Design

College Students

- Targeted and gated to college students
- FB, etc, Gas all had the same launch strategy - start with students
- American Press Institute (2022) finds that only 37% percent of U.S. Gen-Z and Millenials follow news related to environmental issues.
- How:
  - Ask how much time you want to contribute
  - Match with other people based on time
  - Create a group chatroom
  - Use AI to help out with tips
  - ask university what u study and match with that industry to become expert and sustainability leader in this field
  - invest time not money, student don't have money
  - consumer branded carbon credits like angry teenagers
  - Kuzminski (2015) ecology of money

Climate Anxiety

Whitmarsh et al. (2022) shows climate anxiety is more prevalent among young people and is a possible motivator for climate action. Ogunbode et al. (2022) finds climate anxiety in 32 countries and also supports the idea that climate anxiety leads to climate activism. Hickman et al. (2021) provides evidence even children are anxious.

- Thompson (2021) Young people have climate anxiety.
- Designing for Health and Sustainability: Health and sustainability are intrinsically connected. Kjrgård et al. (2014) shows how *"By understanding health and sustainability as a duality, health both creates conditions and is conditioned by sustainability, understood as economic, social and environmental sustainability, while on the other hand sustainability creates and is conditioned by human health."*
- Finds that climate anxiety predicts joining climate action movements
- Design for Human Rights UNFCCC Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) (2022) text refers to "human right to a clean, healthy and sustainable environment".
- Refi podcast: people need agency

Design Implications:

- How to support the youth?
- Design to reduce climate anxiety
- Is getting people to go to nature more a good way to increase ecological awareness?

Empowerement

Empowered by Design - The design should empower young people.

- (**rossClimateChangeChallenge2016?**) says most people in the US don't act on climate change. "Action on climate change has been compromised by uncertainty, aspects of human psychology".
- Rooney-Varga et al. (2019) shows the effectiveness of ***The Climate Action Simulation*** in educating users about success scenarios.

Design Implications:

- Younger people show higher motivation (participants in climate protests). How to be relevant for a younger audience?
- Yet action remains low.

- The demographics that stand to win the most from the green transformation of business are the youngest generations, with more years of life ahead of them, and more exposure to future environmental and social risks. It would be advisable for Generation Z and their parents (Millennials) to invest their resources in greener assets, however, it's still difficult to pick and choose between 'good' and 'bad' financial vehicles to invest in.
- This creates an opportunity for a new generation of sustainable investment apps, focusing on the usability and accessibility of ESG for a mainstream audience. Generation Z and Millennials expect a consumer-grade user experience.
- What would that experience look like? I've chosen these demographics with the assumption that if given the right tools, the emotional demand for sustainability could be transformed into action. The exploration of systems of feedback to enable consumers to apply more direct positive and negative pressure to the businesses and consumers signal consequences for undesirable ecological performance is a major motivation of this study.

Personas

- Use personas to articulate assumptions
- Persona: I care mostly about… fashion, art, …
- Don't Look Up (n.d.) Don't look up five user models / roles Consumer, Investor, Activist, ..

Community

- People exist in relation to other people.
- Psychology of 'fundraising clubs' vs individual investing
- "UkraineDAO Is Bidding on Ukrainian Flag | PartyBid" (n.d.) Ukraine DAO
- POAPs:

Zero Waste Lifestyle and Minimalism

Young people like to follow trends.

The opposite of overconsumption is the zero waste lifestyle. A movement of people living a simple life. This is always going to be a small percentage of people.

- Tokyo Simple Eco Life (2021)
- Costa (2018): Finnish socialists: minimalism
- Most college students are not zero waste or minimalist.

Design Implications: These social movements are small and require too much effort to be feasible for the app?

Group Purchases

Zero waste suggests people buy in bulk to save

Food ordering apps are popular.

- Buying in bulk for more savings.
- Through group purchases and community investing while also reducing consumption.
- People want to help and make a difference. Give people things to do.
- Choose Your Climate Solutions
- Find Your Composting Community
- Monoculture -> regenerative food forests Oil -> electric cars / bicycles

Mobile-First

Young people are mobile-first.

There's a number of user interface design patterns that have provide successful across a range of social media apps, copied from one to another, to the extent that the largest social media apps share a similar look and feature set.

