1. Introduction

Critical thinking skills are important as it helps us to better process and evaluate information that we see, especially when we are inundated with information online. In this Information Age, there are often conflicting pieces of information, as authors attempt to push their own agendas onto the reader. Without critical thinking skills, readers may be misled, taking information at face value. The consequences of these mistruths can ripple, for instance, the anti-vaccine groups around the world. Thus, in order to combat ourselves from such incidents, we have to equip ourselves with critical thinking skills.

Ennis's model splits the guidelines of critical thinking into dispositions and abilities (Ennis, 2015). On the other hand, Paul and Elder's framework contains various standards, elements and intellectual traits of critical thinking (Paul and Elder, 2020). While these frameworks are fairly comprehensive of what is expected of critical thinking, they contain many details that might overwhelm someone just starting out in learning critical thinking. The frameworks also lack clarity in structure and sequence for readers to apply critical thinking, which can act as barriers to entry.

Having gone through both Ennis and Paul and Elder's frameworks, we as a group decided to adopt Ennis's framework due to its more general nature. It also emphasises on the human aspect of critical thinking which we believe to be an important part of any SOP. Furthermore, it addresses fallacies and other issues outside the immediate scope of the text, which we feel was missed out in other frameworks like Paul and Elder.

2. SOP Creation Process

During the creation process, our group agreed to focus on creating a SOP that caters to newcomers rather than experienced critical thinkers. Our group also realised that we need clarity and structure to ensure memorability and proper application. We thus formulated our SOP with these realisations in mind.

Our SOP's mnemonic is **"ICAN DO IT"**, a phrase of encouragement to those new to critical thinking. While the mnemonic is on the longer side, research shows that the average human mind is able to remember a maximum of 9 characters. **ICAN DO IT** stands for **I**dentify, **C**larify, **A**nnotate, **N**arrow followed by **D**etermine, **O**rganise followed by **I**nvestigate and **T**ransfer.

Our SOP's mnemonic is not strictly sequential, meaning that each letter does not represent a specific step that must be done in a particular order. However, it is partially sequential in that each word comprising the mnemonic should be done in order. That is to say, the phrase is split into 3 distinct sections - **"ICAN"**, **"DO"**, and **"IT"**. The ordering of these sections should be followed. The table below summarises the SOP's essential ideas and guiding questions:

Pass #	SOP	Guiding Questions	Link to Ennis Framework
1	**ICAN**	What is the issue being discussed? What are the author's main claims and conclusion? Are there any assumptions or fallacies in the argument?	Dispositions 1, 2; Abilities 2, 3, 13
2	**DO**	To what extent is this reason / evidence / assumption / fallacy significant and relevant to the argument? What kind of evidence should be needed to support the claim, to what extent does the author match that? Is any reason blatantly untrue, unprovable, etc?	Abilities 7, 9, 17
3	**IT**	What reasons would someone who disagrees offer? Does the author address these in any meaningful way? How accurate are the facts mentioned? What other reasonable conclusions are possible? Does the strength of the author's conclusion match the reasons provided? What are the implications of the author's conclusion? Can I take away any learning points to apply in my own domain?	Dispositions 5, 7 ,8, 9; Ability 14

Table 1: Linking SOP to CT framework

The main idea behind the SOP is to pass over the text multiple times, each time compressing the text to what is most relevant and significant, increasing our understanding of the argument being presented, as well as progressing our level of analysis of the text.

3. Application of SOP

3.1 Summary

Our chosen text is an opinion article from the New York Times, written by Damon Beres. It focuses on the effects of technology on humans and the planet. We have placed an (annotated) copy of the article in Appendix A for reference. The following is the link to the source: https://www.nytimes.com/2021/04/25/opinion/iphone-apple-electronics-technology.html.

3.2 First Pass (ICAN)

The first pass mainly focuses on the identification and literal comprehension of the text. It involves some form of annotation of the text, with the objective of obtaining a rough understanding of the text and filtering out irrelevant ideas. For written and spoken media, annotation is straightforward using highlighters and writing on the margins. However, in the case of multimodal sources, where transcribing the text would lose too much relevant information, we suggest capturing and editing it on a tablet, computer or smartphone.

