patriotic Education Campaign, celebrated the contributions of the army and the communist party in order to restore their image. China has done very little to memorialize the Tiananmen Square protests, and much to eliminate the topic from history. Another form of censorship is the restriction of educational and technological resources. With 1.4 trillion yuan spent on public security, the Chinese government conducts thorough surveillance of the internet activity of its citizens in addition to using cameras in major cities to track and publicly shame citizens, with recognition being 99.8% accurate (Thompson). Popular western social media apps like Twitter and Instagram are replaced with Chinese versions like Oasis and Sina Weibo that can be closely monitored and censored. Under the guise of using these security measures to track criminals, the Chinese government also censors activists attempting to spotlight human rights abuses in their own country.

Another reason China should not have been permitted to host the 2022 Winter Olympic Games is because of the government's treatment of Uighurs. Since the Chinese government believes that any sort of religion is a threat to their influence and power, they forced around one million Uighur Muslims into "re-education camps" in Xinjiang province, essentially imprisoning them without legal justification. The overall mission of the Chinese government is to eradicate the entire Uighur population and religion: women are forced into hysterectomies and abortions to prevent population growth, and mosques are ridiculed and defaced. Claiming that the camps protect China from Islamist extremism and terrorism, the government maintains that they are acting in the best interest of its citizens (BBC News).

The Chinese government's infiltration of Tibet and Hong Kong is another human rights violation that makes the nation unfit to host the Olympic games. Originally, the Tibetan government protested China, but delegates were forced to sign a treaty that would soon allow the Chinese to invade Tibet. China aims to eliminate Tibetan culture through genocide, reintroducing labor camps and rounding up thousands of Tibetans in order to relocate them and commercialize Tibetan land and resources. And even though Tibet legally is an autonomous region, their

religion is closely monitored as China governs most of the land. In Hong Kong, people's democratic rights are slowly being claimed by Beijing. Citizens live under basic law that protects freedom of speech and assembly; however, they are still partly influenced by China as all leaders are selected by the Chinese president, Xi Jinping. Mainland China also established a new national security law over Hong Kong that criminalizes pro-democratic protests. The law gives power to Beijing, restricting Hong Kong's independence and freedom of expression.

Though China has considerable political power, the IOC ultimately has power over the Olympic games. The IOC should use its position to act in stronger defense of human rights. To maintain neutrality, the IOC Rule 50 bans any "kind of demonstration or political, religious, or racial propaganda," but this rule mainly harms minority athletes. It is understandable for the rule to be in place to prevent violent hate speech, symbols, or ideologies, but it also politicizes human rights; athletes with huge platforms looking to support the BLM or the StopAsianHate movement are unable to show solidarity with marginalized groups since those topics are labeled as "too political." The athletes are independent people and should be allowed to compete while expressing themselves. Competitors do not change the neutrality of the event by expressing their opinions, as they are not speaking on behalf of their countries or governments.

The Olympics have historically been politically charged: "Six times [...] countries officially boycotted the Olympic Games, with as few as three countries refusing to compete in 1964 and as many as 65 nations staying home in 1980" (Kennedy). For example, South Africa was banned from participating because of apartheid, and North Korea boycotted the 1988 games in South Korea. By hosting the 2022 Winter Olympic games, China profited economically while enjoying a boost to their international influence as the games became a cover-up for their past and ongoing human rights violations. The Olympics should not be even held in the United States, a nation responsible for countless deaths of people of color. The founding of the nation was an act of theft from indigenous peoples who were subsequently erased from history; black people were kept as slaves and still suffer from systemic racism centuries later.

Holding the Olympics in countries like China or the US creates a false sense of normality and masks human rights violations while letting the host country profit, disregarding the atrocities and trauma minority populations have endured. Action from the government and foreign governments needs to be taken to save the lives and cultures of those who have fallen victim to the human rights abuses in China. The IOC should be clear-eyed about their role and

responsibility in the geopolitical landscape. The Human Freedom Index, which is an “annual report that evaluates the state of human freedom in 165 countries and territories around the world,” scores categories such as “Rule of Law” and “Regulation” should be a standard to which the IOC evaluates each eligible host country. They should look to companies with high scores, like Switzerland, New Zealand, and Estonia, which have the highest human freedom indexes. Measures like this would be a small step in addressing China’s human rights problem.

Work Cited

- BBC News. "Who Are the Uyghurs and Why Is China Being Accused of Genocide?" *BBC News*, 21 June 2021, www.bbc.com/news/world-asia-china-22278037.
- Cancian, Dan. "'Boycotts Don't Work': U.S. Olympic Committee Rejects Calls to Shun Beijing 2022 Games." *Newsweek*, 11 Mar. 2021, www.newsweek.com/u-s-olympic-committee-rejects-calls-winter-olympic-games-boycott-1575376.
- "Freedom Index by Country 2022." *World Population Review*, worldpopulationreview.com/country-rankings/freedom-index-by-country. Accessed 3 Apr. 2022.
- "Hong Kong | History, Location, Map, and Facts." *Encyclopedia Britannica*, www.britannica.com/place/Hong-Kong. Accessed 28 Mar. 2022.
- Kennedy, Lesley. "6 Times the Olympics Were Boycotted." *HISTORY*, 26 July 2021, www.history.com/news/olympic-boycotts.
- Kine, Phelim. "'Checking a Box': Biden's Beijing Diplomatic Boycott Flop." *POLITICO*, 20 Jan. 2022, www.politico.com/newsletters/politico-china-watcher/2022/01/20/checking-a-box-bidens-beijing-diplomatic-boycott-flop-495781.
- Kuang, Wing. "How China's Patriotic Education Became One of the 'Longest Successful Propaganda Campaigns.'" *ABC News*, 4 July 2021, www.abc.net.au/news/2021-07-05/ccp-patriotic-education-young-people-in-australia/100260298.
- "NPR Cookie Consent and Choices." *Facial Recognition And Beyond: Journalist Ventures Inside China's "Surveillance State,"* 5 Jan. 2021, www.npr.org/2021/01/05/953515627/facial-recognition-and-beyond-journalist-ventures-inside-chinas-surveillance-sta.
- Rogin, Josh. "China's Atrocities in Tibet Are Growing Too Big to Ignore." *Washington Post*, 24 Dec. 2020, www.washingtonpost.com/opinions/global-opinions/chinas-atrocities-in-tibet-are-growin-g-too-big-to-ignore/2020/12/24/ba9d5c4e-4624-11eb-b0e4-0f182923a025_story.html.
- Shesgreen, Deirdre, Schad, Tom. "Citing 'ongoing Genocide,' Biden Announces Diplomatic

Boycott of 2022 Beijing Olympics.” *USA TODAY*, 6 Dec. 2021, www.usatoday.com/story/news/politics/2021/12/06/2022-winter-olympics-biden-announces-diplomatic-boycott-beijing/8837884002.

Thompson, Adrienne. “China’s ‘Sharp Eyes’ Program Aims to Surveil 100% of Public Space.” *Center for Security and Emerging Technology*, 2 Mar. 2021, <https://centerforsecurityandemergentechnology.org/article/chinas-sharp-eyes-program-aims-to-surveil-100-of-public-space/>.

“Tiananmen Square Incident | Summary, Details, and Facts.” *Encyclopedia Britannica*, www.britannica.com/event/Tiananmen-Square-incident. Accessed 27 Mar. 2022.

Xu, Beina. “Media Censorship in China.” *Council on Foreign Relations*, 17 Feb. 2017, www.cfr.org/backgrounder/media-censorship-china.

How Has The COVID-19 Pandemic Affected The Workers Perception of Automation In The Food Processing & Manufacturing Industry? How Has Perception of Automation Affected Job Satisfaction During COVID-19? By Calvin Boasberg

Abstract

This study aimed to see if COVID-19 has had an effect on the perception of automation and if the new perception of automation has changed job satisfaction in the food processing industry. To answer this question, five managers in the food processing industry were interviewed from two different companies, and they shared their perspectives on automation. The results proved that COVID-19 was a catalyst in making participants view automation in a more positive light because of the labor crunch and the unavailability of humans. Additionally, the results showed that automation increased job satisfaction because increased automation decreased stress. The implication of this research is that companies could be more incentivized to automate after COVID-19, possibly further displacing workers.

Introduction

One of the most extensive drivers of the increase in productivity in the modern economy is automation. Automation is when a machine replaces a worker's task (Auter). As a new machine is introduced into a task, a worker is no longer needed for that task, resulting in either the worker's job to shift or job termination. As the use of artificial intelligence increases, an increasing number of jobs will become automated because it is more efficient to employ a robot than a human. As high as 47% of all jobs are susceptible to automation in the near future (Frey and Osborn). However, job loss from automation is not just a modern occurrence; it has been happening for the better part of the 20th century (Auter; Vermulen; Connolly-Barker). For example, in 1958 longshoremen held a protest in New York City to unionize against the rising tide of automation, and in 1962 John F. Kennedy even ranked automation as the number one job challenge (Nevard; Braestrup). Automation will continue to expand as technology advances, but what does that mean for the future of work?

In spite of the problem of automation and job loss, the job market has been constantly growing. In the US alone, between 1998-2008, 20 million new jobs were created (Total Job Openings). Contrary to common beliefs, automation does not create a scenario where all jobs are lost. In the short run, automation replaces workers' tasks; however, in the long run, more tasks

are generated (Mokyr et al.). Automation creates tasks in three ways: first, it creates new industries supporting the machines; second, companies can increase production and, in turn, profits, allowing them to expand; and, finally, companies can lower prices, allowing consumers to buy more (Mokyr et al.). While automation has been slowly changing the way the job market operates for some time, COVID-19 has greatly changed the global economy in a short period of time.

Since the end of 2019, the world has been wrapped up in a global pandemic of unseen proportions, which has created massive social dilemmas and taken a toll on the worldwide economy. COVID-19 has caused disruptions to the supply chain and world trade. Supply chains are affected in two ways: either a manufacturer is shut down from a lockdown, preventing further downstream production, or trade is blocked from one country to another (Agrawal et al.). COVID-19 has also forced businesses to temporarily shut down in an attempt to prevent the spread of COVID-19. The down side of shutting these businesses down is the workers become temporarily laid off, and can no longer support other business, forcing other companies to lay off workers (Asahi et al.; Agrawal et al.; Hossain).

COVID-19 has been detrimental to the economy; however, it may increase efficiency in the long run through increased automation. In past recessions automation has generally increased, and even though COVID-19's recession has been unique in origin, its end result has still been the same: increased automation (Blit).

Definitions

- Automation- a machine or technology that replaces a human task (Auter)
- COVID-19-The Novel Coronavirus SARSCoV2 originated from Wuhan, China, in late 2019 and is part of the Coronavirus family of viruses. It has become a worldwide pandemic (Velavan and Meyer)
- Job satisfaction- The enjoyment or pleasure one gets from doing a task or series of tasks in a job (Schwabe and Castellacci)
- Grounded theory- qualitatively creating a theory through finding common themes throughout written data sets (Cresswell and Cresswell)

- Qualitative research- Research that does not involve numerical data. Generally, qualitative research is based around open-ended questions with data that can not be categorized through numerical data (Cresswell and Cresswell)
- Correlation research- A quantitative form of research that looks at the correlation between two variables. Correlation research is normally measured through statistical analysis (Simon and Goes)
- Phenomenological Analysis- data analysis that involves breaking down a phenomenon and finding its effect (Merriam and Tisdall)

Literature review

COVID-19 has had an unprecedented impact in a short span of time, profoundly changing the global economy (Agrawal et al.). In looking at whether COVID-19 is likely to impact automation and the ramifications of that automation on job satisfaction, it is helpful to review previous literature on automation and job satisfaction.

One study published by the journal Sustainability examined three possible scenarios that automation can create: "end of work" (automation takes all the jobs leaving humans unemployable), "structurally lower" (automation takes a large chunk of the jobs, but humans still perform the majority of jobs), or "rebound" (automation creates new jobs). It concluded that the end of work scenarios is theoretically possible, but its outcome is improbable. Instead, the most likely scenario is the rebound scenario because as automation increases, more jobs will be created in the long run through new industries and spillovers into complementary sectors (Vermeulen et al., 2018). Thus, automation plays a crucial role in creating more jobs, but it does not mean automation is without its negative consequences (Vermeulen et al.; Blit; Butt; Auter; Connolly-Barker).

A number of studies have researched the correlation between job satisfaction and automation, and found the psychological effect of fearing that one's job will be taken away can negatively affect job satisfaction (Schwabe and Castellacci; Abeliansky et al.; Shoag et al.). A study conducted in Norway surveyed a wide variety of people over three years and found that roughly 40% of workers feared that a machine would replace their job at some point. This fear of replacement was not just in low-wage earners. It was also present in people who received a tertiary education (Schwabe and Castellacci). The fear of replacement not only causes stress and

anxiety, but it can also decrease motivation to work. The study posits the fear of replacement is a result of the media sensationalizing the negative, catchy aspects of automation, giving people a false perception of reality (Schwabe and Castellacci).

Another study between automation and job satisfaction researched truck drivers in the United States of America (Shoag et al.). The study found in a survey that 56% of drivers thought that autonomous vehicles would dominate roads in the coming decades. Moreover, changing careers for the drivers was not realistic because of the financial instability that comes with retraining. This over-competitiveness creates an unhealthy work culture, and therefore a decrease in job satisfaction (Shoag et al.).

While it may seem that automation has no positive benefits on job satisfaction, in certain cases it can. Machines have the capability to create massive upheaval but can also reform jobs (Wilkinson et al.; McGuinness, Abeliansky et al.). When a machine does not replace a worker but does replace some of their tasks, this can create a positive effect on job satisfaction because it replaces tedious, monotonous tasks with non-routine tasks and forces workers to upskill. However, this positive effect is usually in high-wage earning positions with a high level of education (McGuinness).

Mental health and job satisfaction have not only been affected by automation but they have also have been affected by the current pandemic. Covid-19 has put a toll on workers' mental health and job satisfaction; however, there is no consensus on its overall impact (Alrawashdeh et al.; McNamara; Orrell and Leger; Ahmad). Some researchers believe that COVID-19 increased job satisfaction by allowing workers to work from home, giving them a better work life balance (Orrell and Leger). Others argue that work from home isolates employees (Ahmad). In-person work, on the other hand, employees had decreased job satisfaction (McNamara; and Alrawashdeh et al.). Doctors, in particular female doctors, have been feeling burnout and have had a strong urge to quit (McNamara; and Alrawashdeh et al.).

COVID-19 has not only impacted job satisfaction and mental health; it has also increased automation's threat. Even though automation and job replacement have been persisting for the better part of the past couple of centuries, COVID-19 has provided a catalyst for increased automation (Sol et al., 2020; How investment in A; Blit; Chernoff and Warman). COVID-19's recession and all previous recessions have increased automation (Blit). There are currently three possible reasons why this is true: first, firms are facing failure and need to improve efficiency;

second, firms have a lower opportunity cost during recessions; third, recessions change the relative cost of laying people off. All these reasons have the same goal of increasing efficiency to maintain competitiveness (Albanesi and Kim; Blit). While the cause of the COVID-19 recession may differ from previous recessions, its result has still been the same: layoffs and incentivization of automation (Blit).

In fact, COVID-19's uniqueness produces more reasons to automate than previous recessions. With the health implications that arise from COVID-19, there is more reason to automate because firms cannot rely on the physical health of workers to continue production (Chernoff and Warman). Furthermore, during the COVID-19 pandemic, there has been a massive amount of volatility, creating a need for employers to implement artificial intelligence to help deal with uncertainty in the future (How investment in AI). The most vulnerable sectors to automation during the pandemic have been high contact and limited space workplaces, while jobs that can switch to working from home have been less affected (Sol et al.). COVID-19's full effect on the economy is still unknown, but the possible ramifications from COVID-19 could increase automation long term.

COVID-19 has heavily impacted manufacturing as a whole because factories have close quarters and long hours, making them susceptible to outbreaks or other COVID-19 related setbacks (Asahi; Contreas et al.). In order to stop outbreaks, social distancing measures have to be implemented, creating a loss in production, especially in industries with perishable goods such as food (Shahbaz et al.; Alikord Molae-Agheee). In the food processing sector, where hygiene is critical to prevent the spread of COVID-19 and other germs, producers have been forced to adapt to stay competitive (Shahbaz et al.). In Los Angeles, food production facilities had the second most outbreaks, only being beaten out by grocery stores (Contreas et al.). As a result, food producers now have higher costs, which could change production methods, increasing in automation (Blit).

There have been few studies on automation in the food processing industry, but some are noted below. In the food and beverage (F&B) industry, innovation methods have been crucial to staying ahead. In South Africa, an intensely competitive F&B market, companies have been forced to automate to maintain competitiveness.(Ronquest-Ross et al.). Similar results have been found in the F&B industry in Singapore (Khan et al.). While in the United Kingdom, Butler studied the effect that automation has had on the milking process in cows. Butler found that

automation gave the farmers more time for other chores and caused less stress on the cow because the cows got to choose when they got milked through the automated milking process. The new process also gave farmers more accurate data on the health of the cows. The study concluded that automating this process in a shrinking dairy market was crucial for creating an interest in farming and helping firms stay competitive (Butler et al.). There has been an increase in automation in the food industry around the world, mainly in packaging and palletization, and one study predicted that automation in this industry will increase drastically as technology improves (Nayik et al.). According to a number of studies, the increase in automation will prevent the tainting of food from human pathogens, create safer work environments, create more consistent products, and increase efficiency (Nayik et al. ; Ronquest-Ross et al.; Khan).

Automation has been integral to our economic growth by increasing production and creating new jobs. At the same time, it has taken a toll on mental health and job satisfaction. No study, however, has to date looked at the relationship between COVID-19, the perception of automation, and job satisfaction. Understanding this correlation could help better understand the impact of automation on workers' job satisfaction, especially in times of stress. Furthermore, there have been no studies that have researched automation in the food manufacturing industry during COVID-19. Finally, there has been little to no qualitative grounded theory research on the perception of automation. Automation is going to increase as time moves forward, and entering a post-pandemic world, researching workers' perceptions of automation is timely. Researching this topic can contribute a better understanding of the relationship COVID-19, automation, and job satisfaction.

Method's Defense

This study used grounded theory research because grounded theory research was feasible, there have been few qualitative studies in the field of automation, and grounded theory allowed for more in-depth responses by participants. Interviews were conducted to collect the data.

Picking grounded theory was not only the feasible option, but it also allowed each participant to give their whole narrative and is a different approach compared to the majority of research—correlational research—in this field. Compared to correlational research, grounded theory has fewer participants. As part of the research, data needed to be collected from employees at companies in the food processing industry. Since many employers did not want a

high school student interviewing their employees about their job satisfaction, conducting correlational research involving a large number of participants and companies was not practical. Grounded theory also allowed more in-depth analysis of the impact of the phenomenon COVID-19, by capturing the unique perspective of each participant, something that would have been lost in correlation research.

Other studies in the field of automation that have used grounded theory are Holter et al. (focused on an automated process called Ehealth and its effect on getting people to quit smoking) and Goodwin-Sak et al. (focused on the willingness to use automation in the workforce). For this study, the methods and analysis borrowed heavily from Holter et al. and Goodwin-Sak et al. ; for example, Goodwin-Sak et al. collected the data through interviews and observations while Holter et al. used thematic analysis to decode the data (Holter et al.; Goodwin-Sak et al.).

Methods

For this research project, participants from two companies were interviewed.

Companies Interviewed

Pseudonym	Location	Company description
Company A	Colorado, USA	Company A has around 300 employees working at a single processing plant. They are contract food processors, making primarily snacks.
Company B	Singapore, Singapore	They are a global food processing company that does on-site food production. In this study all participants were from one of the Singapore facilities.

The two companies were selected because they are both in the food processing industry, they both had enough employees to interview, and they both were enthusiastic about participating in the study.

For this study, qualitative interviews and thematic data analysis were used. The variables that were measured were COVID-19's effect on the worker's perception of automation and the perceived level of automation's effect on job satisfaction. There were five managers interviewed.

Only management was interviewed because at Company A line workers did not have the English proficiency skills to participate, finding a translator for all the different languages (Burmese, Somali, and others) was not possible, and they could not be pulled off the line to participate. Since the interviews from Company A were first, continuing with only management at Company B created more reliable data.

List of Participant (arranged by order of interview)

Pseudonym of Participant	Job Title	Company	Appendix Containing Interview
Participant A	Safety Manager	Company A	Appendix G
Participant B	Production Supervisor	Company A	Appendix H
Participant C	Operations Manager	Company B	Appendix I
Participant D	Site Manager	Company B	Appendix J
Participant E	Head of Kitchen	Company B	Appendix K

The study was announced in a company announcement shared by the head of human resources in Company A and a senior manager at Company B. Participation in the study was optional. The interviews were held over Zoom at Company A and in person at Company B. Only audio data was recorded, but they had the option to turn on their camera. All participants signed up on the google form (Appendix B) were selected. The interviews were 15-20 minutes each, and each participant was offered a 25 USD Amazon gift card. The data was recorded and transcribed through Otter.ai software. During the interviews, questions revolved around two topics: the level of automation pre and post COVID-19 and job satisfaction. All interviews were structured with the same questions because having a uniform structure throughout the data collection process creates validity in the data collection (see appendix A for the interview

questions). If clarification was needed on specific questions, clarifying questions were added and noted.

The data was collected from February 22th to March 8th. The data analysis was done concurrently, with the final project completed on March 30th.

The central ethical dilemma and risk of the study for the participants was that some of the questions revolved around workers' job satisfaction, which some workers may have felt uncomfortable sharing because of job satisfaction's relation to employment. Given ethical considerations, the study made all interviews optional, confidential, and consensual (consent form in Appendix C). Since the interviews were optional and confidential, the interviews had minimal risk.

For the data analysis, phenomenological analysis was used. The phenomenon that was looked at was COVID-19's effect on the perception of automation and job satisfaction. Open coding was used to analyze the data. Open coding takes an inductive approach where the researcher takes the data and creates themes concurrently with the analysis (Merriam and Tisdall). All codes were made during the analysis process.

Results

After interviewing the five participants, the interviews were coded into the themes below to conclude if COVID-19 affected the participants' perception of automation and this perception's effect on job satisfaction. The narrative interviews were broken down into six themes (with some themes including sub-themes).

Definition of Themes

Themes	Definition
Employment During COVID-19	Workers stayed at the same job for a shorter time than before COVID-19. Workers did not show up to work for sickness or other reasons.
COVID-19's Effect on the Level of Automation	The effect that COVID-19 had on the level of automation (Includes sub-themes of COVID increased level of

	automation, decreased level of automation, or no effect on the level of automation).
Sentiment Towards Automation	Participant's feelings/perceptions about automation (Includes sub-themes of positive, negative, or neutral sentiment).
COVID-19's Effect on the Sentiment Towards Automation	The effect that COVID-19 has had on the job satisfaction of the employees (Includes sub-themes of increased, decreased, or no effect in job satisfaction during COVID-19).
COVID-19's Effect on Job Satisfaction	Effect that COVID-19 has had on the job satisfaction of the employees (Includes sub themes of increased, decreased, or no effect in job satisfaction during COVID-19).
Automations Effect on Job Satisfaction During COVID-19	The effect that automation has on the employees' job satisfaction (Include sub-themes of increased, decreased, or no effect in job satisfaction from automation).

Throughout the interview process all five participants had different views on all six themes; however, across both Company A and Company B the same themes were present. While all six themes are mentioned by each participant, not all views aligned; for example, all participants mentioned sentiment towards automation, but Participants A and C had positive sentiment, Participant B and E had neutral sentiment, and Participant D had negative sentiment. The only theme that was universally agreed upon was employment during COVID-19, with all participants believing that people either quit or were too sick to work. With regard to the themes of COVID-19's effect on the sentiment towards automation and automation's effect on job satisfaction during COVID-19 Participants A, C, and D believed that COVID-19 increased perception of automation and job satisfaction, while Participants B and E saw no change. COVID-19 decreased job satisfaction for all participants except Participant E.

Discussion of Results

In order to explore the relationship between COVID-19, perception of automation, and job satisfaction, the six themes present were analyzed, to find if there was a relationship between the variables. Each theme was compared to previous research and was not organized based on importance.

First Theme: Employment During COVID-19

Previous research has looked at the effect that COVID-19 has had on employee retention and social distancing measures. For example, Asahi and Contreas et al. looked at social distancing measures and outbreaks and their effect on productivity, while Geisler, 2021 looked at the resignations during COVID-19. The interviews that this researcher collected had similar findings.

The theme of companies not being able to be fully staffed was present in all five participants. There were three reasons why employee retention was so difficult during COVID-19: people leaving jobs, being sick, and the restrictions that came with COVID-19.

In the food processing industry, hiring and getting people to stay became very difficult because the pool of applicants changed and wanted to change jobs. At Company A, they had a difficult time bringing in new employees and keeping the ones they had, forcing them to reduce headcount in the manufacturing process (Participant A). Similarly, Company B also had difficulty getting new employees because of the lack of new migrant workers coming into Singapore (Participant C).

Employees being sick or scared was another factor that prevented the companies from being fully operational. During the COVID-19 pandemic, Company A and B both had employees get COVID-19, preventing them from coming to work (Participant B; Participant E). When one worker was sick in a factory line, someone else either needed to fill in, or the rest of the team could not function efficiently, forcing longer shifts and more overtime (Participant A). As more people have become vaccinated, this has become less of a problem (Participant B).

The final factor was the restrictions that had been implemented by the companies or by the government. These restrictions were implementing social distancing or quarantine rules, anshalting or altering production (Participant A; Participant C).

Second Theme: COVID-19's Effect on the Level of Automation

Previous research suggests that automation has increased during COVID-19 because workforce participation became unreliable and the relative upside of automating (Blit; Chernoff and Warman). This research aligns with the research collected in this study, both showing automation (or at least discussions about automation) increasing.

During the interviews, there was only one time when automation was implemented—a manual nutter butter line was automated—at Company A; however, it is unclear if COVID-19 affected that implementation (Participant A). Even though COVID-19 did not increase the actual level of automation, discussions around increasing automation did increase, depending on the job. For example, Participant A, safety manager, and Participant C, operations manager, stated that the discussion on increasing automation increased drastically because they needed a way to combat the labor crunch. The other participant stated that they did not know if discussions increased because they were not involved in those discussions.

Third Theme: Sentiment Towards Automation

Previous research on sentiment towards automation has been mixed depending on job level. While Schwabe and Castellacci looked at the effect that automation had on all workers, finding that there was a negative correlation, McGuinness looked at the effects of automation at higher-level jobs, finding that automation had a positive to neutral effect. Since the interviewees in this study are from higher-level positions, the data correlating with positive to neutral views aligns with past research. McGuinness found that there was a positive correlation because automation reduces monotonous tasks; however, this researcher found that positive correlation was because automation reduced dangerous tasks and reduced cost.

Each person's sentiment towards automation varied: participants A, C, and E favored automation, while participants B and D had a more neutral stance.

Even though Participants A, C, and E all viewed automation positively, their motivations were wide ranging. Participant A thought that automation had many benefits to workers, such as reducing repetitive motion and replacing dangerous tasks. As a safety manager, their job is to make sure people are safe, and they believed that automating tasks was one of the best ways to stay safe. Participants C and E, on the other hand, saw automation in more economic terms because it reduced cost and improved efficiency. Even though participant C views automation

positively, they still had concerns about the reduction in human touch that comes with automation.

Participants B and D also varied in their reasoning. Participant B viewed automation as positive if it is effective but harmful if not properly functioning. While Participant D feared that increased automation decreases human interaction with the final product.

There was no clear-cut sentiment towards automation; all interviewees had a different perspective.

Fourth Theme: COVID-19's Effect on the Sentiment Towards Automation

There has been no previous research on COVID-19's effect of the sentiment towards automation, so the themes discussed in this section cannot be compared to past research.

In order to combat the loss in production from losing or sick employees, Company A and B felt like automation would be an easy way to solve this. More positive sentiment towards automation was felt in three interviews (Participants A, C, and D), while no change in sentiment was felt in two (Participants B and E). More negative sentiment was not mentioned in any of the interviews.

The reason for more positive sentiment towards automation was uniform across Participants A, C, and D. They all believed that it could help alleviate the strain on their employees working longer, and they could no longer find a sufficient employee base, making automation one of the best options to make up for lost labor. Participant D, who held one of the strong anti-automation views, found COVID-19 made him want to implement more automation because, during the pandemic, he saw that automation could help the overburdened employees.

Participants B and E believed that their sentiment towards automation did not change much because they were satisfied with the status quo and did not experience enough automation for a change in sentiment.

While some participants COVID-19 did not affect the view, most believed automating could combat the labor shortage.

Fifth Theme: COVID-19's Effect on Job Satisfaction

Previous research on COVID-19 has shown that it has had a very negative impact on job satisfaction; for example, Alrawashdeh et al. saw an increase in burnout/fatigue in physicians.

While there has been no previous research in food processing, the research in this study suggests similar findings.

Throughout all interviews except Participant E, the theme of decreased job satisfaction was present because the pandemic has increased stress levels, forced employees to work more, and caused lots of burnout.

During the pandemic, workers fell sick, people left, and expectations changed; these events contributed to increased stress levels because people constantly had to respond to new crises, such as clients having different requirements and safety concerns (Participant C).

Since the facilities sometimes did not have enough staff, the staff there had to work longer hours or more days to maintain the production schedule. For example, at Company A, working on Saturdays and Sundays became a regular occurrence during the pandemic (Participant B).

Participant E felt that the pandemic did not affect their satisfaction because they still enjoyed their job during the pandemic. Overall, however, the interviewees believed that COVID-19 decreased their job satisfaction.

Sixth Theme: Automations Effect on Job Satisfaction During COVID-19

While there has not been research on automation and job satisfaction during the pandemic, there has been research on automation previously, with Shoag et al. and McGuinness. McGuinness found that automation had positive effects on job satisfaction because it created more varied tasks. The research in this study was more aligned with McGuinness because the interviewees are at high-level positions in their companies, but the main reason for increased job satisfaction in this research was that automation was a destressor.

Automation's effect on job satisfaction during COVID-19 was mixed. While Participants B and E believed that their job satisfaction was not affected by automation, Participants A, C, and D thought it had a positive impact.

Participants A, C, and D thought that automation improved their job satisfaction because it was a destressor. Participant C gave the example of a cleaner's tasks being automated, resulting in Participant C no longer needing to worry if their floor will get clean and the cleaner's task will get upskilled. Conversely, Participants B and E believed that automation did not impact their job satisfaction because they would still be doing similar jobs without it.

The only time automation decreased job satisfaction during COVID-19 was when it was confusing. Even though Participant A thought automation had a positive impact on job satisfaction, under COVID-19 protocols, they could not have third-party technicians set up and show how to use the machines, causing increased stress and decreased job satisfaction until they could properly use the machine.

Limitations

With regard to this study's limitations, the limitations include inherent bias in the data, selection of interviewees, and only interviewing management, possibly making the findings inaccurate.

The most significant limitation is only interviewing management because it was not feasible to interview line workers. Without the line worker's perspective, the data does not represent the entire population, so the data set may be skewed.

The next limitation was how the participants were chosen. The participants were chosen with a preferred selection. Only participants who wanted to participate signed up, so the data set may not represent the entire population.

The final limitation was the inherent bias in coding and the participants self-reported data. Researchers' bias may have caused misinterpretation of the data in the coding process. Another bias that may have occurred was in the participants' self-reporting because they may see their actions improperly and choose what to tell the researcher.

Even though the research has limitations, the research still holds merit because of the diverse and representative sample size, and accurate inferences can still be made.

Conclusions

This study has multiple implications in the field of automation. In answering the first part of the research (COVID-19's impact on the perception of automation), the research implies that COVID-19 has impacted the perception of automation because most participants think that COVID-19 positively shifted their perception in both companies. One of the biggest reasons for the shift was the unavailability of workers. Since workers either quit or got sick, processes were halted, making it more important to have tasks that did not rely less on people.

In answering the second question (new perception of automation effect on job satisfaction), the research indicates that automation increased job satisfaction during COVID-19 since workforce availability was so unreliable. Even though overall job satisfaction decreased, most participants believed that implementing automation increased job satisfaction, especially during COVID-19. The three participants that thought that COVID-19 increased positive sentiment towards automation were the same ones who saw that automation increased job satisfaction, resulting in the two themes being correlated. Even though some participants did not change their perception of automation, the increase in positive sentiment toward automation and the increased job satisfaction from the implementation could change future decisions of these companies when it comes to considering automation. Even now, discussions of increasing automation have increased, further showing that implementation of automation at these companies could increase after COVID-19.

Further research is needed to understand better the correlation between COVID-19, perception of automation, and job satisfaction. Research is needed to test whether COVID-19 improvement in the perception of automation and its impact on job satisfaction holds true in other companies, outside the food processing industry, and with all level of workers. Most importantly the long-lasting effects of COVID-19 on automation need to be researched to see if perception will change over time. To fully understand the impact of the new perception of automation, how this new perception of automation impacts the implementation of further automation also needs to be researched.

The impact of this research is on workers and employers. As management starts to view automation more positively, what does that mean for workers? How will this new perception of automation change the amount of automation in the workforce, and what are the long-term effects on job satisfaction?