- Mobile-first
- Provides a community for pooling money with like-minded investors
- Social
- Educational
- Edutainment
- Fun
- Stories section like IG / app store
- Common UI parts. Feed. Stories. By using common UI parts from social media users have an easier time to accept the innovative parts. add Viz charts. Avatars are increasingly common and new generations are used to talking to computers.
- Hoang (2022): "Dynamic interfaces might invoke a new design language for XR"

- aespa (2020): Karina from Korea. It makes sense your sustainability assistant would talk to you. Studies show gen N is speaking to computers all the time. Interacting with the user is on the rise. For example, Chime makes tipping suggestions on the place of purchase.

Intelligent Interfaces

- What is the role of an AI Designer? Linden (2021)
- *People + AI Guidebook* (n.d.)
- "Language Model Sketchbook, or Why I Hate Chatbots" (n.d.)
- Parundekar (2021)

Interaction Design

- Kolko & Connors (2010) and IxDF (n.d.) believe interaction design is still an emerging (and changing) field and there are many definitions. I prefer the simplest version: interaction design is about creating a conversation between the product and the user.
- Weinschenk (2011) says "People expect most online interactions to follow the same social rules as person-to-person interactions. It's a shortcut that your brain uses to quickly evaluate trustworthiness."
- Richard Yang (2021) and Justin Baker (2018) say some of the tools used by interaction designers include
- Red Route Analysis?
- AI for design: (**AINextChapter2023?**)
- Interface Studies: David Hoang (2022), the head of product design at Webflow, suggests taking cues from art studies to ***isolate the core problem***. "An art study is any action done with the intention of learning about the subject you want to draw". As a former art student, Hoang looks at an interface as *"a piece of design is an artwork with function"*.
- Social Objects: People need something to gather around and discuss. Sharing.Lab (2015): I'm interested in the concept of a "social object".
- How the design can connect people to sustainable outcomes while shopping and investing? Perhaps even forming a community of sustainable action. What I showed in class looks like an app but it could also be a physical object (a speculative design). From the presentations I saw most students seemed to be interested in form and light (many lamps) and a couple were about medical uses. I don't remember seeing one that could be compatible with the environmental sustainability focus unfortunately…

Design Implications

- Your shopping products mostly come from Protector and Gamble (3x) and Nestle. These are large conglomerates with a massive CO2 footprint. See the index to find some alternatives.

Experience Design

- In Michael Abrash (2017) Meta Oculus AR Incubation GM Laura Fryer: "People buy experiences, not technology."
- Loaning terminology from service design, the user journey within an app needs to consider each touchpoint on the way to a state of success.

Product Design

Young people expect a product.

- Konings (2020)
- "Digital sustainability principles"
- Eminent journal Design Studies, 1st design journal
- Ceschin & Gaziulusoy (2016) shows how design for sustainability has expanded from a product focus to systems-thinking focus placing the product inside a societal context of use.
- *Cargo Bike | FREITAG* (n.d.), Recycled clothing maker FREITAG offers sustainability-focused services such ass cargo bikes so you can transport your purchases and a network for *shopping without payment* = swapping your items with other members, as well as repairs of their products.

Design Systems

Create a design system to best to showcase my analytic skills

- *A Comprehensive Guide to Design Systems | Inside Design Blog* (n.d.)
- M. Suarez et al. (n.d.)
- "Method Podcast, Episode 18" (n.d.)
- *Atomic Design by Brad Frost* (n.d.)

Data-Driven Design

- Product marketers focus on the ***stickiness*** of the product, meaning low attrition, meaning people keep coming back.
- What percent of all design is "sustainable design" ? Promoting sustainable design.
- "Any community on the internet should be able to come together, with capital, and work towards any shared vision. That starts with empowering creators and artists to create and own the culture they're creating. In the long term this moves to internet communities taking on societal endeavors."
- Josh Luber (2021) Trading cards are cool again
- Jesse Einhorn (2020)
- Connie Loizos (2021)
- Natasha Mascarenhas (2021)
- JEFF JOHN ROBERTS (April 23, 2020 at 2:00 PM GMT+3)

Design Implications:

- Rebuilt the app as a personalized, narrative lifestyle feed.