For annotations to be useful, one must know what to look out for, and which questions to ask. The SOP provides simple guiding questions for users to leverage on. The first, and most obvious, steps would be to clearly identify what is being communicated - the main issue being discussed and the conclusion provided by the author (*Disposition 1*). A natural progression from that would be to highlight the supporting reasons and evidence for each claim made by the author (*Disposition 2*). It is recommended to use some form of colour coding when annotating for easier reference in the following steps.

Additionally, the SOP reminds users to be alert to assumptions made in the argument, fallacies committed by the author, and also value preferences that he/she seems to hold (*Ability 13*).

Lastly, the SOP guides users to note down clarification questions (*Ability 3*) for sections that were unclear on the first read, and also ambiguity in words or phrases used. By the end of the first pass, users should have a well annotated (and rather messy) version of the text, and a clearer idea of which portions are significant and require further attention. The table below summarises and exemplifies the aforementioned steps by applying them to the text. As mentioned above, the annotated version of the text can be found in Appendix A.

3.3 Second Pass (DO)

While the first pass separates reasons from non-reasons, it does not differentiate between the significance of each reason. This is where the second pass comes in. The objective is to apply a stricter filtering mechanism to the text, by determining their significance and relevance to the main issue (*Ability 9*).

In general, to determine the significance of something, we can ask questions such as: If this were to be the case (or not the case), how would that affect the strength of the argument? For instance, when determining the significance of a reason, we can think about a) the plausibility of it being true, and b) its sufficiency, that is, the extent to which the strength of the reason matches the claim it supports (*Ability 7*).

Additionally, the second pass is where users will organise the text into a simpler, more readable form that outlines the argument and its most salient points (*Ability 17*). While this step is optional as it may seem time consuming, it is recommended that one does not skip it if time permits.

This is because summarising the text in this way forces users to confirm their understanding of the author's argument, and it also makes the final steps of the SOP more productive, as that involves evaluating the claims in a systematic manner. Users would be more prone to committing fallacies (especially the straw-man fallacy) if they relied on their memory to keep track of the author's argument.

With reference to this example text, we can readily observe the utility of having a high-level overview of the argument structure at hand (the outline for this text can be found in Appendix B). For instance, notice that the claim for consumers to do more is hardly touched on by the author.

This may be for various reasons, but as critical thinkers, we should question why this is the case. Does this show that the author's argument is lopsided against manufacturers? Do big companies really ought to carry this much of the responsibility in this problem? Or does this show that the author is biased against corporations? This is a significant observation as it is important to be aware of an author's leanings.

Additionally, in determining the significance of the claim that *"there is movement afoot to change the current situation"*, we find that it is unnecessary to the author's main argument, which is that manufacturers and consumers should do more in terms of sustainability and repairability. Therefore, we can direct our resources away from critically evaluating the supporting reasons.

In the interest of brevity, we have included the analysis for a subset of claims or statements:

1. *"Manufacturers don't talk about this turnover (of devices) … This is all by design."*
    - *"There's a term for it: planned obsolescence"*
    - *"Ever try to get your TV repaired?"*

This claim is significant because it implicitly suggests that manufacturers are deliberately working against sustainability, likely due to profit interests. If the author did not state that *"this is all by design"*, then the claim would be a weaker statement. However, that phrase turns it into one that we should critically investigate further.
The author's supporting evidence is mostly rhetoric, and even fallacious. The author commits the fallacy of **explaining by naming** - the fact that planned obsolescence is a term that describes the situation does not mean that manufacturers actually do them. Even though it is likely that the two are correlated, we should not assume that this is the case without any further probing. Moreover, the author cites an even weaker 'reason' to explain that planned obsolescence is real, using a rhetorical question.

