An Evolutionary Mismatch
Designing resistance against the exploitation of our primitive minds by technology.

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ABSTRACT

Persuasion profiling, deceptive charts, false experts, addictive mechanics, fear-inducing and emotional narratives, the average internet user is constantly bombarded with content sometimes created to persuade, manipulate or exploit our minds that are still in the process of adapting to our ever-advancing technological environment. This pictorial presents the design process of creating an artifact that aims to protect users against online manipulation. Principles of evolutionary psychology, user experience design and gamification were used as foundations for the creation of the final artifact. The design methodology and steps for the creation of the final prototype are discussed along with a reflection about the challenges faced during the design process from user research to the creation of an interactive prototype.

Authors Keywords

Resistance to Persuasion; Neuroethics; Forewarning; Gamification; Social Media Manipulation; Evolutionary Psychology.

INTRODUCTION

Our human minds have adapted to their surrounding environment over thousands of years, and created mental short-cuts (fast-thinking) to help our brains process information more efficiently. Although fast-thinking is useful to conserve energy and serves for rule-of-thumb logic, it often results in thinking errors and bias [16].

The mental heuristics that humans inherited as result of evolutionary developments, can today be exploited by technology due to an evolutionary mismatch [12]. Evolution is not a quick process, and thousands of years may be required for humans to create evolutionary adaptations to a new environment. With the advent of the internet and modern communication, the evolution of the informational landscape has outpaced our ability to adapt to a new environment. Dr. E.O. Wilson said: "The real problem of humanity is the following: we have paleolithic emotions, medieval institutions; and god-like technology" [19].

Fast thinking
- Impulsive decisions
- Automatic
- Mental Heuristics
- Low Energy

Slow thinking
- Logical thought
- Analytical
- More Reliable
- High Energy

LITERATURE REVIEW

Technology is not the only thing that can exploit our primitive brain mechanics. Long before the internet, Aristotle defined the three forms of persuasion: Ethos, Pathos and Logos. According to Aristotle, a combination of those forms will result in more persuasive rhetoric to an audience [15]. Ethos and pathos rely on system 1 thinking: shortcuts our brain will use to quickly decide what is true or not. While Logos will appeal to our rational brain system 2: "slow-thinking". Certain professionals thrive on principles of persuasion and influencing others by using mechanisms that are hardwired in our brains [2]. Dr. Robert Cialdini's tried to answer the question "Why do we comply?" by conducting several experiements which resulted on the discovery of the 7 principles of persuasion [6]. Humans are incredibly susceptible to those principles throughout cultures worldwide, and those principles can be found in advertisement, sales and listings both online and offline. Those bugs in thinking are also known as cognitive biases, and they are fast-thinking heuristics that we use in four types of situations: when we have too much information to deal with, when we don't have enough time to think, when we lack meaning, and when we lack memory [4]. Those errors in thinking shape the way we make decisions and behave in society.

Rethoric
Aristotle's modes of persuasion

Fast-thinking

Ethos
Credibility and trust

Pathos
Emotional persuasion

Slow-thinking

Logos
Appeal to rational thinking

Influence
Cialdini's principles of influence

Fast-thinking

Authority
We trust in authority figures

Social Proof
We are persuaded by the actions of others

Reciprocity
We like to reciprocate actions

Commitment & Consistency
We feel the need to be consistent

Liking
We say yes because we like the person

Scarcity
We are afraid to miss opportunities

Unity
We have in-group biases

Behaviour, Memory, Decision-Making and Judgment
Cognitive Biases

Fast-thinking

Confirmation Bias
We favour information that confirms pre-existing beliefs

Negativity Bias
We are more affected by negative things than positive things

What You See is All There Is
We have a tendency to overestimate the spectrum of information we see.

Bandwagon Effect
We believe in something based on the number of people sharing the same belief

Framing Effect
We react to things differently based on how is presented to them

False Consensus
We overestimate how many others agree with us

EMPATHIZE

As the first part of the Design Thinking methodology adopted in this project, the empathize phase was the starting point to connect with users and learn more about their problems, goals and opinions about online manipulation and persuasion. During this phase a survey was conducted along with the creation of scenarios, an empathy map and a user persona.
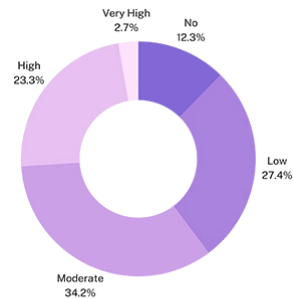
Survey

An online survey that received 70 valid responses was conducted using Microsoft Forms. The learnings from this survey suggest that social media is a focus area for manipulation and is where most people spend their time online. It also suggested negative feelings towards online manipulation.

73%

Ranked social media as first or second online time-consumer

When asked to rank how people spend their non-work-related time online, social media was ranked as first or second for most participants.

Very High 2.7%
No 12.3%
High 23.3%
Low 27.4%
Moderate 34.2%

4 out 5

Feel uncomfortable with persuasive technology shaping their behaviour

When asked how comfortable are people with persuasive technology that shapes behaviour, 84% answered they are uncomfortable.

39.7% said online manipulation had either low or no effect on their behaviour.

Even though people perceive online manipulation as not affecting them, 91% responded later in the survey that they used social media to relief boredom and 69% reported losing track of time when using social media.

Most used social media apps (ascending order)

User Persona

The data acquired through the survey helped create this persona, which is meant to represent the average internet user who spends most of their entertainment time on social media.