Narrative Design

Bring together film school **storytelling** experience with design... Does branding also go here?

- Older research on young adults by Kate Moran (2016) (Millenials at the time) highlights how Millenials "use Google as a reference point for ease of use and simplicity".
- The rising availability of AI assistants however may displace Google search with a more conversational UX. Indeed, Google itself is working on smarter tools to displace their own main product, as exemplified by Google Assistant and large investments into LLMs.

Nudge & Gamification

- The literature on *nudge* is huge, as researches try to find ways to affect human behaviors towards sustainability. Some notable examples:
- Wee et al. (2021) proposes 7 types of nudging technique based on an overview of 37 papers in the field.

Name	Technique
Prompting	Create cues and reminders to perform a certain behavior
Sizing	Decrease or increase the size of items or portions
Proximity	Change the physical (or temporal) distance of options
Presentation	Change the way items are displayed
Priming	Expose users to certain stimuli before decision-making

Name	Technique
Labelling	Provide labels to influence choice (for example CO2 footprint labels)
Functional Design	Design the environment and choice architecture so the desired behavior is more convenient

- Eriksson et al. (2023) discusses best practices for reducing food waste in Sweden.
- Novoradovskaya et al. (2021) "16 billion paper coffee cups are being thrown away every year". Study of behavior change in Australia. **(Need access!)**
- Bain et al. (2012) "Promoting pro-environmental action in climate change deniers" **(Need access!)**
- Allcott (2011) "Social norms and energy conservation" **(Need access!)**
- Schuitema & Bergstad (2018) "Acceptability of Environmental Policies" **(Need access!)**
- Nilsson et al. (2016) "The road to acceptance: Attitude change before and after the implementation of a congestion tax" **(Need access!)**
- Acuti et al. (2023) makes the point that physical proximity to a drop-off point helps people participate in sustainability.
- A small study (n = 33) Perez-Cueto (2021) in the Future Consumer Lab in Copenhagen found that designing a "dish-of-the-day" which was prominently displayed helped to increase vegetarian food choice by 85%.
- Guath et al. (2022) experiments (n=200) suggested nudging can be effective in influencing online shopping behavior towards more sustainable options.
- Berger et al. (2022) **(Need access!)**
- Google and X have offered the "Green Filter" on Maps, Flights, etc. What if there was a "Green Filter" on every product everywhere?

- One example of *nudge* are the small UI updates released by Google across its portfolio of products: Google Flights and Google maps. Google's research introduces the concept of *digital decarbonization*, which Implement Consulting Group (2022) defines as "Maximising the enabling role of digital technologies by accelerating already available digital solutions".
- In Kate Brandt & Matt Brittin (2022), Google's Chief Sustainability Officer Kate Brandt suggests "Digital solutions play an important enabling role for at least 20-25% of the reductions required to achieve a net-zero economy in Europe".
- Mohit Moondra (n.d.): Google Maps AI suggests more eco-friendly driving routes
- Google Flights suggests flights with lower CO2 emissions

№	Product	Nudge
1	Google Maps	Show routes with lower CO2 emissions
2	Google Flights	Show CO2 emissions

- Becoming a Sustainability-Aware App or Game.

- Jeni Miles (2022) suggests "Google recently shared its goal to help one billion people make more sustainable choices by embedding carbon emissions information into Google Flights and surfacing whether a hotel is Green Key or EarthCheck certified."
- Kate Brandt & Matt Brittin (2022)
- "Support a Clean Energy Future with Nest Renew" (2022)
- Climatiq (2023) Automate GHG emission calculations
- Google (2023) Google Cloud Carbon Footprint tool.
- Sundar Pichai (2021) sustainability tools inside Google's products.
- EarthCheck (2023) sustainable tourism certification
- LFCA (2023) corporate climate action
- Greenhouse Gas Protocol (2023) standards to measure and manage emissions
- *Space Ape Games* (n.d.) game company going green
- Playing for the Planet Alliance (2021)