2. *"If they (manufacturers) won't (change), governments must make them."*

This claim is unsupported, perhaps the author **implicitly assumes** that if an issue is large and 'bad' enough, then there is strong cause for government intervention. Even though there may be good reasons for this, as critical evaluators, we should question this assumption: Should we turn to government regulation for such a problem? Are there drawbacks to such a solution? What is/are the alternative(s)? The author did state that *"if unrepairable gadgets don't sell, manufacturers will change course"*, acknowledging the effectiveness of the free market to regulate such behaviour, and in turn, the consumers' power to do so. Hence, we should not blindly accept that the government directly mandating manufacturers is the only good solution to this problem.

3. *"Although tech companies will often speak of sustainability, many lobby against repair legislation"*
    - *"(They are) fearful it will loosen their control and eat into their profits"*

This is a factual claim; it can be verified (mostly) objectively. However, the author does not give appropriate evidence to support it. Rather, the reason given merely begs the question. We may trust that the author has done the appropriate research, and that the NYT is a reputable source. However, if we want to be rigorous, we can verify this for ourselves, since it is a significant claim to the whole argument. If only a few tech companies lobbied against repair legislation, then the cause of this issue may lie somewhere else.

4. *"Sustainability matters, but marketable design appears to matter more to these companies."*
    - *"Consumers are urged to upgrade annually"*
    - *"Well north of 1 billion smartphones were shipped in 2020"*
    - *"None of Apple's iPhones or MacBooks earned above a 7, with 10 being the top score — making the company a C student at best … Other manufacturers like Microsoft and Samsung fared about the same."*

This is a well-supported claim. Therefore, the questions we can ask are: Is it reasonable to mandate manufacturers to (or think that they must) prioritise sustainability over profit-motives? To allocate resources toward, for example, R&D relating to sustainability? The value conflict here is mainly between **social responsibility and freedom of choice**. That is, the author seems to believe that the manufacturer's responsibility to minimise environmental damage should be valued more highly than their freedom to pursue their own objectives.

3.3 Third Pass (IT)

In the final section of the SOP, users should ideally be dealing with the most significant ideas of the text. Therefore, we can focus on them and rigorously evaluate their validity or truth using critical reasoning or research. The objective of the third pass is to evaluate the overall soundness of the argument presented, to come up with their own conclusion on the issue, and to think of the implications of the message.

To achieve this, the SOP tasks its users to investigate and evaluate each reason. The SOP recommends playing the role of devil's advocate as an effective starting point for critical evaluation (*Disposition 8, Ability 14*). It suggests that users ask questions such as "What reasons would someone who disagrees offer?" and "Does the author address them in any meaningful manner?". This reminds users that on the surface, an argument will almost always be dressed in its best clothes as the author wishes to convince them of their view.

The following table exemplifies the third pass by investigating the significant claim that: "Although tech companies will often speak of sustainability, many lobby against repair legislation".

Guiding Points	**Application on Source**
Reasons and Evidence	• "(They are) fearful it will loosen their control and eat into their profits" • "Sustainability matters, but marketable design appears to matter more to these companies."
Possible assumptions	• Companies are aware about the importance of being sustainable but choose to ignore it and have made the product unsustainable. • Making the products sustainable will lead to loss in profits for manufacturers.
Possible alternatives	• Manufacturers might be able to engage in other methods to address the issue of sustainability. Is there a way for sustainability and profit-making to coexist? • It may not be reasonable to mandate manufacturers to prioritise sustainability over profit-motives. • Perhaps, there are other reasons why new models are released so frequently. Are consumers the one that want the new devices?
Accuracy of the facts mentioned	• Not many resources can be found regarding the fact that making products fixable will lead to a loss in profits. In fact, devices might be unable to be fixed due to unavailable parts and schematics because the respective manufacturers, Microsoft and Google included, do not share them. They claim that it rips off their intellectual property and exposes the consumers to security risk. Additionally, should the manufacturers choose to sell the parts, they can sell them at a profit as well. It is understandable why from the consumers' point of view that the manufacturers are doing so to gain more profit. Thus, the first statement provided to support the claim is not justified. • Apple does invest in renewable energy to reduce its carbon footprint and it issues green bonds as well. Sustainability can be done in other ways apart from simply increasing the lifespan of the device. It is hard to justify whether marketable design is more important to manufacturers, but most are putting their effort in sustainability, especially so as compared to a decade ago.
Conclusion	It is understandable why tech companies are against the repair legislation. Should their intellectual property be ripped off, it would be detrimental for the company, especially since they are supporting thousands of employees. There are more layers of reasons behind the short lifespan of devices that should have been discussed and neglected in this article. There are also many other ways to address the issue of sustainability that is not brought up, such as that through the manufacture process.