Jessica Mallow

Age 26 | Languages English | Education Bachelor's Degree

Bio
Jessica is a recent graduate in Biomedicine. She is tech-savy and likes to check the news and chat with friends on social media during short breaks at work and also after she gets home.

Frequently used

Main Influences
Celebrities, Ads, Peers, Authorities

Goals
· Communicate with friends and family
· Stay up-to-date on news
· Entertainment
· Consume high-quality content

Frustrations
· Algorithmic manipulation
· Unethical attempts of persuasion
· Not knowing what is true and what is fake
· Wasting too much time on her phone
· Not knowing who to trust

Tech
Social Media | Gaming
Browsing | Shopping

Empathy Map

Jessica's empathy map demonstrates what she says, thinks does and feels.

Says

"Remember yesterday I was telling you about that new yoga place that opened down the road? Now look what appeared on my Instagram!"

· Leaves phone in another room to be able to focus
· Rejects cookie pop-ups
· Have a discussion about politics during family dinner.

Does

Thinks

Oh god! I've been scrolling for 40mins!

Winning the election will be easy, nobody is voting for the other side...

Powerless and lacking control

Confused | Angry | Easily Distracted

Feels

Storyboards

As-is, and to-be storyboards were created to represent current and desired states for Jessica's interactions with technology and social media.

PERSONA
Jessica Mallow

Hooked by Social Media at Work

DISTRACTED AT WORK
During work hours, Jessica gets a phone notification and immediately reaches out to check what it is

LOST TRACK OF TIME
She opens the social media notification and stays there scrolling for longer than she wanted

NEGATIVE BIAS/FILTER BUBBLE
While scrolling she finds a lot of outrage content shared amongst friends who share the same opinions

IMPULSIVE BUYING
She continues scrolling to find that only 3 shoes are left from a Sale at a shop

DINNER CONFLICT
During family dinner, she finds out her son is on the other side of an issue and a fight starts

PERSONA
Jessica Mallow

Human-centered interactions

MESSAGES HUSBAND ON HER WAY HOME
During her commute home, Jessica decides to message her husband about ordering take-out tonight

CHECKS LATEST NEWS ON SOCIAL MEDIA
When checking the news, Jessica can see both sides of a polarizing political discussion and checks for bias

ALL CAUGHT UP!
After catching up with the news, she logs out and starts reading a book

DINNER WITH FAMILY
She gets home and has a lovely dinner with her family

HELPFUL APP REMINDERS
The "Goals App" reminds her to drink water and the Yoga class in 1h

DEFINING THE PROBLEM

To define the problem it was important to delineate the difference between ethical persuasion and unethical manipulation or coercion. Ethical persuasion are those instances where the brain heuristics are used for the benefit of the user. On the other hand, unethical persuasion attempts to benefit primarily the actor, not the user [17].

Ethical Principles for Persuasive Design

Because persuasive design is based on human psychology, the ethical principles from the American Psychological Association were adopted to evaluate ethical persuasive design [2].

Strava using principles of consistency and social proof to motivate physical activity

Extreme levels of fear or distress induced to generate compliance

Appeal to emotion being used to persuade smokers to stop smoking

Falsely using persuasive principles like scarcity, authority or reciprocity to trick users into an action

Ethical ———————————————————— Unethical

Campaign using humour to persuade people not to drink and drive

Social proof being used to persuade dog owners to pick after their dogs

Using profit-driven habit-forming/addictive mechanics on unconsenting and unaware users

Non-consensual digital experiments that induce bad feelings on purpose

Principle A
Beneficence and Nonmaleficence

Principle B
Fidelity and Responsibility

Principle C
Integrity

Principle D
Justice

Principle E
Respect for People's Rights and Dignity

How can technology persuade or manipulate?