Work Cited

- Ahmad Nayik, Gulzar. "Robotics and Food Technology: A Mini Review." *Journal of Nutrition & Food Sciences*, vol. 05, no. 04, 2015, <https://doi.org/10.4172/2155-9600.1000384>.
- Agrawal, Shruti, et al. Effect of COVID-19 on the Indian Economy and Supply Chain. preprint, *SOCIAL SCIENCES*, 9 May 2020, <https://doi.org/10.20944/preprints202005.0148.v1>.
- Albanesi, Stefania, and Jiyeon Kim. "Effects of the COVID-19 Recession on the US Labor Market: Occupation, Family, and Gender." *Journal of Economic Perspectives*, vol. 35, no. 3, 2021, pp. 3–24., <https://doi.org/10.1257/jep.35.3.3>.
- Abeliansky, Ana Lucia, and Matthias Beulmann. Are They Coming for Us? Industrial Robots and the Mental Health of Workers. Working Paper, 379, cege Discussion Papers, 2019. www.econstor.eu, <https://www.econstor.eu/handle/10419/201804>.
- Alikord, Mahsa, and E Molae-aghuae. "Impact of Covid-19 Pandemic Crisis and Food Safety System: A Literature Review." *African Journal of Food, Agriculture, Nutrition and Development*, vol. 21, no. 06, 2021, pp. 18206–18222., <https://doi.org/10.18697/ajfand.101.20795>.
- Alrawashdeh, Hamzeh Mohammad, et al. "Occupational Burnout and Job Satisfaction among Physicians in Times of Covid-19 Crisis: A Convergent Parallel Mixed-Method Study." *BMC Public Health*, vol. 21, no. 1, 2021, <https://doi.org/10.1186/s12889-021-10897-4>.
- Asahi, Kenzo, et al. "The Effect of Covid-19 on the Economy: Evidence from an Early Adopter of Localized Lockdowns." *Journal of Global Health*, vol. 11, 2021, <https://doi.org/10.7189/jogh.10.05002>.
- Autor, David H. "Why Are There Still so Many Jobs? the History and Future of Workplace Automation." *Journal of Economic Perspectives*, vol. 29, no. 3, 2015, pp. 3–30., <https://doi.org/10.1257/jep.29.3.3>.
- Blit, Joel. "Automation and Reallocation: Will COVID-19 Usher in the Future of Work?" *Canadian Public Policy*, vol. 46, no. S2, 2020, <https://doi.org/10.3138/cpp.2020-065>.
- Braestrup, Peter. "PRESIDENT RANKS AUTOMATION FIRST AS JOB CHALLENGE; He Cites 'Burden' of Finding Work for Youths and Those Displaced by Machines President Terms Automation Leading Problem of the 1960's." *The New York Times*, 15 Feb. 1962, <https://www.nytimes.com/1962/02/15/archives/president-ranks-automation-first-as-job-challenge-he-cites-burden.html>.

- Butler, Deborah, and Lewis Holloway. "Technology and Restructuring the Social Field of Dairy Farming: Hybrid Capitals, 'Stockmanship' and Automatic Milking Systems." *Sociologia Ruralis*, vol. 56, no. 4, 2015, pp. 513–530., <https://doi.org/10.1111/soru.12103>.
- Chernoff, Alex, and Casey Warman. "Covid-19 and Implications for Automation." National Bureau of Economic Research, 2020, <https://doi.org/10.3386/w27249>.
- Connolly-Barker, Melissa. "Advanced Automation Technology, Labor Market Insecurity, and Collective Joblessness: The Determinants, Constraints and Employment Effects of Robots and Artificial Intelligence on the Realm of Work." *Psychosociological Issues in Human Resource Management*, vol. 6, no. 2, 2018, p. 92. DOI.org (Crossref), <https://doi.org/10.22381/PIHRM62201810>.
- Contreras, Zuelma, et al. "Industry Sectors Highly Affected by Worksite Outbreaks of Coronavirus Disease, Los Angeles County, California, USA, March 19–September 30, 2020." *Emerging Infectious Diseases*, vol. 27, no. 7, 2021, pp. 1769–1775., <https://doi.org/10.3201/eid2707.210425>.
- Creswell, John W., and J. David Creswell. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications, Inc, 2018.
- Egana-del Sol, Pablo, et al. "Covid-19's Impact on the Labor Market Shaped by Automation: Evidence from Chile." *SSRN Electronic Journal*, 2021, <https://doi.org/10.2139/ssrn.3761822>.
- Frey, Carl Benedikt, and Michael A. Osborne. "The Future of Employment: How Susceptible Are Jobs to Computerisation?" *Technological Forecasting and Social Change*, vol. 114, 2017, pp. 254–280., <https://doi.org/10.1016/j.techfore.2016.08.019>.
- Geisler, Jill. "The Great Resignation: Reality or myth?" *Healthcare Financial Management*, vol. 75, no. 7, Oct. 2021, p. 44. Gale Academic OneFile, link.gale.com/apps/doc/A687457624/AONE?u=sas&sid=bookmark-AONE&xid=bb64c199.
- Goodwin-Sak, Cindy, et al. *Courageous Cultures Embrace Automation: A Grounded Theory Investigation to Determine Individual Willingness to Adopt Automation in the Workplace*. SSRN Scholarly Paper, ID 3454062, Social Science Research Network, 5 Sept. 2019. [papers.ssrn.com, https://papers.ssrn.com/abstract=3454062](https://papers.ssrn.com/abstract=3454062).

- Holter, Marianne, et al. "Qualitative Interview Studies of Working Mechanisms in Electronic Health: Tools to Enhance Study Quality." *Journal of Medical Internet Research*, vol. 21, no. 5, May 2019, p. e10354. DOI.org (Crossref), <https://doi.org/10.2196/10354>.
- Hossain, Mokter. "The Effect of the Covid-19 on Sharing Economy Activities." *Journal of Cleaner Production*, vol. 280, 2021, p. 124782., <https://doi.org/10.1016/j.jclepro.2020.124782>.
- Ilyukhin, Sasha V, et al. "A Survey of Automation Practices in the Food Industry." *Food Control*, vol. 12, no. 5, 2001, pp. 285–296., [https://doi.org/10.1016/s0956-7135\(01\)00015-9](https://doi.org/10.1016/s0956-7135(01)00015-9).
- Khan, Rao Sanaullah, et al. "Characterization of Food Product Innovation Practices with Reference to Functional Food Product Development in Singapore." *Asian Journal of Agriculture and Food Sciences*, vol. 5, no. 2, 2017, <https://doi.org/10.24203/ajafs.v5i2.4507>.
- Merriam, Sharan B., and Elizabeth J. Tisdell. *Qualitative Research: A Guide to Design and Implementation*. Langara College, 2009.
- McGuinness, Seamus, et al. "Skills-Displacing Technological Change and Its Impact on Jobs: Challenging Technological Alarmism?" *SSRN Electronic Journal*, 2019, <https://doi.org/10.2139/ssrn.3445807>.
- Mokyr, Joel, et al. "The History of Technological Anxiety and the Future of Economic Growth: Is This Time Different?" *Journal of Economic Perspectives*, vol. 29, no. 3, 2015, pp. 31–50., <https://doi.org/10.1257/jep.29.3.31>.
- McNamara, Damian. "About One in Five Clinicians Considers Quitting Because of Pandemic." *The Hospitalist*, 7 Apr. 2021, <https://www.the-hospitalist.org/hospitalist/article/238319/business-medicine/about-one-five-clinicians-considers-quitting-because/>.
- Nevard, Jacques. "17,500 Dockers Meet to Oppose Automation on Piers; 17,500 Dockers Meet to Oppose Spread of Automation on Piers." *The New York Times*, 19 Nov. 1958, <https://www.nytimes.com/1958/11/19/archives/17500-dockers-meet-to-oppose-automation-on-piers-17500-dockers-meet.html>.
- Orrell, Brent, and Matthew Leger. "The Trade-Offs of Remote Work: Building a More Resilient Workplace for the Post-COVID-19 World." *American Enterprise Institute*, 16 Nov. 2020,

- <https://www.aei.org/research-products/report/the-trade-offs-of-remote-work-building-a-more-resilient-workplace-for-the-post-covid-19-world/>.
- Ronquest-Ross, Lisa-Claire, et al. "Application of Science and Technology by the South African Food and Beverage Industry." *South African Journal of Science*, vol. 114, no. 9/10, 2018, <https://doi.org/10.17159/sajs.2018/4757>.
- Schwabe, Henrik, and Fulvio Castellacci. "Automation, Workers' Skills and Job Satisfaction." *PLOS ONE*, vol. 15, no. 11, 2020, <https://doi.org/10.1371/journal.pone.0242929>.
- Shahbaz, Muhammad, et al. "Strategic Measures for Food Processing and Manufacturing Facilities to Combat Coronavirus Pandemic (COVID-19)." *Journal of Pure and Applied Microbiology*, vol. 14, no. 2, 2020, pp. 1087–1094., <https://doi.org/10.22207/jpam.14.2.01>.
- Shoag, Daniel, et al. "How Do Workers Perceive the Risks from Automation and the Opportunities to Retrain? Evidence from a Survey of Truck Drivers." *SSRN Electronic Journal*, 2021, <https://doi.org/10.2139/ssrn.3823616>.
- Simon, Marilyn K., and Jim Goes. *Dissertation and Scholarly Research: Recipes for Success*. Dissertation Success, LLC, 2011.
- "Total Job Openings, 1998-2008: Replacement and Growth." U.S. Bureau of Labor Statistics, U.S. Bureau of Labor Statistics, 14 Mar. 2000, https://www.bls.gov/opub/ted/2000/mar/wk2/art02.htm?view_full.
- Velavan, Thirumalaisamy P, and Christian G Meyer. "The COVID-19 epidemic." *Tropical medicine & international health : TM & IH* vol. 25,3 (2020): 278-280. doi:10.1111/tmi.13383
- Vermeulen, Ben, et al. "The Impact of Automation on Employment: Just the Usual Structural Change?" *Sustainability*, vol. 10, no. 5, 2018, p. 1661., <https://doi.org/10.3390/su10051661>.
- Wilkinson, Wyoma, et al. "Data-Driven Automated Decision-Making in Assessing Employee Performance and Productivity: Designing and Implementing Workforce Metrics and Analytics Social Sciences, Sociology, Management and Complex Organizations." *Psychosociological Issues in Human Resource Management*, vol. 7, no. 2, 2019, p. 13. DOI.org (Crossref), <https://doi.org/10.22381/PIHRM7220192>.

Piezo Board: A Keyboard That Powers Itself By Vinay Ayala

Abstract

This paper describes the generation of electricity through a keyboard that converts the mechanical energy from human typing into electrical energy in a clean and renewable way. The keyboard is built with piezoelectric crystal elements arranged between the keys with conducting strips. Voltage is generated when pressure is applied to the keys. Generating electricity from repetitive human actions is both cost-effective and easy to implement. We built a prototype of a piezoelectric keyboard and analyzed the electricity generated by the device. This concept offers reliable energy, portability, and does zero environmental harm. Two prototypes were built to analyze power output and effective design. Prototype 1 was built using piezo discs and Prototype 2 uses piezo benders. Prototype 1 produced slightly more voltage on average (298.3mV) than Prototype 2 (167.3 mV).

Introduction

The global energy crisis, environmental pollution, and climate change due to the rapid consumption of non-renewable energy sources has prompted scientists and researchers to seek alternatives to harvest energy available in the ambient environment. Sustainable and renewable energy is required to satisfy current and future energy demands. Mechanical energy¹ is the most investigated for renewable energy applications due to its abundance and ubiquity in the environment. In the last three decades, piezoelectric materials have been designed as efficient mechanical energy harvesters that convert mechanical energy.

The phenomenon known as piezoelectricity dates back more than a century as it was discovered in the year 1880 by French brothers, Pierre and Jacques Currie. They discovered that certain natural crystals produced a charge when mechanical stress was applied to them. This is known as the piezoelectric effect.

Kinetic energy is the main source of power for piezoelectric energy harvesting. It can be found throughout the human body through continues vital activities and body movements such as wailing. Blood pressure, cardiovascular motions, and breathing have been explored as other sources of energy. In this research, we explore the typing motion for piezoelectric energy harvesting. Recent advances in low-power electronic technologies and power storage devices

have made piezoelectric harvesting a potential alternative to batteries in portable consumer electronics.

In 2008, the *Journal of Micromechanics and Microengineering* published a study on the energy harvested from a keyboard using a combined electromagnetic and piezoelectric conversion. The author's working prototype using cylindrical discs to generate 40.8mW to 176mW from finger keystrokes⁶. In the literature, this is one of the more successful prototypes due to its hybrid system. In 2011, researchers Beker, Kulah, and Muhtaroglu created a piezoelectric keyboard sporting a dome structure with experimentally verified power of 16.95mW. A frequency-up-conversion technique contributed to higher power generation by an additional 2.81 mW⁷. A study conducted on the feasibility of energy harvesting from piezoelectric keyboards revealed that the prototype yielded 0.65 mV of voltage per keystroke⁵. While this is low, the stored energy is still being investigated as a source for applications in technology that use vibrational energy.

The prevalence of gamers, popularity of e-sports, and the increasing adoption of PCs and their peripherals in the education sector are all contributing factors to the surging growth of the keyboard market that is expected to reach \$10.52 Billion in 2025. Most PC keyboards that exist today require an external power source such as a direct current or power from batteries. The popularity of wireless keyboards is driving the market, leading to an increased usage of non-rechargeable batteries that are harmful to the environment. When disposed, these batteries corrode and the chemicals seep into the soil and pollute groundwater.

Piezoelectric energy harvesters offer a reliable, robust solution by converting mechanical oscillatory energy in the environment to usable electrical energy. Piezoelectric energy can be harvested by converting the human typing motion into electrical power. Figure 1 gives an overview of the piezoelectric energy harvesting process⁴. The goal of this research is to identify other means of harnessing energy using piezoelectric materials. In this paper, a system is proposed that uses piezo sensors to generate power from human typing.

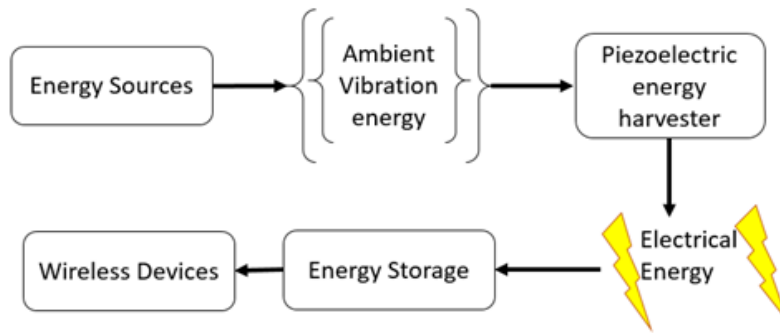


Figure 1. Overview of the piezoelectric energy harvesting process

Methods

Two prototypes were created using different kinds of piezoelectric materials³. See the Materials section for a comprehensive list of materials used in this research.

Prototype 1 was built using 27mm piezo disc sensors that were inserted directly under the keys of the keyboard. Figure 2 depicts the conceptual model of Prototype 1. For the purposes of testing, we used a mechanical keyboard. We opened the keyboard and removed the switches from the ‘ASDF’ row. Then, piezo disc sensors were flued onto the PCB and soldered in a serial connection. Two remaining wires were designated for ground and serial input; these were linked together in a breadboard and wired to an Arduino circuit board with the current flowing through a 1 megohm resistor (Figure 3). A simple knock code was run to measure the input from the piezoelectric circuit and confirm the power output. Figure 4 is Prototype 1 assembled for testing.

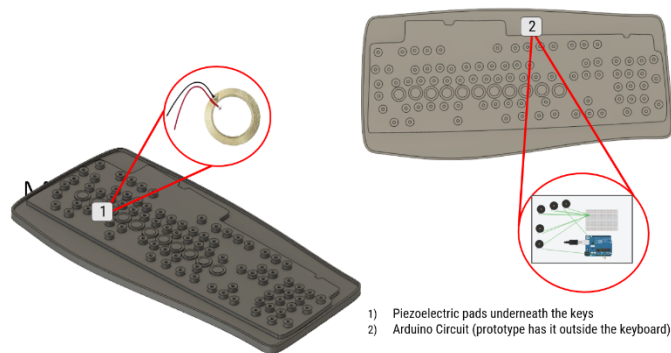


Figure 2. Prototype 1 conceptual model.

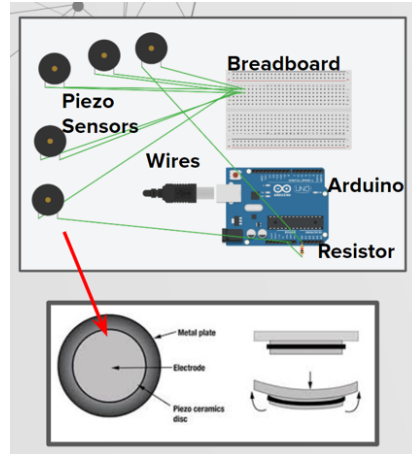


Figure 3. Arduino connections to record voltage readings.

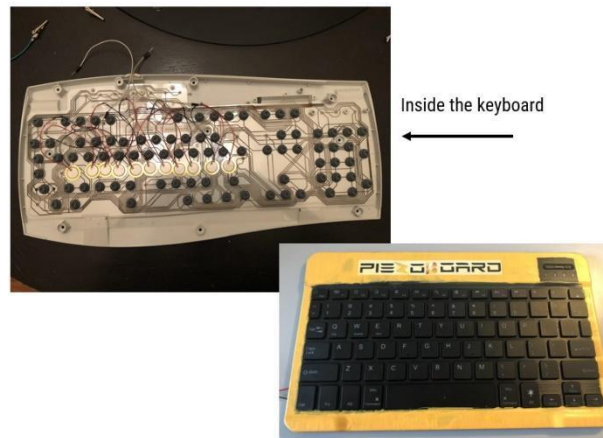


Figure 4. Prototype 1 assembled model for testing.

Prototype 2 was built using piezoceramic benders (piezo bends). Piezo bends do not need to be implemented with additional circuitry as they fit directly on the PCB without being mounted. The benders charge a battery to the power of the keyboard and the switches did not need to be modified to interact with the discs. For testing purposes, three piezo bends were mounted under the spacebar, enter, and control keys, respectively (Figure 5). Figure 6 is Prototype 2 assembled for testing.

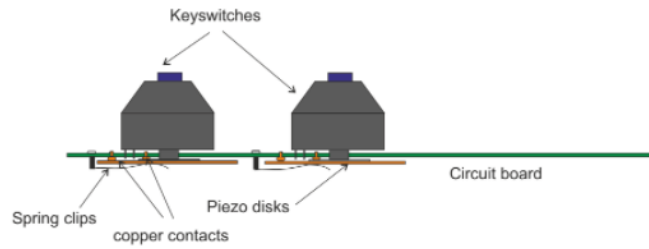


Figure 5. Prototype conceptual diagram.

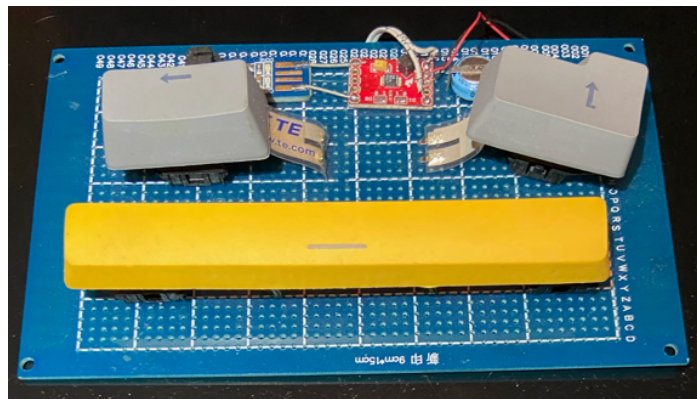


Figure 6: Prototype 2 assembled model for testing.

Harvester integrated circuits were used to regulate the flow of voltage from the piezo bends to produce a steady, fixed voltage to drive the charging circuit. A supercapacitor was also used to store charge from the harvester circuit before the power transferred into the charging circuit. Both prototypes were tested by measuring their power output per click for a total of ten clicks. A digital multimeter was connected to the positive and negative wires of the piezo circuit to display voltage readings on the device. A 1 megohm resistor was used to the control the electrical flow through the circuit. A multimeter was used to measure the current (in amperes) of the piezoelectric circuit.

Material

Prototype 1 keyboard model using piezo discs:

- Speakers & Transducers PIEZO ELEMENT 150mm LEADS
- Printed Circuit Board (PCB)
- Soldering rod
- Digital Multimeter
- Arduino UNO Rev3
- USB 2.0 Cable Type A/B
- Megohm Resistors

Prototype 2 keyboard model using piezo benders:

- Vibration Sensors Hi Out Piezo M Sens LDTC Vert Mounted
- Supercapacitors / Ultracapacitors 0.1F 5.5V 85C
- Power Management IC Development Tools Micro Lipo USB Lilon/LiPoly Charger
- Pushbutton Switches Full Travel, Mech. Keyswitch Linear Feel (Black stem), 60cN No LED, No Diode Frame Mount (no fixation pins)
- Switch Bezels / Switch Caps Tact cap - Square Black - 12 x 12mm
- Power Management IC Development Tools Energy Harvest B/O LTC3588 - red one
- Printed Circuit Board (PCB)
- Space bar, Control, and Enter switches
- Soldering rod
- Digital Multimeter
- Arduino UNO Rev3

Methods

After measuring the output from the piezo circuit on the multimeter for ten trials, we found that the piezo discs produced an average power output of 298.3 millivolts. The piezo benders only produced an average of 167.3 millivolts. Based on these values, the circuit created with piezoelectric discs outperformed that circuit with the piezo benders. The value of power observed was multiplied with the highest value of the current noted to predict the greatest amount of electrical power (in watts). This estimated value was multiplied by 52,800 – the

average number of clicks a user types per day. From this, we deduced the average wattage for day 5.4 watts. The average wireless keyboard requires approximately 2 watts² for full functionality. Our data suggests that piezoelectricity is a viable source of renewable energy to power wireless keyboards.

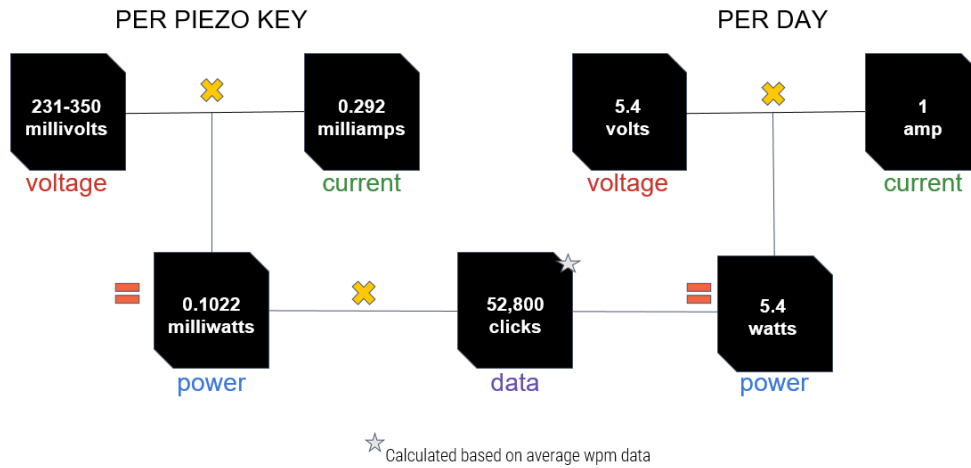


Figure 7. Prototype 1 expected power output calculations.

Table 1. Voltage produced by piezo disc prototype 1 and piezo bender prototype 2.

Key Clicks	Prototype 1 Voltage (mV)	Prototype 2 Voltage (mV)
1	286	201
2	312	187
3	259	163
4	292	179
5	334	166
6	351	140
7	278	162
8	274	175
9	301	142

10	296	158
Average	298.3	167.3

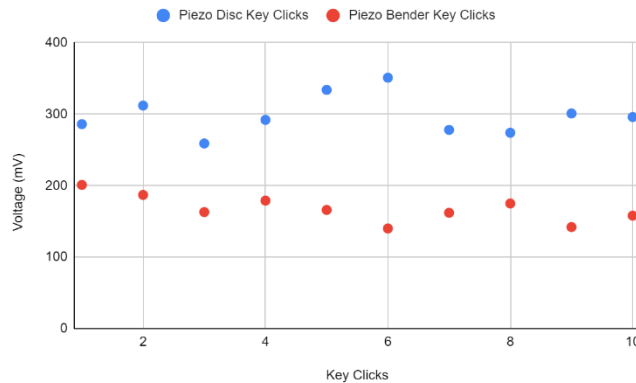


Figure 8. Graph of voltage produced by piezo disc prototype 1 and piezo bender prototype 2.

Conclusion

The two prototype piezoelectric keyboards were tested with piezo discs and piezo benders, respectively. The discs consistently produced a greater, more sustainable voltage than the benders over the course of 10 trials. The integrated circuit was designed as a piezo harvester/generator, but there may be differences between the discs and the benders. It was revealed that they seem to produce voltage in a different way, which may be why the discs seem to produce a more sustained voltage.

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Work Cited

- Baniya, Priyanka, et al. "Power Generation using Piezoelectric Material." International Research Journal of Engineering and Technology, vol. 06, no. 6, May 2019, pp. 6586-6589, <https://www.irjet.net/archives/V6/i5/IRJET-V6I5919.pdf>.
- "USB Keyboard Power Consumption: How Much Does Your Keyboard Use?" Remote Work Warriors, <https://remoteworkingwarriors.com/usb-keyboard-power-consumption/>.
- Poplavko, Yuriy, and Yuriy Yakymenko. "Piezoelectricity." Functional Dielectrics for Electronics. 2020, <https://www.sciencedirect.com/topics/materials-science/piezoelectricity>.
- Anton, Steven R., and Mohsen Safaei. "Piezoelectric Energy Harvesting." 2020.
- Page, Tom. "A Feasibility Study in Energy Harvesting from Piezoelectric Keyboards." International Journal of Energy Optimization and Engineering (IJE OE), 6(2). 2017.
- Wacharasindhu, Tongatawee, and Kwon, Jae W. "Micromachined energy harvester form a keyboard using combined electromagnetic and piezoelectric conversion." Journal of Micromechanics and Microengineering, 18(10). 2008.
- Beker, Levent, Zolue, Ozge, and Muhtaroglu, Ali. "Hybrid energy harvesting from keyboard". Institute of Electrical and Electronics Engineers. 2011.

An Experienced Industry: How Prior Experience Shapes The Hiring Process In The Engineering Field By Cody A Mihills

Introduction

“You can’t get a job without experience, and you can’t get experience without a job. Once you solve that problem, you are home free.” - Jack Buck

Most companies seek individuals with adequate experience in the market field when looking for new hires. Most studies of experience and performance tend to treat experience as a proxy for knowledge. However, prior work experience may include not only relevant knowledge and skill, but also routines and habits that do not fit in the context of the new organization (Dokko, Wilk, & Rothbard, 2009) [6]. Similarly, in studies of engineering practice, the early career phase is a complex field to navigate due to the intricate nature of the field as a whole. This study hopes to shed light on the effect of how prior experience can affect the hiring process in the engineering industry. I pose the question: What is the importance of experience in the engineering industry, and how can it affect both the hiring firm and the individual seeking employment? With students wanting to enter such a complex field, often without adequate experience, it is important that the level of prior experience required for such a position is analyzed, thus allowing individuals seeking a position in the field foresight into what may need to be done to acquire the position. By looking into the three most common engineering degrees as found through the recording of job postings, data is to be recorded regarding all considerations of experience: both required and requested. Websites used to gather this data are job posting websites, commonly used for both businesses and individuals looking for work to post and review jobs and companies. Thus the hypothesis, that a higher level of prior experience correlates to both a higher rate of job acceptance, and range of jobs available to an individual seeking work within the engineering industry, is raised.

Literature Review

People have always strived to gather a myriad of knowledge about a certain field before delving into participation, whether through learning, experimentation, or failure; prior experience in a field can help one better understand it before advancing completely. This is especially true in the world of engineering. According to (Traum, Prantil, Farrow, and Weis 2013) [11], the implementation of hands-on experimentation and learning helped students better grasp and

become more involved in the learning process surrounding them. Similar studies showed the use of rocketry in a classroom setting environment which helped give students a physical model to pertain to, and to work around, as researched by (Niemi 2003) [9]. Alongside analyzing prior research in a classroom setting, I will be looking into how general research has gone into the effect of prior experience on a job-seeking individual. It is through this lens of integrated rocketry programs that I ask the question: What is the importance of experience in the engineering industry, and how can it affect both the hiring firm and the individual seeking employment?

Research into hands-on implementation in the classroom.

Getting students to be more involved in school is an age-old question that hands-on learning seeks to answer. Although utilizing these specialized teaching techniques is used in all fields of education, it is most prevalent in a scientific setting, where students must gather and analyze data from experimentation. Research conducted by (Bilen, 2015) [1] describes how the utilization of 3D printing physical prototypes helps students better grasp the scientific processes at play. By using physical prototyping, it gave students who struggled with socratic learning a chance to understand and work with the scientific principles at play, thus leaning towards the benefits of kinesthetic learning [1]. Despite the great strengths of utilizing 3D printing to provide students with visual trial and error, it comes with a drawback of time, as with current technologies, common classroom 3D printers are not capable of mass and rapid production of models, thus slowing down the learning process. While 3D printing is an invaluable asset to learning, not everyone has access to such technology, in a study by (Lang, 2020) [4] shows how utilizing similar trial and error techniques without the use of 3D fabrication can result in similar results on students' learning. By incorporating the physical and theoretical use of hands-on learning in a non-scientific major, the study showed an increase in students' awareness and understanding of complicated scientific concepts that before were harder for said students to grasp [4].

Research Into How Prior Experience Affects Working Individuals.

Life experiences, whether learning or emotional, can shape people to become more resilient individuals. Through the analysis and knowledge of what shapes us as people, we

can make better informed decisions in our fields of study and work. A study by (Smith and Green, 2005) [10], emphasizes the importance of allowing students to partake in workplace or internship experiences. Benefits that arise from such experience can help students solidify experience and or entry to a certain career, and in cases of internships, allow the student permanent employment of the above internship. This study also examines what effect part-time jobs have on student career engagement, concluding that while “less important as career development pathways, they allow students to have means of supporting other study” [10]. Though studies such as those performed by Smith and Green demonstrate the importance of granting students access to work experience, the same study has limitations that prevent it from seeing the broader scope of how this experience can directly shape the workplace industry. A study by (Dokko, Wilk, and Rothbard 2009) [6] describes the relationship between prior experience and job performance, and both the direct and indirect conclusions drawn from their findings. Through interviewing and analyzing job performance over a myriad of companies, the authors concluded that they “find evidence for a strong positive indirect relationship via knowledge and skill such that individuals do bring valuable human capital across the firm boundary” [6].

Conclusion

Experience is an invaluable tool, especially pertaining to fields such as aerospace and engineering. Whilst existing research takes into consideration the lens of scholarly engineering experience within an academic setting [9][11], these same sources fall short when it comes to explaining the long lasting effects of these utilizations of academic experience. While these sources describe the effects of academic experience in the classroom, and the short term effects once a student leaves an institutional setting, they also fall short in detailing what happens after this absence of institutional learning. Whereas in research articles covering this above topic, of how experience affects job life [5][6], they again fall into a gap of not pertaining to a specific field or aspect, in my case, engineering. It is this gap of how prior experience affects the job life in regards to the engineering industry that I set forth to address.

Methodology

Job Posting Websites

From a wide range of job posting websites, my study specifically consists of job postings listed from LinkedIn, Indeed inc., and Glassdoor. Whilst there are numerous websites to utilize for this research, these three were chosen as they are often seen as the primary, and most often used posting websites for company and consumer alike in seeking employment. According to a statistical analysis website, ApolloTechnical, the combined monthly user count between Glassdoor, Indeed, and LinkedIn surpassed that of 300 million in the United States in 2021 alone. (ApolloTechnical, 2020, 25 Best Free Job Posting Sites For Employers)From the postings available on the websites, I have narrowed down to the State of Texas, and all outside companies with postings listed within the state. This choice to narrow down was that the research is being focused specifically on jobs and job postings within the State of Texas. This narrowing down was to help gather more data in the limited window of time I had to conduct this research project. Using the search engine installed in all three of these websites, the following phrases; ‘engineer’, ‘aerospace engineer’, or ‘mechanical engineer’ were used to specify which postings would provide data for my research analysis. The choice of the analysis of engineering careers was specifically highlighted to best answer my research question: How has prior engineering experience affected the hiring of employees in the engineering field as according to hiring corporations and firms?

Background

With the use of job posting websites, it is important to give adequate foundational information regarding such websites before proceeding with details regarding data collection procedures. The decision to utilize job posting websites above options such as: interviews, company surveys, or other such formats was primarily chosen for ease of data gathering, and limitations given due to the scenario of this research project; including such as the timeframe available for this research, and the information applicable from job postings. Job posting websites, as stated in their name, are websites which let companies post and review job postings, applications, and other company ratings, and allow the public access to these job postings and reviews, and to apply to any application on the site. These websites also offer a multitude of built-in tools to help the user to specify which job it is they would like to apply for. A secondary factor of many of these job posting websites is the ability to read and write public reviews

regarding places of employment. While company rating is not a vital part of my research, it is still worth mentioning to help inform the function of these websites which will be used to pull data from. Below are three separate examples of the job posting sites being utilized . (Fig 1,2,3) Each example is highlighted with a selection of colors to help show the layout and purpose of each aspect of the website. For each example, the following colors highlight the following meaning: Yellow underlines User Interface options used to narrow down a job posting, Blue underlines information being utilized within the posting for research, and Red indicates the current job posting being examined.

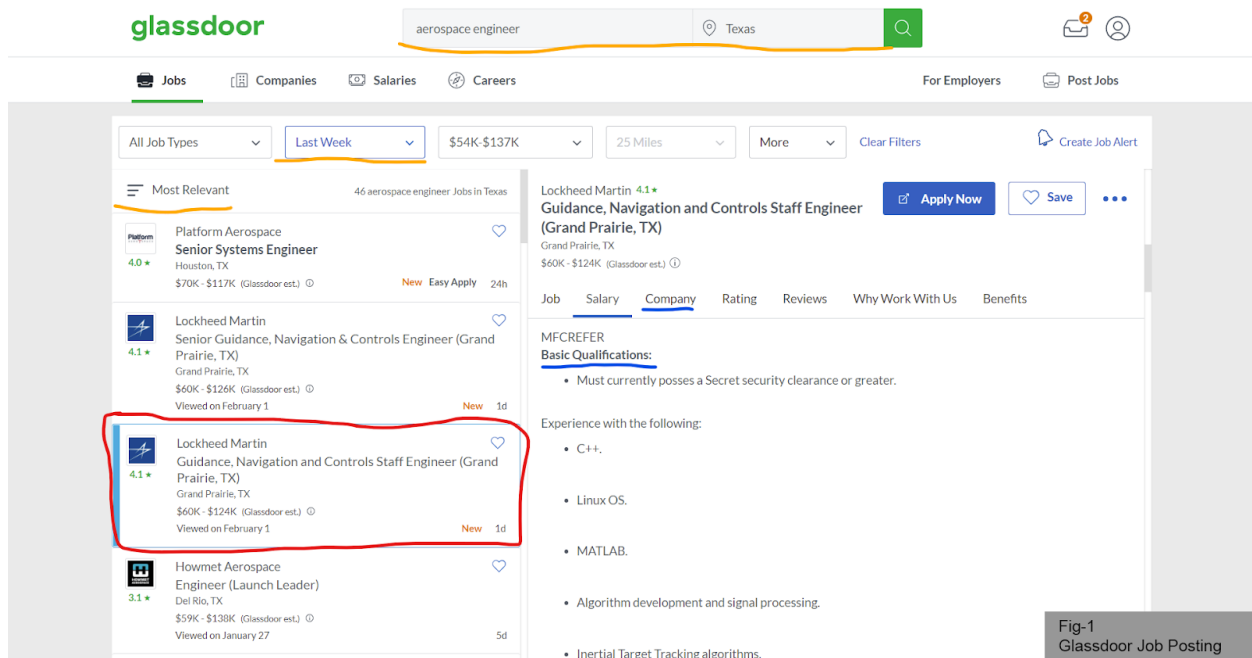


Fig-1: A view of the Glassdoor Website, showcasing a job posting and its User Interface.