Table 2: Investigation of source for claim 3

After each claim has been individually tested, the SOP guides users to evaluate the overall validity of the author's conclusion. In doing so, the SOP also prevents users from falling into the trap of rigid and dichotomous thinking, through guiding questions such as "What other reasonable conclusions are possible?" and "Does the strength of the author's conclusion match that of the reasons provided?".

One can gauge the strength of a statement using if-clauses to precede them, as they acknowledge that the statement is based on particular claims or assumptions about which the author is uncertain. By identifying reasonable alternative conclusions, users can determine which of those, if any, they would be willing to accept in place of the author's conclusion (*Disposition 9*).

Overall, the article revolves around the fact that smartphones and most electronic devices are not sustainable with many being disposed of each year. This is a fact well-supported with statistics. However, the reasons supporting the case is incomprehensive, as the author mainly puts the blame on the manufacturers. Our group agrees that smartphones should be made more sustainable, with efforts put in by the manufacturers, government and consumers as well. Manufacturers should also make the supposed lifespan of devices known to consumers for them to make better purchase decisions. To reduce waste, especially electronic waste, one can consider recycling the devices or looking into the concept of a circular economy. To transfer such learnings to our daily life, one can consider how their lifestyle habits can contribute to sustainability, especially if they were to frequently purchase new devices or travel. The topic of sustainability can also be brought up in other areas, such as at home, in school or in companies and the operations.

3.4 Evaluation of SOP

While most SOP only contain 5 letters, ours has 8 letters, which some might find long and possibly harder to remember. However, according to Miller (1956), the optimal number of memorising is 7, plus or minus 2. This means that a mnemonic of length 8 is not too long for users to remember.

One disadvantage of our SOP is that some steps, such as annotate, might be harder to execute for non-text forms like videos or audio. While that is true to some extent, this can be mitigated by using a transcript of the video or audio to annotate one during practice in the beginning stages. Eventually the user would be familiar with the SOP to quickly identify and carry out these steps in the mind to analyse these media critically.

On the other hand, one advantage of using our SOP is that we could encapsulate more points from Ennis's model to teach beginners about applying critical thinking skills. The 3-pass method also separates these points into clear steps that the reader should take when analysing information. While the 3-pass method may be time consuming, it is to break down and engrain these steps for the reader. Eventually, critical thinkers will be well-familiarised to apply all these steps concurrently into 1 pass to analyse text or media quickly.

4. Concluding Remarks

From the usage of our SOP, we could easily break on the article using the prompts at each step. We were also able to identify fallacies and certain ambiguous arguments, but eventually we found that the article was well presented and good arguments to justify their stance of supporting electronics that last and that it should be easily repaired.

This SOP is good for critical thinkers of all levels, be it from students to professionals. By applying our SOP to online texts regularly, we will gradually improve our critical thinking skills such that it will become second nature to us.

5. References

1. Miller, G. A. (January 01, 1956). The magical number seven plus or minus two: some limits on our capacity for processing information. Psychological Review, 63, 2, 81-97.
2. Ennis, R. (2015). Critical thinking: A streamlined conception. In M.Davieset al. (Eds) The Palgrave Handbook of Critical Thinking in Higher Education
3. Paul and Elder (2020) The Miniature Guide to Critical Thinking Concepts and Tools. Rowman & Littlefield.