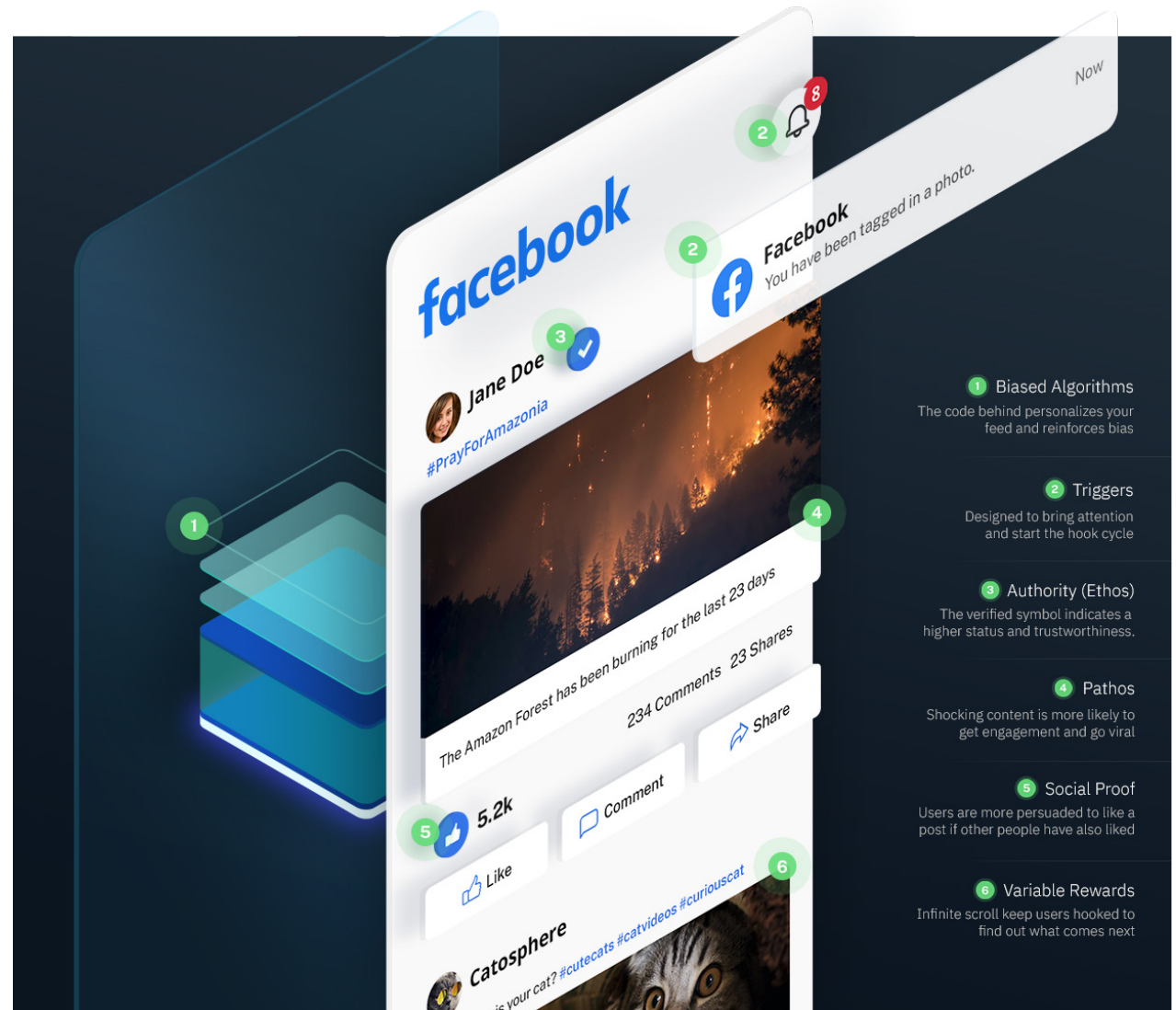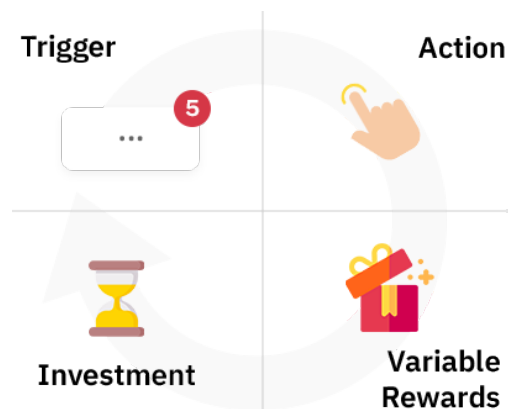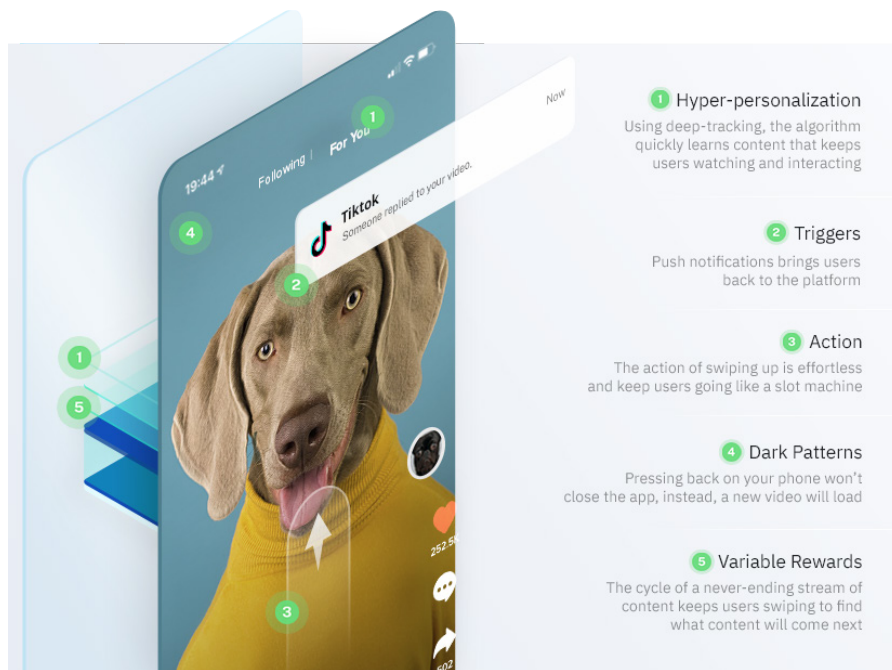The study of persuasive technology was coined as Captology by BJ Fogg [9]. Due to the fast advancement of technology, the vulnerabilities in our brains are now exploitable not only on an individual level, but on a much larger scale. There are significant advantages machines have when persuading humans: they don't get tired, they can exponentially learn more about your habits and behaviours, and they can be more persistent and precise [10,11].