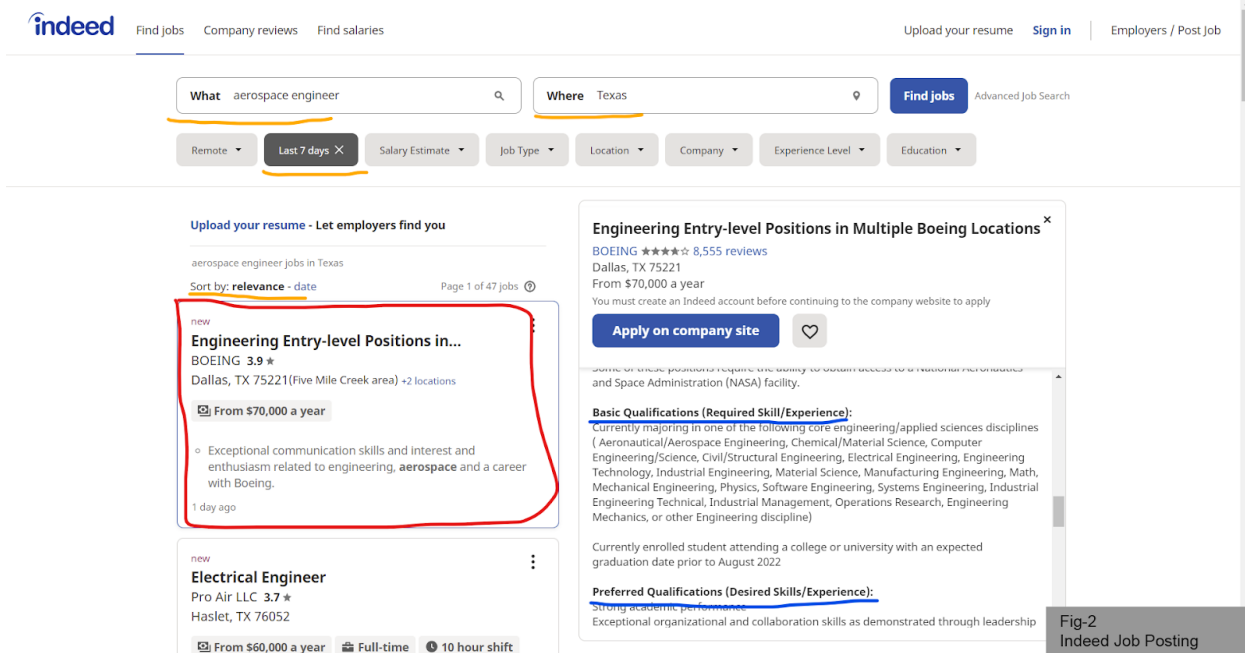


Fig 2: A view of the Indeed Website, showcasing a job posting and its User Interface.

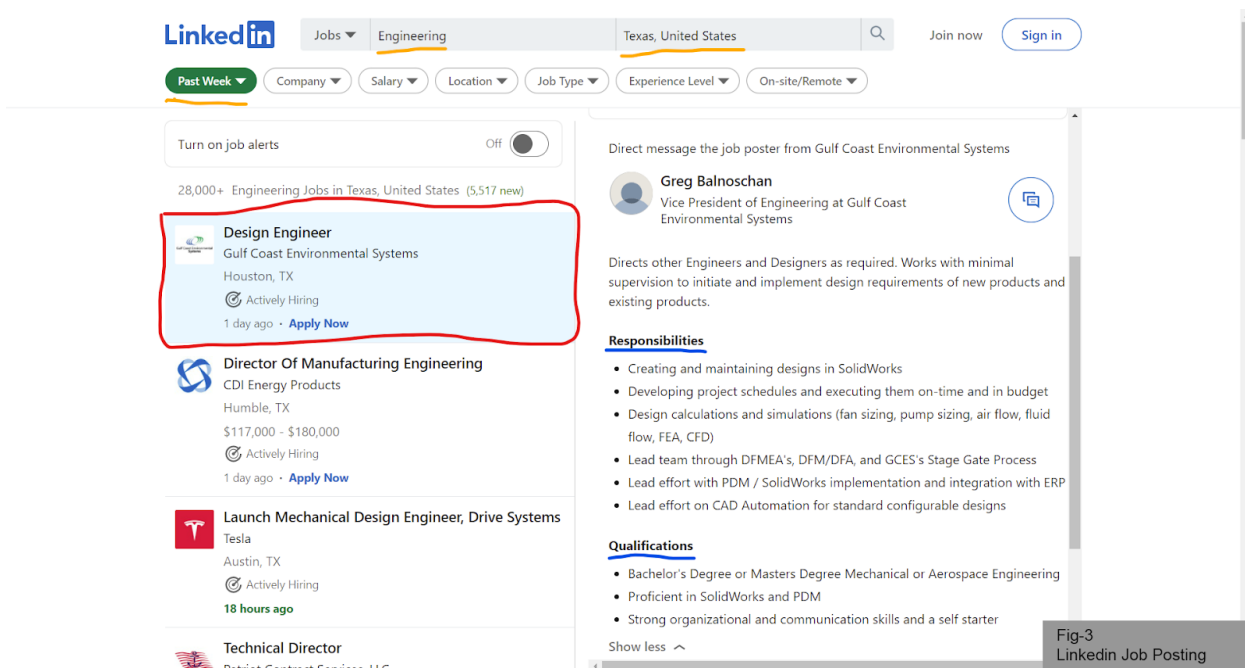


Fig 3: A view of the LinkedIn Website, showcasing a job posting and its User Interface.

Procedures

To collect data posted across the websites, a spreadsheet was created which held all critical information pertaining to every job posting read and recorded. This spreadsheet was used to transcribe a number of important values for the research. These included: employer name, job title, job summary, job requirements, job recommendations, the date in which the job posting was listed, and the employment level in which the job took place. To collect data to fill this spreadsheet, the innate search engine in each posting website was used, alongside a number of parameters which let the user narrow down what is to be searched. Utilizing these tools, the term ‘engineer’, ‘mechanical engineer’, or ‘aerospace engineer’ were inputted into the search bar, alongside setting the time parameter to a space of one week prior to the search taking place. With these parameters now set in place, four to five job postings were inputted into the spreadsheet on a daily basis, resulting in an average of twelve postings recorded every day.

Measures

A number of data was collected across the many different stages of this research. With regard to the job postings on LinkedIn, Glassdoor, and Indeed, the requirements for prior experience fluctuated in range between 1-10 years. Another main point of data collection is the correlation between the degree and level thereof, and the job posting itself: For example, do similar jobs require similar degree levels? The collection of these types of data help to best answer my research question. As both degree level and required experience can help show correlation between such ties and jobs. Companies that I have noted to appear more frequent than others include those such as Lockheed Martin and Bell Textron. To record postings in my spreadsheet, I use the ‘time posted’ filter in the websites to select ‘past 7 days’. With this narrowed down list of information, I record postings listed in order as they appear on the website, and refresh the list every day I record data.

Trends in Data

With the collection of one-hundred unique job posting logs, a number of trends in the data have appeared, many of which will be described in this section. In regards to the association between degree level and job listed, seventy-seven state a bachelor's degree as a required trait in the hiring process, whilst fifty-eight state it as a recommended trait. In regards to a master's

degree, only ten of the hundred state it as a requirement, in comparison to only five listing it as a recommendation. Now focusing on the correspondence between job and past experiences, eighty-six of the one-hundred logs state past experience as either a recommended or required qualification; with five or more years of experience being the average time for qualification of experience. Data pertaining to the degree type across jobs is equally important to the level of degree. With thirty-four entries stating mechanical engineering as a required degree and twenty stating aerospace engineering as a required degree, these two are often intertwined in regards to jobs in the aerospace industry. Outside of the aerospace industry, a collection of other engineering degrees make up the vast majority of the entries: Examples of these include: chemical, civil, computer, electrical, or other general engineering fields; with these degrees making up forty-seven of all entries.

Summary of Data Collection

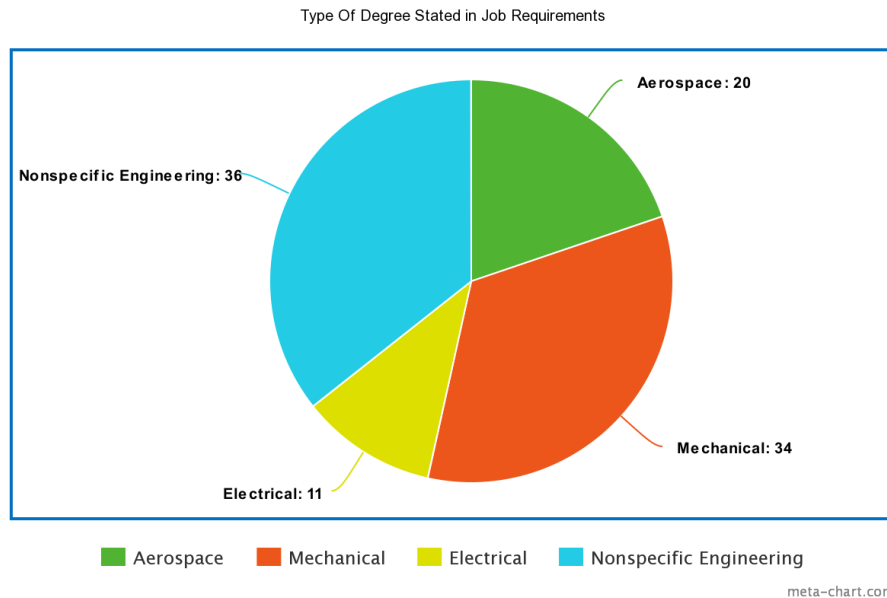
Over a timeframe of seven weeks, and a total data log of one hundred unique entries, I have collected nine outstanding points of data to put forth in the results of this research. Pulling from job postings in engineering fields, data was taken from postings of any experience or level of education, to refrain from unintentional cherry picking of data sources. To obtain data for job postings, the websites LinkedIn, Glassdoor, and Indeed were used, to allow a wider range of job postings websites to be gathered in a weekly timeframe. Data logged regarding engineering looked at the three engineering fields that appeared most commonly in the job posting sites: these being mechanical, electrical, and aerospace. The objective of this research was to state correlations, if any, between engineering jobs, and the type and or amount of experience required or recommended for the job position. The following data shows the job postings collected, how they were analyzed, and the potential implications and limitations of such a study on the engineering field.

Presentation of Data

Starting with data pertaining to the type of academic degree required for a certain job posting, three degree fields stood out as more frequently mentioned than other engineering degrees: those being mechanical, aerospace, and electrical engineering. Those three degrees, with some being mentioned together in a single posting, made up over 72% of all degree

requirements in job postings that required degrees. The other ~38% of postings either mentioned a general engineering degree, or a lesser common field of engineering, such as Civil or Nuclear. Whilst the vast majority of postings, at 88%, stated a degree to be required for the job, a substantial 22% stated no requirement for any academic degree.

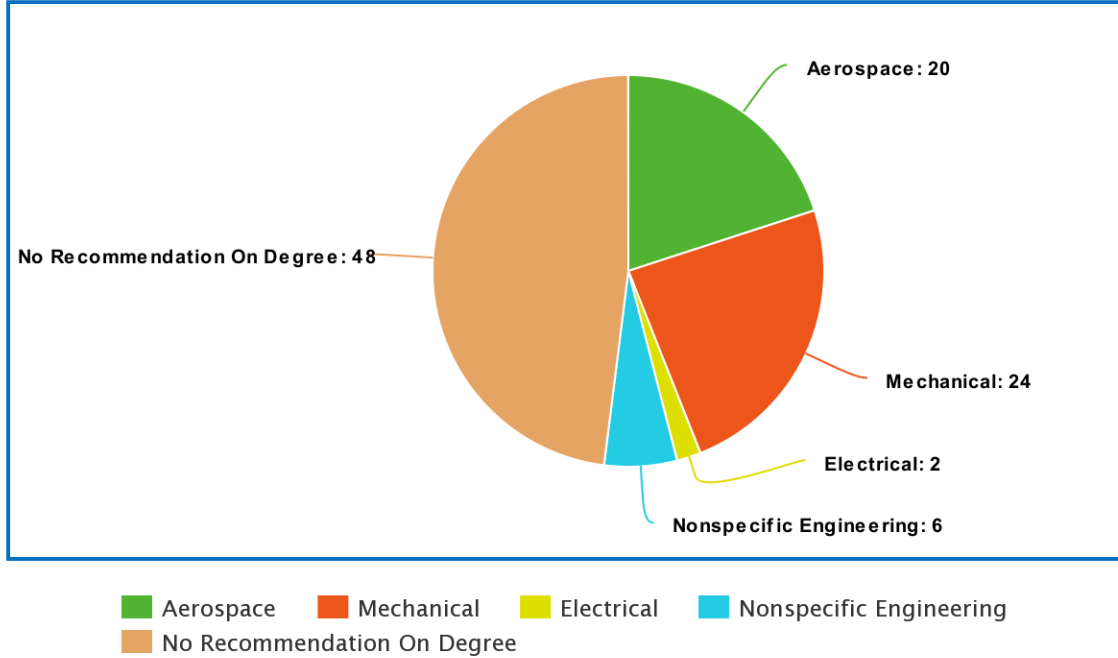
Table.1 - Numerical chart displaying degree requirements for job postings, This is not in percentages, but in numbers of postings stating such information.



Going alongside the data aspect of the required scholarly degree, the information regarding recommended degrees is equally important. Despite this seemingly equal importance fact, nearly half of all postings logged, at 48%, stated no recommendation pertaining to scholarly experience. Out of the 52% of postings that did state a recommendation, the three fields of Aerospace, Mechanical, and Electrical continued to stand out as the most prominent engineering fields stated. In stark contrast to the large 36% of non-specific degrees stated in job requirements, only 6% of job recommendations stated a non-specific, or lesser known engineering degree as its choice.

Table.2 - Numerical chart displaying degree recommendations for job postings, This is not in percentages, but in numbers of postings stating such information.

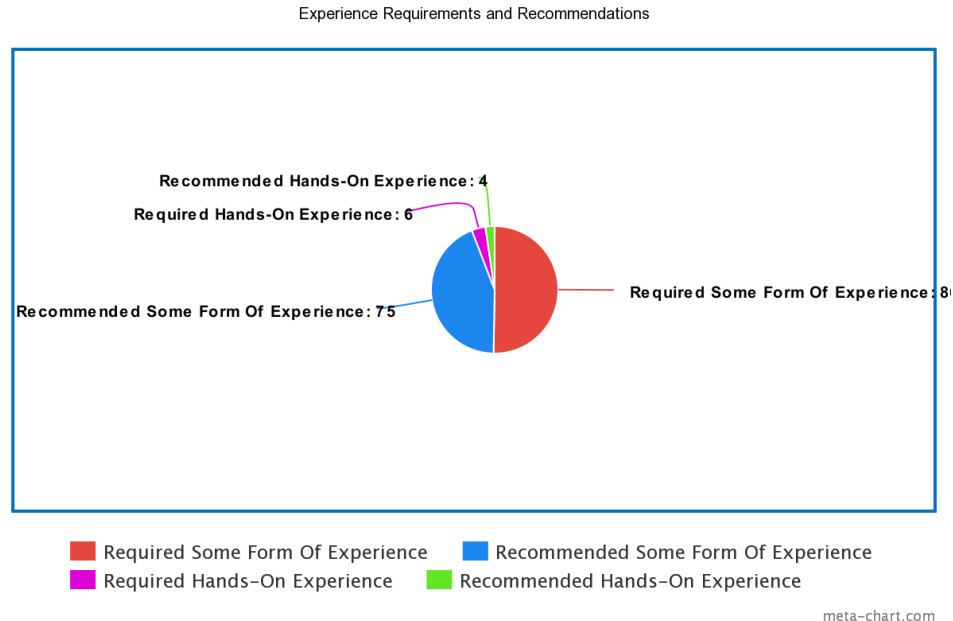
Type Of Degree Stated in Job Recommendations



meta-chart.com

In regards to experience both required and recommended, a staggering 86% of all postings logged required some form of experience, be it from prior job experience, to a certain length of time in the field prior. Out of these 86% of postings, only 6% stated a requirement for hands-on experience in the selected field. Data pertaining to recommendations, 75% of postings recommended some form of experience, in stark contrast to the steep drop in degree requirements to recommendations. Out of these 75% of posting recommendations, only 4% stated hands-on experience as a preferred recommendation in the desired field.

Table.3 - Numerical chart displaying recommendations and requirements pertaining to experience for job postings, This is not in percentages, but in numbers of postings stating such information.



Discussion

Interpretations

Based on the charts and data presented in the above Section 4, a correlation can potentially be drawn between job postings in the engineering field, and the requirement of past experience. With over 85% of all job postings stating any form of required experience to apply for the position, and 75% recommending experience as well, a strong correlation can be suggested between the requirement and recommendation of prior experience, and the availability of engineering jobs open to an individual seeking work. With regards to job recommendations, a wide majority of postings stated no mention for degree, whilst mechanical won out as the most commonly recommended at 24%. This follows suit in the degree requirements, where mechanical comes out on top as a specific degree with 34% of all postings stating it as a required option. While the hypothesis and results of this study may suggest that more experience correlates to more availability in the engineering job market, the correlation between experience and other job types cannot be considered due to the results of this study, and thus, cannot be eliminated.

Implications

The basis of this research was heavily built on existing studies regarding similar topics in this field of research on how experience can affect future developments. Dokko, Wilk, & Rothbard (2009), state “Although prior studies have found that the new or diverse knowledge carried by workers can be valuable because it allows them to be more innovative (e.g., Rosenkopf and Almeida 2003, Song et al. 2003), in our supplemental analyses we find that unrelated prior experiences carry neither benefits nor baggage to the new firm.” [4] This study provides new insight into my research regarding the true relationship between prior experience and the propensity for an engineering firm to hire an individual. In another study by Smith & Green (2005), they state “Work experience performed a useful function in opening respondents’ eyes to career possibilities.” [10] These results build on existing evidence from my study, stating the seemingly positive correlation between prior experience, and more availability and access to positions in the engineering field.

Limitations

Whilst this study provides focused data into the scope of a specific field, any data pertaining to fields outside that of engineering are beyond the realm of this study, and thus, cannot be truthfully considered when addressing the results of this research study. Due to the scope in which this study was performed, being a high school level study into online job posting websites, important research aspects such as interviewing, or gathering data directly from engineering firms were not utilized, and thus, less precise data is generated in the results of this study. Another limitation coming with the situation in which this research was conducted was lack of time; despite the amount of job postings recorded, it only shows data over a three month period, and due to this, trends that change over this time frame cannot be seen or analyzed. One critical piece of information this study lacked, was that of direct employee feedback, or gathering the opinions on prior experience directly from new hires, and how it positively or negatively affected their experience in the engineering field. Whilst this study did record the requirements and recommendations of a number of job postings, what it could not record was the type of prior experience had by the individual applying for the job. Without knowing for certain, such as through use of interviews, the benefits or detriments of experience on a job hiring process cannot be considered.

Conclusion and Further Studies

In this study, it was hypothesized that a higher level of individual prior experience correlated to a higher rate of job application acceptance. Regarding the hypothesis of this study, the results inclined to follow this hypothesis, creating a highly positive correlation between job application requirements and recommendations, and prior experience requested for these criteria. After measuring a total of one-hundred unique job postings across three major job posting websites; LinkedIn, Glassdoor, and Indeed, seventy-five percent of all job postings recorded recommended some level of prior experience, and eighty-six percent of all job postings recorded required some level of prior experience. However, Brunhaver, Jesiek, Forte, & Strong (2021)[2] highlight the fact that an early engineer's work experience and identity to be shaped more so by their ability to apply their technical expertise within their organization, more so than the work experience itself. Dokko, Wilk, & Rothbard (2009)[4], support the hypothesis that prior work experience carries knowledge and skills contributing to the goals of an organization. Similarly, McDaniel, Schmidt, & Hunter (1988)[9] state that the correlation between job experience and overall job performance tends to be positive.

While this study examined basic information relating to job posting websites, and all data pertaining to postings within such websites, such limitations that come with the sole use of such data gathering measures create significant areas to be improved upon in future research. Limitations such as lack of knowledge of type of experience, lack of outside knowledge regarding other industries, and lack of time given for further consideration, are some of the major limitations this study faced. For example, prior experience may not always be a positive factor in hiring, and hiring corporations may not know the possible adverse experiences one may have coming into a job [8]. These individual unknown factors can drastically alter what prior experience truly means in the scope of a job hiring process. Another such limitation to this study is that of lack of outside knowledge pertaining to other job fields. While this study's scope focused solely on postings within and around the engineering field, its numbers could be heavily swayed if other fields were put into consideration, with fields such as business and commercial coming to mind.

With the results of this study, the implied results or actions taken into account help to support the hypothesis that experience correlates to a higher rate of hiring acceptance in the

engineering field. With the results showing that eighty-eight percent of all job postings required some form of academic degree, being a bachelor, masters, or Ph.D, implications could be drawn suggesting a trend between job acceptance rate, and the past academic degree experience. While not every job required a form of academic degree, a similar percentage of job postings, at eighty-six percent, required any form of past related experience; thus suggesting a trend between related experience had by an individual, and job acceptance rate. With these two suggested trends, it allows individuals seeking a position in the engineering field prior knowledge of what could be required before seeking employment in their desired area of work.

While this study may suggest the two above trends in relation to the data acquired and job posting requirements, it does not account for the nature of said experience or degree. While it can be hypothesized that higher levels of related experience could replace the requirement for an academic degree, such as stated by trends recorded by FlexJobs (Rachel Pelta, 2020, Education vs. Experience: What Do Employers Want More?); The data collected in this research study suggests an indifference in requirements between related experience and academic degree, with the two being only two percent apart in number required in the job posting collected.

It is possible that, given a longer period of time, the results from this research could fluctuate greatly, or not at all. With the small scope of time given for this research, it is feasible that a greater time slot is given on such a topic in future research could obtain larger sums of data over an extended period. Another such limitation in this research, is the inability to gather information directly from firms actively hiring individuals, or recent hires. Such data to be obtained from direct data gathering methods such as interviews, could provide more insight into the actual effect of prior experience on a hiring process. Regardless, this study, despite its inherent limitations, helps to point where to go next in the research topic regarding how experience can help or hinder the hiring process.

Work Cited

- [1] Bilen S., & Wheeler T. (2015). Applying 3D Printing to Model Rocketry to Enhance Learning in Undergraduate Engineering Design Projects. *2015 ASEE Annual Conference & Exposition*. 10.18260/p.24448
- [2] Brunhaven, S.R., Jesiek, B.K, Forte, R.F, & Strong, A.C. (2021). The Early Career years of Engineering; Crossing the threshold between education and practice. *Engineering Studies*, 13(2), 79-85.
- [3] Campbell T., & Okutsu M. (2016). Model Rocket Project for Aerospace Engineering Course: Trajectory Simulation and Propellant Analysis. *Department of Mechanical Engineering, The Catholic University of America, Washington D. C., USA*.
- [4] Dokko G., & Wilk S., & Rothbard N. (2009). Unpacking Prior Experience: How Career History Affects Job Performance. *Organization Science*. 20(1)
- [5] Gurel, C., Olgun, H., Suzuk, E, & Gurel, Z. (2014). Discourse Analysis Of The Arguments Developed in Model Rocketry Learning Environments. *International Online Journal Of Educational Sciences*, 6(1), 144-165.
- [6] Holstermann N., & Grube D., & Bogeholz S. (2009). Hands-on Activities and Their Influence on Students' Interest. *Research In Science Education*. 40(743)
- [7] Lang, N. (2020). The Effectiveness of Model Rocketry to Teach Science and Quantitative Content to Students in a Non-Science Majors Course at the College Level: An Example from a Planetary Geology Course. *Open Journal of Statistics*. 10. 139-153.
- [8] mcDaniel, M.A, Schmidt, F.L, & Hunter, J.E. (1988) Job Experience correlates of job performance, *Journal of Applied Psychology*, 73(2), 327-330.
- [9] Niemi, E. (2002). Using Model Rocketry To Introduce Students To Aerospace Engineering. *American Society For Engineering Education Annual Conference & Exposition*. 2793(1)
- [10] Smith, E. & Green, A. (2005). How workplace experience while at school affects career pathways. *National Vocational Education and Training Research Evaluation Program*.
- [11] Traum M., & Prantil V., & Farrow W., & Weiss H. (2013). Interconnecting the Mechanical Engineering Curriculum Through An Integrated Multicourse Model Rocketry Project. *2013 ASEE Annual Conference & Exposition*.

D.T. Suzuki and Thich Nhat Hanh: The Rise of Contemporary Zen in the West By Taoxi Xie

Introduction

During the last century, Zen has become a well-established part of Western culture. Major Western universities offer higher degrees in Zen Buddhism, courses about Zen Buddhism are in high demand, and aspects of Zen have made their way into mainstream Christianity and Judaism.¹ Yet, how has Zen achieved this general appeal? Zen has a long history; having originated in China during the sixth century, it quickly spread to Vietnam, Japan, and Korea. However, in the West, Zen was introduced to the general public only about a century ago.² Initially, people in the West were curious and viewed Zen as a symbol of Eastern philosophy rather than as a practice they could embrace.³ Later, Zen turned into a social movement and an embodiment of contemporary counterculture.

This paper will explore how Zen first began to gain a foothold in the West by tracing the careers of two influential scholars whose accomplishments contributed significantly to the introduction of Zen to the West. In the early 1900s, D. T. Suzuki was one of the first to provide Zen with an academic framework that allowed Western intellectuals to appreciate Zen as a philosophy. Several decades after the death of Suzuki, Thich Nhat Hanh, a Vietnamese monk, introduced the practice of Zen to the general public. Hanh's embrace of the peace movement and anti-Vietnam War efforts, as well as his subsequent exile, contributed to the popularization of Zen in the cultural life of the United States and Europe. Together, the contributions of Suzuki and Hanh have laid the groundwork that allowed Zen to develop from a minor academic interest to a significant religious movement.

D. T. Suzuki's Life and Legacy

I will begin with D. T. Suzuki, who was one of the first scholars to introduce the academic study of Buddhism, including Zen, to Western universities. Suzuki's father, a physician from a

¹ For more information on the intersection of Judaism, Islam, Christianity and Buddhism, see the following books: William Johnston, *Christian Zen* (New York: Fordham University Press, 1997); David M. Bader, *Zen Judaism: For You, a Little Enlightenment* (New York: Harmony Books, 2002).

² For a more detailed history on Zen Buddhism, see Damien Keown, *Buddhism: A Very Short Introduction*, 2nd ed. (Oxford: Oxford University Press, 2013); Heinrich Dumoulin, *A History of Zen Buddhism*, 5th ed. (Boston, Mass.: Beacon Press, 1975); Heinrich Dumoulin, *Zen Buddhism: A History* (New York: Macmillan, 1990).

³ Larry A. Fader, "Zen in the West: Historical and Philosophical Implications of the 1893 Chicago World's Parliament of Religions," *The Eastern Buddhist* 15, no. 1 (1982): 122-123.

low-level samurai clan, died when Suzuki was a child, leaving Suzuki in poverty. Because of his financial hardships, Suzuki could no longer afford a formal education and became a student of Imakita Kōsen, the Zen master of Engakuji Temple. Lacking the financial means to pay for train rides, he walked all night to reach the monastery in time for morning meditation.⁴

Despite his financial difficulties, Suzuki excelled in his studies. In 1893, he was honored with the opportunity to attend the World's Parliament of Religions at the 1893 Columbian Exposition in Chicago as a translator for Sōen, the new abbot of Engakuji Temple.⁵ This opportunity proved to be a breakthrough for Suzuki and Zen Buddhism in many ways. Paul Carus, a wealthy and influential publisher who resided in Chicago, was so impressed by Sōen's speech that he invited Sōen to remain in Illinois and translate Eastern religious texts with him. Sōen had to decline the offer but recommended Suzuki in his place. Suzuki was hired on the spot and subsequently worked as a translator and a junior editor for the philosophical journal *The Monist*.⁶ Carus and Sōen embarked upon a collective intellectual endeavor toward an ultimate truth for humanity, reflective of an attitude that left its imprint on Suzuki's work.⁷

Suzuki's fluency in English provided him with an opportunity to socialize with other influential philosophers, such as Carl Jung, Alan Watts, Thomas Merton, Allen Ginsberg, and Martin Heidegger, some of whom he even mentored.⁸ In the 1950s, Suzuki taught at several prominent institutions on the East Coast, including Columbia University.⁹ He published numerous celebrated works, such as *Essays in Zen Buddhism*, *Introduction to Zen Buddhism*, and *Zen and Japanese Culture*.¹⁰ His academic achievements further strengthened his position as an authority on Zen. Even after he retired from teaching in his early seventies, Suzuki worked continuously on his interpretation of the original Buddhist text in an academic manner. Suzuki's approach to Zen was undoubtedly revolutionary in his times. Suzuki's effectiveness in translating

⁴ Eric, Cunningham, "D. T. Suzuki: A Biographical Summary," *Asia: Biographies and Personal Stories*, Part II, Volume 20:2 (Fall 2015): 42.

⁵ Margaret H. Dornish, "Aspects of D.T. Suzuki's Early Interpretations of Buddhism and Zen," *The Eastern Buddhist* 3, no. 1 (1970): 50.

⁶ Shōjun Bandō, "D. T. Suzuki's Life in La Salle," *The Eastern Buddhist* 2, no. 1 (1967): 137.

⁷ Dornish. "Aspects of D.T. Suzuki's Early Interpretations of Buddhism and Zen," 51.

⁸ Cunningham. "D. T. Suzuki: A Biographical Summary", 43.

⁹ Cunningham. "D. T. Suzuki: A Biographical Summary", 44.

¹⁰ For more information on Suzuki's publications, see the following books: Daisetsu Suzuki, *An Introduction to Zen Buddhism* (New York: Grove Press, 1991); D. T. Suzuki, *Essays in Zen Buddhism* (New York: Grove/Atlantic, 2007); Daisetz Teitaro Suzuki and Richard M. Jaffe, *Zen and Japanese Culture* (Princeton, NJ: Princeton University Press, 2019).

Zen presents this ancient tradition with a sound, authentic and profound effect.¹¹ Taken together, the consistency of his ideas has cemented his legacy in the early academic study of Buddhism.

D. T. Suzuki's Approach to Zen

Suzuki's intellect undoubtedly had a lasting impression on his contemporaries. However, what made Suzuki especially remarkable was his success in satisfying the Western interest in Eastern religion by formulating his philosophy of Zen. Because of his upbringing, Suzuki interpreted Zen not only from the perspective of a religious scholar but also as an active practitioner of Zen.¹² Highly regarded in academia, his *An Introduction to Zen Buddhism* received attention from the general public and was republished after World War II.

An Introduction to Zen Buddhism was based on his previous work, *First Series of Zen Essays*.¹³ While *First Series of Zen Essays* explored Zen in the form of numerous shorter publications, *An Introduction to Zen Buddhism* analyzed Zen more systematically – focusing on several central ideas of Zen. Unprecedented in the 1930s, *An Introduction to Zen Buddhism* summarized the history of Zen Buddhism with emphasis on its practice and impact. Suzuki's language is considered “evocative” and “strangely fascinating and refreshing on repeated readings.”¹⁴

Suzuki's *An Introduction to Zen Buddhism*:

In this book, Suzuki argues that four ideas stand at the center of Zen. These ideas include the concepts of the illogical nature of Zen, *Satori* (sudden enlightenment), higher affirmation, and *Koan* (a paradoxical anecdote). The following passages will present the principal meanings of those four concepts. My analysis will illustrate Suzuki's articulation of Zen and its reception in the West.

¹¹ Thomas Merton, “D. T. Suzuki: The Man and His Work,” *The Eastern Buddhist* 2, no. 1 (1967): 6.

¹² Dornish, “Suzuki's Early Interpretations of Buddhism and Zen,” 52.

¹³ Yoshito S. Hakeda, “Review: *An Introduction to Zen Buddhism* by D. T. Suzuki,” *The Journal of Asian Studies* 24, no. 3 (1965): 516.

¹⁴ Hakeda, “Review: An Introduction,” 516.

The Illogical Nature of Zen

Suzuki's construction of Zen is unique to his scholarship. To highlight his contribution to the study of Zen, I will present a comprehensive scope as to what Suzuki wished his readers to understand. Although Suzuki regarded Zen as fundamentally "illogical," the emergence of logic in his writing is extensive. Suzuki merges philosophical and psychological interpretations of Zen with a set of pure Zen experiences.¹⁵ Initially, Suzuki's understanding of Zen might seem speculative and implausible because he describes the idea of Zen in contradictory terms. For example, Suzuki compares Zen to the "silence of an eternal abyss in which all contrasts and conditions are buried."¹⁶ In the following sentence, he describes Zen as the "silence of thunder."¹⁷ Those notions appear disparate, but they collectively reflect the inadequacy of words to interpret what Suzuki considered the essence of Zen. Another example of Suzuki's illogical explanation of Zen is his claim that Zen is not a religion. Zen has "no god to worship, no ceremonial rites to observe." At the same time, Zen does not deny the "existence of god" such that one could still consider it a religion in the most basic sense.¹⁸ Next, Suzuki clarifies that "Zen wants to rise above logic."¹⁹ In this interpretation, one can view Zen as a study that supersedes common logic to free human intelligence from the confines of sequential reasoning.²⁰ Thus, for Suzuki, Zen is best interpreted as illogical logic.