Platform Economy & Superapps

- Superapps are possible **thanks to Nudge.**
- The rise of the platform economy has given us marketplace companies like Airbnb and Uber that match idle resources with retail demand and optimize how our cities work. The massive amounts of data generated by these companies are used by smart cities to re-design their physical environments. With this perspective of scale, what would a shopping experience look like if one knew at the point of sale, which products are greener, and which are more environmentally polluting?
- Young people are stuck inside platforms. You don't own the data you put on TikTok. You can't leave because you'll lose the audience.
- Network Effects: The more people use a platform, the more valuable it becomes.
- The most successful businesses today (as measured in terms of the number of users) look at the whole user experience. Popular consumer platforms strive to design solutions that feel personalized at every touchpoint on the user journey (to use the language of service design) but doing so at the scale of hundreds of millions (or even billions) of users - personalization at scale.
- What would a sustainable investment platform that matches green investments with the consumers look like, if one saw the side-by-side comparison of investment vehicles on their ESG performance?

- How to design superapps? Lots of options in a single app.
- "Will Europe Get a Superapp, and Who Will It Be?" (2022)
- WeChat
- Adaptive AI
- Vecchi & Brennan (2022) China is the home of many superapps and this paper discusses the strategies taken to expand to other markets.
- Shabrina Nurqamarani et al. (2020) discusses the system consistency and quality of South–East Asian superapps Gojek and Grab.
- Zeng (2015) **(need to pay for article!)**
- Huang & Miao (2021) **(need to pay for article!)**
- G. Suarez et al. (2021) suggests using alternative data from super-apps to estimate user income levels, including 4 types of data: Personal Information, Consumption Patterns, Payment Information, and Financial services.
- Roa et al. (2021) finds super-app alternative data is especially useful for credit-scoring young, low-wealth individuals.
- Giudice (2020) MA thesis's argues WeChat has had a profound impact on changing China into a cashless society, underlining how one mobile app can transform social and financial interactions of an entire country.
- Fleet Management Weekly (2022) "Sustainability and superapps top Gartner's Top 10 2023 Trends List"
- Bernard (2022)
- Dave Wallace (2021) "The rise of carbon-centric super apps"
- Lori Perri (2022)
- "Partnership Brings Sustainability Mobility into Superapps" (2022)
- goodbag (2023) "goodbag: Sustainable Super App"
- "The Company Now Dominating European Fintech Is… Paypal" (2021) PayPal dominance

Quantified Self & Wearables

Use technology to be more aware of one's health.

- Figure 9: Popular Strava sports assistant provides run tracking and feedback. AI Financial Advisors will need to go further to motivate users. because of the nature of the technology, which is based on the quality of the data the systems ingest, they are prone to mistakes.

There is a lot of research on quantified self. the Wearable devices like Apple Watch, Oura Ring and apps help users track a variety of health metrics. Can we also track personal sustainability in a similar fashion?

- There is a parallel in health to sustainability and indeed both are inextricably linked.
- Apple (2022a): In a 2022 report Apple outlines its plans to : "Empowering people to live a healthier day"
- Apple (2022b) What's new in HealthKit
- Delclòs-Alió et al. (2022) discusses walking in Latin American cities. Walking is the most sustainable method or transport but requires the availability of city infrastructure, such as sidewalks, which many cities still lack.
- Giannakos et al. (2020) used wearable devices to measured physiological parameters of students at school to determine their learning efficiency.
- Shin et al. (2019) synthesis review of 463 studies shows wearable devices have potential to influence behavior change towards healthier lifestyles.
- Tsai et al. (2019)
- Burger et al. (2019)
- Aromatario et al. (2019) behavior changes
- Liu et al. (2019) tracks how wearable data is used for tracking sleep improvements from exercise
- Ayoola et al. (2018) wellbeing data
- Godfrey et al. (2018)
- Thomas et al. (2018)
- Tonne et al. (2017)
- Grigsby-Toussaint et al. (2017) Sleep apps and behavioral constructs
- Anselma et al. (2017)
- Forlano (2017) post-humanism and design

- Saubade et al. (2016) motivating physical activity
- Greenbaum & Gerstein (2016)
- Millings et al. (2015)
- Reis et al. (2015)
- Bower & Sturman (2015)
- Fletcher (2022)
- Ryan (2022) uses the "capability methodology" to evaluate if apps help people eat healthily.
- Tyler et al. (2022) surveys the use of self-reflection apps in the UK (n=998)
- Wirani et al. (2022) students in Indonesia enjoy using Kahoot and it's gamification elements are perceived to have positive impact on individual learning outcomes so they are happy to continue using it.
- Baptista et al. (2022) apps for sleep apnea

Design Implications:

- What would that look like for sustainability?
- Empowering people to live a sustainable day

Education

Guided Sustainability

Sustainability touches every facet of human existence and is thus an enormous undertaking. Making progress on sustainability is only possible if there's a large-scale coordinated effort by humans around the planet. For this to happen, some technological tools are required.