The technological ability to exploit our brains brought a great opportunity for tech companies to commoditize human attention [13]. Facebook (Meta), Google (Alphabet), Twitter, and other tech companies offer free products to users in exchange for their time on the platform. As a result, corporations had the incentive to copy competitors and use every tool at their disposal to keep users glued to their apps - what ex-Google's Design Ethicist Tristan Harris called "The race to the bottom of the brain stem." [18]. The results of this race can now be perceived in the form of tech addiction, decreased attention spans and increasing polarization [14,3,5] . Social media keeps users glued to the screen using habit-forming mechanics like the Hook Model [9].

Trigger

Action

Investment

Variable Rewards

1. **Biased Algorithms**
The code behind personalizes your feed and reinforces bias

2. **Triggers**
Designed to bring attention and start the hook cycle

3. **Authority (Ethos)**
The verified symbol indicates a higher status and trustworthiness.

4. **Pathos**
Shocking content is more likely to get engagement and go viral

5. **Social Proof**
Users are more persuaded to like a post if other people have also liked

6. **Variable Rewards**
Infinite scroll keep users hooked to find out what comes next

Hyper-personalization
Using deep-tracking, the algorithm quickly learns content that keeps users watching and interacting

Triggers
Push notifications brings users back to the platform

Action
The action of swiping up is effortless and keep users going like a slot machine

Dark Patterns
Pressing back on your phone won't close the app, instead, a new video will load

Variable Rewards
The cycle of a never-ending stream of content keeps users swiping to find what content will come next

SEME
Search Engine Manipulation Effect (SEME) can covertly manipulate demographics with *Primacy* and *Recency* order effects

Confirmation Bias
Google searches are personalized based on web activity, search history, clicks, and others

WYSIATI Bias
"What you see is all there is" bias is what makes poeople believe they have the full picture

Negativity Bias
Negative search results attract more attentions and get more click rates

TikTok, like Facebook, also uses the Hook Model. In addition, it also contains a precise personalization algorithm that powers its personalization engine providing better variable rewards. Search engines like Google, on the other hand, can use other kinds of covert manipulation. According to Dr. Robert Epstein, Google can change the opinions of undecided voters from 50/50 to 90/10 in favor of a candidate using Search Engine Manipulation Effect [7].

Competitor Analysis
There are already some solutions aimed at protecting users against bias, manipulation, addictive mechanics and attention hoarding. However, they only provide partial protection to manipulation, and use tactics that are unlikely to work on many platforms (like the complete removal of timelines).
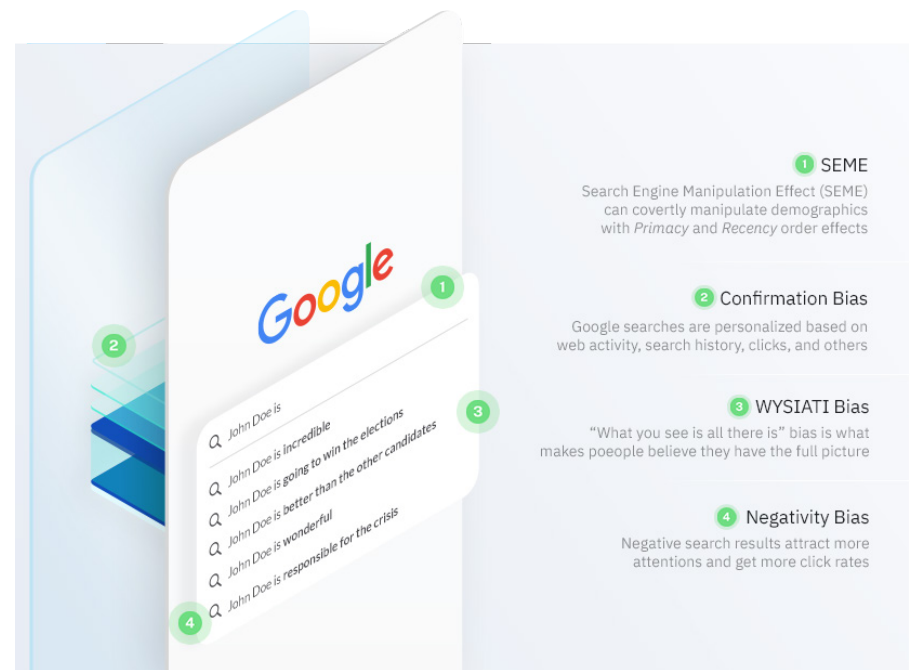
Competitor Analysis	Bias	Algorithmic Manipulation	Unethical Persuasion	Addictive Mechanics	Attention Hoarding	Platform Support
News Feed Eradicator	✓	✓		✓	✓	8
All Sides	✓					N/A
Ground News	✓					N/A
Stay Focused					✓	All
Unhook		✓		✓	✓	YouTube
UnDistracted	✓	✓		✓	✓	5
Nudge	✓	✓		✓	✓	5

Jobs-To-Be-Done and How-Might-We

Because of the complexity of themes and causes of manipulation online, JTBD statements were created to help define the specific user jobs. Those were then translated to HMW statements and potential solutions.

Brainstorming

Based on the JTBD and HMW answers, ideas that can potentially support users were generated through brainstorming.

JTBD: When doing a task, I would like to keep focus so that I can accomplish my goals

How might we protect users against attention hoarding?
- Trigger Controls?
- Define a purpose before using tehcnology?
- Focus time?
- Meditation?

JTBD: When dealing with controversial subjects, I would like to understand opposing viewpoints so that I can form better opinions and relatioships

How might we help users deal with increasing polarization?
- Expose users to opposing points of view?
- Promote open discussion?
- Decrease amount of outrage exposure by having a different timeline mechanic?