Satori and Koan:

Logic is central in Suzuki's interpretation of the concepts of *satori* and *koan*, which are inextricably linked. In the process of gaining *satori*, *koan* functions as a preparation. *Satori* means acquiring a new viewpoint through enlightenment. Suzuki uses multiple paradoxical anecdotes or *koans* to analyze the fundamentals of *satori*. One such anecdote centers on Kyogen, an apprentice of the Zen master Hyakujo. The account begins with Kyogen's puzzle about the nature of Zen, which he does not comprehend. He thus turns to a senior apprentice of his master, Yisan, for advice: "Let me have your view as to the reason of death and birth; that is, as to your own being before your parents had given birth to you."²¹ Yisan does not know how to reply; he

¹⁵ Sakamoto Hiroshi, "D. T. Suzuki as a Philosopher," *The Eastern Buddhist* 11, no. 2 (1978): 36.

¹⁶ Suzuki, *Introduction to Zen Buddhism*, 35-36.

¹⁷ Suzuki, *Introduction to Zen Buddhism*, 36.

¹⁸ Suzuki, *Introduction to Zen Buddhism*, 39.

¹⁹ Suzuki, *Introduction to Zen Buddhism*, 39.

²⁰ D. T. Suzuki, "Zen: A Reply to Van Meter Ames," *Philosophy East and West* 5, no. 4 (1956): 349.

²¹ Suzuki, *Introduction to Zen Buddhism*, 91.

trudges to his room but is unable to find a suitable passage to express his view. He then responds: “I really have nothing to impart to you, and if I tried to do so, you might have occasion to make me an object of ridicule. Besides, whatever I can tell you is my own and can never be yours.”²² Kyogen considers Yisan unkind, since he fails to resolve his problems concerning the perception of Zen. We learn, however, that Kyogen does achieve *satori* in the end. When he retires, he spends his life in solitude in accord with certain Buddhist principles. Once Kyogen’s mind is inherently prepared, the sound of percussion made by bamboo elevates his senses and permits him to achieve *satori*. He becomes joyous: all the questions he has asked have been answered.

We learn from this anecdote that if Yisan had answered him, Kyogen would never have achieved *satori*. Suzuki suggests that *satori* cannot be analyzed intellectually. One cannot obtain *satori* by analyzing dialogue. In that case, there is no need for *satori* at all. One can never reach enlightenment through a logical analysis in a situation, since *satori* is inherently illogical. Suzuki also insists that the process of *satori* is not associated with mere luck: “all the causes, all the conditions of *satori* are in the mind; they are merely maturing.”²³ Extending this point, he argues: “When the mind is ready, for any reason – a bell rings or a bird flies and you at once return to your original home; that is, you discover your now real self.”²⁴ Any object or incident can lead to one’s *satori* when the mind is on the brink of an epiphany.

Suzuki believed that “the ultimate destination of *satori* is toward the self.”²⁵ The seeking of true self is the true seeking of Zen. Nonetheless, Suzuki determined that *satori* is the product of suddenness. In his writing, he does not perceive meditation as a way to uphold the structure of *satori*. Suzuki summarizes *satori* and meditation as follows: “It is evident, therefore, that meditating on metaphysical and symbolical statements...play no part in Zen.”²⁶ In Suzuki’s mind, the existence of *satori* is the prerequisite to approaching Zen: “In Zen there must be *satori*; there must be a general mental upheaval which destroys the old accumulation of intellect and lays the foundation for a new life.”²⁷ In other words, without escaping from the limitations imposed on the mind by traditional forms of rationality, *satori* can never be achieved and Zen can never be understood.

²² Suzuki, *Introduction to Zen Buddhism*, 91.

²³ Suzuki, *Introduction to Zen Buddhism*, 92.

²⁴ Suzuki, *Introduction to Zen Buddhism*, 92.

²⁵ Suzuki, *Introduction to Zen Buddhism*, 93.

²⁶ Suzuki, *Introduction to Zen Buddhism*, 95.

²⁷ Suzuki, *Introduction to Zen Buddhism*, 96.

If *satori* has no logical approach, how can it be acquired? Suzuki believes that *koan*, a paradoxical anecdote, can serve as a “leaven” during the acquisition of *satori*.²⁸ *Satori* prepares one for an awakening. One famous *koan* that illustrates the process of *satori* starts with the monk Myo asking the Sixth Patriarch to elaborate on the nature of Zen. The Sixth Patriarch answers in full affirmation: “When your mind is not dwelling on the dualism of good and evil, what is your original face before you were born?”²⁹ The Sixth Patriarch sees that Myo has tried earnestly to grasp the meaning of Zen. Eventually, this interaction between the two inspires Myo to find the “original face” or the true meaning of Zen. The “fruit” of Zen has ripened; it only requires some affirmation for the fruit to drop.³⁰ This *koan* shows that *satori* will blossom naturally when the time comes, meaning that it will occur when all mental conditions have been met. It is important to remember that listening to anecdotes (*koan*) is not sufficient for reaching *satori*. A *koan* might promote the growth of *satori*, but one can obtain *satori* only through personal experience. No one can analyze the how and why of *satori*, but if one engages in *satori*, one shall know Zen entirely in one’s subconscious mind. The accumulation of *koan*, which could be considered a personal experience, plays a significant role in one’s *satori*.

Higher Affirmation of Zen:

The next concept for discussion is the principle of higher affirmation. Suzuki mentions that “life is affirmation itself,” but to exist in Zen is to achieve absolute affirmation.³¹ The very objective of a Zen master is to “endeavour to take away all footholds from the disciple which he ever had since his first appearance on earth and then to supply him with one that is really no foothold.” Suzuki’s simplified interpretation of higher affirmation is to contrive an escape, not through common logic but through “a mind of higher order.”³² Suzuki then uses a *koan*, a succinct paradoxical statement, to illustrate the higher affirmation of Zen: “Hoyen (Fa-yen, died 1104), of Gosoan (Wu-tsu-shan), once asked, ‘When you meet a wise man on your way, if you do not speak to him or remain silent, how would you interview him?’”³³ He then defines absolute affirmation thus: “Not merely to escape the antithesis of ‘yes’ and ‘no,’ but to find a positive way

²⁸ Suzuki, *Introduction to Zen Buddhism*, 105.

²⁹ Suzuki, *Introduction to Zen Buddhism*, 104.

³⁰ Suzuki, *Introduction to Zen Buddhism*, 105.

³¹ Suzuki, *Introduction to Zen Buddhism*, 68.

³² Suzuki, *Introduction to Zen Buddhism*, 69.

³³ Suzuki, *Introduction to Zen Buddhism*, 69.

in which the opposites are perfectly harmonized – this is what is aimed at in this question.”³⁴ Then, he uses another *koan* to illustrate an example of an absolute affirmation. In this passage, Sekito asserts: “Assertion prevails not, nor does denial. When neither of them is to the point, what would you say?”³⁵ Yakusan remains meditative, as he does not grasp the meaning of the question. The master then tells him to go to Badaishi (Ma Tai-shih) of Chiang-hsi, who might be able to open the monk's eye to the truth of Zen. Badaishi remarks, “I sometimes make one raise the eyebrows, or wink, while at other times to do so is altogether wrong?” The very notion is that one can neither negate nor affirm. Suzuki insists that one shall reach a point where “negation and assertion are unified in a higher form of statement.”³⁶ Further, it is noteworthy that one cannot blindly follow and adhere to the solutions within each *koan*. The key to one *koan* is not interchangeable, meaning that one cannot use the answer in any other *koan*. In each circumstance, Suzuki believes that if the individual can apply those principles accordingly without hesitation, they truly understand Zen.

Suzuki's analysis of Zen Buddhism has not gone uncontested. Van Meter Ames, for example, remarked that Suzuki applied an intellectual dichotomy that is foreign to Zen, in which Suzuki's conceptual analysis diminished the original intent of consciousness and plainness (non-abstract process).³⁷ In response to this critique, Suzuki stated that scholars are invited to interpret Zen with the help of philosophy. This approach is “not below the dignity of Zen.” He objected to an attempt to interpret Zen through purely intellectual means, as Zen has always had a practical element. He further stated that intellectuals, big or small, could not comprehend Zen in their minds and writings if they choose not to experience Zen existentially.³⁸

Despite the occasional critical voice, Suzuki's academic analysis is logical and reasoned. His method is best perceived similarly to metaphysics rather than as an irrational conjecture or implication.³⁹ Suzuki uses a thought process comparable to the Socratic Method to inspire his readers' connection with Zen. Since Zen evades a precise definition, it allows for the coexistence of different interpretations.

³⁴ Suzuki, *Introduction to Zen Buddhism*, 69.

³⁵ Suzuki, *Introduction to Zen Buddhism*, 69.

³⁶ Suzuki, *Introduction to Zen Buddhism*, 70.

³⁷ Van Meter Ames, “Zen and Pragmatism,” *Philosophy East and West* 4, no. 1 (1954): 19-21.

³⁸ Suzuki, “Zen: A Reply,” 351.

³⁹ Thomas P. Kasulis, “Reading D. T. Suzuki Today,” *The Eastern Buddhist* 38, no. 1/2 (2007): 52-53.

Buddhism as a Practical Subject: Thich Nhat Hanh

We will now turn to examine the life of the Vietnamese monk, Thich Nhat Hanh, who also played a significant role in introducing Zen Buddhism to the West. With D. T. Suzuki, we encountered a relatively academic approach to Zen. When we turn to the work of Hanh, we discover that Zen engages with contemporary issues such as world peace and social justice. Several factors cumulatively unique to Hanh have contributed to the popularization of Zen; these include his personal history, involvement in what he refers to as Socially Engaged Buddhism, openness to other religions and media presence.

Much of Hanh's activism was inspired by his personal story and experiences. Contrary to Suzuki, Hanh was not forced into the monastery by poverty but rather, joined of his own free will. When Hanh was a child, he was fascinated by pictorial representations of Buddha, noting that he seemed to radiate an aura of peace.⁴⁰ As the years went by, Hanh developed an increasing commitment to Buddhism until, eventually, his parents granted their approval for him to join a monastery at the age of 16. For Hanh, practicing Zen meant that he could gain epiphanies through simple means. Having encountered the brutality and atrocities committed by the U.S. Military and two Vietnamese governments during the Vietnam War, he came to Europe and North America to appeal for peace.⁴¹ During his travels in the West, he was offered the opportunity to address the English, Canadian, and Swedish Parliaments, and he met Pope Paul VI.⁴² In 1966, Hanh held a press conference in Washington D. C., where he raised five points.⁴³ First, he declared that the best intervention would be for the U.S. to support the Vietnamese in building their own government immediately. He also appealed to the U.S. government to cease its war effort and resultant bombings. Moreover, Hanh declared that the U.S. military should only act in self-defense and that the U.S. should also demonstrate its willingness to withdraw its

⁴⁰ "Oprah Talks to Thich Nhat Hanh," *Oprah*, last modified February 16, 2010, accessed March 9, 2022, <https://www.oprah.com/spirit/oprah-talks-to-thich-nhat-hanh/2>.

⁴¹ Aidyn Fitzpatrick, "Thich Nhat Hanh, Father of Mindfulness, Awaits the End," *Time*, last modified January 24, 2019, accessed March 9, 2022, <https://time.com/5511729/monk-mindfulness-art-of-dying/>.

⁴² Fitzpatrick, "Thich Nhat," *Time*.

⁴³ 112 Cong. Rec. 14891 (June 6, 1966).

forces from Vietnam at the earliest possible point. Finally, he wanted the U.S. to help rebuild the country.⁴⁴

Unfortunately, this appeal did not only fall on deaf ears; it also led to his expulsion from his home country of Vietnam.⁴⁵ The Vietnamese government could not tolerate any obstruction of its foreign policy, which reinforced the necessity of war. Furthermore, Hanh's peacekeeping efforts were deemed dangerous, particularly because his work was well received in the West. As a result, Hanh's passport was revoked and his application for visas was automatically denied. He wrote continuously to Senators Robert Kennedy and George McGovern in the hope of regaining entry to the United States.⁴⁶

Hanh's expulsion and subsequent exile elevated his reputation and public image in the West, making him a legendary character. Unsurprisingly perhaps, the expulsion from Vietnam did not keep Hanh from engaging in his peace-related activities; Hanh was determined to advance these efforts in the United States. In the early 1960s, Hanh enrolled at the Princeton Theological Seminary. Upon graduation, he taught Comparative Religions at Columbia University and eventually helped organize anti-Vietnam War protests.⁴⁷ In 1966, Harvard University invited him to present his ideal of self-determination to the public.⁴⁸ His reputation reached a pinnacle one year later, when Martin Luther King Jr. nominated him for a Nobel Peace Prize.⁴⁹ Recognized by the international community, Hanh's stature as an international leader bolstered his peace efforts and led to various publications, that helped launch his meditation villages worldwide.

⁴⁴ Celine Chadelat, Bernard Baudouin, and Bo du an, *Zheng Nian De Zu Ji: Yi Xing Chan Shi Zhuan Ji = Thich Nhat Hanh : Une Vie En Pleine Conscience*, chu ban. ed. (Tai bei shi: shi bao wen hua chu ban qi ye gu fen you xian gong si, 2018), 968, Kindle Edition(Iphone).

⁴⁵ Fitzpatrick, "Thich Nhat," *Time*.

⁴⁶ Thich Nhất Hạnh, *At Home in the World: Stories and Essential Teachings from a Monk's Life* (Berkeley, CA: Parallax Press, 2016), 12.

⁴⁷ Ashley Ross, "How Meditation Went Mainstream," *Time*, last modified March 9, 2016, accessed March 9, 2022, <https://www.thecrimson.com/article/1966/5/27/vietnam-buddhist-thich-nhat-hanh-will/>.

⁴⁸ Stephen D. Lerner, "Vietnam Buddhist Thich Nhat Hanh Will Lecture On Self-Determination," The Harvard Crimson, last modified May 27, 1966, <https://www.thecrimson.com/article/1966/5/27/vietnam-buddhist-thich-nhat-hanh-will/>.

⁴⁹ Martin Luther King Jr., "Letter from Dr. Martin Luther King, Jr. nominating Thich Nhat Hanh for the Nobel Peace Prize in 1967," *Plum Village*, <https://plumvillage.org/letter-from-dr-martin-luther-king-jr-nominating-thich-nhat-hanh-for-the-nobel-peace-prize-in-1967/>.

To further explore Hanh's impact on the spread of Buddhism, I will analyze his principle of Engaged Buddhism and its moral justification. Then, I will discuss his book *The Miracle of Mindfulness* in two parts: (1) Hanh's approach to Zen and (2) meditational guidelines. Finally, I will provide further context of his perception on the universality of religions and his skill in utilizing his online presence to promote Buddhism in the West.

Hanh and Socially Engaged Buddhism:

One of Hanh's most notable accomplishments was his implementation of Socially Engaged Buddhism and his striving toward world peace.⁵⁰ Much of Hanh's activism stemmed from his disappointment with his fellow monks, who contributed no actions against injustice. While Zen practitioners traditionally studied in mountains or other inaccessible locations, Hanh revolutionized Zen by encouraging monks to enter the cities and become involved in social work. Hanh was critical of the indifference that he detected at the well-respected Buddhist institutes of his country. He noted that "though many of our teachers [...] spoke about peace... few of them did anything."⁵¹ Hanh expressed his moral justification for Socially Engaged Buddhism in an interview with *Lion's Roar* magazine, where he stated: "[Socially] Engaged Buddhism is just Buddhism. When bombs begin to fall on people, you cannot stay in the meditation hall all the time."⁵²

The idea of Buddhist monks involving themselves in social activism is of course not new and in no way restricted to Hanh's work. The Chinese monk Tai-Xu, for example, adopted Socially Engaged Buddhism by saving soldiers in the Second Sino-Japanese War and by establishing new Buddhist institutions.⁵³ While Tai-Xu's activism was limited to China, Hanh's Socially Engaged Buddhism extended beyond the borders of his home country. It resonated with the American public, which was reeling from the fallout of the Civil Rights Movement and the country's involvement in the Vietnam War. One reason Hanh's take on Zen Buddhism has been so successful stems from the fact that it provides peaceful resolutions to contemporary conflicts.

⁵⁰ Sallie B. King, "Transformative Nonviolence: The Social Ethics of George Fox and Thich Nhat Hanh," *Buddhist-Christian Studies* 18 (1998): 11-13.

⁵¹ Hanh, *At Home*, 40.

⁵² John Malkin, "In Engaged Buddhism, Peace Begins with You," *Lion's Roar*, last modified July 16, 2020, accessed March 9, 2022, <https://www.lionsroar.com/in-engaged-buddhism-peace-begins-with-you/>.

⁵³ Darui Long, "An Interfaith Dialogue between the Chinese Buddhist Leader Taixu and Christians," *Buddhist-Christian Studies* 20 (2000): 167, 170, 173.

Hanh's religious convictions were not well received in his home country. While the Vietnam War was underway, Hanh wrote to the Institute of Buddhism in Vietnam, calling for religious reform, but his proposal was struck down repeatedly.⁵⁴ Hanh pressured the Institute of Buddhism to take a more active approach in advocating for peace. Rather than engaging in a constructive dialogue, the Institute chose to expel Hanh. His expulsion from the Institute did not deter Hanh from his belief that reforms were needed. Consequently, he joined forces with a group of friends, including Sister Chan Khong, and together they succeeded in creating various social programs.

Hanh demanded three aspects of reform within the Institute: (1) cessation of hostilities among South Vietnam, North Vietnam and the United States; (2) the founding of a new Buddhist institute to train future Buddhist leaders; and (3) the establishment of a social work organization to reaffirm Buddha's teachings.⁵⁵ The Institute only accepted Hanh's second suggestion, and he proceeded to co-found the Van Hanh Buddhist University (then Institute of Higher Buddhist Studies) in 1964.⁵⁶ Hanh followed his passion for reforming Buddhism, and shortly after founding the University, he established the School of Youth for Social Service (SYSS) without the support of the Institute. SYSS constructed housing for those who had lost their homes regardless of their political ideology during the Vietnam War.⁵⁷ Hanh also arranged transportation and help for Vietnamese refugees who were fleeing the violence and terror of the Vietnamese government.⁵⁸ Hanh implemented his religious beliefs as a means of social service. His novel interpretation of Zen transformed Zen and even after his expulsion from the Institute and Vietnam, Hanh utilized his principles to communicate the values of Zen to Western nations.

The Miracle of Mindfulness

Hanh further expanded on his general philosophy of Engaged Buddhism in his publications, especially in *The Miracle of Mindfulness*. This book, published in 1975, is perhaps the most notable popularization of Zen in the Western World and introduced American readers to

⁵⁴ Hanh, *At Home*, 41.

⁵⁵ Philip Taylor, *Modernity and Re-enchantment: Religion in Post-revolutionary Vietnam; [Vietnam Update Conference (2005: Canberra, Australia)]* (Singapore: ISEAS, 2007), 301.

⁵⁶ Taylor, *Modernity and Re-enchantment*, 301.

⁵⁷ Hanh, *At Home*, 54-55.

⁵⁸ Hanh, *At Home*, 61-67.

a new idea: the concept of mindfulness which Hanh pairs with detailed instructions on meditation and Buddhist philosophy.

Hanh uses the principle of mindfulness to communicate the core values of Zen Buddhism. Throughout the book, his illustrations of mindfulness are plain and easily accessible. The first two chapters summarize “mindfulness” and Hanh’s progress as a Zen practitioner. To be mindful, a person must be “conscious of [their] presence” and “conscious of [their] thoughts and actions.”⁵⁹ By focusing on simple daily activities like washing dishes, Hanh presents Zen to his readers as something that was deeply connected to the details and experiences of their lives. Hanh’s simple language describes mundane tasks to create a link between him and his audience. He presents his thoughts with great clarity; he minimizes intricate ideas and illustrates them in a clear manner. His view that everything that has happened on this planet is a miracle is indeed extraordinary. For instance, the “black eyes of a child,” the “blue sky,” and the “white clouds” are all miraculous.⁶⁰ His thought reveals his appreciation and profound understanding of the world. According to Hanh, we must exist in the moment and value the time, objects, and people we encounter. Hanh’s justification of mindfulness is straightforward. “Mindfulness embodies us; without it, we are not truly alive.”⁶¹ Essentially, the motivation of the book is to persuade people to practice mindfulness or Zen using philosophical and analytical dialogue. In this case, Zen and mindfulness have equivalent meanings.

Hanh interprets his personal observations to illustrate his point. For instance, he mentions a close companion’s interactions with his young children to reveal different perspectives. At the beginning, Hanh asks about his companion’s life after he fathered his children. Initially, his companion, Allen, does not answer directly. Hanh senses Allen’s hesitation and fatigue. Then Allen mentions his new approach to familial duties: “In the past, I used to look at my time as if it were divided into several parts. One part I reserved for Joey, another part was for Sue, another part to help with Ana, another part for household work...But now I try not to divide time into parts anymore. I consider my time with Joey and Sue as my own time...The time for them becomes my time.”⁶²

⁵⁹ Thích Nhất Hạnh, *The Miracle of Mindfulness: An Introduction to the Practice of Meditation*, repr. ed. (Boston, Mass.: Beacon Press, 2013), 8.

⁶⁰ Hạnh, *The Miracle*, 12.

⁶¹ Hạnh, *The Miracle*, 33.

⁶² Hạnh, *The Miracle*, 2.

Hanh's audience can perceive his simple and well-intentioned anecdotes without further research. Exceptionally, Hanh's writing consists of richness and transparency. For example, in the previous story, Hanh uses a concise fable to exemplify the meaning of altruism, generosity, concentration, and kindness. And yet, Hanh solely expresses and portrays the ideas, leaving the interpretations to his readers. The values Hanh embedded in his book appeal to transcend religious belief and embrace common understanding among humans.

Hanh's Meditational Guidelines:

The Miracle of Mindfulness is an outstanding book because it introduces the concept of mindfulness to a broader audience and contains extensive details regarding meditation guidelines which were unprecedented in the 1970s.⁶³ As a primary form of attaining mindfulness, meditation was rarely practiced by the general public. Even people motivated to research meditation had no access to adequate resources or information. This lack of information was the result of geographical isolation. For instance, to learn the basics of Tibetan meditation, one needed to be physically present in Tibet. The same applies to other styles of meditation, practiced elsewhere, for which no easily accessible sources existed.

Meditation is one of the most effective forms of training in Zen. Hanh recognized the value of including explicit and suitable content for Westerners to practice meditation. In *The Miracle of Mindfulness*, Hanh translates and explains traditional meditation techniques in ancient Buddhist texts. Just as texts are central to religions like Judaism, Christianity and Islam, Buddhism centers on religious writings. Hanh embeds his insights about mindfulness in a historical framework that his readers can easily follow. When Hanh quotes from the *Sutra of Mindfulness*, he expresses the idea through the following statement: "Breathing in a long breath, you know."⁶⁴ To fulfill the interests of his audience and provide historical justification for his book, Hanh references several classical Buddhist texts. For example, he uses the *Anapanasati Sutta* to interpret meditation through the "awareness of the physical process involved in breathing," such as "whether the breath is long or short."⁶⁵ When stressing the importance of

⁶³ *The Miracle of Mindfulness* was reprinted several times due to its popularity (See other reprint versions of *The Miracle of Mindfulness*):

https://www.google.com/books/edition/The_Miracle_of_Mindfulness_Gift_Edition/2NkiDQAAQBAJ?hl=en&gbpv=0&kptab=editions

⁶⁴ Hanh, *The Miracle*, 15.

⁶⁵ Robert E. Buswell and Donald S. Lopez, *The Princeton Dictionary of Buddhism*, course book. ed. (Princeton, NJ: Princeton University Press, 2013), 41.

good posture and attitude, he references the *Sikṣasamuccaya Sutra*.⁶⁶ Similarly important is the *Vimalakīrti Nirdeśa Sutra*, which contains a discussion of Dharma.⁶⁷ Finally, Hanh's explanation of mindfulness also draws from foundational texts of Mahayana Buddhism and Pāli.⁶⁸ In short, Hanh brings the essence of Zen philosophy to life by incorporating the meanings of various religious texts and summarizing the central notion of the sutra.

The Miracle of Mindfulness contains philosophical dialogue that upholds the significance of meditation while simultaneously expressing its fundamental guidelines with great clarity. Hanh's meditational guidelines always include titles that incorporate essential aspects of Zen, such as "Half-smiling during your free moments," "Letting go in the sitting position," and "Measuring your breath by your footstep."⁶⁹ In other words, the title itself is a representation of Zen. The meditation steps are akin to the following: "Sit in the half or full lotus or take a walk. As you inhale, be mindful that 'I am inhaling, one.' When you exhale, be mindful that 'I am exhaling, one.' Remember to breathe from the stomach. When beginning the second inhalation, be mindful that 'I am inhaling, two.' And slowly exhaling, be mindful that 'I am exhaling, two.' Continue on up through 10. After you have reached 10, return to one. Whenever you lose count, return to one."⁷⁰ By concentrating on one's actions in the present, one can gain a clearer perspective.

Hanh's decision to introduce mindfulness to the public proved a success. Popularizing traditional texts allowed Hanh to satisfy public curiosity and encourage physical and mental well-being. Eventually, Hanh's pursuit of the generalization of mindfulness or Zen induced a contemporary era of "Zen" fever.⁷¹

Hanh, Buddhism and Christianity:

An additional factor that secured Hanh's success was his openness to incorporate other religious traditions into the philosophy of Zen. For instance, Hanh merged the principles of Zen

⁶⁶ Susanne Mroczek, *Virtuous Bodies: The Physical Dimensions of Morality in Buddhist Ethics* (Oxford: Oxford University Press, 2007), 5-6.

⁶⁷ Kumārajīva, and Burton Watson, *The Vimalakīrti Sutra* (New York: Columbia University Press, 2001), 2-3.

⁶⁸ Tse-fu Kuan, *Mindfulness in Early Buddhism: New Approaches through Psychology and Textual Analysis of Pali, Chinese and Sanskrit Sources* (London: Routledge, 2012), 58-60.

⁶⁹ Hanh, *The Miracle*, 80-81.

⁷⁰ Hanh, *The Miracle*, 82.

⁷¹ Ross, "How Meditation," *Time*.

Buddhism and Christianity, insisting that a common truth exists among religions.⁷² Hanh believed that “many elements of Buddhist teachings can be found in Christianity, Judaism and Islam.”⁷³ For him, this common truth among religions would “dissolve our wrong perceptions, transcend our wrong views, and see one another in fresh, new ways.”⁷⁴ He argued, “What they [Buddha and Jesus Christ] said may be less important than how they said it.”⁷⁵ It is in this context that Hanh stated: “Just as a flower is made only of non-flower elements, Buddhism is made only of non-Buddhist elements, including Christian ones, and Christianity is made of non-Christian elements, including Buddhist ones.”⁷⁶

Hanh further asserted that people could be Buddhist and Christian simultaneously: “There are many, many Christians who practice Buddhism, and they become better and better Christians all the time.”⁷⁷ As a case in point, Hanh used Jesus as his role model for his doctrine of non-violence. He stressed that “Jesus was non-violent and never encouraged people to respond to acts of violence with violence.”⁷⁸ By including Judeo-Christian values in his teachings, Hanh catered to individuals searching for religious unity by emphasizing the commonality of faiths and by validating religions other than Buddhism. Jeffrey Carlson, a professor of Theology at Dominican University, affirms Hanh’s notion when he states: “We are all, and each, intrinsically plural. Together we share that formal complexity, that syncretic identity.”⁷⁹

Hanh’s philosophy shows that he perceived religion as a way to promote peace rather than a necessity that coerces people into believing certain teachings. Because of this attitude, Hanh became a mentor for audiences who were conflicted about their religious and cultural upbringings. Even if people do not seek spiritual guidance, Hanh’s work can lead them in the direction of peace. Thus, his take on Zen appeals to the public, no matter their ages, experiences, or ways of life.

⁷² Jeffrey Carlson, “Pretending to Be Buddhist and Christian: Thich Nhat Hanh and the Two Truths of Religious Identity,” *Buddhist-Christian Studies* 20 (2000): 117.

⁷³ “Extended Interview Thich Nhat Hanh,” *PBS*, last modified September 19, 2003, <http://Extended Interview Thich Nhat Hanh>.

⁷⁴ Thich Nhat Hanh, *Living Buddha, Living Christ* (New York: Riverhead Books, 1997), 41, EPUB.

⁷⁵ Hanh, *Living Buddha*, 99.

⁷⁶ Hanh, *Living Buddha*, 40.

⁷⁷ Hanh, *Living Buddha*, 99.

⁷⁸ Hanh, *Living Buddha*, 99.

⁷⁹ Carlson, “Pretending to Be Buddhist,” 124.

PR: Mindfulness of the Media

Apart from being attuned to the social issues of his time, Hanh also proved himself to be flexible and open to innovation. As a case in point, Hanh began taking advantage of the Internet to spread his message of peace and social justice more effectively. His accomplishments, personal history, and educational efforts are to this day well documented on his website that also contains modern images and presents his monastery as a conduit of mindfulness.⁸⁰

To a considerable degree, Hanh's persona is shaped by the online profile he created for himself. Hanh adopted two methods to enhance his image: (1) He provided easy access to engage his audience, and (2) He used online media to spread his message and teachings. His official website documents his most influential interviews with *Time*, the *Guardian*, and even Italian and Spanish news outlets.⁸¹ Further, his personal YouTube account grants easy access to high-profile media appearances, such as his interview on the Oprah Winfrey show.

Beyond documenting his media appearances and interviews, Hanh employed multiple social media outlets to spread his teachings. With half a million followers, Hanh's official Twitter account presented his personality, quotes/sayings, and activities in Plum Village, the meditation center he founded in Dordogne, France in 1982.⁸² Plum Village's YouTube account, though not as popular as Hanh's personal Twitter account, still accumulates millions of views. In addition, Hanh's personal YouTube account lists many of his speeches that are still in high demand. Plum Village even launched a free meditation app with Buddhist teachings in multiple languages. His mission statement promotes peaceful living within the doctrines of Buddhism. Hanh accommodated his audience by providing Dharma talks that center on common concerns. He elaborated on challenges such as "How to avoid doing too much" by drawing on personal experiences, and offered practical advice on dealing with related issues.⁸³ Through his online

⁸⁰ See Plum Village Website, Plum Village, *Plum Village*, <https://plumvillage.org/>.

⁸¹ Below is a list of interviews for reference purposes:

1. <https://www.oprah.com/spirit/oprah-talks-to-thich-nhat-hanh>
2. <https://plumvillage.org/about/thich-nhat-hanh/interviews-with-thich-nhat-hanh/the-guardian-uk-28-march-2014/#filter=topics-business>
3. <https://www.theguardian.com/sustainable-business/zen-master-thich-nhat-hanh-love-climate-change>
4. <http://content.time.com/time/world/article/0,8599,1670911,00.html>
5. <https://www.nytimes.com/1999/10/16/us/a-monk-in-exile-dreams-of-return-to-vietnam.html>
6. https://www.huffpost.com/entry/beliefs-buddhism-exclusiv_b_577541

⁸² Plum Village was founded by Hanh together with the nun Chan Khong. It started out as a modest retreat south of Paris, France. Soon it began to grow in popularity and now it is one of the major meditation centers in Europe. See Robert Harlen King, *Thomas Merton and Thich Nhat Hanh: Engaged Spirituality in an Age of Globalization* (New York, NY: Continuum, 2003), 96-99.

⁸³ Thich Nhat Hanh, lecture, *Plum Village*, <https://plumvillage.org/library/dharma-talks/?people=thich-nhat-hanh>.

presence, Hanh spread his image globally and thus epitomized his stature as a religious leader. Even after his death, his leadership and vision persist through his various online channels.

Conclusion:

This paper documented the rise of two of the most influential figures of the contemporary Zen movement. We first studied the Japanese scholar D. T. Suzuki, whose approach to Zen guaranteed its recognition as a world religion. Suzuki was one of the first academics to write and teach about Buddhism in English, thus making the subject matter accessible to a broader audience. Many established theologians and philosophers revere Suzuki's academic achievements. Though his academic analysis was not always entirely accepted, his historical significance in the academic study of Zen is profound.

Suzuki's endeavor of establishing Zen as a topic of academic interest was soon paired with a public need to experience the actual practice of Zen. Religious leader Thich Nhat Hanh actively merged the ideal of Zen with popular culture and contemporary social movements. Hanh preached peace through his vision and ideology of Zen. He crafted the concept of Socially Engaged Buddhism and reaffirmed values such as kindness and compassion as deeply rooted in Buddhism. Through his peaceful protest of the Vietnam War, he acquired a reputation as "an apostle of peace." He was a prolific writer and influenced readers around the globe. Hanh also institutionalized Buddhism in the West by creating Plum Village and EIAB (European Institute of Applied Buddhism), now recognized as influential Buddhist institutes. Hanh elevated the relevance of Zen in a modern context. Rather than portraying Zen as an obsolete course of study from the East, he fused Zen ideals to serve the common good. As a result, the values of Zen serve as the motto for an ideal society and promote sympathy, empathy, and compassion among religions.

In conclusion, it may be stated that Suzuki and Hanh undoubtedly articulated their own visions of Zen within the cultural and social frameworks of their times. Although Suzuki's and Hanh's methods and aspirations operated on fundamentally different levels, they are still complementary. Suzuki and his academic analysis constructed Zen as a serious subject worthy of academic study in the early twentieth century. Hanh, by contrast, used his public image and modern technologies to popularize and integrate Zen into contemporary society. Zen in the West

evolved from a minor academic interest to a world religion through the works of Hanh, Suzuki, and many other prominent scholars of Zen.