6. Distribution of Roles

Team Member	Role(s) in Project Paper	Role(s) in OP
Wong Peng Xiang	Introduction and Conclusion	Speaker 1 (Introduction and Conclusion)
Yuvaraj Kumaresan	SOP Introduction	Speaker 2 (SOP Introduction)
Choi Minseok	Summary of Source and Application of SOP 1st Pass	Speaker 3 (Source Summary and Application of SOP 1st Pass)
Brandon Thio	Application of SOP 2nd Pass	Speaker 4 (Application of SOP 2nd Pass)
Michelle Yong Kai Wen	Application of SOP 3rd Pass and Efficacy of SOP	Speaker 5 (Application of SOP 3rd Pass and Summary)

7. Appendix

Appendix A (Annotated Source Text)

The New York Times

LOG IN

OPINION

GUEST ESSAY

Your Smartphone Should Be Built to Last

April 25, 2021

Claim

Evidence

Rhetoric

By Damon Beres

Mr. Beres is a journalist whose work focuses on the effects of technology on people and the planet. He co-founded the publication OneZero at Medium.

Years from now, what creature will digest the new iPads and AirTags that Apple announced on Tuesday? What soil will absorb their metals?

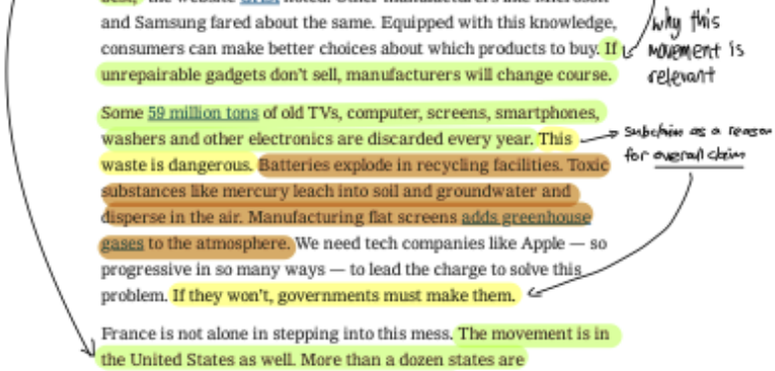
The shiny gadgets of today will be waste tomorrow. As you eye that upgraded tablet, consider that Apple shipped so many new iPads last year that if they were all laid flat and stacked, they would be about as tall as 862 Empire State Buildings. Then think about whatever old iPad of yours is languishing now in some unknown place.

Manufacturers don't talk much about this turnover when they announce the big new thing that will replace your mostly just as good old thing. This is all by design. There's a term for it: planned obsolescence, or designing a product with an intentionally limited life span. Ever try to get your TV repaired?

Apple, Samsung, Sony and other manufacturers of high-tech electronics release waves of new hardware every year even as the tide of screens and circuitry is engulfing us in discarded devices.

Now there is a movement afoot to change that approach.

This year, the French government began requiring tech manufacturers to list an "indice de réparabilité," a repairability score, on product pages for items like the iPhone and MacBook. If a device can be repaired, then its life can be extended, saving consumers money and the planet the burden of so many trashed gadgets. None of Apple's iPhones or MacBooks earned above a 7, with 10 being the top score — making the company a "C student at best," the website Grist noted. Other manufacturers like Microsoft and Samsung fared about the same. Equipped with this knowledge, consumers can make better choices about which products to buy. If unrepairable gadgets don't sell, manufacturers will change course.



Some 59 million tons of old TVs, computer, screens, smartphones, washers and other electronics are discarded every year. This waste is dangerous. Batteries explode in recycling facilities. Toxic substances like mercury leach into soil and groundwater and disperse in the air. Manufacturing flat screens adds greenhouse gases to the atmosphere. We need tech companies like Apple — so progressive in so many ways — to lead the charge to solve this problem. If they won't, governments must make them.

France is not alone in stepping into this mess. The movement is in the United States as well. More than a dozen states are considering so-called right-to-repair legislation, a rare bipartisan concern centered on the idea that manufacturers should not restrict access to information and parts that would allow independent shops to fix busted gadgets.