JTBD: When using technology, I would like to have clear boundaries so that I can acomplish what I need to do

How might we help users set boundaries with technology?
- Maximum usage times? (currently implemented in China)
- Break unethical addictive cycles (infinite timeline, variable rewards)

JTBD: When consuming information, I want to know about existing biases and manipulation so that I can make better decisions and have better behaviours

How might we create a more transparent informational landscape for users?
- Forewarning?
- Innoculation theory?
- Teaching about methods?
- Help users see and correct their biases?

JTBD: When using technology, I would like to protect my mental health so that I can life a hapier life

How might we protect user's mental health when they are using technology?
- Warnings for emotional manipulation?
- Teach users how to protect their privacy?
- Bring focus to their own objectives?
- Help users spot manipulation attempts?

New Social Media App (Ethical)

Pros:
Full Control over mechanics and content

Cons:
Competition against adictive mechanics
Costly to get users to migrate

Anti-persuasion software (add-on)

Pros:
Unlimited internet coverage

Cons:
Doesn't teach users about persuasion
Doesn't encourage mindful technology use

Persuasion Inspector (add-on)

Pros:
Teaches users about persuasion
Works as forewarning

Cons:
No incentive to continuing using it

Detox Game

Pros:
Teaches users about persuasion
Works as forewarning
Persuasion used for good
Unlimited internet coverage

Cons:
Bigger commitment from user

Chosen Idea: Gamified experience

The gamified experience can work both as a platform for learning about biases, but also for taking action against manipulation and providing healthier features. Technically, the app is an add-on to the browser (desktop) or WebApp (mobile) that can add UI elements to pages. Users can earn points (XP) whenever they choose to mitigate biases and use technology mindfully. Players could also earn badges for accomplishments protecting their minds from manipulation. Players will receive forewarnings for unethical persuasive content on the platform. Using a game can be a great way to teach users ethical persuasion use and help them identify unethical manipulation. In addition, the add-on layer can remove elements and add friction to manipulative design.

Wireframes

Because of scope and the fact that research pointed to social media as a main source of manipulation, the wireframes will focus on the scenario of social media usage. The first step of wireframing was to ideate potential features of this app, and how will they work alongside of popular social media sites.
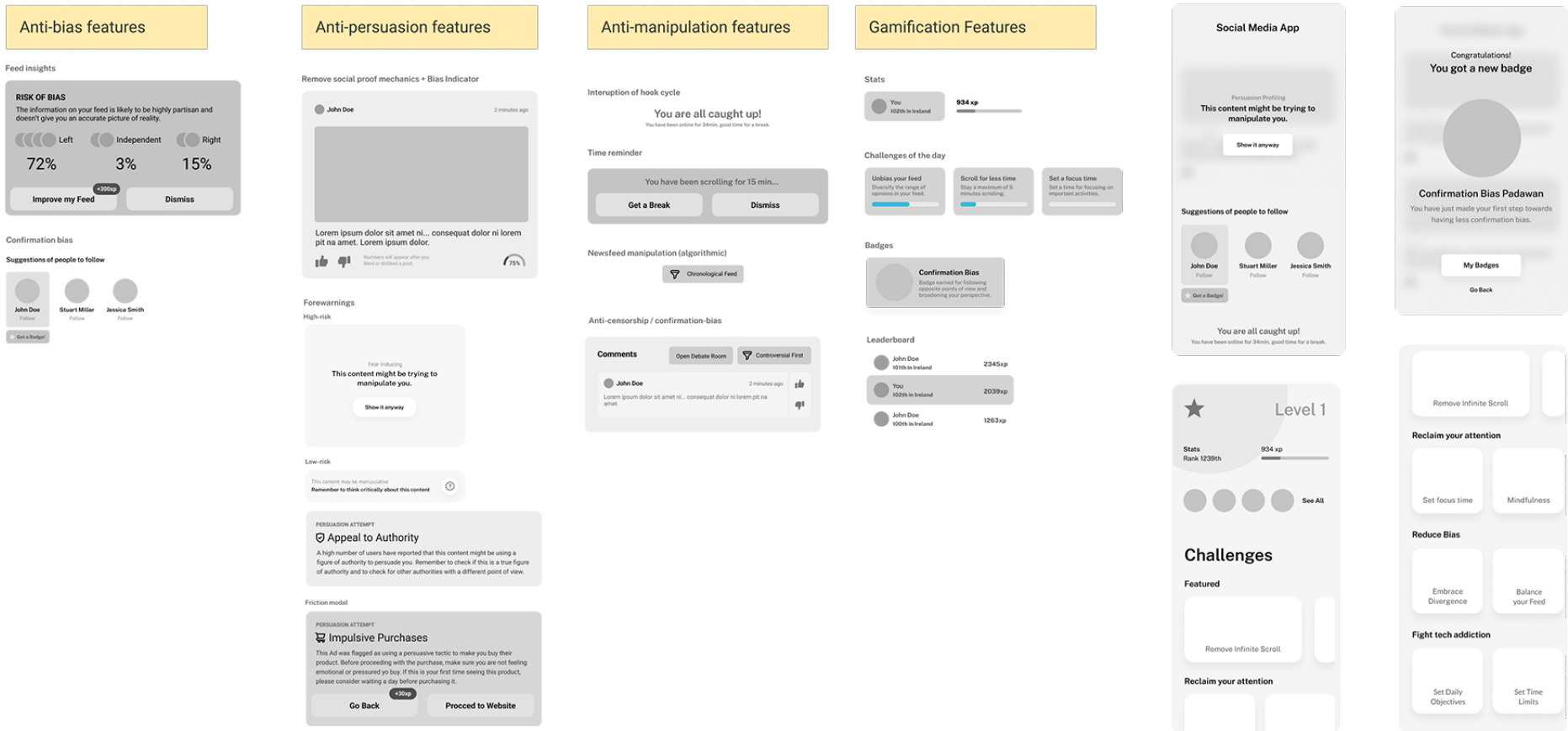
Mood board

This mood board compiles the typefaces, colours, styles and themes chosen for the creation of the hi-fidelity designs of the game application.