Work Cited

- Ames, Van Meter. "Zen and Pragmatism." *Philosophy East and West* 4, no. 1 (1954): 19-33.
- Bader, David M. *Zen Judaism: For You, a Little Enlightenment*. New York: Harmony Books, 2002.
- Bandō, Shōjun. "D. T. Suzuki's Life in La Salle." *The Eastern Buddhist* 2, no. 1 (1967): 137-46.
- Buswell, Robert E., and Donald S. Lopez. *The Princeton Dictionary of Buddhism*. Course Book. ed. Princeton, NJ: Princeton University Press, 2013.
- Carlson, Jeffrey. "Pretending to Be Buddhist and Christian: Thich Nhat Hanh and the Two Truths of Religious Identity." *Buddhist-Christian Studies* 20 (2000): 115-25.
- Chadelat, Celine, Bernard Baudouin, and Bo du an. *Zheng Nian De Zu Ji: Yi Xing Chan Shi Zhuan Ji = Thich Nhat Hanh : Une Vie En Pleine Conscience*. Chu ban. ed. Tai bei shi: shi bao wen hua chu ban qi ye gu fen you xian gong si, 2018. Kindle Edition.
- 112 Cong. Rec. 14891 (June 6, 1966).
- Cunningham, Eric. "D. T. Suzuki: A Biographical Summary." *Education About Asia* 20:2 (Fall 2015): *Asia: Biographies and Personal Stories*: 42-45.
- Dornish, Margaret H. "Aspects of D.T. Suzuki's Early Interpretations of Buddhism and Zen." *The Eastern Buddhist* 3, no. 1 (1970): 47-66.
- Dumoulin, Heinrich. *A History of Zen Buddhism*. 5th ed. Boston, Mass.: Beacon Press, 1975.
- "Extended Interview Thich Nhat Hanh." PBS. Last modified September 19, 2003.
<http://Extended Interview Thich Nhat Hanh>.
- Fader, Larry A. "Zen in the West: Historical and Philosophical Implications of the 1893 Chicago World's Parliament of Religions." *The Eastern Buddhist* 15, no. 1 (1982): 122-45.
- Fitzpatrick, Aidyn. "Thich Nhat Hanh, Father of Mindfulness, Awaits the End." *Time*. Last modified January 24, 2019. Accessed March 9, 2022.
<https://time.com/5511729/monk-mindfulness-art-of-dying/>.
- Hakeda, Yoshito S. "Review: An Introduction to Zen Buddhism by D. T. Suzuki." *The Journal of Asian Studies* 24, no. 3 (1965): 516-17.
- Hanh, Thich Nhat. *Lecture. Plum Village*.
<https://plumvillage.org/library/dharma-talks/?people=thich-nhat-hanh>.
- Hanh, Thich Nhat. *Living Buddha, Living Christ*. New York: Riverhead Books, 1997. EPUB.

- Hạnh, Thích Nhất. *At Home in the World: Stories and Essential Teachings from a Monk's Life*. Berkeley, CA: Parallax Press, 2016.
- Hạnh, Thích Nhất. *The Miracle of Mindfulness: An Introduction to the Practice of Meditation*. Repr. ed. Boston, Mass.: Beacon Press, 2013.
- Hiroshi, Sakamoto. "D. T. Suzuki as a Philosopher." *The Eastern Buddhist* 11, no. 2 (1978): 33-42.
- Johnston, William. *Christian Zen*. 3rd ed. New York, N.Y.: Fordham University Press, 2003.
- Kasulis, Thomas P. "Reading D. T. Suzuki Today." *The Eastern Buddhist* 38, no. 1/2 (2007): 41-57.
- Keown, Damien. *Buddhism: A Very Short Introduction*. 2nd ed. Oxford: Oxford University Press, 2013.
- King, Martin Luther, Jr. "Letter from Dr. Martin Luther King, Jr. nominating Thich Nhat Hanh for the Nobel Peace Prize in 1967." Plum Village.
<https://plumvillage.org/letter-from-dr-martin-luther-king-jr-nominating-thich-nhat-hanh-for-the-nobel-peace-prize-in-1967/>.
- King, Robert Harlen. *Thomas Merton and Thich Nhat Hanh: Engaged Spirituality in an Age of Globalization*. New York, NY: Continuum, 2003.
- King, Sallie B. "Transformative Nonviolence: The Social Ethics of George Fox and Thich Nhat Hanh." *Buddhist-Christian Studies* 18 (1998): 3-36.
- Kuan, Tse-fu. *Mindfulness in Early Buddhism: New Approaches through Psychology and Textual Analysis of Pali, Chinese and Sanskrit Sources*. London: Routledge, 2012.
- Kumārajīva, and Burton Watson. *The Vimalakirti Sutra*. New York: Columbia University Press, 2001.
- Lerner, Stephen D. "Vietnam Buddhist Thich Nhat Hanh Will Lecture On Self-Determination." *The Harvard Crimson*. Last modified May 27, 1966.
<https://www.thecrimson.com/article/1966/5/27/vietnam-buddhist-thich-nhat-hanh-will/>.
- Long, Darui. "An Interfaith Dialogue between the Chinese Buddhist Leader Taixu and Christians." *Buddhist-Christian Studies* 20 (2000): 167-89.
- Malkin, John. "In Engaged Buddhism, Peace Begins with You." *Lion's Roar*. Last modified July 16, 2020. Accessed March 9, 2022.
<https://www.lionsroar.com/in-engaged-buddhism-peace-begins-with-you/>.

- Masao, Abe. "Zen and Buddhism." *The Eastern Buddhist* 26, no. 1 (1993): 26-49.
<http://www.jstor.org/stable/44361979>.
- Merton, Thomas. "D. T. Suzuki: The Man and His Work." *The Eastern Buddhist* 2, no. 1 (1967): 3-9.
- Mrozik, Susanne. *Virtuous Bodies: The Physical Dimensions of Morality in Buddhist Ethics*. Oxford: Oxford University Press, 2007.
- "Oprah Talks to Thich Nhat Hanh." Oprah. Last modified February 16, 2010. Accessed March 9, 2022. <https://www.oprah.com/spirit/oprah-talks-to-thich-nhat-hanh/2>.
- Pearson, James. "Thich Nhat Hanh, revered Zen Buddhist monk and peace activist, dies at 95." Reuters. Last modified January 21, 2022. Accessed March 9, 2022. <https://www.theguardian.com/world/2022/jan/22/thich-nhat-hanh-revered-zen-buddhist-monk-and-peace-activist-dies-at-95>.
- Plum Village. Plum Village. <https://plumvillage.org/>.
- Ross, Ashley. "How Meditation Went Mainstream." *Time*. Last modified March 9, 2016. Accessed March 9, 2022. <https://www.thecrimson.com/article/1966/5/27/vietnam-buddhist-thich-nhat-hanh-will/>.
- Suzuki, D. T. *Essays in Zen Buddhism*. New York: Grove/Atlantic, 2007.
- Suzuki, D. T. "Zen: A Reply to Van Meter Ames." *Philosophy East and West* 5, no. 4 (1956): 349-52.
- Suzuki, Daisetsu. *An Introduction to Zen Buddhism*. New York: Grove Press, 1991.
- Suzuki, Daisetz Teitaro, and Richard M. Jaffe. *Zen and Japanese Culture*. Princeton, NJ: Princeton University Press, 2019.
- Swearer, Donald K. "RELIGION, WORLD ORDER, AND PEACE: Buddhist Responses." *CrossCurrents* 60, no. 3 (2010): 314-18.
- Taylor, Philip. *Modernity and Re-enchantment: Religion in Post-revolutionary Vietnam* ; [Vietnam Update Conference (2005: Canberra, Australia)]. Singapore: ISEAS, 2007.

In the Wake of Unprecedented Anti-abortion Actions, a Call for Reproductive Justice By Srinidhi Nagarajan

Introduction

2021 is shaping up to be a challenging year for abortion rights and women's health.⁸⁴ Already this year, over 561 abortion restrictions have been introduced in state legislatures across the country. Many of these state lawmakers claim these policies advance the health of women. The evidence, however, points in a different direction, instead playing a substantial role in harming pregnant people.

The following paper will outline the different attacks on abortion access being advanced across the country, highlighting how such policies inhibit -- rather than advance -- women's health. Following this analysis is a discussion of policies that actually help women lead healthy, fulfilling lives. This research paper, while analytical, is also a call to action. If state lawmakers do value women's health, it is important they push for policies that substantially advance reproductive rights -- not roll them back.

A Slew of Attacks on Abortion Access

In analyzing restrictive abortion policies, it is helpful to separate such policies into two distinct categories. The first includes supply-side restrictions, which impact abortion providers (i.e. the supply). The second category is demand-side restrictions, which impact those seeking access to abortion services (i.e. the demand).

TRAP laws, which stand for Targeted Restrictions on Abortion Providers, are a prime example of supply-side abortion restrictions. They are “medically unnecessary, costly, and often burdensome standards - which single out abortion clinics and force them to jump through hoops despite abortion's 99% safety record.”⁸⁵ Some examples of these hoops include down-to-the-inch dimensions for operating rooms, mandating the width of hallways, and cumbersome hospital admitting privileges. State legislators across the country have worked to erect these costly

⁸⁴ Nash, Elizabeth, and Lauren Cross. “2021 Is on Track to Become the Most Devastating Antiabortion State Legislative Session in Decades.” Guttmacher Institute, 14 June 2021, www.guttmacher.org/article/2021/04/2021-track-become-most-devastating-antiabortion-state-legislative-session-decades.

⁸⁵ Mukpo, Ashoka. “TRAP Laws Are the Threat to Abortion Rights You Don't Know About.” *ACLU of North Carolina*, 6 Mar. 2020, www.acluofnorthcarolina.org/en/news/trap-laws-are-threat-abortion-rights-you-dont-know-about.

administrative and regulatory obstacles on health care providers.⁸⁶ Thirty eight states require an abortion to be performed by a licensed physician, and nineteen states require an abortion to be performed in a hospital after a specific point in pregnancy.⁸⁷

In this context, federal courts have underscored the harmful impact of such laws. In 2016, the Supreme Court ruled against a Texas TRAP law in *Whole Woman’s Health v. Hellerstedt*, finding that the law’s requirements made it extremely difficult for Texas women to access abortion, and didn’t serve them well in any way.⁸⁸ This ruling established, once again that women possess a constitutional right to pre-viability abortion care, but other TRAP laws were still viewed as constitutional. As affirmed by the Supreme Court, it is clear that TRAP laws’ objective is not to enhance the safety of abortions, but rather to generate red tape limiting access crucial reproductive health services. Despite progress in federal courts, 23 states still have laws or policies that regulate abortion providers and go beyond what is necessary to ensure patients’ safety; all apply to clinics that perform surgical abortion, and 12 states place unnecessary requirements on clinicians that perform abortions.⁸⁹

Demand-Side Restrictions On Abortion

Demand-side restrictions, which impact those seeking abortions, can also limit access to critical health care services. Private insurance coverage falls into this classification: 12 states restrict coverage of abortion in private insurance plans under their regulatory purview, usually limiting coverage to situations where the patient’s life would be endangered if the pregnancy were carried to term.⁹⁰ If someone cannot afford an abortion, they are less likely to seek one out, in turn reducing ‘demand’ for the service.

Another example is state-mandated counseling. According to the Guttmacher Institute, 18 states mandate that individuals be given counseling before an abortion that includes information

⁸⁶ Berg, Miriam. “These 4 Types of TRAP Laws Are Dangerously Chipping Away at Abortion Access Under the Guise of ‘Women’s Health’.” *Planned Parenthood Action Fund*, 15 June 2016, www.plannedparenthoodaction.org/blog/these-4-types-of-trap-laws-are-dangerously-chipping-away-abortion-access-under-the-guise-of-womens-health.

⁸⁷ “An Overview of Abortion Laws.” *Guttmacher Institute*, 11 Aug. 2021, www.guttmacher.org/state-policy/explore/overview-abortion-laws.

⁸⁸ “TRAP Laws.” *NARAL Pro-Choice California*, prochoicecalifornia.org/issues/trap-laws/.

⁸⁹ *Targeted regulation of abortion providers*. Guttmacher Institute. (2021, August 11). <https://www.guttmacher.org/state-policy/explore/targeted-regulation-abortion-providers>.

⁹⁰ “An Overview of Abortion Laws.” *Guttmacher Institute*, 11 Aug. 2021, www.guttmacher.org/state-policy/explore/overview-abortion-laws.

on at least one of the following: the purported link between abortion and breast cancer (5 states), the ability of a fetus to feel pain (13 states), or long-term mental health consequences for the patient (8 states).⁹¹ Just as insurance restrictions ‘reduce demand’ for abortions by rendering the procedure too expensive, state-mandated counseling policies use fear, stigma, and misinformation to stray individuals from wanting an abortion.

The True Aim of Such Policies

While the policies discussed above are varied, they are connected by a shared goal: to restrict access to abortion at the national level. Lawmakers in these states distract from this fact by claiming that they are prioritizing women’s health. After helping advance anti-abortion policies in her home state, Mississippi Attorney General Lynn Fitch said, “The Mississippi Legislature enacted this law consistent with the will of its constituents to promote women’s health and preserve the dignity and sanctity of life.”⁹²

However, such statements focused on women’s health are false flags. Policies such as TRAP laws do nothing to improve patient safety. This fact is underscored in a 2018 study published by the Journal of the American Medical Association (JAMA), finding that abortions are just as safe when performed in doctor’s offices as in hospitals or ambulatory medical centers.⁹³ Indeed, if the concern for women’s health was what was driving this legislation, it would not be targeting abortion.⁹⁴ A person is 14 times more likely to die by carrying a pregnancy to term than by legally induced abortion. Not only do such policies fail to improve women’s health; they actively harm pregnant people, as will be discussed in the following section.⁹⁵

⁹¹ “An Overview of Abortion Laws.” *Guttmacher Institute*, 11 Aug. 2021, www.guttmacher.org/state-policy/explore/overview-abortion-laws.

⁹² Barnes, Robert. “Supreme Court to Review Mississippi Abortion Law That Advocates See as a Path to Diminish Roe v. Wade.” *The Washington Post*, WP Company, 19 May 2021, www.washingtonpost.com/politics/courts_law/supreme-court-abortion-roe-v-wade/2021/05/17/cdaf1dd6-b708-11eb-a6b1-81296da0339b_story.html.

⁹³ Roberts, Sarah C.M. “Association Between Abortion Facility Type and Procedural Complications.” *JAMA*, JAMA Network, 26 June 2018, jamanetwork.com/journals/jama/article-abstract/2685987.

⁹⁴ Goodwin, Michele. “Banning Abortion Doesn't Protect Women's Health.” *The New York Times*, The New York Times, 9 July 2021, www.nytimes.com/2021/07/09/opinion/roe-abortion-supreme-court.html.

⁹⁵ Raymond, Elizabeth G. “The Comparative Safety of Legal Induced Abortion and Childbirth in the United States.” *Obstetrics and Gynecology*, U.S. National Library of Medicine, pubmed.ncbi.nlm.nih.gov/22270271/.

The new makeup of the Supreme Court sheds light on other possible motives of anti-choice lawmakers. Statements that claim to prioritize women’s health may mask a broader legal strategy to overturn the landmark Supreme Court decision *Roe V. Wade*. Anti-abortion political actors are likely taking advantage of the newly-established conservative majority in the Supreme Court, and it has worked - Supreme Court Justices have agreed to listen to a new case that could possibly overturn nearly five decades of precedent establishing abortion as a constitutional right.⁹⁶

The case involves a Mississippi law that would ban abortions after 15 weeks of pregnancy, demonstrating an extensive threat to reproductive rights.⁹⁷ The Center for Reproductive Rights, which represents the clinic challenging the Mississippi law, states that the consequences of a *Roe* reversal would be devastating. Lawyers for the clinic note that the law “places a complete and insurmountable obstacle in the path of every person seeking a pre-viability abortion after 15 weeks who does not fall within its limited exceptions.”⁹⁸

State lawmakers claim that the policies outlined above are to improve women’s health. It is clear that the true aim of such policies is to use state legislatures and the courts to gut pregnant people’s access to abortion. The following section will delve into the devastating consequences of a world without abortion access.

Rolling Back—Rather Than Advancing—Women’s Health

Having established the underlying goal of policies restricting abortion access, this section will delve into exactly how these policies accomplish the complete opposite of lawmakers’ claims. Rather than advance women’s health, anti-abortion policies inflict substantial and long-lasting harm on pregnant people.

One landmark study that illustrates this reality is the Turnaway Study. This body of research demonstrates the differences between the life outcomes of those who were able to

⁹⁶ Totenberg, Nina. “Supreme Court's New Supermajority: What It Means For *Roe v. Wade*.” *NPR*, NPR, 31 Dec. 2020, www.npr.org/2020/12/31/951620847/supreme-courts-new-supermajority-what-it-means-for-roe-v-wade.

⁹⁷ Liptak, Adam. “Supreme Court to Hear Abortion Case Challenging *Roe v. Wade*.” *The New York Times*, The New York Times, 17 May 2021, www.nytimes.com/2021/05/17/us/politics/supreme-court-to-hear-abortion-case-challenging-roe-v-wade.html.

⁹⁸ Dobbs, Thomas E. *Supreme Court of The United States Thomas E. Dobbs, State Health Officer of the Mississippi Department of Health, et al. Petitioners, v. Jackson Women’s Health Organization, et al., Respondents.*, Supreme Court of The United States, 2020. Supreme Court of The United States, https://www.supremecourt.gov/DocketPDF/19/19-1392/150668/20200819155412230_39883%20pdf%20Scott.pdf. PDF download.

access an abortion and those who weren't, finding that the latter were incredibly concerning. The results of the Turnaway study clearly demonstrates that women who sought out abortions but weren't able to receive them are more likely to deal with self esteem issues and anxiety in the short term, deal with poor physical health, stay in abusive relationships, and are not as likely to be motivated to plan for their lives in the future.⁹⁹ This is an excellent illustration of the ripple effects that are created from denying women abortion access. Not allowing women to have full control over the choices they make regarding their own bodies ultimately results in the deterioration of their health and quality of life. It is the enactment of the policies described in the previous section that result in women being denied abortions, which leads to these long-term consequences.

Furthermore, The Turnaway Study demonstrates the harmful intergenerational impacts of reduced access to abortion. Unwanted pregnancies are a horrible outcome not just for those forced to carry a pregnancy to term, but for the children who are born.¹⁰⁰ When pregnant people are denied an abortion, their children do worse in two areas in particular. First, they struggle to match the regular developmental milestones of other children related to language and motor skills, as well as social and emotional skills. They are also more likely to be living in homes that are food, housing, and transportation insecure. These challenges are only exacerbated by the United State's anemic safety net. Compared to other nations, parents and their children struggle to access crucial social services like parental leave and child care, health care, and quality education. Prohibiting pregnant people from possessing reproductive agency doesn't just affect the long-term quality of their lives, it could also limit the capacity of their children to lead happy and healthy lives as well.

An Issue of Racial Justice

This section has outlined the immense harm abortion restrictions induce on women and their families. Unfortunately, that harm is not distributed evenly. Due to systemic racism in every facet of life, women of color are disproportionately harmed by attacks on abortion, making expanding access to abortion access a matter of racial justice. Black people are three times as likely to die during childbirth as white people, therefore making limited access to abortion --

⁹⁹ "The Turnaway Study." *ANSIRH*, 4 Aug. 2021, www.ansirh.org/research/ongoing/turnaway-study.

¹⁰⁰ "The Turnaway Study." *ANSIRH*, 4 Aug. 2021, www.ansirh.org/research/ongoing/turnaway-study.

leading to unwanted pregnancies carried to term -- an even higher-risk outcome for Black women.¹⁰¹

Unfortunately, the COVID-19 pandemic has only exacerbated challenges in accessing abortions, specifically in Black and Brown communities. Due to legacies of redlining and racialized economic discrimination, abortion access depends heavily on geography and economic resources. A majority of Black women currently live in places -- due to high caseloads and lack of community resources such as transportation, childcare, etc. -- where it does not feel safe to venture out of their homes in the middle of a pandemic.¹⁰²

Affording an abortion is yet another obstacle. Due to centuries of employment and economic discrimination stemming from the legacy of slavery, Black women are more likely to be low-income and enrolled in Medicaid, the country's low-income health insurance program. Indeed, 30 percent of Black women and 24 percent of Hispanic women are enrolled in the program, compared to 14 percent of white women. Medicaid does not cover abortion except for extreme exceptions, meaning even insured women of color disproportionately lack access to affordable abortion care.¹⁰³

This is worse in the context of the pandemic. In June of 2020, 54% of Black women reported that they faced some kind of economic hardship -- including being laid off from their jobs due to rapid unemployment rates as a result of the pandemic.¹⁰⁴ Abortion bans only perpetuate the systems of oppression that threaten Black women's lives daily. During this period in which the pandemic has exacerbated existing economic and health-related disparities, it has become increasingly difficult for Black women and their families to survive in their homes and communities.

¹⁰¹ Long, Stephanie. "Abortion Bans Pose A Danger To All Mothers. For Black Women, They're Especially Damaging." *Why Abortion Bans Are Racist & Threaten Black Women*, www.refinery29.com/en-us/2020/10/10015405/abortion-ban-racism-black-women-effects.

¹⁰² Long, Stephanie. "Abortion Bans Pose A Danger To All Mothers. For Black Women, They're Especially Damaging." *Why Abortion Bans Are Racist & Threaten Black Women*, www.refinery29.com/en-us/2020/10/10015405/abortion-ban-racism-black-women-effects.

¹⁰³ Parenthood, Planned. "Hyde Amendment." *Planned Parenthood Action Fund*, www.plannedparenthoodaction.org/issues/abortion/hyde-amendment.

¹⁰⁴ Long, Stephanie. "Abortion Bans Pose A Danger To All Mothers. For Black Women, They're Especially Damaging." *Why Abortion Bans Are Racist & Threaten Black Women*, www.refinery29.com/en-us/2020/10/10015405/abortion-ban-racism-black-women-effects.

Call To Action

This research paper has so far outlined the landscape of anti-abortion policies, underscoring that actions restricting abortion access actively harm, rather than help, pregnant people. The remainder of this research paper acts as a call to action addressed to key players in the abortion and women's health sphere. Unlike anti-abortion restrictions proposed across the country, these policy recommendations will work to advance the health of pregnant people and improve the quality of their lives.

Recommendations grounded in a reproductive justice framework

The following policies are grounded in a framework of reproductive justice, which is defined as the right of all people to maintain personal bodily autonomy, to be given the right to choose whether to have children, to not have children, and to raise the children they have in safe, healthy, and sustainable communities.¹⁰⁵ For reproductive justice to be achieved, women and girls must be able to make healthy decisions about their lives, bodies, and reproduction for themselves, their families, and their communities. At first glance, it may appear that protecting the right to choose is the only relevant factor, but upon further analysis, it becomes clear that this approach does not consider other factors that advance or limit people's agency, such as poverty, lack of access to health care, and institutionalized racism. "There is an increasing need for the reproductive justice movement due to increasing societal instability, including conditions such as public assistance program reductions, abortion access restrictions, and environmental regulation diminishment."¹⁰⁶ Reproductive justice is absolutely essential to protecting women's health, which is why the following recommendations will be grounded in this framework.

Recommendation 1: Ensure That Affordable Abortion Services Are Included In Health Coverage Benefits.

¹⁰⁵ Venkatraman, Richa. "The Embryo Project Encyclopedia." *"A New Vision for Advancing Our Movement for Reproductive Health, Reproductive Rights, and Reproductive Justice" (2005), by Asian Communities for Reproductive Justice (ACRJ) | The Embryo Project Encyclopedia*, 17 Nov. 2020, embryo.asu.edu/pages/new-vision-advancing-our-movement-reproductive-health-reproductive-rights-and-reproductive.

¹⁰⁶ Venkatraman, Richa. "The Embryo Project Encyclopedia." *"A New Vision for Advancing Our Movement for Reproductive Health, Reproductive Rights, and Reproductive Justice" (2005), by Asian Communities for Reproductive Justice (ACRJ) | The Embryo Project Encyclopedia*, 17 Nov. 2020, embryo.asu.edu/pages/new-vision-advancing-our-movement-reproductive-health-reproductive-rights-and-reproductive.

State and federal policymakers must also ensure that private insurance and Medicaid plans cover abortion procedures. State actions provide crucial examples. For example, in 2017, Republican Gov. Bruce Rauner of Illinois signed a bill lifting the state’s ban on Medicaid coverage of abortion, extending coverage to the half million women of reproductive age enrolled in the program.¹⁰⁷ In total, 15 states currently cover abortion care under Medicaid by financing the procedure from their own coffers, an example of a policy that states should seek to replicate. Furthermore, policymakers can also follow the lead of California and, more recently, New York, Oregon and Washington, by requiring private insurers to include abortion as a covered service. If this fails to work, they can allow abortion to be covered by private plans by removing the bans that prevent it from being covered to begin with.¹⁰⁸

States must also work to either establish statutory protections or ensure the right to abortion access is safeguarded by the constitution. Regarding the former, eight states have adopted laws that are aimed at reaffirming the Roe V. Wade decision and other similar Supreme Court decisions.¹⁰⁹ While this action may not be as secure as ensuring that the right to abortion is safeguarded by the state constitution, it can most definitely still help to preserve access. For instance, states can enact laws that prevent the government from interfering with the choices an individual chooses to make regarding their pregnancy. Oregon established a law in 2017 from restricting an individual from terminating their pregnancy, and that “interference as a result of the regulation or provision of benefits, facilities, service, or information” is included in that.¹¹⁰ Ensuring that the government does not interfere with a women’s right to choose is absolutely crucial in order to achieve reproductive justice.

Constitutional protections at the state level are also an effective method to protect abortion rights. Currently, there are nine states in which highest state court has interpreted state constitution to protect the right to abortion and, “in many of these cases, state constitutional protections have served as greater protection for abortion than the federal constitutional

¹⁰⁷ Nash, Elizabeth, and Megan K. Donovan. “Ensuring Access to Abortion at the State Level: Selected Examples and Lessons.” *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

¹⁰⁸ “A Proactive Abortion Agenda.” *ANSIRH*, 17 Mar. 2021, www.ansirh.org/news/proactive-abortion-agenda.

¹⁰⁹ “What If Roe Fell.” *Center for Reproductive Rights*, maps.reproductiverights.org/what-if-roe-fell.

¹¹⁰ Nash, Elizabeth, and Megan K. Donovan. “Ensuring Access to Abortion at the State Level: Selected Examples and Lessons.” *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

standard.”¹¹¹ While constitutional amendments safeguarding abortion rights may be more challenging to enact, they can provide a substantial bulwark against federal threats to Roe.

Furthermore, another attainable goal for state lawmakers is to publicize and promote online abortion access to the best of their abilities. Online abortion access, or telemedicine, expands access to medication abortion, and at least ten states have made that available currently.¹¹² State lawmakers can provide communities that previously lacked access to abortion with more of it and to other communities in general, and “fill gaps created by an increasingly hostile policy environment.”¹¹³ Expanding online access is yet another way to allow more people much deserved access to abortion.

Recommendation 2: Extend Health Coverage To All Individuals, Including New Mothers, Immigrants, And Other Marginalized Populations.

If lawmakers are truly committed to advancing pregnant people’s health, they must focus on expanding postpartum medicaid coverage. There is a significant link between the reproductive justice framework and this policy - reproductive justice cares immensely about women having the right to have children in healthy and safe communities. Extending coverage of medicaid to recent moms does indeed improve women’s health as well. Medicaid funded 43 percent of the births in the US in 2018, demonstrating that it plays an incredibly significant part in improving women's health. Furthermore, “Connecticut Medicaid covers pregnant women up to 263 percent of poverty, parents in a family of three up to 160 percent of poverty, and other low-income adults up to 138 percent of poverty.”¹¹⁴

Expanding coverage for individuals regardless of their immigration status is also essential. Oregon addressed this problem in 2017, when it established a program to reimburse

¹¹¹ “Abortion Policy in the Absence of Roe.” *Guttmacher Institute*, 11 Aug. 2021, www.guttmacher.org/state-policy/explore/abortion-policy-absence-roe.

¹¹² Nash, Elizabeth, and Megan K. Donovan. “Ensuring Access to Abortion at the State Level: Selected Examples and Lessons.” *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

¹¹³ Nash, Elizabeth, and Megan K. Donovan. “Ensuring Access to Abortion at the State Level: Selected Examples and Lessons.” *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

¹¹⁴ Babbs, Gray, et al. “Expanding Postpartum Medicaid Benefits to Combat Maternal Mortality and Morbidity.” *SPH Expanding Postpartum Medicaid Benefits to Combat Maternal Mortality and Morbidity Comments*, 4 Feb. 2021, www.bu.edu/sph/news/articles/2021/expanding-postpartum-medicaid-benefits-to-combat-maternal-mortality-and-morbidity/.

individuals not otherwise eligible for medical assistance (such as people barred from Medicaid enrollment because of their immigration status) for reproductive health care, including abortion care.

Recommendation 3 : Advance Narratives That Reflect the Reality and Normalcy of Abortion Experiences Rather Than Stigmatizing or Avoiding the Subject.

The next set of policy recommendations are oriented around culture and mass media, which play a sizable role in influencing specific narratives around abortion, in turn shaping how people perceive it. For instance, mass media (television, movies, advertising, etc.) have the power to advance narratives surrounding abortion that heavily influence the decisions that people make surrounding it. Unfortunately, many of these narratives do not reflect reality. The media portrays abortion as dangerous, with 9% of fictional women dying from abortions, when in fact, the death rate is about 0%¹¹⁵. The fact that perceived elevated risks for abortions (a nine percentage point jump from reality to fiction) are so high, they would definitely influence people's risk calculations when seeking out an abortion. This could even be considered a soft demand-side restriction through cultural means. It is incumbent upon those who control cultural narratives, including the entertainment industry (producers, script-writers, etc) to actually consider real experiences of abortion when producing content.

Recommendation 4: Safeguard Adolescent Access to Abortion.

Finally, the following section of the paper will outline policy recommendations regarding increasing adolescent access to abortion. Central to this are issues of parental consent. The Reproductive Justice framework notes that everyone should have the ability to control their bodies no matter their age, income, or any differences regarding their current status in life. A well-formulated policy that other states can definitely model their policies after is “a District of Columbia regulation that explicitly establishes the right of patients younger than 18 to consent to abortion care without parental involvement.”¹¹⁶ This is incredibly crucial as stricter parental consent laws will affect the abilities of a wide number of individuals to control their own bodies

¹¹⁵ Sisson, Gretchen, and Katrina Kimport. *Abortion on Film and TV*, 2014. Contraception, <https://www.ansirh.org/sites/default/files/publications/files/abortion-on-film-and-tv-800px.jpg>. PDF Download.

¹¹⁶ Nash, Elizabeth, and Megan K. Donovan. “Ensuring Access to Abortion at the State Level: Selected Examples and Lessons.” *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

however they would like to. People being able to exert full control over their bodies no matter their age is a crucial part of reproductive justice.

Other states have made progress towards safeguarding adolescents' abortion rights. Maine, for instance, has more limited protections in place allowing patients younger than 18 to consent to have an abortion, but only after enhanced counseling and a determination from the provider is the adolescent able to consent. While this policy can be improved upon in centering adolescents' reproductive agency, it is a step forward in the right direction.

There are also 11 states that are effectively silent on the question of adolescents' right to consent to abortion, either because they had a parental involvement requirement that was struck down in court or because they have never enacted such a requirement.¹¹⁷ This silence in the law allows a medical professional to provide abortion services without parental involvement but could also result in a situation similar to that in Maine, in which the provider exercises sole discretion about whether or not to offer care without parental involvement.¹¹⁸ While there may be political constraints, working toward these goals is extremely important. States must take action to either move in the direction of these policies mentioned or aim to establish policies that advance reproductive justice for adolescents.

Comprehensive, affirming, and medically-accurate sexual education is also central to a reproductive justice agenda for younger adults. There are multiple states that have realized this and that are currently doing so, such as California, Vermont and Washington DC, as they require that information about abortion be included as part of middle and high school sex education.¹¹⁹

However, most states do not mandate any sex education or require any instruction related to abortion when sex education is provided. In fact, there are multiple states who prohibit instruction on abortion.¹²⁰ This is most definitely a problem, because sexual education is crucial in order for young people to gain necessary information on their rights as well as how they

¹¹⁷ Nash, Elizabeth, and Megan K. Donovan. "Ensuring Access to Abortion at the State Level: Selected Examples and Lessons." *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

¹¹⁸ Nash, Elizabeth, and Megan K. Donovan. "Ensuring Access to Abortion at the State Level: Selected Examples and Lessons." *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

¹¹⁹ Nash, Elizabeth, and Megan K. Donovan. "Ensuring Access to Abortion at the State Level: Selected Examples and Lessons." *Guttmacher Institute*, 21 Aug. 2019, www.guttmacher.org/gpr/2019/01/ensuring-access-abortion-state-level-selected-examples-and-lessons.

¹²⁰ "10 Things You Need to Know about Abortion Laws in the US." *Amnesty International*, 25 Aug. 2021, www.amnesty.org/en/latest/news/2019/06/abortion-laws-in-the-us-10-things-you-need-to-know/#:~:text=This is the harshest law, even if they realize they are pregnant.

should go about exercising them. In order for people to make educated decisions out of their own volition, they must have the education necessary to do so.

Along with this, queer-affirming sex-ed is incredibly important. All people, including LGBTQ people, deserve the right to affirming and accurate sexual and reproductive health care, as they too regularly seek abortions. LGBTQ people are "not a monolithic population, and people within that community have different needs, experiences with barriers and levels of access to care."¹²¹ A Guttmacher study estimated that several hundred transgender and nonbinary individuals obtained abortions nationally in 2017, primarily at facilities that did not provide transgender-specific health care.¹²² Actions have been taken to support this, for example, the "Providing Quality Family Planning Services" guidelines set by the Centers for Disease Control and Prevention and The U.S. Department of Health and Human Services Office of Population Affairs call for a person-centered approach that integrates the needs of LGBTQ patients.¹²³ However, this issue clearly demonstrates the importance of integrating a more inclusive sexual health education curriculum for LGBTQ youth itself, as they too deserve to have the knowledge in order to make their own decisions about their bodies, once again grounding this recommendation in a reproductive justice framework.

Concluding Thoughts

This research paper has underscored the harm that anti-abortion policies cause for pregnant people and their families. Importantly, this work of analysis concludes with a call to action, providing policies that would substantially improve women's health. The purpose of this work is to break through the often incorrect use of "women's health" as a tool to advance

¹²¹ Dawson, Ruth, et al. "Not Up for Debate: LGBTQ People Need and Deserve Tailored Sexual and Reproductive Health Care." *Guttmacher Institute*, 19 Nov. 2020, www.guttmacher.org/article/2020/11/not-debate-lgbtq-people-need-and-deserve-tailored-sexual-and-reproductive-health.

¹²² Dawson, Ruth, et al. "Not Up for Debate: LGBTQ People Need and Deserve Tailored Sexual and Reproductive Health Care." *Guttmacher Institute*, 19 Nov. 2020, www.guttmacher.org/article/2020/11/not-debate-lgbtq-people-need-and-deserve-tailored-sexual-and-reproductive-health.

¹²³ Dawson, Ruth, et al. "Not Up for Debate: LGBTQ People Need and Deserve Tailored Sexual and Reproductive Health Care." *Guttmacher Institute*, 19 Nov. 2020, www.guttmacher.org/article/2020/11/not-debate-lgbtq-people-need-and-deserve-tailored-sexual-and-reproductive-health.

anti-abortion actions, highlight the very real harm induced by anti-abortion policies, and call for a shift in policymaking grounded in reproductive justice and centering pregnant people.