- "Guided Sustainability refers to a concept of using technology, such as AI and machine learning, to help individuals and organizations make more sustainable decisions and take actions that promote environmental and social sustainability. This can include things like analyzing data on resource usage and emissions, providing recommendations for reducing the environmental impact of operations, or helping to identify and track progress towards sustainability goals. The goal of guided sustainability is to make it easier for people to understand their impact on the environment and to take steps to reduce that impact."
- Sanchez et al. (2022) LoRaWAN

- There are many examples of combination of AI and human, also known as "human-in-the-loop", used for fields as diverse as training computer vision algorithms for self-driving cars Wu et al. (2023) and detection of disinformation in social media posts: Bonet-Jover et al. (2023). However Krügel et al. (2023) finds humans don't necessarily correct mistakes made by computers and may instead become "partners in crime".
- Stanford Institute for Human-Centered Artificial Intelligence Ge Wang (2019)

Table 3: Examples of human-in-the-loop apps

App	Category	Use Case
Welltory	Health	Health data analysis
Wellue	Health	Heart arrythmia detections
QALY	Health	Heart arrythmia detections
Starship Robots	Delivery	May ask for human help when crossing a difficult road or other confusing situation

Design Implications:

- Guidance could help young people beat climate anxiety by taking meaningful action.
- The app is just as much about helping people deal with climate anxiety as it's with solving the climate issue.
- List of metrics that should be tracked to enable useful analytics. Ex: % of beach pollution, air pollution, water pollution (I had this idea while meditating). In essence, "green filter" is a central data repository not unlike "Apple Health for Sustainability".
- Health and fitness category apps
- Using "green filter" you can get a personalized sustainability plan and personal coach to become healthy and nature-friendly

Imagination

It's important to be able to imagine a better future.

Speculative Design

- The term *'speculative design'* was invented by Dunne & Raby (2013) in their seminal book as the question on the intersection of user experience design and speculation. Speculative design makes use of future scenarios to envision contexts and interactions in future use.

- Phil Balagtas, founder of The Design Futures Initiative at McKinsey, discusses the value of building future scenarios at his talk at Google (Google Design (2019)). One of his examples, the Apple Knowledge Navigator, from an Apple vision video in 1987, took two decades to materialize in the real world, inspired by a similar device first shown in a 1970s episode of Star Trek as a magic device (a term from participatory design), which then inspired subsequent consumer product development - and then another 2 decades, until the launch of the iPhone in 2007 - a total of 40 years!
- Barendregt & Vaage (2021) explores the potential of speculative design to stimulate public engagement through thought experiments that spur public debate on an issue chosen by the designer.

Design Implications:

- "Speculative Design" for a sustainability assistant
- All green categories — Green hub — Ask the user to prioritize
- In my "green filter" AI advisor app's scenario, the AI is scanning for opportunities matching the user's sustainable investment appetite and risk profile, using different methods of analysis, including alternative data sources. Traditionally, financial analysts only looked at traditional data, such as company reports, government reports, historic performance, etc., for preparing advisory guidance to their clients. With the advent of AI and big data analysis, many other options of research data have become available, for example, accurate weather predictions for agriculture can affect guidance, because of expected future weather disasters in the area. Other examples include policy predictions, pollution metrics, etc.
- Professional financial advisors use automated tools to analyze data and present it in human form to clients. Today's ubiquitous mobile interfaces, however, provide the opportunity to 'cut out the middleman' and provide similar information to clients directly, at a lower cost and a wider scale, often without human intervention. Additional (more expensive) "human-judgment- as-a-service", a combination of robots + human input, can help provide further personalized advice for the consumer, still at a cheaper price than a dedicated human advisor. Everyone can have a financial advisor.

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