Hi-fidelity Designs

The name Paleo was chosen to reflect the main objective of the app - help aid the relationship between technology and our "paleolithic brains". In that same tone, the color scheme was chosen to represent nature, and the typeface resembles ancient scriptures.
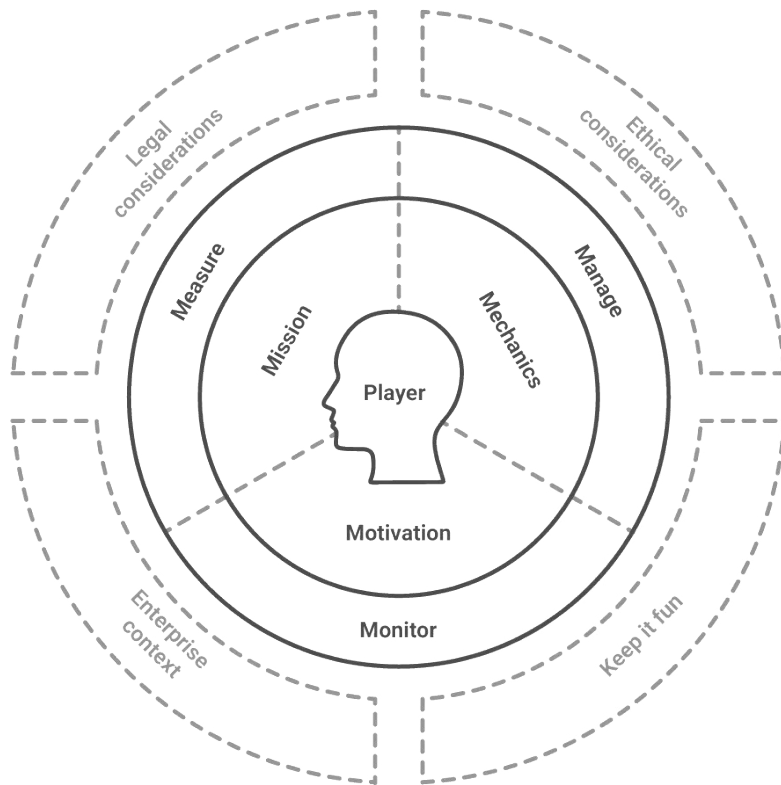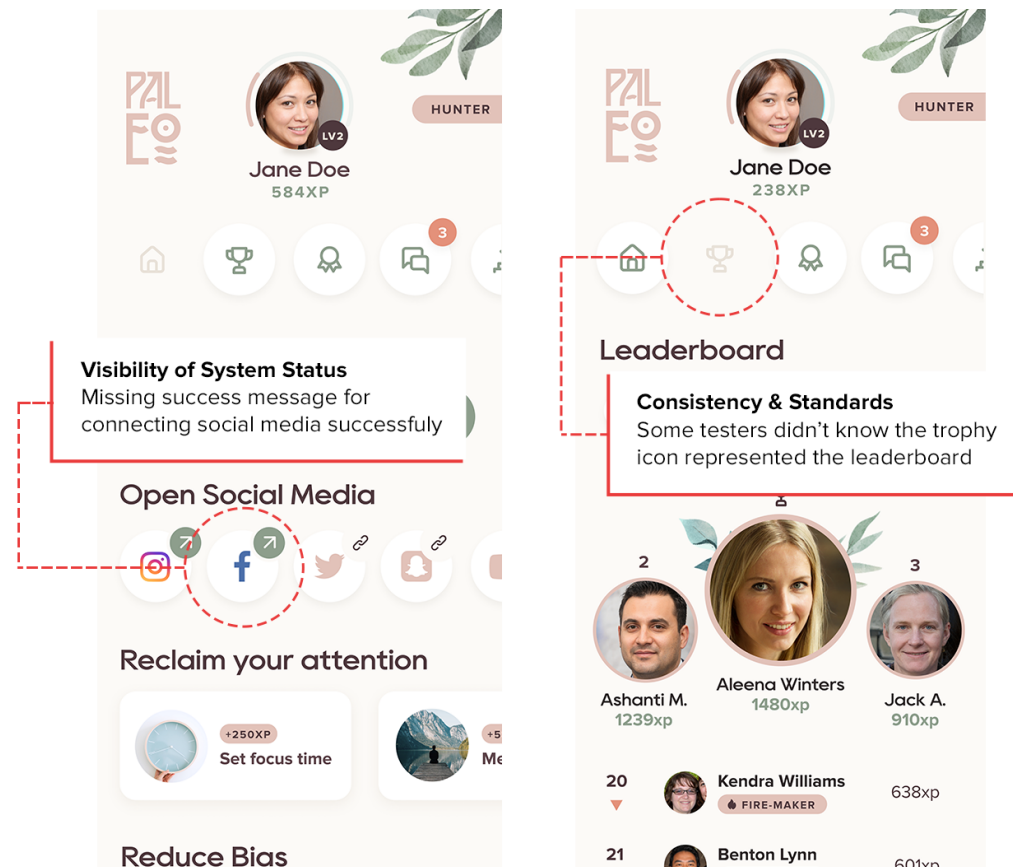
Gamification and Player-Centered Design