Developments in Cell-Replacement Therapy in Parkinson's Disease By Gaurangi Doshi

Abstract

This review will discuss stem-cell-based treatments for Parkinson's disease and evaluate their effectiveness and uses. The first attempts in this treatment method used fetal mesencephalic tissue. Currently, the advent of cell-reprogramming techniques has offered a new avenue to replenish the brains of Parkinson's disease patients with dopaminergic neurons. The review will discuss a preclinical study on the efficacy of induced pluripotent stem cell-derived dopaminergic neurons transplants in rhesus monkey models and a case study on a human patient. This paper will also discuss future pathways like the use of glial cell conversion as a cell replacement therapy. All the methods described may require further development, but the potential impact on patients' lives is incredibly powerful.

Key Words

Translational Medical Sciences; Disease Treatment and Therapies; Parkinson's Disease; Cell-replacement Therapy; iPSCs.

Introduction

Parkinson's disease (PD) is a neurodegenerative disease that primarily affects the dopaminergic neurons of the substantia nigra. From a medical point of view, PD is characterized mainly by motor symptoms. Many PD symptoms are related to motor skill deficits since the dopamine released by these neurons plays a prominent role in motor function. The most common symptoms are tremors, rigidity, and slowness of movement. Other symptoms include muscle tension, cramps, freezing, falls, and dizziness. The main risk factor for the disease is aging, as it mainly affects people over 65 years. With the population aging, PD cases are on the rise: Currently, there are approximately 5 to 35 new cases per 100 000 people per year, but the numbers are expected to go up.

PD is characterized by a combination of the loss of dopaminergic neurons and the accumulation of aggregated forms of the protein α -synuclein. Accumulation and aggregation of α -synuclein is thought to be strongly associated with the pathogenesis of PD because all patients share it, and mutations in the *SNCA* gene (encoding for α -synuclein) are among the known genetic causes of PD. α -synuclein are found across multiple brain regions, and they seem to spread in a predictable way. It has recently been proposed that α -synuclein aggregated species propagate to different brain areas through axons, where they "seed" aggregation of other α -synuclein molecules. This proposed mechanism is called prion-like propagation, and it means that — in the presence of α -synuclein aggregates — normal α -synuclein molecules go through conformational changes, which make them more prone to aggregation, making the disease all the more challenging to tackle therapeutically.

The dopaminergic neurons affected by PD are mainly located in the substantia nigra pars compacta. The substantia nigra is involved in the circuit of the brain that regulates movement, including the striatum, which consists of the caudate and putamen. The substantia nigra contacts the striatum to modulate its effect on downstream pathways. The loss of dopamine in the motor pathway causes motor symptoms.

iPSC and post-mortem examinations showed that PD patients had increased α -synuclein expression and that mutations and the brain's aging might contribute to it. Generally, α -synuclein is degraded by LAS and ubiquitin-proteasome systems, but getting older seems to inhibit those systems. Moreover, many mutations that are genetic causes of PD also inhibit LAS function. PD patients also have lower levels of GBA, a lysosomal enzyme, which contributes to more α -synuclein aggregates.

Cell replacement therapy is an avenue of regenerative therapy and aims to replace lost cells with new ones. Cell replacement therapy can be valuable in neurodegenerative diseases, like PD, where a decreasing number of neurons causes symptoms. Cell replacement therapy is especially a good option in these diseases because lost neurons do not regenerate. Neurons lost in PD do not regenerate, so it is thought that adding new healthy neurons could help restore dopamine release in the brain with the ultimate goal of ameliorating the motor symptoms caused by the lost dopamine.

This review shows different attempts at cell replacement therapy, including fetal mesencephalic tissue transplants, transplants of dopaminergic neurons derived from induced

pluripotent stem cells (iPSCs), and glial cell conversion. Historically, embryonic transplants were used. Although this approach proved not to be a sustainable option for large-scale therapy because of the amount of starting material necessary, it acted as a precursor to show that cell replacement therapy was a viable option. Experiments have now transitioned to using iPSCs because they are easier to obtain in more significant amounts. Other options like glial cell conversion show promise for the future.

Results and Discussion

Neuronal Transplants of Fetal Dopaminergic Neurons in Two Parkinson's Patients

Fetal mesencephalic tissue was implanted into the caudate-putamen of two PD patients in the hemisphere contralateral to the tremors and rigidity. The cells are transplanted into the striatum, which is the brain area that is regulated by dopamine and helps control motor functions. This makes it easier for cells to innervate and make connections that the brain would naturally have. The goal was to regulate dopamine function and raise it to normal non-PD patient levels to decrease motor deficits. Patients with unilateral symptoms were used. In this scenario, the patients could undergo unilateral surgery to treat the most affected side while remaining half untreated. This allowed experimenters to treat the patient while providing the untreated hemisphere as an internal control for the procedure.

One of the patients was a 49-year old with idiopathic PD who displayed a tremor and rigidity predominantly in the right side of his body. He could initially control his symptoms with L-DOPA, but they progressed quickly, and he experienced four to five "off" periods per day. Besides, he was also unable to sleep at night without taking L-DOPA. In order to keep variables constant, his medications remained unchanged throughout the study and for five months post-operation.

For the first two weeks after the graft, his symptoms worsened drastically as a side effect of the procedure. After two months, however, rigidity decreased considerably, and it was almost eliminated three months post-operation. "Off" periods were reduced in length and number, and — in some cases — they were characterized by the manifestation of milder symptoms. The authors also evaluated his motor function while the patient was unmedicated. In this case, the severity of his tremors did not decrease, but they occurred rarely. At the same time, muscle tone appeared to be decreased in the right arm. Bradykinesia was assessed in a series of behavioral

tests evaluating the amplitude of movements and the velocity at which the movements were performed, both in simple and complex tasks. These assessments revealed a major improvement in the patient's bradykinesia. Finally, the nocturnal administrations of L-DOPA could be suspended, thus suggesting that the efficacy of a single dose of L-DOPA might have been extended, as demonstrated by further assessments.

Finally, the experimenters tried to demonstrate that the beneficial effects observed in the patients derived from the graft itself. Therefore, [¹⁸F]-DOPA brain scans were taken after the grafts and showed increased synthesis and storage of dopamine, thus confirming graft survival. The authors also argued that the improvements of the patient were likely happening because of the procedure itself and not uncontrolled variables. Placebo effects and fluctuations for PD are unlikely because recorded symptoms were stable for eleven months post-op. The chances that improvements were seen due to breaking the blood-brain barrier during surgery are low because tissue implants would create a sufficient barrier within one to two weeks. However, the patient was stable for longer than that. Medications were also kept stable throughout the study.

A similar procedure was repeated in the right putamen of a 59-year-old patient who was also followed for ten years. Pre-operation, the patient showed poor symptoms-management with "off" periods characterized by hypokinesia and rigidity. Post-operation, the patient showed drastic improvements in symptom management. Due to symptom progression, L-DOPA treatments were eliminated after 32 months and then restarted at a much lower dosage than pre-operation after 74 months. Rigidity and hypokinesia decreased steadily and significantly three years after the procedure, and, as expected, there was more improvement on the side contralateral to the grafts. During the off periods, there were fewer symptoms in his left arm (contralateral to graft) than his right arm. The time that the patient's time in "off" periods decreased from 60% to 30%. As with Patient 3, tremors did not improve after the transplant. In contrast, Patient 4 showed no change in rigidity. As for bradykinesia, Patient 4 underwent similar tests to Patient 3, with similar positive results. Nevertheless, there were not any major improvements in leg movement performance. The efficacy of one dose of L-DOPA increased in a similar fashion to the other patient. After ten years, rigidity, hypokinesia, and resting tremors were minimal without any "off" periods. The patient recorded the symptoms every 30 minutes, and clinical assessments were done monthly for the first year and 4 to 5 times during the following years.

The grafts successfully induced dopamine release and decreased motor issues and continued to do so during brain scans taken ten years later. In particular, an increase of [18F]-DOPA uptake to normal levels was observed after three years with minimal fluctuations in the ten years, confirming graft survival. After ten years, the patient also underwent two [11C]-RAC scans with saline and methamphetamine infusions to track basal and maximum dopamine release from the neuron grafts. In the grafted putamen, the [11C]-RAC scan showed that basal dopamine release was equal to that of a normal brain. Maximum release was evaluated after a methamphetamine infusion, and it appeared to be decreased in the grafted putamen to almost control levels.

Dopaminergic Neurons Derived from iPSCs Transplanted in Primate models of Parkinson's Disease

Currently, research is being done to determine if iPSCs could be used to treat PD. iPSCs are stem cells that have been derived from somatic cells through a process called cell reprogramming. When taken from humans, they can be differentiated into human dopaminergic neurons, among other types of cells. Researchers are aiming at transplanting human iPSC-derived dopaminergic neurons into the affected hemispheres of patients to replenish dopamine production, thus reducing symptoms.

There have been several pre-clinical studies to evaluate the feasibility of this procedure. The most recent one used rhesus monkeys. PD was induced in one hemisphere of the monkeys' brains with MPTP, and they were left to age to replicate the chronic nature of the disease. After 2 to 3 years, the monkeys were treated with the dopaminergic neuron precursors derived from iPSCs. One group of monkeys was given neurons derived from iPSCs generated from their own skin cells (autologous), while another was given neurons derived from iPSCs generated from another rhesus monkey's skin cells (allogenic). The animals' behavior was tested to evaluate possible improvements from the procedure. Clinical tests were performed by the animal while tasks like posture, grasping, gait, and ability to climb and walk were evaluated. Monkeys with autologous transplants showed a 40 to 60 percent improvement in performance, while monkeys with allogeneic transplants showed none. Autologous transplant monkeys showed more speed and fluidity in their movements, and gait tests were performed more easily. Motor movements like climbing showed no improvement in allogeneic graft monkeys, but autologous graft

monkeys performed it more easily. Moreover, [11C]DTBZ PET scans showed an increase in dopaminergic activity in the autologous transplant and did not show any increase in activity in allogeneic transplants. There was also histological evidence of the grafts. Brain sections were examined post-mortem and showed an increase in TH+ neuron density and integration of neuron fibers into the rest of the brain in the autologous grafts compared to allogeneic grafts. The importance of testing both autologous and allogeneic grafts is to evaluate the possibility of having iPSC donors for treatments on a larger scale. That possibility seems unlikely in rhesus monkey studies; however, more research is being done on whether a universal donor bank of iPSCs is possible. There would need to be enough donors for transplant receivers to find a match to decrease the possibility of allogeneic grafts being rejected.

Dopaminergic Neurons Derived From iPSCs Transplanted in a Parkinson's Patient

The same procedure as the previous paper was done in one human patient study. Autologous iPSCs were grafted into both hemispheres of a patient's brain during two separate surgeries done six months apart. The researchers assessed motor skills and saw no major improvements; however, it is necessary to consider that the patient declined to participate in a pre-procedure assessment of symptoms without medication, so comparisons were made while the patient was still taking medication. [18F]DOPA PET scans were taken before and after the surgery to assess graft survival and measure dopamine levels in the transplantation area. There was no significant increase in the PET signal after the procedure, suggesting that the procedure itself might not have been successful. However, the patient was also asked to fill out a survey of his quality of life and reported an increase. These results do not rule out the potential efficacy of this procedure, but further experimentation will be required to optimize the procedure and assess its therapeutic potential.

Astrocyte Conversion into Dopaminergic Neurons in Murine Models of Parkinson's Disease

Another avenue of PD treatment is cell conversion. Instead of introducing new cells into the body, this method converts glial cells into dopaminergic neurons. The experiment was done in injured midbrains of mouse models of PD with the ultimate goal of replenishing their brains

with dopamine. Astrocytes were used because they are abundant in lesioned brain areas and have a similar lineage to neurons, making them easier to transform into neurons.

To achieve this goal, PTB expression was decreased in astrocytes using RNAi, which resulted in astrocytes conversion into neurons both in *in vitro* cultures of mouse cortical astrocytes and *in vivo*, in different mouse brain areas. The newly created neurons generated in the midbrain were dopaminergic and innervated the nigrostriatal pathway.

After a successful first experiment, the authors converted astrocytes into dopaminergic neurons in PD models. This successfully replenished the midbrains of PD mouse models with new dopaminergic neurons and restored dopamine release in their striata. The motor function of the mice was tested after the procedure, and they showed a recovery in motor skills.

The experimenters also used ASOs to inhibit PTB expression instead of RNAi. The experiment showed that ASOs could successfully inhibit PTB expression, induce conversion, and restore some motor function in mice. This method is more viable for large-scale treatment because it is easier to administer. This experiment also reinforced the findings of the previous study since it shows that the patients benefited from the reduction in PTB expression and not the method itself.

Similar results are observed in *Glia-to-Neuron Conversion by CRISPR-CasRx Alleviates Symptoms of Neurological Disease in Mice using the CRISPR-CasRx system*. The experiment was performed in a PD mouse model, and it successfully induced astrocyte conversion into dopaminergic neurons. The mouse models underwent a series of motor function tests which showed increased motor function compared to controls.

Conclusions

PD is prevalent amongst people over 65 and dramatically decreases their quality of life. Current treatments focus on symptom management and not on halting the progression of PD. The new avenues of treatment discussed in this literature review aim to increase the dopamine levels of PD patients by replenishing the affected areas with dopaminergic neurons. These procedures are still at very early stages of experimentation, but the successes in these experiments can guide future treatment plans.

Historically, neuron grafts have been supplied by fetus brain tissues. The first attempts using this method were made in 1989 and 1992. Fetal mesencephalic tissue was implanted into the brains of 4 patients, all of whom saw an increase in dopamine levels and motor function,

which was reflected by a decrease in the severity of the symptoms. Looking at the follow-up ten years later, although the disease continued to progress, the treatment was still effective at managing the patients' symptoms. One may argue that PD is a complex disease characterized by more than just striatal dopamine deficiency, but dopaminergic neuron grafts may drastically improve the quality of life of PD patients and reduce their need for dopamine replacement therapy. Early clinical studies on fetal mesencephalic tissue transplants have demonstrated that this treatment can be successful but difficult to sustain; 7 fetuses are required to make enough tissue for one adult, and there are ethical concerns around the use of fetuses. The experiment acts as a proof of principle for neuronal graft-based treatments.

New methods of producing dopaminergic neurons include using iPSCs to create grafts for patients. iPSCs can be created more efficiently and in a greater number than fetal neurons. This method was used in a human patient first, which was followed by more extensive experimentation in rhesus monkeys. The Parkinson's patient did not show increased dopaminergic activity in PET scans, and motor skills remain unchanged. However, the animal models showed success. The treated rhesus monkeys showed improvements in brain scans and motor skill tests, and the autopsies showed an overall improvement of the condition. From this experiment, we can see that the procedure has not yet been improved enough to be used on a larger scale, but there is promise in this field. Continued research is being done on making this treatment more cost-effective for use on a larger scale.

One of the challenges of cell-replacement therapy is trying to make the procedure the least invasive as possible. This may entail limiting the use of immunosuppressants. In order to achieve this, it has been suggested an individualisation of the treatment. However, individualizing the stem cells for each patient can take a long time, and it is not sustainable to treat all PD patients. One option to make this procedure more efficient is to have universal donors donate stem cells that can be used to create grafts for patients. With this method, cells that tend to survive grafts can be specifically selected, making the process more likely to have better results. Universal donors also reduce the need for immunosuppression during treatments.

Glial cells conversion is being tested as a future treatment for PD and has shown promising results so far. Astrocytes are a type of glial cell abundant in damaged areas of the brain, making them readily available for PD patients. Moreover, astrocytes are developmentally linked to the neurons that are present around them, so they are easy to convert into the right kind

of cell. This method also mitigates the hurdle of individualizing and transplanting cells for patients and makes it easier to use as a large-scale treatment. Experiments have successfully been completed in animal models. This method is still in its rudimentary stages, but there is potential for it to become a treatment in the future.

PD treatments continue to evolve daily, using different techniques and methods. Current treatments only remediate symptoms for a short period of time without slowing the progression of the disease. Since PD symptoms can be debilitating, it is important to give patients a normal life. The future avenues discussed in this paper have the potential to greatly slow the progression of the disease and dramatically increase the quality of life of PD patients. Patients who have undergone successful procedures report little to no symptoms and a lifestyle akin to not having PD or having an early stage of it. Due to the nature of PD, it is difficult to prevent the onset of or eradicate the disease from patients. Nevertheless, there is promise that continued research can help halt the progression of PD in patients. Further work must be done to make the procedures viable for mass use, but it would be a life-changing investment for many patients and their families.

Work Cited

- Wu, W.-M.; Wu, Y.; Wu, Y.-L.; Yao, Z.-J.; Zhou, C.-M.; Li, Y.; Shan, F. Unified mechanistic framework for the Fe (II)-induced cleavage of qinghaosu and derivatives/analogues. The first spin-trapping evidence for the previously postulated secondary C-4 radical. *J. Am. Chem. Soc.* 1998, 120, 3316–3325.
- Lindvall, O., Brundin, P., Widner, H., Rehnström, S., Gustavii, B., Frackowiak, R., Leenders, K. L., Sawle, G., Rothwell, J. C., & Marsden, C. D. (1990). Grafts of fetal dopamine neurons survive and improve motor function in Parkinson's disease. *Science (New York, N.Y.)*, 247(4942), 574–577. <https://doi.org/10.1126/science.2105529>
- Lindvall, O., Widner, H., Rehnström, S., Brundin, P., Odin, P., Gustavii, B., Frackowiak, R., Leenders, K. L., Sawle, G., & Rothwell, J. C. (1992). Transplantation of fetal dopamine neurons in Parkinson's disease: one-year clinical and neurophysiological observations in two patients with putaminal implants. *Annals of neurology*, 31(2), 155–165. <https://doi.org/10.1002/ana.410310206>
- Piccini, P., Brooks, D. J., Björklund, A., Gunn, R. N., Grasby, P. M., Rimoldi, O., Brundin, P., Hagell, P., Rehnström, S., Widner, H., & Lindvall, O. (1999). Dopamine release from nigral transplants visualized in vivo in a Parkinson's patient. *Nature neuroscience*, 2(12), 1137–1140. <https://doi.org/10.1038/16060>
- Qian, H., Kang, X., Hu, J., Zhang, D., Liang, Z., Meng, F., Zhang, X., Xue, Y., Maimon, R., Dowdy, S. F., Devaraj, N. K., Zhou, Z., Mobley, W. C., Cleveland, D. W., & Fu, X. D. (2020). Reversing a model of Parkinson's disease with in situ converted nigral neurons. *Nature*, 582(7813), 550–556. <https://doi.org/10.1038/s41586-020-2388-4>
- Schweitzer, J. S., Song, B., Herrington, T. M., Park, T. Y., Lee, N., Ko, S., Jeon, J., Cha, Y., Kim, K., Li, Q., Henchcliffe, C., Kaplitt, M., Neff, C., Rapalino, O., Seo, H., Lee, I. H., Kim, J., Kim, T., Petsko, G. A., Ritz, J., ... Kim, K. S. (2020). Personalized iPSC-Derived

Dopamine Progenitor Cells for Parkinson's Disease. *The New England journal of medicine*, 382(20), 1926–1932. <https://doi.org/10.1056/NEJMoa1915872>

Tao, Y., Vermilyea, S. C., Zammit, M., Lu, J., Olsen, M., Metzger, J. M., Yao, L., Chen, Y., Phillips, S., Holden, J. E., Bondarenko, V., Block, W. F., Barnhart, T. E., Schultz-Darken, N., Brunner, K., Simmons, H., Christian, B. T., Emborg, M. E., & Zhang, S. C. (2021). Autologous transplant therapy alleviates motor and depressive behaviors in parkinsonian monkeys. *Nature medicine*, 27(4), 632–639. <https://doi.org/10.1038/s41591-021-01257-1>

Zhou, H., Su, J., Hu, X., Zhou, C., Li, H., Chen, Z., Xiao, Q., Wang, B., Wu, W., Sun, Y., Zhou, Y., Tang, C., Liu, F., Wang, L., Feng, C., Liu, M., Li, S., Zhang, Y., Xu, H., Yao, H., ... Yang, H. (2020). Glia-to-Neuron Conversion by CRISPR-CasRx Alleviates Symptoms of Neurological Disease in Mice. *Cell*, 181(3), 590–603.e16. <https://doi.org/10.1016/j.cell.2020.03.024>

Behavioral Biases in Financial Investments By Jason Wang

Abstract

Many investors have to face a variety of biases when they make investment decisions, these biases cause them to make unnecessary losses and mistakes that could be easily avoided with complete rational behaviors. This paper introduces three of the most common investment biases (Confirmation Bias, Loss Aversion, Bandwagon Effect), proves their existence in the financial society and provides solutions to counter these biases so that investors would be able to fully employ their investment strategies while minimizing wrongdoings.

Introduction

In today's world of investment, many investors believe the concept that the more money an investor has, the more money he or she can make. In other words, if investor A's asset is 1 million dollar while investor B's asset is merely 100,000 dollar, it is widely believed that investor A can make 10 times more money than investor B. Nevertheless, this theory is made under the assumption that all investors pursue rational decisions that would always allow them to gain rather than lose. This assumption is clearly unrealistic because it disregards the fact that most investors do sometimes make irrational decisions and are unable to control their emotions when they invest. As a result, it is arguable that the more money an investor has, the more money he or she could lose and potentially end up with countless debts. What behind the formations of most irrational investment decisions are bias and heuristics that drive investors away from identifying the correct pathway for their investment, preventing them to effectively employ their assets and reach the full potential of their investment abilities. Through examining the three investment biases: Confirmation Bias, Loss Aversion Effect and Bandwagon Effect, and proposing the potential solutions to avoid these biases in decision making, this paper will present an efficient investment strategy to guide investors towards the road of successful and profitable investments.

Confirmations Bias refers to the tendency that investors are often overconfident and subjective about their strategies because they tend to collect data that support their existing beliefs, which include the investor's expectation about a particular prediction or outcome, and convince themselves that their investment decisions are correct.

Loss aversion is a bias that causes investors to be twice as emotional as the pleasure of gaining when they face the pain of losing during an investment activity. This psychological impact motivates investors to be more serious about avoiding losses than acquiring equivalent gains, prompting them to refuse taking losses stocks until the stocks' prices go back up.

Bandwagon effect refers to a psychological phenomenon that, regardless of their personal needs and objective in their investments, investors tend to perform an investment activity similar to the action and decision of the majorities. This effect is notable the most in bull markets or during the growth of asset bubbles as many investors helped to bring prices up without a particular reason.

Confirmation Bias

Without objectively extracting updated information about the market due to investors reluctant to change their mind, Confirmation Bias causes a false sense that nothing will go wrong when it actually increases the risk of losses as something does go wrong. For example, Investor A is analyzing the ABC company and figuring out whether the company is worth investing in. Investor A is originally biased towards ABC company because his parents are working for the company, and they tell the investors that ABC is the best company with the highest investment potentials. As a result, even though Investor A considers himself to be unbiased, confirmation biases begin to influence investor A as soon as he starts researching ABC. For instance, investor A would always notice positive information about the company, such as the new technology it developed, and ignore negative information that works against the company, such as the fact that the average enrollment of employees is less than 2 years (Clark, 2022, pg.1).

Not only would investor A ignore negative information, he or she might also interpret the negative information in a way that is supportive to his initial bias (Clark, 2022, pg.1). For instance, even though low average enrollment of employees in a company signals the fact that employees are less loyal to the company or are dissatisfied with their working conditions,

investor A might interpret low average enrollment means the company is very competitive and there is a large pool of applicants applying to work there. Therefore, the Investor would conclude that by laying off employees in less than two years, the company might find someone that is better fit to the position and contribute more towards the company's well-being, which subsequently drives the company's price up and bolsters their investment potential.

The scenario connects with many historical investment events that showcases how investors actually missed an investment opportunity when they failed to prevent confirmation biases. As mentioned by the Book "What Wall Street Doesn't Want You To Know," during the 19-year period from 1966 to 1984, many investors decided to switch their investments in stocks to bank certificates due to the large media projection that bank certificates would outperform stocks by almost 1% per annum. As a result, those investors trusted the media because they were biased about the idea that the media they chose to access would never provide misleading information and that they "are all too willing to abandon their investment strategies based on much shorter term results." (Swedroe 242) It is true that the media didn't lie about the rise of bank certificates, but it failed to provide correct guidiances towards long term investments, and that those investors who chose bank certificates over stocks eventually missed the greatest bull market in history. This situation shows that confirmation bias could mislead investors to miss the best investment decision, because they believe in limited information that fails to illustrate the whole picture of long-term investment opportunities. In this case, confirmation bias played a major role in misleading investors to choose bank certificates over high potential stocks. Without confirmation bias, according to Swedroe, investors would be able to realize the fact that bank certificates would never outperform stocks in the long run and that they should make their decision based on this objective information (Swedroe 243). Doing so would allow all investors to benefit from the rise of the stock market in the following years and avoid financial loss from choosing bank certificates.

Experiment I

To further analyze the strengths and seriousness of confirmation biases, here is an actual experiment conducted and published by the Canadian Center of Science and Education. Professor Chu Xin Cheng, who was in charge of carrying out the experiment, intended to answer

the question whether or not investors are more willing to accept information favoring or criticizing their investment decisions. In his experiment, Professor Cheng recruited 125 participants with the age of 18 or older and a minimum of a high school education degree. These participants were asked to answer multiple questions of a survey (Cheng, 2022, 51).

The questions on the survey were divided into two sections: experimental questions and personal questions, both of each intended to provide answers to the central questions of whether or not investors are “more willing to accept information consistent with their previous decision” (Cheng, 2022, 51-52). At first, participants are given the background information about the two kinds of mutual funds: actively managed funds, which are more risky but more rewarding, and index funds, which are more risk protected but lower earning. After evaluating through the background information, the participants would make a decision between the two funds and imagine themselves investing in the selected fund. Next, two articles are shown to the participants regarding active management funds. On the one hand, the first article headline is “The Case For Active Management”, which is clearly supportive of active management funds. On the other hand, the second article headline is “I hate Active Management,” which is oppositional to the funds. (Cheng, 2022, 52)

After the participants finish reading the article they choose, they are given a chance to alter their investment decision: invest more, no change or withdraw. Disregarding invalid responses, there are 129 responses collected at the end of the experiment. Within those responses, 74 investors invested in actively managed funds and 55 of investors invested in index funds (Cheng, 2022, 53). As shown by table 1, within those who chose actively managed funds, 65 of them read the article “The Case for Active Management.” Additionally, table 3 shows that around 70% of those who both read the article and invested in actively managed funds decided to either continue investing or invest more in the fund. This result shows that people who invest in active management funds are more likely to choose information that supports their initial decision and reject information that is against them. As a result, this experiment proves the theory that confirmation biases do exist in the real world as people (the participants) connect information preference to what they have already believed while simultaneously avoiding information that suggests the wrongdoing of their decisions.

Table 1. Results of investment decisions and article preferences

	People who choose to read “The Case for Active Management”	People who choose to read “I Hate ‘Active Management’”	Total number of people
People who invested in Active Management Funds	65 (88% of total)	9	74
People who invested in index funds	35 (64% of total)	20	55
Total	100	29	129

Table 3. Results for Re-consideration question

	No Change	Invest(more) in Active	Invest(more) in Index	Withdraw from Active	Withdraw from Index	Total
Invest in Active + Read “ The Case for AM ”	12 (18.75%)	33. (51.56%)	14 (22.87%)	5 (7.81%)	0	64
Invest in Active + Read “ I Hate AM ”	5 (50%)	0	4 (40%)	0	1 (10%)	10
Invest in Index + Reda “ The Case for AM ”	11 (33.33%)	14 (42.42%)	3 (9.09%)	2 (6.06%)	3 (9.09%)	33
Invest in Index + Read “ I Hate AM ”	15 (75%)	1 (5%)	4 (29%)	0	0	20

Note. Active = Active Management Funds; The Case for AM: The Case for Active Management; Index = Index Funds; I hate AM = I Hate “Active Management Funds”; Total = Total number of people who answered the follow-up question.

Solutions I

In order to counter confirmation bias in investment decision making, investors can utilize the NDR technique that would allow them to make objective decisions and gather precise information. The N stands for neutral questions, investors should constantly evaluate a certain stock with unbiased questions, they should ask themselves “What are the ups and downs of investing stock A” instead of “how high is the return of stock A when X amount of money is invested.” The D stands for doubts, which refers to appointing critics to constantly doubt and debate upon a decision an investor is going to make, so that the investor would be able to hear the negative opinions about his strategy instead of making subjective judgments by himself. Investors' critics have to believe in unbiased facts and be able to compare those facts with investors' strategy. Therefore, investors should appoint critics based on the critics personal background and expertise. For example, if investors are investing teslas, they can employ critics that are working in the publishing industry. This is because most critics in the publishing industry do not have biases towards Teslas and that they can provide objective and rational opinions that would help investors to review their strategy. Doing so would allow investors to get the most authentic opinions and support from their critics. The R stands for rethinking, which means

investors have to always rethink about their decision before they actually make it happen. For example, before investing in stock X, investors should come up with a checklist about everything he has to do and verify, “Did I check through all the previous data of stock X? Did I fully consider both the positive and negative aspects of investing this stock? Am I choosing the correct time and amount of assets that I’m going to invest?” Investors should use this technique based on the original order. In other words, investors should complete N before D, and D before R. This is because investors have to first come up with their own strategy, then have their strategy examined by critics, and finally review their strategy to find possible amendments and mistakes that they can change or improve before making the final decision.

Loss Aversions

As Adam Smith once said, “we suffer more when we fall from a better to a worse situation than we ever enjoy when we rise from a worse to a better.” Adam Smith's statement shows that Loss aversion is another important bias that prevents investors from fully utilizing their talents and resources, which causes numerous adversity towards rational investments as it encourages investors to avoid selling losing investments before it gets worse, creating hopes that the price of the losing investments will come back up so that the investors can pay off their losses. For instance, investor B buys a stock for 1000 dollars but then the stock drops by 10% the next day. Due to the effect of loss aversion, Investor B doesn't like to see a loss and refuses to cut off his investment. Instead, in the hope of covering the loss and regaining profits, Investor B made the decision to hold on to the stock as it keeps dropping in the following days. Not until after a week, Investor B's share dropped by 50% and decided to quit as he began to realize that it is a losing stock. At this point, Investor B might notice his friend, investor C, only lost 10% even though they both invest in the same stock. Unlike investor B, investor C is not affected by the loss aversion effect and is able to immediately understand the downfall of his shares and drops out before it gets worse.

To further understand the concept, here is a simple illustration of loss aversion in our daily lives. In the Book “Market wizard”, investor Michael Steinhardt compared the loss aversion effect to a turkey trap with corn leading into the big trap box. One side of the box is installed with a hinged door, which connects with a trigger that allows the owner to shut the door when there are enough turkeys wandering into the trap (Schwager, 2012, 229). One day, the

owner finds out that there are a dozen turkeys in the box but one of them walks out. The owner thought that “maybe if I wait, he will get back in” (Schwager, 2012, 229). Later, two more turkeys walked out, but, instead of closing the door immediately to avoid more losses, the owner convinced himself that “if just one of them walks back, I will pull the string” (Schwager, 2012, 229). Eventually, the owner was left empty-handed as he refused to cut it off even when there was only one turkey left. In fact, the owner in this story closely reflects the cousin of Larry Hite, another talented investor introduced in *Market Wizards*, who bought \$90,000 worth of Merrill Lynch options and eventually ended up in debt for \$10,000 after a month (Schwager 186). He said, “I originally bought the options at \$4.5. When the price went down to \$1, I figured out that if I bought another 20,000, all it had to do was go back to \$2.75 for me to break even. So I went to the bank and borrowed \$10,000” (Schwager 186). These examples reflect on a common mistake that many investors make with loss aversion: they all want to have a break even when they keep losing and fail to realize their wrong doing before nothing left in their investments. This mistake causes them to suffer severe consequences of loss aversion bias and shows that, because they were unable to control their psychological influences that keep them holding the losses, they eventually failed to control the risk of investments, leaving them with nothing but griefs and regrets.

Experiment II

In an experimental study of loss aversion, Christoph Merkle, a professor of the department of Bank and Finance at the University of Mannheim, conducted a panel survey with brokerage clients at Barclays Stock Broker, which is one of the largest brokerage providers in the UK. A sample of 617 clients were selected and participated to answer two questions on the survey. The first question asks them how they would rate the returns they expect from their investment portfolio in the next three months. The second one asks them to rate the returns of their investment portfolio over the past three months (Merkle 11). Both of the two questions provide a seven point scale option from “extremely bad” to “extremely good”. The results show that the average expected portfolio return rating is 4.2, which is slightly above 3.5, the middle point of the scale. Additionally, the relationship between expected portfolio returns and the subjective rating of these returns has a positive correlation of 0.4 (Merkle 16). These results show that the participants feel better about higher return because it provides higher utility to

investors, they also intentionally attempt to avoid losses as compared to gains because they are all optimistic about their portfolio performance as indicated by positive returns-ratings correlation: investors have higher subjective mindset when they rated high return, which shows that they all personally want to have positive outcomes and avoid negative outcomes. The research strongly suggests that loss aversion is an existing issue in the investors community because the brokerage clients in those experiments could represent the same ways other investors would react to loss aversions, in which they might all have an optimistic view on their portfolio and are unable to react to losing shares in a proper and objective manner before the loss gets worse.

Solutions II

There are various ways to guard against loss aversion effects, one of the most important methods is to set a stop price and execute the stop if the share reaches below the stop price. For example, if the investor invested a thousand dollars in a certain stock, he or she should consider to set the stop price at 85% to 95% of the initial amount of investment, which is 850 to 950 dollars. This is because if the price reaches below 85%, it shows a clear sign of loss and that investors have to drop out their share before the price gets worse (D. Kahneman, 2022). Additionally, investors have to learn to control their emotions and adapt the idea that “it is ok to take losses,” doing so would allow investors to stick with their stop prices and objectively evaluate the pros and cons of buying or selling a stock at a certain price.