The New York State Assemblymember Patricia Fahy will hold a virtual town hall on the topic May 5. Anyone can attend. And the Federal Trade Commission is expected to release a long-delayed report soon on repair restrictions in consumer technology that could set the stage for a bigger push from the Biden administration.

Repairability is a surefire path toward longevity. Items become waste when they are no longer useful. Some of this is the simple march of progress. Other times, it is much harder to see the justification, such as when a Sonos speaker is cut off from software updates seemingly overnight.

Although tech companies will often speak of sustainability, many lobby against repair legislation, fearful it will loosen their control and eat into their profits. This can lead to a sort of cognitive dissonance.

Apple's annual environmental report, published this month, asserts a commitment to device longevity and sustainability. It also speaks of the Apple Pencil stylus as though it contains secrets lost in some fragment of the Rosetta Stone. The company is "designing, developing and testing additional disassembly tools — including new methods for recovering materials from Apple Pencil," it says, as though the methods could only be reverse-engineered, rather than integrated from the very first stage of design.

There's the issue in a nutshell: Sustainability matters, but marketable design appears to matter more to these companies. Consumers are urged to upgrade their devices annually. Well north of 1 billion smartphones were shipped in 2020 — and it was a sluggish year because of the Covid-19 pandemic.

Manufacturers must do better. Their devices must be repairable by

all and kept compatible with software updates for as long as possible, not artificially obsoleted. Consumers should support right-to-repair legislation. Buy what you please, be it a fancy fridge or a smartphone — no one is changing the world by holding on to an iPhone 7 for an extra year — but know to ask three simple questions when you're shopping: "How long will this last?," "How will I get it fixed when it breaks?" and "How will I recycle this when I need a new device?" Follow through and get the thing fixed or take it to a trustworthy recycler when it's time. (Apple's store employees can help with this step, for instance.)

In this world, damage is a certainty. But we cannot leave things broken: A problem of our creation is a problem that can be fixed.

More on technology and waste

Opinion | The Editorial Board
It's Your iPhone. Why Can't You Fix It Yourself?
April 6, 2019

How to Make Your Tech Last Longer
July 1, 2020

Electronic Marvels Turn Into Dangerous Trash in East Africa
May 12, 2019

The Price of Recycling Old Laptops: Toxic Fumes in Thailand's Lungs
Dec. 8, 2019

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Appendix B (Example Outline)

Overarching Claim

"Manufacturers must do better. Their devices must be repairable by all and kept compatible with software updates for as long as possible, not artificially obsoleted."

No	Claim	Reasons / Evidence
1	"Manufacturers don't talk about this turnover (of devices) … This is all by design."	▪ "There's a term for it: planned obsolescence" ▪ "Ever try to get your TV repaired?"
2	"If they (manufacturers) won't (change), governments must make them."	
3	"Although tech companies will often speak of sustainability, many lobby against repair legislation"	▪ "(They are) fearful it will loosen their control and eat into their profits" ▪ "Sustainability matters, but marketable design appears to matter more to these companies."
4	"This waste (from discarded electronics) is dangerous"	▪ "Consumers are urged to upgrade annually" ▪ "Well north of 1 billion smartphones were shipped in 2020" ▪ "None of Apple's iPhones or MacBooks earned above a 7, with 10 being the top score — making the company a C student at best … Other manufacturers like Microsoft and Samsung fared about the same." ▪ "59 million tons of old TVs, computers, screens, smartphones, washers and other electronics are discarded every year." ▪ "Batteries explode in recycling facilities. Toxic substances like mercury leach into soil and groundwater and disperse in the air. "
5	"There is movement to change the current situation"	▪ The French government recently mandated tech manufacturers to list repairability scores on product pages ▪ "More than a dozen states in the US are considering right-to-repair legislation" ▪ "New York State Assembly is organising a virtual town hall open to the public" ▪ "Federal Trade Commission is expected to release a report of repair restrictions in consumer technology"