The gamification foundation for the Paleo App used the Player-centered Design framework to help think about the game mechanics introduced to the user [14]. Gamification introduced on a serious game/app like Paleo should strike a balance between fun and completing real-world user objectives. To accomplish that, leaderboard were introduced to incentivise competition with friends and connectedness. In addition, badges and a point system were introduced to incentivise players towards progression and give them tangible proof of achieving long-time goals.

Usability Testing

Hi-fidelity designs were transformed into a prototype that could be used for usability testing. 5 users were asked to perform 8 tasks on the Paleo app, and also asked to give qualitative feedback that was collected during the live usability testing sessions. The sessions uncovered some issues that were also mapped to heuristics. Later, an iterated design made improvements on learnability, understanding and design theme.

Visibility of System Status
Missing success message for connecting social media successfuly

Consistency & Standards
Some testers didn't know the trophy icon represented the leaderboard

Second Iteration

The qualitative feedback from the usability testing session inspired a re-design of the Paleo app that reflected a gamified and more colorful experience. Usability errors identified during usability testing were fixed and illustrations were added both on the main interface and also on the widgets.

Paleo Widgets

For the widgets which are surfaced inside social media apps, a little arrow was introduced to the top right corner to indicate to users that the element belongs to the Paleo app and is part of the gamified experience. Small indications of points to be earned were also added to the CTAs to incentivize players towards their goals.
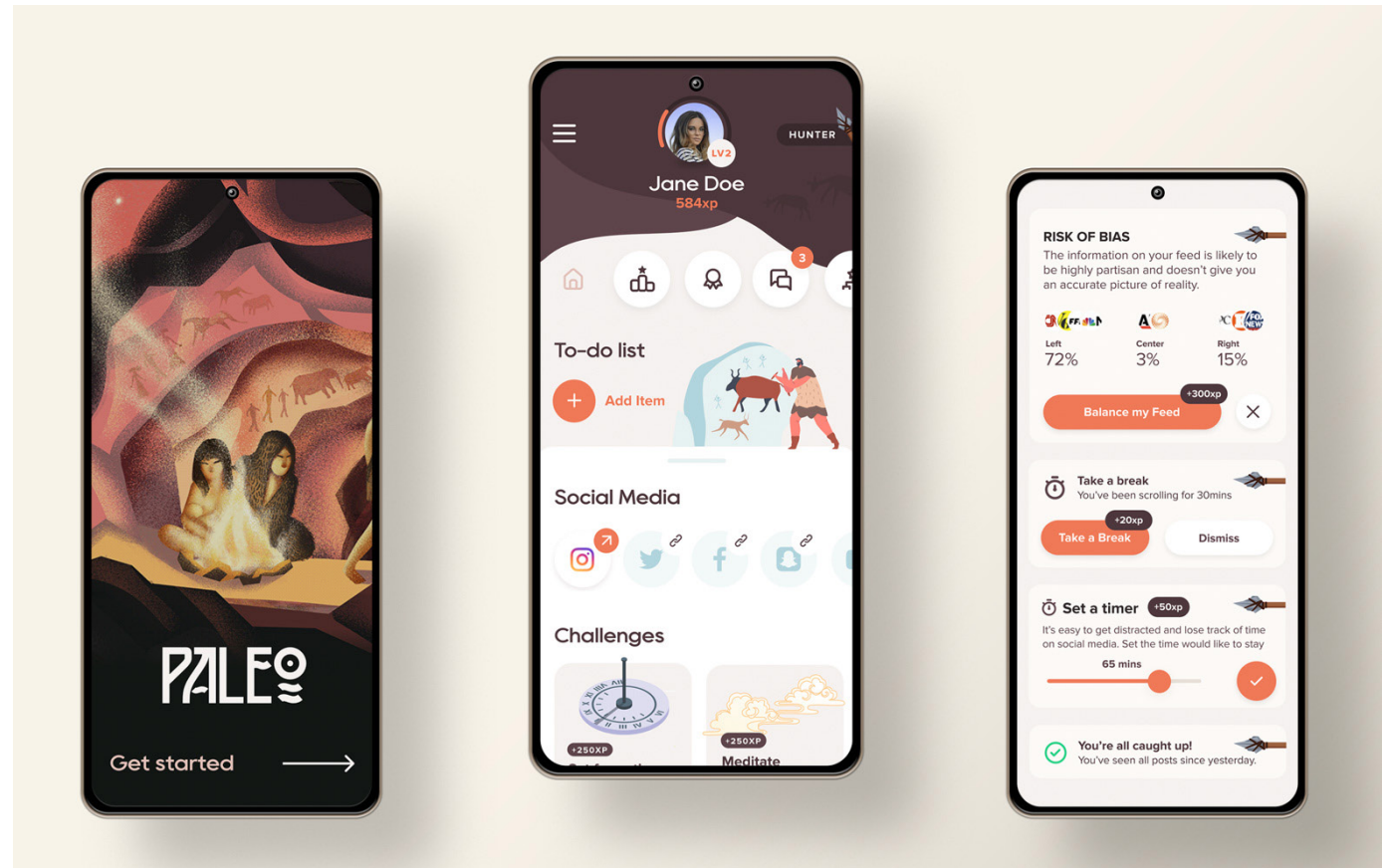
CONCLUSION

This pictorial has demonstrated the user-centered design process for the creation of an application for improving the relationship between humans and technology by adding friction to unethical attempts at manipulation, and giving users the opportunity to overcome biases.