If investors notice that they are unable to control their emotion or focus on the price shifts, the first thing they should do is to drop out their share and take a break to regain their objective mindsets. For example, if investor A is mentally depressed about a life event that occurred, he or she would be unable to concentrate the fluctuation of the market and appropriately set a stop price for his or her investment (Brock, 2021). Therefore, investor A needs to take a rest to regain an objective mindset and avoid emotional misjudgement. Once investors manage to control their emotions and be able to obey reasonable stop prices for their shares, investors can start with a small amount of investments and gradually increase their investments as they improve their ability to execute the techniques. For instance, investors might want to begin investing 10 dollars in a share. Once the investor finds out that the investment is increasing for a month as the stop

price really helped to prevent losses and that the investor is able to fully control his or her emotions, the investor can increase the investment by 20% within a certain time interval: from 10 dollar to 15 dollar for the following 2 months and from 12 to 14.4 for the next two month and so on. This is because an increase of 20% investment would generate higher returns while still maintaining a manageable level of risk.

Bandwagon Effect

Bandwagon effect is another important bias to investors when they make daily investments decisions. The effect exists in the financial markets in two notable ways. First, it generates price bubbles by raising the price of a particular stock beyond a reasonable point, causing the stock to be overvalued. This occurs when many investors line up and buy the stock to drive the price up, which would attract other investors to join the line and cause a higher price. Second, the effect also creates liquidity holes, which refers to situations in which most investors halt their investment activities during unexpected news and events. These actions cause liquidity to decrease significantly as the number of buyers and sellers are reduced in the market, causing a massive shift of asset prices and subsequently creating panics and uncertainties (Tracy, 2019).

To analyze how bandwagon effects affect individual investment decisions, imagine a scenario in which ABC company just launched a new electric car and is widely reported by the top media in the country. Because the car looks so authentic and innovative on the television, investor A began to believe that ABC is a good company that will thrive in the market with its attractive new product. Investor A would then make an investment in the company and tell his friends, investors B, C and D, that they should also invest in ABC due to its great potential of high returns. As a result, investors B, C and D would also invest in the company and share the rumors to their other friends, investors E, F, G and so on (Adock, 2021). These eventually create an extensive chain effect that the rumors will keep spreading to many investors and that they would make an investment decision according to the rumor while passing the rumor further to someone else. However, these investors' decision to invest in ABC is solely based on the fact that they “heard good things about it” or “think it is a neat company” (Tracy, 2019). They neither have done their own research on the company nor evaluate more deeply about potential consequences of choosing to follow what everyone else is doing .

Such a bandwagon effect increases the vulnerability to risks because if the investors decision to invest is found out to be wrong, all of them would have to suffer the same losses and cause a huge turmoil in the market. In the example above, investors would find out that three months later, the new electronic car is reported with serious safety issues and is highly inefficient compared to other brands of car. Therefore, the market price of the company would be dragged down rapidly by the decreased number of customers and sales. These mean not only Investor A,B,C,D,E and F have to suffer losses due to their reckless decisions, but also affected their friends as they believed and helped to spread the rumor.

The example clearly shows how dangerous the Bandwagon effect is to the well-being of financial markets and that it is important for investors to learn and avoid it. Yet, there are a lot of real world investment events in which investors failed to counter the Bandwagon effect and subsequently shoot themselves in the foot when they recklessly follow other investors' decisions. In Market Wizards, Larry Hite, as introduced in the previous paragraph, had a friend who was constantly following the corn market. His friend told him that he should buy the new crop corn and sell the old crop corn because the new crop corn would outperform the old one. Larry eventually believed his friends and offsetted his long position in the one contract month and short position in another month. Nevertheless, the government released a surprising crop estimate within a week, which proved Larry's friend hypothesis is completely wrong (Schwager, 2012, p.186).

Larry's decision to follow his friend and his subsequent wrong decision in the crop market ultimately caused him to go limit-down in the month he was long, and went limit-up in the month he was short. These wrongdoings dragged Larry into pains and despair as he "literally getting down on my (his) knees and saying out loud, "Dear God, I don't care how much I lose, but please don't let the account go into a debit"" (Schwager, 2012, p.186). Larry's experience not only shows that bandwagon effects could ruin investors portfolio in a matter of a month or even a week, but also illustrates the psychological damages that would bring investors into despair and regrets as they realize how naive they are to listen to their friends instead of doing their own research.

Experiment III

In order to verify the existence of the bandwagon effect in real life, here is a study done by Inwon Kang, who is a professor in the department of international business and trade in Kyung Hee University. Professor Kang conducted a survey of 218 visiting Asian international students in Seoul to study the bandwagon effect on consumer consumption behaviors. Within the sampled participants, 48.6% are male and 51.4% are female. With regards to nationality, 64.7% of the participants are from China, followed by 19.3% of Vietnamese participants (Kang, 2020, p.9). At the beginning stage of the experiment, Professor Kang listed three questions on his survey and asked the participants to answer those questions with a 5 point scale (1=totally not true of me, 5=extremely true of me). The questions are “How likely is it that you would purchase/use products worn by most people?”, “How likely is it that you would purchase/use popular products that everyone would approve of?” and “How likely is it that you would purchase/use products recognized by many people?” The responses of these questions are categorized with the level of Fear of Missing Out (FoMO), which refers to the extent consumers would be following the decision of the majority group (Kang, 2020, p.9). As such, the level of FoMO is the highest if a participant rated 5 for all the questions and the lowest if participants rated 1.

The result of the experiments shows that, with a 4.18 out of 5 FoMO rating, participants showed a higher level of bandwagon consumption pattern mostly in luxury goods, and that the FoMO level is linearly related to product category with a 99% confidence level (Kang, 2020, p.11). This means that, the more luxurious the products are, the more likely consumers will experience bandwagon effects. This experience proves that the bandwagon effect does exist in real lives as people are unlikely to make purchasing decisions independent of the influence of others. Additionally, it also shows that the bandwagon effect tends to be stronger when it applies to more luxurious or higher spending of products. This result also connects with the bandwagon effect that influences financial decisions as many investors make decisions based on the majority of investor belief and that the higher the price of the investment is, the more investors will trust each other due to the higher confidence level of earnings.

Solutions III

Investors can follow the SMC steps to minimize or eliminate the bandwagon effect. SMC stands for Slowing down decision making, Making independent decisions and Considering alternative options. First, investors need adequate time between receiving investment news and making final decisions. Doing so would allow investors to think more critically about the news so that they can make fewer mistakes and avoid quickly accepting an idea that is not situationally correct. Going back to the electronic car example from the previous paragraph, investors would be able to realize the huge downfall of the company if they could have given more time to do deep research and analysis about the rumors they have heard.

Second, investors have to individualize their strategy as much as possible, this is because investors are less exposed to uncontrollable risks when they are able to adjust the way they invest based on their personal preferences and beliefs. For example, investor A is conservative and wants to invest in low risk stocks. Therefore, investor A should not follow other investors who invest in new technology startups because they are relatively high risk. Instead, Investor A should do his or her own research to find low risk investments such as stocks in the Federal Deposit Insurance Corps or private companies that have low fluctuation of prices.

Investors also have to consider alternative strategies if necessary. Investors should not be afraid of not aligning themselves with the majority if they think that the majority is wrong. In fact, history has shown that there are many occasions when the majority investors have to suffer wrong decisions and the minority benefits from making the opposite decisions. For instance, millions of investors have invested in General Electric because they believe that the company has been “a piston of the American economic engine for 125 years” (Egan, 2020) and that it has a huge market potential. On the other hand, only a few thousand held short of GE’s stock and believed that the company was approaching price decay. The minority was correct, the company lost more than \$100 billion in market value and it has admitted that it can no longer afford to pay the dividends. This greatly affected its investors as the company’s stocks crashed to a six-year low in November 2016 and the investors’ portfolio has plummeted 42% (Egan, 2020). Therefore, investors should always trust their own strategy instead of constantly staying with the majority decisions. They should realize that most people choosing the same strategy doesn’t mean that they are correct, but they might be wrong if the strategy is not based on factual evidence. After

all, the SMC is clearly an efficient and helpful step that investors can take in order to get rid of bandwagon effects and improve the flexibility of decision making.

Conclusion

Through providing multiple illustrations, real examples and previously done experiments, this paper has illustrated that Confirmation bias, Loss aversion and Bandwagon effect are serious biases that are influencing investors and causing them to make unjustified decisions that create undesirable outcomes. Therefore, investors should follow the solutions that are proposed to counter each of the three biases and strengthen their mindset when it comes to choosing the right stocks for their portfolio. Doing so would not only help investors to avoid unnecessary losses, but also provide them opportunities to extend their investment potential to the maximized limits.

Work Cited

- Brock, Melissa. "Loss Aversion: How It Can Damage Your Investing and Trading Efforts and How to Stop It." *Entrepreneur*. Entrepreneur, August 28, 2021.
- But now GE faces a different kind of challenge -- a nightmare cash crunch that could take years to recover from. GE (GE) has been left in turmoil years of questionable deal-making, M. E. (2017, November 20). How decades of bad decisions broke Ge. CNNMoney. Retrieved May 20, 2022
- Philip Adcock. "Bandwagon Effect in Marketing - Adcock Solutions." *Bandwagon Effect in Marketing - Adcock Solutions*. Adcock Solutions, October 5, 2021.
- Clark, Stan. "Behavioral Finance Confirmation Bias Is Normal – but ..." Accessed April 23, 2022.
- Cheng, Chu Xin. "Confirmation Bias in Investments." *International Journal of Economics and Finance* 11, no. 2 (2018): 50.
- D., Kahneman, and Tversky A. "Loss Aversion." *Economics Help*. Accessed April 22, 2022.
- Healy, Patrick. "Confirmation Bias: How It Affects Your Organization: HBS Online." *Business Insights Blog*. Harvard University, August 18, 2016.
- Kang, Inwon, and Ilhwan Ma. "A Study on Bandwagon Consumption Behavior Based on Fear of Missing out and Product Characteristics." *Sustainability* 12, no. 6 (2020): 2441.
- Merkle, Christoph. "Financial Loss Aversion Illusion*." *Review of Finance* 24, no. 2 (2019): 381–413.
- Schwager, Jack D. *Market Wizards*. New York, New York: Wiley , 2012.
- Swedroe, Larry E. *What Wall Street Doesn't Want You to Know: How You Can Build Real Wealth Investing in Index Funds*. New York: Truman Talley Books/St. Martin's Press, 2004.
- Tracy, Paul. "Bandwagon Effect Definition & Example." *InvestingAnswers*, October 1, 2019.

Consumer's Perceptions of Recycled and Remanufactured PV Solar Panels in Nova Scotia: Basis for the Development of a New Market By Nora Kaizer

Abstract

The possibilities of recycled and remanufactured solar panels, if integrated into the market properly, could create an economic, environmental, and political opportunity in Nova Scotia and other regions across the world. Previous research is limited pertaining to the recycled or remanufactured solar panel market due to it being a recent concept. Most research focuses on the science of solar panel composition and the expected production of solar energy, not the implementation of more environmentally friendly panel options in the market. Due to this lack of research, there is no foundational research to determine if there exists a market for recycled and remanufactured solar panels in the first place which is the gap this study aims to fill. This study uses a two-part method composed of a quantitative anonymous questionnaire followed by a qualitative analysis of the data gathered. The goal of this study is to determine if there is a possible market for, and gather consumers' perceptions of recycled and remanufactured solar panels in comparison to newly manufactured solar panels. The findings of this study conclude that the majority of consumers would rather purchase recycled or remanufactured solar panels but have expectations to pay less for them as opposed to newly manufactured solar panels. This research sets the foundation for future studies by determining that a possible market exists and allows for future research on how this possible market could be directed and implemented.

Introduction

Assuming no future incentives beyond 2019, 140MW (approx. 17,500 solar homes) are expected to be installed in Nova Scotia by 2030 (Dunsky Energy Consulting). This is evidence of Nova Scotia Power's goal to have energy sourced from 80% renewable sources by 2030 and being net zero by 2050 ("Clean Energy"). There has been immense growth in the renewable energy industry in Nova Scotia, and one of the most prominent forms of renewable energy being installed is solar power. Due to its feasibility and economic possibilities, solar power is one of the most profitable forms of renewable energy. Solar power is the only renewable energy source that is commercially viable and able to be installed in individual homes and businesses rather than be funded by the government. Other forms of renewable energy such as wind power use funding from the government to be installed, whereas solar does not require this and the

installation costs can be covered by an individual. This allows for more solar energy to be produced as solar panels take up less space and consumers pay the initial installation costs often with the help of government rebates. Due to solar panels being commercially sold, individuals reap the benefits of paying less to power their homes and the government benefits by reaching sustainability goals and pushing installation costs onto consumers thus saving them money.

The aim of this study is to analyze consumer's perceptions of the only commercially viable renewable energy source available: solar panels. The solar panel industry will benefit the overall economy and environment as it grows. The creation of jobs, dispersal of costs among consumers, sustainability goal completion and the investment in the future of their province, country, etc. are just some reasons the solar panel industry is important for governments, businesses, and individuals alike. To maximize the benefits of solar energy, encouraging recycled and remanufactured panels will decrease the marginal cost of producing each panel by decreasing its impact on the environment and the cost of the materials required to produce them therefore increasing the profit that could be made per panel. This makes recycled and remanufactured solar panels an exciting direction for the solar panel market that with further research on how it would be brought into the market could lead to making a previously environmentally friendly industry even more sustainable than it already is whilst increasing its economic benefits for numerous parties.

The research question for this study is: What are consumer's perceptions of recycled and remanufactured PV solar panels in Nova Scotia and is there a possible market for them? The hypothesis is that consumers will be more likely to purchase and willing to pay more for newly manufactured solar panels. Although this hypothesis is derived as a result of the modern consumerist society, where individuals often prefer to purchase newer or branded products, even if the hypothesis is proven to be true it could still lead to future research into what incentives will make consumers more favorable to recycled and remanufactured PV panels.

Literature Review

All sources in this literature review have been analyzed to meet the currency (published date recency), relevance (connection to the topic), authority (authors and publisher's credibility), accuracy (how truthful the information contained is) and purpose (reasoning for why the source was created) of the given topic. The information contained within this literature review has been

organized thematically (in a way that relates to the topic) within the categories of *Green Marketing, Marketing of PV Solar Panels, and PV Solar Panel and Renewable Energy Industry in Nova Scotia*.

Green Marketing

1.1- Environmental Awareness of Consumers, Organizations, Companies, and Governments

Climate change, pollution, and ecosystem diversity among others are some of the many global issues currently being faced. Many organizations, companies, governments, and even consumers have taken action to mitigate these issues. As time goes on, more environmental awareness can be identified throughout society due to educational efforts made by a variety of government, organization, and individual educational efforts. In a survey conducted by researchers at Southern Cross University, 93% of the 913 respondents from the United States of America and Australia indicated a general concern for the environment and 77% were interested in furthering their education on how to live a sustainable lifestyle (“Going Green”).

The 2017 Carbon Majors Report asserts that 71% of all global GHG emissions since 1988 can be traced to just 100 fossil fuel producers, including ExxonMobil Corp, Aramco (Saudi Arabian Oil Company), and Chevron Corp, among others; however, many other large companies throughout a variety of industries have made huge advances towards becoming more environmentally aware (Griffin 8, 14-15). The Honda Sustainability Report outlined details of Honda’s initiatives to lower CO2 emissions from their vehicle, motorcycle, and power products by 30% in the year 2020 (57). McDonald’s supports the UN Sustainable Development Goals movement and has already begun making advances to reduce their environmental impact; 80% of guest packaging sourced for McDonald’s restaurants was made of fiber sources as opposed to plastic, just one of the advances they have made to date. Even in the clothing industries, companies such as NIKE have made the switch to using 100% renewable energy in the U.S. and Canada (14). These are just a few of the many companies that are demonstrating environmental awareness and aspiring for sustainable changes.

Governments around the world have been major motivators for the environmental movement. Organizations such as the United Nations which has 193 member nations have laid out collaborative plans to solve environmental issues. The UN’s Sustainable Development Goals and Agenda have been major contributors to action taken around the world and has caused many

governments to reduce the environmental impact within their countries (Department of Economic and Social Affairs).

1.2- Green Marketing Trends

“Green,” “Eco-Friendly,” “Sustainable,” and “Net Zero ” are among the most searched environmentally friendly keywords on Google (Green Buzzwords Online Search Edition, 2016). Words like these are common marketing strategies used to let consumers know that a product is more environmentally friendly than its competitors who do not use these keywords. Many producers have been known to use these words on their packaging and in marketing without any real basis to support their use. Labels have been created to help consumers identify genuinely environmentally friendly products that have specific requirements in order to qualify for the use of each one. In Canada, EcoLogo, Energy Star, Forest Stewardship Council, Fairtrade, and the Mobius Loop (recyclable symbol), are all examples of labels created by organizations that have specific requirements in order for companies to obtain permission to use their logo on product packaging (Hahnel, et al.). These labels and buzzwords make products more desirable and increase sales; however, many consumers have become skeptical due to a lack of consistency in the qualifications to use certain words and labels on products that differ by organization (Duquesne University).

1.3- Predicted and Actual Success of Green Marketing

MECLABS, the world’s largest marketing research institute found that green marketing had a 46% relative increase in conversion. They claim that the success of green marketing is determined by four factors: 1. Tangibility, 2. Relevance, 3. Uniqueness of Claim, and 4. Believability. If a green marketing claim meets these four criteria, it is expected that the product will see increased sales. These trends carry across all markets and success is directly related to the alignment of the claim with the four criteria mentioned above (McGlaughlin).

Researchers at NYU’s Stern Center for Sustainable Business found that products marked as sustainable grew 5.6% faster than those not marked as sustainable. It was also determined that products marked as sustainable were responsible for 51.6% of packaged goods market growth from 2013-2018, despite only making up 16.6% of the total market. This study did not consider products with recyclable packaging or natural products with no other sustainable identification as

sustainable products. By not including these products in the study, the actual growth can be assumed as larger than indicated (Kronthal-Sacco, Randi and Tansi Whelen).

Marketing of PV Solar Panels

The information contained within section 2. *Marketing of PV Solar Panels* contains non-academically sourced data. The rest of this report is academically sourced but due to the nature of this section of the literature review it was necessary to include non-academic sources as no academic sources are currently available at the time this report was written. When researching current marketing strategies for PV solar panels, the data was retrieved by using a Google search engine and searching for “Solar marketing strategies.” The first five results were then analyzed to determine what strategies are commonly used as there is no academic compilation of this data available. The non-academic sources contained within this section are cited in the subsection of the works cited labeled “Works Cited for Literature Review Section 2”.

2.1- Common Marketing Strategies Implemented with PV Solar Panels

The first five results from a Google search engine when “Solar marketing strategies” is researched are Webfx.com, aurosolar.com, creativenurds.com, reonomy.com, and cleanegroup.org. The common strategies these websites listed for marketing solar panels include: search engine optimization (SEO), social media marketing, conversion rate optimization (CRO), paid social and search ads, infographics, payback and size calculators, market affordability, reducing complexity, and increasing visibility. SEO was the most commonly mentioned marketing strategy. SEO refers to using keywords to increase traffic on their website by making their website come up as results for a variety of searches. Paid ads, advertisements that the company pays another organization to make public, were also commonly mentioned. The trending overall theme that was recognized was website improvement which includes nearly all of the marketing strategies found on the five search results in one way or another. There was no research found on the effectiveness of these strategies which could be a direction for future research.

PV Solar Panel and Renewable Energy Industry in Nova Scotia

3.1- Nova Scotia's Renewable Energy Industry in Comparison to Other Provinces in Canada

In 2018, Nova Scotia generated 55.8% of its energy and produced 2319MW of energy from renewable sources. In comparison to the other Atlantic provinces, Nova Scotia is ranked 3rd in both total renewable energy production and the percentage of their energy production that is renewable. New Brunswick is the only Atlantic province below Nova Scotia in terms of the percentage of energy production that is renewable as only 30.6% of its energy comes from renewable sources (2018). Prince Edward Island ranks lowest in total renewable energy production having produced only 642MW of energy from renewable sources in 2018. However, the 642MW of energy covers 99.2% of PEI's total energy consumption. Looking outside the Atlantic provinces, 99.9% of Manitoba's energy comes from renewable sources, making it the highest in the country followed by Quebec, Prince Edward Island, and then British Columbia. The lowest percentages across the country are in Alberta (9.1%), Saskatchewan (16.8%), New Brunswick (30.6%) and Ontario (34.8%). The Canadian territories were not included in this comparison because of their low populations which makes any comparison with a populated province draw an irrelevant conclusion (CER).

Nova Scotia is sixth in Canada for the percentage of their energy production that comes from renewable sources and 9th in terms of total renewable energy production, followed only by PEI (Canada Energy Regulator, Data and Analysis Division, 19 Mar. 2021. www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/canadas-renewable-power/canadas-renewable-power/provinces/renewable-power-canada-nova-scotia.html). Nova Scotia is one of the least advanced provinces in the renewable energy sector, meaning there is plenty of room for development. This helps to show the importance of this study as Nova Scotia is rapidly progressing in its development of renewable energy and solar energy in particular. In a Nova Scotia Natural Resources and Renewables News Release, Jean Habel, the director of the Canadian Renewable Energy Association for Quebec and Atlantic Canada stated that “the wind and solar industries are uniquely positioned to deliver clean, low-cost, reliable, flexible and scalable solutions to meet Nova Scotia's energy needs.” (Natural Resources and Renewables, 11 Feb. 2022. novascotia.ca/news/release/?id=20220211004). Nova Scotia Power has continued to show its confidence in the solar industry for fulfilling its energy demand by investing in

numerous solar projects such as the *Community Solar Garden Pilot* (Nova Scotia Power. Community Solar Garden Project).

3.2- The Role of PV Solar Panels Within Nova Scotia's Renewable Energy Industry

Nova Scotia Power reports that they have decreased carbon emissions by 34%, reduced the use of coal by 43%, and are on track to be using 60% renewable energy sources by the end of 2022 (Nova Scotia Power. Clean Energy). Nova Scotia's largest renewable energy sources are hydroelectricity, wind, and biomass/geothermal; however, all of these are mainly government supported projects and their purchase is not feasible for individual consumers. Solar makes up roughly 1.0% of Nova Scotia's total energy production, but it is growing rapidly and is the only renewable energy source that is available for individual consumers to purchase that is economically viable (Canada Energy Regulator, Data and Analysis Division, 19 Mar. 2021. www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/canadas-renewable-power/canadas-renewable-power/provinces/renewable-power-canada-nova-scotia.html).

Gap In Research

After having completed a literature review, the gap identified in the research was a lack of data pertaining to if a market for recycled and remanufactured PV solar panels exists. There is an abundance of research developing the science behind solar panels and the marketing of recycled and remanufactured products; however, there exists very small amounts of data combining the two, pertaining to the recycled and remanufactured PV solar panel market which this report aims to resolve. Filling this gap in the research and determining if a market for recycled and remanufactured solar panels exists is just the first step in developing the market and provides direction for future research.

Study Design

This study explores the market viability of recycled and remanufactured solar panels in Nova Scotia. The goal of this study is to determine if there is a possible market for and gather consumers' perceptions of recycled and remanufactured solar panels in comparison to newly

manufactured solar panels. This is important because the PV solar panel industry is growing rapidly in Nova Scotia and is the only renewable energy source that is feasible for commercial sale. Making this industry more sustainable is important so the environmental consequences of producing newly manufactured solar panels as a main energy source do not need to be resolved in the future.

A quantitative anonymous questionnaire followed by a qualitative analysis was the method of this study and was conducted throughout January and February of 2022. This approach allowed the accurate representation of a large subject pool with little to no bias or factors that could lead to untruthful responses. This method of study was chosen due to the goal of the research. When analyzing consumers' perceptions, an experiment would not provide relevant data, and interviews would have limited my subject selection to a few individuals and thus limited my results. Other study methods have similar flaws when examining this topic of research. The method chosen provided both quantitative and qualitative data as a result of the types of questions being asked and the conclusions that can be obtained from them. The quantitative values were derived from the division among respondents' perceptions as will be found using the questionnaire method and the qualitative data will be inferred from the quantitative data using an analysis method.

Respondent Selection

Respondents for this study were gathered openly and by the respondent's own personal will. The questionnaire was distributed via a variety of social media platforms where it could be easily accessed and shared. This method of open respondent selection was chosen in order to reach the largest number of respondents within Nova Scotia from a variety of locations across the province. The use of social media opened the opportunity for a larger region to be analyzed rather than, for example, my local county. Respondents were encouraged to share the questionnaire once they had completed it in order to expand my respondent group and create a wider range of diversity in age, gender and location amongst the respondents. This was done in hopes of obtaining the most accurate representation of Nova Scotia's population as possible. Being a Nova Scotia resident over the age of 13 was the only requirement to respond to the questionnaire which allowed a larger group of respondents to be eligible. Age 13 was chosen as the minimum response age as it was assumed an elementary level education would be required to

have a full understanding of the questions within the questionnaire. In Nova Scotia, by age 13, all children should have completed their elementary education and therefore 13 was chosen as the minimum respondent age. Nova Scotia was selected as the area of concentration because of the accessibility to respondents as well as the fact that Nova Scotia is the #1 ranked province in Canada for installing solar panel systems as of May 1st, 2021 according to Energy Hub, a legally licensed social enterprise that offers free resources pertaining to the solar energy industry (*Solar Power Nova Scotia (Complete Guide 2021)*) making it a prime location to analyze consumers perceptions of a new solar panel market.

Ethics

This research meets the ethics requirements laid out by the Health Canada and Public Health Agency of Canada Research Ethics Board (REB). The four main criteria of ethics as determined by the REB are as follows: “The research is scientifically sound; The potential benefit significantly outweighs the potential for harm; There is an adequate process for informed consent, and assent where applicable; and There is justice or fairness in the selection of participants.” (Health Canada, Health Science and Research, 13 Jan. 2022.

www.canada.ca/en/health-canada/

services/science-research/science-advice-decision-making/research-ethics-board/policy-guidelines-resources.html#a2) The *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans - TCPS 2 (2018)* is the most recent detailed ethics regulations that the Health Canada and Public Health Agency of Canada REB has published on the government of Canada website. This research meets all of the four main requirements and has been reviewed to ensure compliance with the full ethics requirements contained in the Tri-Council Policy Statement.

This research is scientifically sound because it uses a common and reliable process for gathering data; a questionnaire. There are records of the data collected and all of the data collected was relevant to the research question being asked because it was designed with the analysis and implications of the research in mind. The potential benefit outweighs the potential for harm when completing an anonymous questionnaire because there is no harm to the respondent. The only personal information being collected is the individual’s age group and general residence location; however, the form used to distribute the survey does not retain respondents’ email or IP addresses and therefore leaves no identifying information linked to the

individual that could be used to cause harm. The benefit of the information when applied as outlined in the *Implications and Future Research* portion of this report significantly outweighs any harm that could occur. Consent is given at the beginning of the questionnaire and outlines the details of the research and how their responses will be used which meets the ethical consent requirements (see *figure 1*). This research meets the requirements for justice and fairness in the selection of participants using the methods described in the *Respondent Selection* portion of this report.

AP Research 12 survey

The following survey is being used to help provide data for a research study on the marketing of solar panels. For the purpose of this study we are looking at just Photovoltaic (PV) solar panels.

Please read and make sure you understand the following definitions before completing the survey:

Remanufactured solar panel: Used solar panels that have been repaired or certain parts have been replaced in order to return it to working standards.

Recycled solar panel: Solar panels made from materials that have been reused and placed through treatments and processes to return them to standards.

Newly manufactured solar panel: Solar panels made from new materials.

THIS SURVEY IS ANONYMOUS

By submitting your response you are consenting for the information you provide to be included in the report

Figure 1: Screenshot of briefing displayed to respondents before beginning of the questionnaire

Results

The questionnaire was completed by 131 respondents across Nova Scotia. The respondents were asked to identify their age group; the results found that 15.3% of respondents were ages 13-18, 6.1% of respondents were ages 19-25, 14.5% of respondents were ages 26-40, 50.4% of respondents were ages 41-60, 12.2% of respondents were ages 61-75, and 1.5% of respondents were ages 75+. The group with the most respondents were the ages 41-60 and the lowest group being ages 75+ (see *figure 2*), this is similar to the population age distribution in Nova Scotia as of 2021, the most recent Nova Scotia demographics statistics official publication (Finance Department, Statistics, 1995. novascotia.ca/finance/stats.div/papers/demograf/demo4.htm.) The relationship between the age demographics of the study's respondents and the age demographics of Nova Scotia helps affirm that the data collected is a relatively accurate representation of Nova Scotia as a whole.

Age Groups	Respondents
13-18	20
19-25	8
26-40	19
41-60	66
61-75	16
76+	2

Figure 2: Respondents Age Group Demographics; Number of respondents per group

Respondents were also asked to identify the gender they most associate with and the results found that 71.8% of respondents identify as female, 26.7% of the respondents identify as male, and 1.5% of respondents identify as ‘other’ (*see figure 3*). These responses may be slightly biased towards a female perspective as there is a higher percentage of female respondents than the actual percentage of the female population in Nova Scotia. According to the 2018 Nova Scotia Finance Statics Report, 51.1%of the population in Nova Scotia is female and 48.9% is male (Finance Department, Statistics. 25 Jan 2019. [novascotia.ca/finance/statistics/news.asp?id=14515#:~:text=This%20illustrates%20a%20continuing%20ageing,51.1%25%20\(490%2C377\)%20female.](http://novascotia.ca/finance/statistics/news.asp?id=14515#:~:text=This%20illustrates%20a%20continuing%20ageing,51.1%25%20(490%2C377)%20female.))

Gender Identity	Respondents
Female	94
Male	35
Other	2

Figure 3: Respondent Gender Identity Demographics; Number of Respondents per Group

The first question respondents answered on the questionnaire was ‘Disregarding prices, which of these three solar panels would you be more likely to purchase,’ the options were: Recycled Solar Panels, Remanufactured Solar Panels, or Newly Manufactured Solar Panels. 49.62% of respondents said that disregarding price they are more likely to purchase Newly Manufactured Solar Panels, 42.75% said they are most likely to purchase Recycled Solar Panels, and 7.63% of respondents indicated that they are most likely to purchase Remanufactured Solar Panels (*see figure 4*). If recycled and remanufactured PV solar panels are grouped together as being the environmentally friendly option, then this data shows that 50.38% of respondents when disregarding price are most likely to purchase a more environmentally friendly PV solar panel. Although the groups are nearly split evenly when grouped this way, it is important to note that this data shows more of an interest for a market in recycled PV solar panels over the market for

remanufactured PV solar panels. The goal of this question was to determine if, disregarding prices, there is a potential market for recycled and remanufactured PV solar panels.

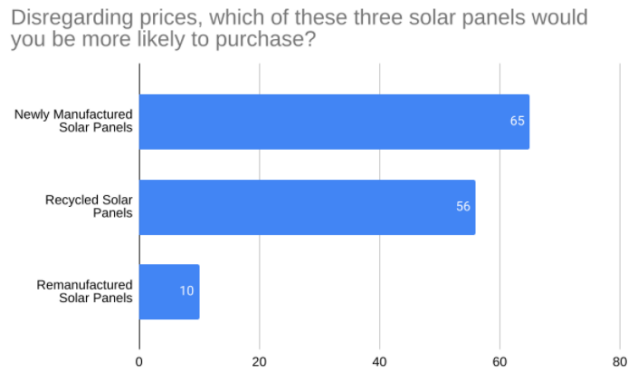


Figure 4: Number of Respondents who each of Selected Newly Manufactured Solar Panels, Recycled Solar Panels or Remanufactured Solar Panels

This raises questions as to if prices are the sole reason for why environmentally friendly solar panels or even other products are purchased less frequently which could be an area for future research.

When asked which factor is most important for an individual when shopping for solar panels, 36.2% responded environmental impact and 63.8% responded price (see figure 5). This shows that although a market exists for recycled and remanufactured PV solar panels, price is an crucial factor on if they would be successful or not.

Which of the following is most important to you when shopping for solar panels
130 responses

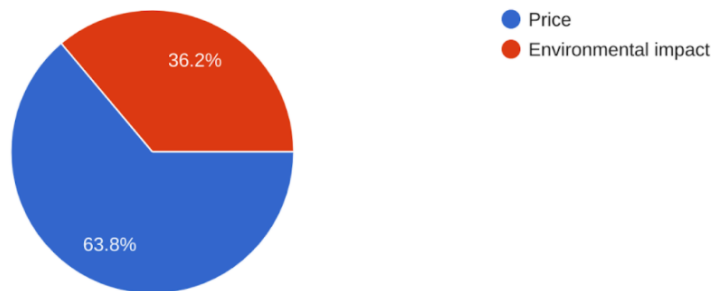


Figure 5: Respondent Percentage Distribution- Personal Importance of Price and Environmental Impact

This leads into the following question where respondents were asked which of the three solar panel options from the first question they would be willing to pay the most for. The data resulting

from the first question was relatively evenly divided, indicating that if the market were to be introduced, the purchasing trends when disregarding prices would align accordingly; however, the responses to the second question are drastically different. When prices are factored in, 79.8% of respondents said they expect to pay the most for Newly Manufactured Solar Panels whereas 2.3% responded that they would expect to pay the most for Remanufactured Solar Panels, and 17.8% responded they would expect to pay the most for Recycled Solar Panels (*see figure 6*). This data shows that consumers expect to pay more for newly manufactured PV solar panels and therefore expect to see discounted prices on recycled and remanufactured PV solar panels in comparison.

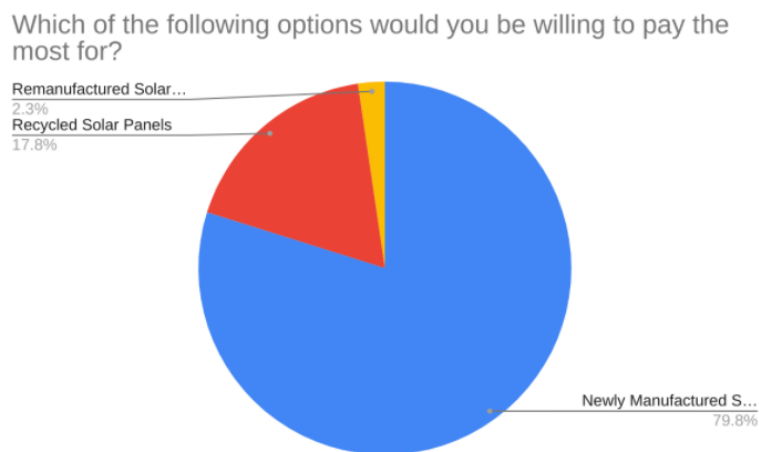


Figure 6: Respondent Percentage Distribution- Are Respondents Willing to Pay More for Recycled, Remanufactured or Newly Manufactured PV Solar Panels?

When asked how much more respondents would be willing to pay for the option they chose in the previous question, 18.5% responded \$0-50CAD, 29.2% responded \$51-100CAD, 30.8% responded \$101-150CAD, and 21.5% responded they are willing to pay upwards of \$151CAD for the option they chose (*see figure 7*).

How much more would you be willing to pay for the option you chose in the previous question (Per panel)? (This is in comparison to the other two panel options)	Respondents (%)
0-50 canadian dollars	18.5
51-100 canadian dollars	29.2
101-150 canadian dollars	30.8
151+ canadian dollars	21.5

Figure 7: Respondent Percentage Distribution- How Much More are Respondents Willing to Pay for the Panel Option They Would be Willing to pay the Most for?

13.7% of respondents said they have previously purchased solar panels and 64.9% intended on buying solar panels in the future. This data shows that a large portion of Nova Scotians intend on buying PV solar panels in the future further reinforcing why it is so important to develop a market for the most sustainable solar panel options available.

The data has found trends that a large percentage of the population is willing to purchase environmentally friendly solar panels, however, they expect to pay less for them in comparison to newly manufactured PV solar panels. This indicates that in order for a recycled and remanufactured PV solar panel market to be successful in Nova Scotia, the market prices will have to be lowered to increase interest due to the fact that Nova Scotians weigh price higher than environmental impact when purchasing solar panels. Due to the current demand, these solar panels have the opportunity to create large amounts of revenue even with decreased prices and will help reach government environmental impact goals by creating a more sustainable market than the one that currently exists.

On everyday products, 48.9% of respondents said they are willing to pay more for a recycled or remanufactured product (*see figure 8*).

On everyday products (groceries, clothing, toiletries, etc.) are you willing to pay more for a recycled or remanufactured product?
131 responses

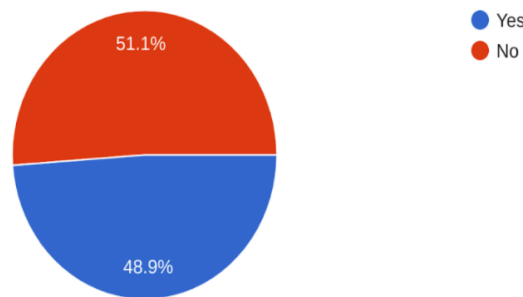


Figure 8: Respondent Percentage Distribution- Willingness to Pay More for Recycled or Remanufactured Everyday Products

This differs from the data obtained when asked if respondents are willing to pay more for recycled or remanufactured solar panels, where much less of respondents were willing to pay increased prices and most expected discounted prices. This shows that in the solar panel market, where the purchase requires a larger investment, consumers in Nova Scotia are extremely willing

to purchase environmentally friendly products but hesitate due to increased prices. This research also determined that for products that require less of an investment: ‘everyday products (groceries, clothing, toiletries, etc.)’ consumers are willing to pay more. The conclusions of this research go against the hypothesis that consumers would be more likely to purchase and willing to pay more for newly manufactured products and instead proves that consumers are more likely to purchase recycled or remanufactured PV solar panels but expect discounted prices in comparison to newly manufactured PV solar panels when doing so.

Limitations

Limitations to this research include the geographic region of Nova Scotia due to a limited time frame, and the duration of the response collection which endured throughout January and February, 2022. Other limitations include the resources available to complete this study including lack of funding and limited exposure to receive more questionnaire responses.

Implications And Future Research

The implications of this research are that there is economic opportunity in the environmentally produced solar panel industry where demand for lower prices is not being met and if met could lead to economic growth for both governments, businesses and individuals. Governments would be inclined to support the production of these products through funding in order to help attain their environmental goals set out in the Nova Scotia Legislatures’, *BILL NO.57, Environmental Goals and Climate Change Reduction Act*, where they state their goal of being net zero by 2050 among other goals (Nova Scotia Legislature, Legislative Business, 28 Oct. 2021. [nslegislature.ca/legc/bills/64th_1st/1st_read/b057.htm](https://www.nslegislature.ca/legc/bills/64th_1st/1st_read/b057.htm).) This research provides the foundation for further research on consumers attitudes towards recycled and remanufactured products in other industries, specifically products that require larger investments. It also allows for further research on how the recycled and remanufactured PV solar panel industry can be integrated into the Nova Scotia economy and produce the most economic and environmental benefit. The results from this research could also be used to aid in developing marketing strategies to reap the benefits of the recycled and remanufactured solar panel industry. Another gap found while conducting the literature review is an overall lack of academic sources containing data on commonly used marketing strategies for solar panels and their effectiveness.

Conclusion

This research aimed to answer the research question: What are consumer's perceptions of recycled and remanufactured PV solar panels in Nova Scotia and is there a possible market for them? The results disproved the hypothesis by finding that consumers are more likely to purchase recycled and remanufactured solar panels but expect discounted prices for them in comparison to newly manufactured PV solar panels. This research provides the foundation for future research and can be implemented by governments and solar panel companies to develop marketing strategies for recycled and remanufactured products in order to increase profits and have less of an environmental impact.

Work Cited

- “Community Solar Garden Pilot.” *Nova Scotia Power*, Emera, 2021, www.nspower.ca/cleanandgreen/innovation/smart-grid-nova-scotia/community-solar-garden-pilot. Accessed 5 Jan. 2022.
- Department of Economic and Social Affairs*, United Nations, sdgs.un.org/goals.
- Dunsky Energy Consulting. “Cansia_nova_scotia_residential_solar_market_outlook_and_labor_force_study_.” *Canadian Solar Industries Association*, Apr. 2019, www.cansia.ca/uploads/7/2/5/1/72513707/cansia_nova_scotia_residential_solar_market_outlook_and_labor_force_study_-_final_report__2019-04-09_.pdf. Accessed 14 Mar. 2022.
- Duquesne University, “Green Marketing Guide for Western Pennsylvania Small Businesses.” *Duquesne University Center for Green Industries And Sustainable Business Growth*, Small Business Development Center Pennsylvania, 2014, Pennsylvania, www.duq.edu/Documents/green-industries/Green%20Marketing.pdf. Accessed 12 Jan. 2022.
- “Going Green.” *Southern Cross University*, 7 July 2019, online.scu.edu.au/blog/going-green/. Accessed 18 Dec. 2021.
- Government of Canada, Canada Energy Regulator, Data and Analysis Division. *Canada’s Renewable Power*, Canada Energy Regulator, 19 Mar. 2021. www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/canadas-renewable-power/canadas-renewable-power/provinces/renewable-power-canada-nova-scotia.html, Accessed 2 Jan. 2022.
- Government of Canada, Health Canada, Health Science and Research. *Research Ethics Board: Policies, guidelines and resources*, 13 Jan. 2022. www.canada.ca/en/health-canada/services/science-research/science-advice-decision-making/research-ethics-board/policy-guidelines-resources.html#a2. Accessed 15 Apr. 2022.

Government of Nova Scotia, Finance Department, Statistics. *Nova Scotia Demographic Trends Into the Twenty First Century*, 1995. novascotia.ca/finance/stats.div/papers/demograf/demo4.htm. Accessed 23 Oct. 2021.

Government of Nova Scotia, Finance Department, Statistics. *Nova Scotia Population Estimates by age and sex, as of July 1 2018*, 25 Jan. 2019. novascotia.ca/finance/statistics/news.asp?id=14515#:~:text=This%20illustrates%20a%20

Government of Nova Scotia, Natural Resources and Renewables. *Province's largest Procurement for Renewable Energy Moves Forward*, 11 Feb. 2022. *Nova Scotia News Department*. novascotia.ca/news/release/?id=20220211004. Accessed 2 Jan. 2022.

Government of Nova Scotia, Nova Scotia Legislature, Legislative Business. *Environmental Goals and Climate Change Reduction Act*, 28 Oct. 2021. nslegislature.ca/legc/bills/64th_1st/1st_read/b057.htm. Accessed 30 Oct. 2021.

Green Buzzwords Online Search Edition, 2016, SheltonGrp, 2016, storage.googleapis.com/shelton-group/Content%20Library/Green-Buzzwords_Online-search-Edition.pdf. Accessed 8 Jan. 2022.

Griffin, Dr. Paul. "The Carbon Majors Database." *CDP Carbon Majors Report*, 2017, CDP Worldwide, July 2017, pp. 8, 14-15, cdn.cdp.net/cdp-production/cms/reports/documents/000/002/327/original/Carbon-Majors-Report-2017.pdf?1501833772. Accessed 18 Dec. 2021.

Hahnel, Ulf et al., "The power of putting a label on it: green labels weigh heavier than contradicting product information for consumers' purchase decisions and post-purchase behavior." *Frontiers in Psychology*, National Library of Medicine, 23 Sep. 2015, <https://dx.doi.org/10.3389%2Ffpsyg.2015.01392>. Accessed 12 Jan. 2022.

Kronthal-Sacco, Randi and Tansi Whelen. *Sustainable Share Index: Research on IRI Purchasing Data (2013-2018)*, NYU Stern Center for Sustainable Business, 11 Mar.

2019. www.stern.nyu.edu/sites/default/files/assets/documents/NYU%20Stern%20CSB%20Sustainable%20Share%20Index%E2%84%A2%202019.pdf. Accessed 17 Feb. 2022. continuing%20ageing,51.1%25%20(490%2C377)%20female. Accessed 23 Oct. 2021.

McDonald's, "Packaging and Waste." *McDonald's Corporate*, 2021, Chicago, www.google.com/url?q=https://corporate.mcdonalds.com/corpmcd/our-purpose-and-impact/our-planet/packaging-and-waste.html&sa=D&source=docs&ust=164856517576131&usg=AOvVaw3jiuw0qqpZtrjztK-8F9Au. Accessed 18 Dec. 2021.

McGlaughlin, Flint. "Does 'Green' Marketing Really Work?" *YouTube*, uploaded by MECLABS, 2 June 2014, youtu.be/oDcfnTR5YxU. Accessed Feb. 7th 2022.

NIKE, "Breaking Barriers." *FY20 NIKE Inc. Impact Report*, 31 May 2020, pp. 14, purpose-cms-preprod01.s3.amazonaws.com/wp-content/uploads/2021/04/26225049/FY20-NIKE_Inc_Impact_Report2.pdf. Accessed 18 Dec. 2021.

"7-Environment." *Honda Sustainability Report*, 2020. Corporate Planning Supervisory Unit, Honda Motor Co., Ltd., July 2020, Tokyo, pp. 57, global.honda/content/dam/site/global/about/cq_img/sustainability/report/pdf/2020/Honda-SR-2020-en-053-079.pdf. Accessed 18 Dec. 2021.

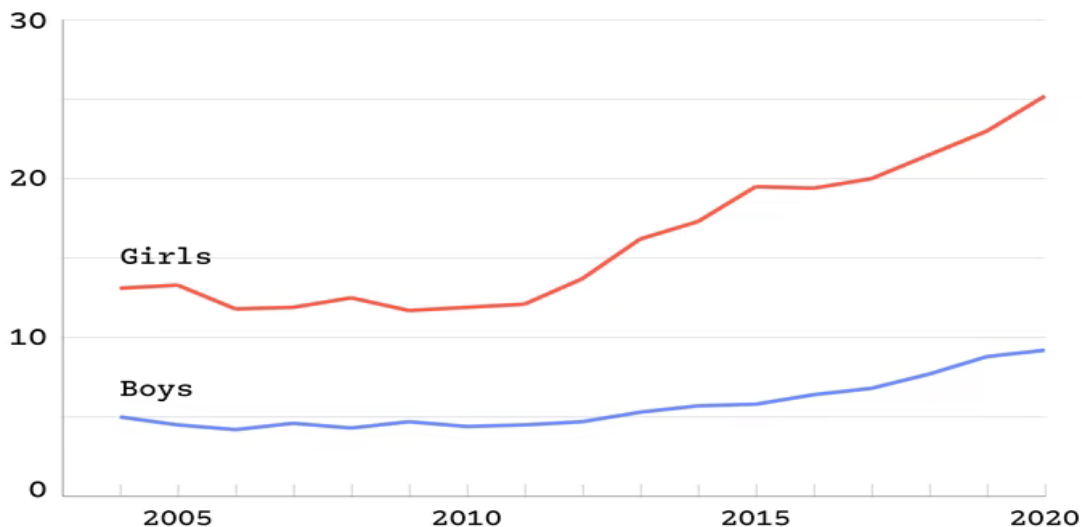
"Solar Power Nova Scotia (Complete Guide 2021)." *Energyhub.org*, Rylan Urban, 26 Dec. 2021, www.energyhub.org/nova-scotia/.

Social Media and Its Horrific Impact on Adolescents By Thomas Lin

“It is all because of Tiktok”, my mother points at my device aggressively and lunges in my direction in an attempt to grab it. My parents used to consistently blame my phone and especially the social media applications on it for my moodiness, distorted sleep schedule, work ethic and many other aspects of my life that I may not have risen above their expectations in. Social media has taken over the lives of teenagers to an aggravating extent, with over 45% of US adolescents reporting that they are online “almost constantly” according to a 2018 survey from Pew Research Center – with the percentage being doubled from Pew’s survey in 2015 (Anderson et al. 2018). This feeling from parents being concerned over their children's mental health, productivity, and life as a result of social media is more common than I expected. From a 2020 poll from Ann & Lurie Children’s Hospital of Chicago, 67% of the 2,909 American parents surveyed have felt concerned over their teen’s addiction to social media. Truthfully, parents pointed out a great social phenomenon that arose in recent years with generation Z as the result of the increased popularity of social media - the negative effects of social media on teenagers are harsh; it is a sword that penetrates the lives of teens from mental well-being, their concepts of beauty and even fundamental sleep patterns. It is time we start to recognize these serious problems.

A social psychologist who I admire named Jonathan Haidt has done extensive research on the relationship between teen mental health and social media. He presented his research on the relationship between social media and teen mental health in an article with The Atlantic, “Something terrible has happened to Gen Z...when we look at what happened to American teens in the early 2010s, we see many such turning points. The data for adolescence depression [is] noteworthy” (Haidt). The evidence for the increase in major depressive episodes is clear and alarming, especially for girls:

Percentage of Americans Age 12–17 Who Had at Least One Major Depressive Episode in the Past Year



Source: U.S. National Survey on Drug Use and Health

(Haidt, The Atlantic)

Some have argued that the correlation between major depressive episodes for Gen Z and the rise of social media is merely the result of more willingness from Gen Z to report their mental health issues (Friedman). But there are also data linking the depressive episodes to hospitalization for suicide attempts for adolescents aged 11-18 – where the attempts doubled from 2008 to 2015 and suicide is the third leading cause of death amongst adolescents in the United States (Plemmons, Gregory, et al.). By all means, correlation does not prove causation; however, Haidt states in the same article that there are simply no plausible alternative reasons, and why does it affect girls in particular? Those reports that only show small effects focus on “screen time” rather than social media particularly, as the fault does not lie in watching movies or FaceTiming (Haidt, Allen). Some other researchers have pointed to the economic crisis of 2008, the 9/11 attacks or school shootings (Vermeulen). The question then becomes why do similar trends exist among teens in Canada in the same time period (Government of Canada)? What should be of the utmost concern is not the fact that there is a harmful impact from social media, but the extent to which the harm has been reached. On platforms where anonymous peer

feedback, personal information and borderline-illegal activities such as sexting are constantly available (Matte) – the victims of these features are our dear teenagers.

One can think of platforms of social media as platforms full of various personas from teenagers, where displaying your authentic self is a rarity. This is supported by a 2019 survey from Pew Research Center where 77% of adolescents aged 13-17 agree that “people are less authentic and real on social media than they are in real life” (Lenhart, Amanda, et al. 9). The forms of inauthenticity can range from politics to body images where users are typically exposed to “idealized” bodies and would spark comparison between themselves to peers and models (Heger). The effects of scrolling through Instagram and browsing videos of fitness instructors or models are also especially pressing for young girls; one 2015 study found that female-identifying college students who are on Facebook more had worse body image, that "young women who spend more time on Facebook may feel more concerned about their body because they compare their appearance to others (especially to peers)." (Aparicio-Martinez, et al). There is also evidence supporting the correlation between time spent on social media, negative body image, and disordered eating (Aparicio-Martinez, et al). Neha Chaudhary, an adolescent psychiatrist at Harvard Medical School remarked on this psychology further, “People end up creating unrealistic ideals for themselves based on what they see and feel distressed when they aren’t able to meet [their own] self-expectations.” (Heger). The keyword from that quote is “distressed”, unlike traditional television and magazines where one may compare themselves to celebrities where the ideal is farther away, with social media, people can compare themselves to their close peers at school or simply people their age – oftentimes those pictures are the most attractive images they have which can also be edited and/or filtered (Fardouly, Vartanian). The consequence of those enlightening features of social media along with its addictive nature (Hilliard) are worsened body image, eating disorders, and in rare cases but without a doubt alarming – could lead to self-harm and attempting suicide.

According to a study by Harvard University, the neurological effects of social media are addictive because activities such as acquiring intriguing information and self-disclosure on social media trigger the same areas of the brain when taking addictive substances (Hilliard). So, how does this affect the sleep of adolescents – when sleep is particularly crucial for physical and intellectual growth during the period of puberty? Sadly, social media is not doing sleep a favour either, as research found the more time adolescents spent on screen-based activities such as

social media during the day (especially in the hour before bed), the harder time they had falling asleep and the less sleep they got during the night. More hauntingly, those sleep issues were then found to be linked with increased symptoms of insomnia and depression (Li, Buxton, et al.). The blue light from electronic devices is notorious for interfering with the circadian rhythm (Harvard Health Publishing), and experts have been suggesting that people should resist using electronic devices the hour before bedtime (Pacheco, Truong). Why would one check social media just minutes before going to bed? The answer is added to the addictive nature, another reason is the Fear of Missing Out (FOMO)(Newsom), where people are lured by the opportunities for communication and the desire of staying connected. According to a 2013 paper, those who check their social media more often before bed experience FOMO anxiety in their lives (Przybylski, Andrew, et al.). In truth, regardless of how much teenagers (including myself) want to refute social media affecting sleep, the scientific literature is clear.

The technological revolution with the emergence of smartphones has benefited many of our lives. However, if you turn to social media particularly, there are substantial negative effects on mental health and physical harm, especially for adolescents. It is time that science devote more time and resources to this concern, as there is already clear evidence about the rise of the issues and harm from social media just within fifteen years of its invention. Haidt exclaimed a warning to many researchers, “[they] seem to be thinking about social media as if it were sugar: safe in small to moderate quantities, and harmful only if teenagers consume large quantities...[but] when most of the 11-year-olds in class are on Instagram (as was the case in my son’s school), there can be pervasive effects on everyone.” (Haidt, Allen). This warning should not only be addressed to the scientific community, but society at large. The rise of social media has given a generation a dent in their development and well-being. From the way online communication and digital addiction is heading, this may only be the beginning.

Work Cited

- Anderson, Monica, and Jingjing Jiang. "Teens, Social Media & Technology 2018." Pew Research Center: Internet, Science & Tech, Pew Research Center, 27 May 2021, <https://www.pewresearch.org/internet/2018/05/31/teens-social-media-technology-2018/>.
- Aparicio-Martinez, et al. "Negative Comparisons about One's Appearance Mediate the Relationship between Facebook Usage and Body Image Concerns." *Body Image*, U.S. National Library of Medicine, <https://pubmed.ncbi.nlm.nih.gov/25462886/>.
- Fardouly, and Vartanian. *Social Media and Body Image Concerns: Current ...* - UNSW. June 2016, [http://www2.psy.unsw.edu.au/Users/lvartanian/Publications/Fardouly%20&%20Vartanan%20\(2016\).pdf](http://www2.psy.unsw.edu.au/Users/lvartanian/Publications/Fardouly%20&%20Vartanan%20(2016).pdf).
- Friedman, Richard A. "The Big Myth About Teenage Anxiety." *The New York Times*, The New York Times, 7 Sept. 2018, <https://www.nytimes.com/2018/09/07/opinion/sunday/teenager-anxiety-phones-social-media.html>.
- Government of Canada, Statistics Canada. "Chart 13 Percentage of Injury Hospitalizations Due to Intentional Self-Harm, by Sex and Age Group, Canada (Excluding Quebec), 2009-2010 to 2013-2014." Government of Canada, Statistics Canada, 8 Mar. 2016, <https://www150.statcan.gc.ca/n1/pub/89-503-x/2015001/article/14324/c-g/c-g13-eng.htm>.
- Haidt, Jonathan, and Nick Allen. "Scrutinizing the Effects of Digital Technology on Mental Health." *Nature News*, Nature Publishing Group, 10 Feb. 2020, <https://www.nature.com/articles/d41586-020-00296-x?sf229901900=1>.
- Haidt, Jonathan. "The Dangerous Experiment on Teen Girls." *The Atlantic*, Atlantic Media Company, 21 Nov. 2021, <https://www.theatlantic.com/ideas/archive/2021/11/facebooks-dangerous-experiment-teen-girls/620767/>.
- Harvard Health Publishing. "Blue Light Has a Dark Side." *Harvard Health*, 7 July 2020, <https://www.health.harvard.edu/staying-healthy/blue-light-has-a-dark-side>.

- Heger, Erin. “Why Social Media Can Make You Feel Bad About Your Body - and 3 Easy Tips to Use Social Media to Boost Self-Esteem.” Insider, Insider, 9 Mar. 2021, <https://www.insider.com/how-social-media-affects-body-image>.
- Hilliard, Jena. “Social Media Addiction.” Addiction Center, 17 Dec. 2021, <https://www.addictioncenter.com/drugs/social-media-addiction/#:~:text=Due%20to%20the%20effect%20that,when%20taking%20an%20addictive%20substance>.
- Lenhart, Amanda, et al. “Social Media and Teen Romantic Relationships.” Pew Research Center: Internet, Science & Tech, Pew Research Center, 31 Dec. 2019, <https://www.pewresearch.org/internet/2015/10/01/social-media-and-romantic-relationships/#:~:text=Many%20teens%20in%20relationships%20view,jealousy%20or%20uncertainty%20about%20the>.
- Li, Buxton, et al. “Sleep Mediates the Association between Adolescent Screen Time and Depressive Symptoms.” Sleep Medicine, U.S. National Library of Medicine, <https://pubmed.ncbi.nlm.nih.gov/30897456/>.
- Lurie Children's. “Parenting Teens in the Age of Social Media.” Lurie Children's, <https://www.luriechildrens.org/en/blog/social-media-parenting-statistics/#:~:text=68%25%20of%20parents%20believe%20social,is%20addicted%20to%20social%20media>
- Matte, Christy. “What Is Sexting and Why Is It a Problem?” Verywell Family, Verywell Family, 7 Aug. 2021, <https://www.verywellfamily.com/what-is-sexting-problem-1258921>.
- Newsom, Rob. “Sleep & Social Media: Staying Connected Can Keep You Up.” Sleep Foundation, 13 Nov. 2020, <https://www.sleepfoundation.org/how-sleep-works/sleep-and-social-media>.
- Pacheco Danielle, Kimberly Truong. “Can Electronics Affect Quality Sleep?” Sleep Foundation, 6 Nov. 2020, <https://www.sleepfoundation.org/how-sleep-works/how-electronics-affect-sleep>.
- Plemmons, Gregory, et al. “Hospitalization for Suicide Ideation or Attempt: 2008–2015.” American Academy of Pediatrics, American Academy of Pediatrics, 1 June 2018, <https://publications.aap.org/pediatrics/article/141/6/e20172426/37690/Hospitalization-for-Suicide-Ideation-or-Attempt>.

Przybylski, Andrew K., et al. "Motivational, Emotional, and Behavioral Correlates of Fear of Missing Out." *Computers in Human Behavior*, Pergamon, 9 Apr. 2013, <https://www.sciencedirect.com/science/article/abs/pii/S0747563213000800>.

Vermeulen, Karla. *Generation Disaster Coming of Age Post-9/11*. Oxford University Press, 2021.

The Analysis of Pet Blind Box Market By Jialu Sun

Abstract

This research essay aims to analyze the pet blind boxes market. In recent years, the blind box market has been booming. Blind boxes are products that have identical exterior packaging in the same series, but the items inside are random, so buyers are not likely to know which item they are buying until they open the box. People are obsessed with finding unknown things in the same packaging, and the probability of finding limited editions is more incentivized. Some businesses have seized the opportunity to sell pets through the popular blind box format. However, the product has become controversial due to frequent negative coverage in the news. This paper will then discuss whether pet blind boxes should exist mainly from the perspective of consumer psychology, marketing strategy, and pet protection.

Introduction

Young people's love of anime has inspired businesses, from past gashapon machines to today's blind boxes. As a key participant in the blind box market, the Pop Mart brand has achieved great success in recent years. According to **Zhao and Xu (2021)**, Pop Mart has more than HK \$100 billion in market capitalization. The blind box products are identical in exterior packaging in the same series, but the items inside are random, so buyers are not likely to know which item they are buying until they open the box. In addition, the most significant selling point of blind boxes is that sellers will set up a limited-edition box in each series to stimulate consumption. For example, if there are twelve toy dolls in a series, the probability of winning a limited edition will be 1/144 (**Zhang, 2021**). As a popular sales model, firms in other industries have also grasped the successful marketing of doll blind boxes and introduced different blind boxes. For example, Converse introduces shoe blind boxes, and Hermes has set up blind box stores to attract customers. According to **Zhao and Xu (2021)**, the blind box market is expected to reach 30 billion by 2024. In this way, a new product, the pet blind box, also appeared in the public eye. In the pet blind box market, customers do not know the actual breed and appearance of the pet before consumption. The seller will also set a lower price than the traditional pet market and use rare breeds as hidden items to attract customers. Although most businesses are willing to replicate Pop Mart's success, pet blind boxes may bring consumers negative shopping experiences. For example, more and more buyers received pets that did not match the seller's

descriptions. Therefore, people began to question the rationality of the pet blind boxes. With the successful development of the blind boxes, more and more people began to investigate the blind box market. Although some adverse news reports have brought pet blind boxes into the public eye, there have been no detailed studies. This article will then discuss whether pet blind boxes should exist mainly from the perspective of consumer psychology, marketing strategy, and pet protection.

Related Studies of Blind Box

Previous studies have shown that the concept of blind boxes has fully captured consumers' curiosity psychology. According to **Zhang (2021)**, the business of introducing blind boxes tends to apply the ideas from Skinner Boxes. Skinner Boxes was an experiment studying animal psychology and behaviors, which involved training rats in acquiring food by pulling a lever. After many attempts, the lab rat not only learned how to pull the lever to get the cheese but also became increasingly excited during the process. The result demonstrated the significance of connecting the subject with the target. Similarly, when individuals buy a blind box and open the desired item, they will continue to spend money on blind boxes. If they do not receive the wanted item, they may also choose to repurchase blind boxes due to the gambling effect. According to **Zhang (2021)**, the gambling effect adopts the uncertainty of the consequences, improves the sense of thrill of buying, and makes consumers desire to repeat the purchase. Since the uncertainty of opening a wanted toy also brings people a sense of freshness and excitement, buyers will get addicted to blind boxes. Specifically, opening a limited edition requires more luck. A limited-edition design is usually associated with popular Influential Property (IP), and the supplied quantities are controlled relatively lower. Although each box in the same series has the same price, the lower probability of opening the limited edition can lead to a higher opportunity cost. Furthermore, the development of blind boxes tends to keep up with the trend, attracting young people's attention. Due to the conformity effect, some buyers may fall into mindless consumption.

The rapid expansion of the blind box market can also contribute to hunger marketing strategies. According to **Zhao and Xu (2021)**, hunger marketing refers to controlling quantities of products to stimulate purchasing decisions without deep considerations. Specifically, blind box businesses usually introduce regular sales and pre-sale patterns. The pre-sale pattern is

designed to push consumers to confirm orders in time. Since different series will be pre-sold in different periods, buyers will be motivated to continue consuming, and hence, the business can make unremitting profits. Furthermore, co-branding blind boxes with other brands and even celebrities can trigger a vast fan effect, leading to significant purchasing power. For example, since the launch of the Harry Potter series, the pre-sale sales of POPMART blind boxes have been outstanding, and the second-hand trade prices are still rising. Besides that, blind box sales are also promoted through the Internet. Buyers will share the video content about their process of opening the blind box on social media platforms by adding related labels before posting it so that they can attract more viewings. At the same time, the blind box company may also hire a Key Opinion Leader (KOL) in the related fields to help with advertising during the pre-sale period. For example, some of them show video content about the process of opening the pet blind boxes, and some of them also introduce the types of pets by adding some attractive music backgrounds and attractive topics. **Chen (2021)** predicted that the blind box would continue to become a vital contributor to economic growth in the next five years. As a derivative of the blind box market, pet blind boxes also apply similar marketing strategies to compete with the traditional pet market. However, whether the successful marketing of the blind box market can be replicated entirely in the pet industry should be questioned. A living pet is not the same as a beautifully packaged doll. Therefore, compared with other blind box markets, this paper will discuss the rationality of introducing pet blind boxes.

Discussion

To begin with, I will argue that pet blind boxes should not exist from the perspective of product features. Traditional blind boxes, such as elaborate dolls, are decorative but lifeless and have no subsequent care costs. However, pets require consumers to bear ongoing costs and risks as living beings. Thus, the consumption of pet blind boxes tends to increase the probability of abandoned pets because some people may not get satisfaction from opening the box. Moreover, most pets need interactions with their owners, so individuals continuously invest time and money after consuming the pet blind box. If people ignore this feature, they will choose to abandon the pets or take no subsequent responsibility after buying pet blind boxes. Hence, these behaviors can cause extreme harm to pets. According to the report by **Chen (2021)**, hundreds of pets were found packed in blind boxes on the street in Shanghai. Some are dying from the sultry

environment and lacking fresh air in transportation. However, sellers did not support free return policies, which could actually reduce their likelihood of being rescued. Although some pets found adopters with the help of kind-hearted people, others did not survive in the harsh environment. Therefore, pet blind boxes could not be transacted without considering the particularity of pets as products.

Although there was negative news, sales of pet blind boxes are still good. Due to sellers' advertisements through social media platforms, potential customers are motivated to purchase by viewing the carefully selected product images, which usually show the cute side of the animals. However, the excessive marketing of pet blind boxes will exacerbate abandonment. By ordering pet blind boxes online, customers may not get honest feedback about the pets' quality in time. If the over package and transportation risk is also considered, the survival rate of pets in blind boxes will be heavily threatened. Moreover, the pricing strategy in the pet market usually depends on their types and breed. In contrast, the pricing of pet blind boxes is likely to be cheaper due to the random selection pattern, which may either give potential customers higher expectations or induce sellers to commit fraud. For example, the seller may price the pet blind box higher by promising it would be a rare pet dog breed. In fact, what the buyer received could be just an ordinary Farm dog. Thus, the buyer may feel extremely disappointed and choose to abandon the pet. **Fan (2021)** reports 160 boxes filled with abandoned blind pet boxes are a case in point. Therefore, the marketing strategies used in other blind box products are not probably suitable for promoting pet blind boxes.

From the perspective of pet protection, the sales model of the blind box can cause other health issues for pets. Firstly, some pet blind boxes may not experience strict animal quarantine standards. For example, some pets are not vaccinated, and some are vaccinated under informal channels. As a result, the health situation of pet blind boxes is not guaranteed before the sale. In addition, unvaccinated pets have more significant morbidity and mortality during transportation. Even if pets arrive safely and signed by consumers, their health situations are still at risk. If there could be heavier health issues, the owner of the pet blind box may not afford the cost of taking the pet to the hospital. Secondly, pet blind boxes can also increase the risk of animal cruelty. Some people may ignore raising pets if they are not claimed as pedigree pets. They can even choose to torture animals because of psychological distortion, which will cause more harm to their pets. The American government has made efforts to enact a comprehensive law to protect

pets. Even if some raising behaviors are legal, they still do not meet the moral constraints and are not supported by public opinion. In some cases, however, blind boxes provide opportunities for pet lovers and pets. Pet blind boxes have opportunity cost advantages, giving buyers another option if they cannot consume at the traditional price level. On the pet side, pets with lousy appearance or defects are usually challenging to find owners in the traditional pet market. When these imperfect pets are packaged in blind boxes, their chances of being raised by consumers increase. However, this does not possibly offset the adverse effects of pet blind boxes on pets themselves. In the future, if more attention is paid to the animal protection issues involved in pet blind boxes, people will better achieve a harmonious coexistence between man and nature. With time, animal protection laws have been gradually improved worldwide. The act of protecting animals sticks to human morality and achieves the spiritual satisfaction of people.

Conclusion

This paper mainly considers whether blind pet boxes should exist on the market from the perspective of consumer psychology, marketing strategy, and pet protection. It can be concluded that pet blind boxes can increase abandonment. In addition, the sales model of pet blind boxes will pose potential threats to pets' health and even life. Finally, pet blind boxes may neither obey the animal protection law nor meet moral constraints. In the future, more advanced pet protection laws should be issued, and extensive discussions should be focused on regulating pet market operations.

Limitations

The main limitation of this essay is that there are no full legal provisions to support pet protection. The pet market is diversifying and appearing in everyday life in various forms. However, it also creates a vast problem of pet torture. Torturing animals is not indicating illegal, but it is not allowed by social morality. As people pay more attention to pet protection in these years, laws and regulations will gradually be updated. Western countries passed legislation many years ago to improve the attitude toward protecting pets. People's policies can also refer to them to comprehensively protect pets.

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Work Cited

- [1] Chen H. (2021, September). Probe launched after abandoned pets in 'blind boxes' rescued. SHINE. <https://www.shine.cn/news/metro/2109215371/>
- [2] Chen, X. (2021, July). Research on Blind Boxes Consumers---Taking Pop Mart as an Example. In 2021 International Conference on Economic Development and Business Culture (ICEDBC 2021) (pp. 21-26). Atlantis Press.
- [3] Fan, Y. (2021, May). China's Dark New "Blind Box" Craze: Live Pets. #SixthTone. <https://www.sixthtone.com/news/1007380/chinas-dark-new-blind-box-craze-live-pets>
- [4] Zhang, Z. (2021, July). Research on Blind Box and its Marketing Strategy. In 2021 International Conference on Economic Development and Business Culture (ICEDBC 2021) (pp. 115-118). Atlantis Press.
- [5] Zhao, R., & Xu, J. (2021, December). New Marketing Inspired by Blind Box. In 2021 4th International Conference on Humanities Education and Social Sciences (ICHESS 2021) (pp. 1673-1676). Atlantis Press.