The literature review conducted helped the definition of the problem uncovering the connection with the evolutionary mismatch and the ways the human mind takes shortcuts to help us navigate the world. Secondly, design thinking methodology served as the base for the process that included user

research, discovery, problem definition, ideation, prototyping and testing.

Considerations for the ethics of persuasion and the definition of the APA principles were essential to guide design decisions. The breakdown of social media and search engine elements helped understand and identify exactly where and how those mechanics work in visual user interfaces - which enabled the creation of widgets. To guide gamification efforts, player-centered design was introduced to the project through design iterations.

In the future, the Paleo App could be expanded to a broader scope and include other ways users can protect themselves

against unethical manipulation. Longitudinal data gathered through diary studies would be beneficial to this work in the future to bring real-time data in regards to user behaviour and pain points. Further research is needed to establish the efficacy of introducing friction to manipulative attempts for users.

As novel technology gets introduced to more people, AI, VR/AR and brain-computer interfaces could introduce new challenges to users seeking to protect the exploitation of their minds. Although this work proposes a design solution, legislation and public awareness would be vital in tackling the problem in a systematic way.

REFERENCES

1. Allcott, Hunt; et al. 2020. The Welfare Effects of Social Media. American Economic Review 110, 3 (March 2020), 629–676. https://doi.org/10.1257/aer.20190658

2. American Psychological Association. 2017. Ethical Principles of Psychologists and Code of Conduct. Retrieved April 02, 2022 from https://www.apa.org/ethics/code?item=3

3. Baumgartner, Susanne E., et al. 2017. The Relationship Between Media Multitasking and Attention Problems in Adolescents: Results of Two Longitudinal Studies. Human Communication Research 44, 1 (Dec. 2017), 3–30. https://doi.org/10.1093/hcre.12111

4. Benson B Manoogian J. 2017. Cognitive bias codex. Retrieved January 09, 2022 from https://betterhumans.coach.me/cognitive-bias-cheat-sheet-55a472476b18

5. Brady, William J. et al. 2017. Emotion shapes the diffusion of moralized content in social networks. Proceedings of the National Academy of Sciences 114, 28 (June 2017), 7313–7318. https://doi.org/10.1073/pnas.1618923114

6. Cialdini, Robert B. 2007. Influence: The psychology of persuasion. Collins.

7. Epstein, Robert and E. Robertson, Ronald. 2015. The search engine manipulation effect (SEME) and its possible impact on the outcomes of elections. Proceedings of the National Academy of Sciences 112, 33 (Aug. 2015). https://doi.org/10.1073/pnas.1419828112.

8. Eyal, Nir and Hoover, Ryan. 2014. Hooked: How to build habit-forming products. Penguin Business.

9. Fogg, BJ. 1998. Persuasive Computers: Perspectives and Research Directions. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Los Angeles, California, USA) (CHI '98). ACM Press/Addison-Wesley Publishing Co., USA, 225–232. https://doi.org/10.1145/274644.274677

10. Fogg, BJ. 2009. A Behavior Model for Persuasive Design. In Proceedings of the 4th International Conference on Persuasive Technology (Claremont, California, USA) (Persuasive '09). Association for Computing Machinery, New York, NY, USA, Article 40, 7 pages. https://doi.org/10.1145/1541948.1541999

11. Fogg, BJ. 2015. Bj-Fogg-Ftc-Fall2006. Retrieved October 3, 2021 from https://vimeo.com/117427520

12. Kahneman, D. and Egan, P., 2011. Thinking, fast and slow. Farrar, Straus and Giroux.

13. Kane, Lexie. 2019. The Attention Economy. Retrieved April 18, 2022 from https://www.nngroup.com/topic/psychology-and-ux/

14. Kumar, Janaki and Herger, Mario. 2022. Player Centered Design. Retrieved February 2, 2022 from https://www.interaction-design.org/literature/book/gamification-at-work-designing-engaging-business-software/chapter-2-58-player-centered-design.

15. Leith, Sam. 2019. You Talkin' To Me?: Rhetoric from Aristotle to Trump and Beyond. Profile Books.

16. Roberts, S. Craig. 2011. Applied Evolutionary Psychology. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199586073.001.0001

17. Simon Longstaff and Matthew Beard. 2018. Ethical by design: Principles for good technology. Retrieved September 10, 2021 from https://ethics.org.au/ethical-by-design

18. Thompson, Nicholas. 2017. Our Minds Have Been Hijacked by Our Phones. Tristan Harris Wants to Rescue Them. January 6, 2022 from https://www.wired.com/story/our-minds-have-been-hijacked-by-our-phones-tristan-harris-wants-to-rescue-them/

19. Wilson, Edward O. 2022. What Is Human Nature? Paleolithic Emotions, Medieval Institutions, God-Like Technology. Retrieved April 18, 2022 from https://bigthink.com/hard-science/eo-wilson-what-makes-us-human-paleolithic-emotions-medieval-institutions-god-like-technology/