Designing for Mindful Human-Computer Interaction

The designer perspective

Alberto Monge Roffarello

Politecnico di Torino

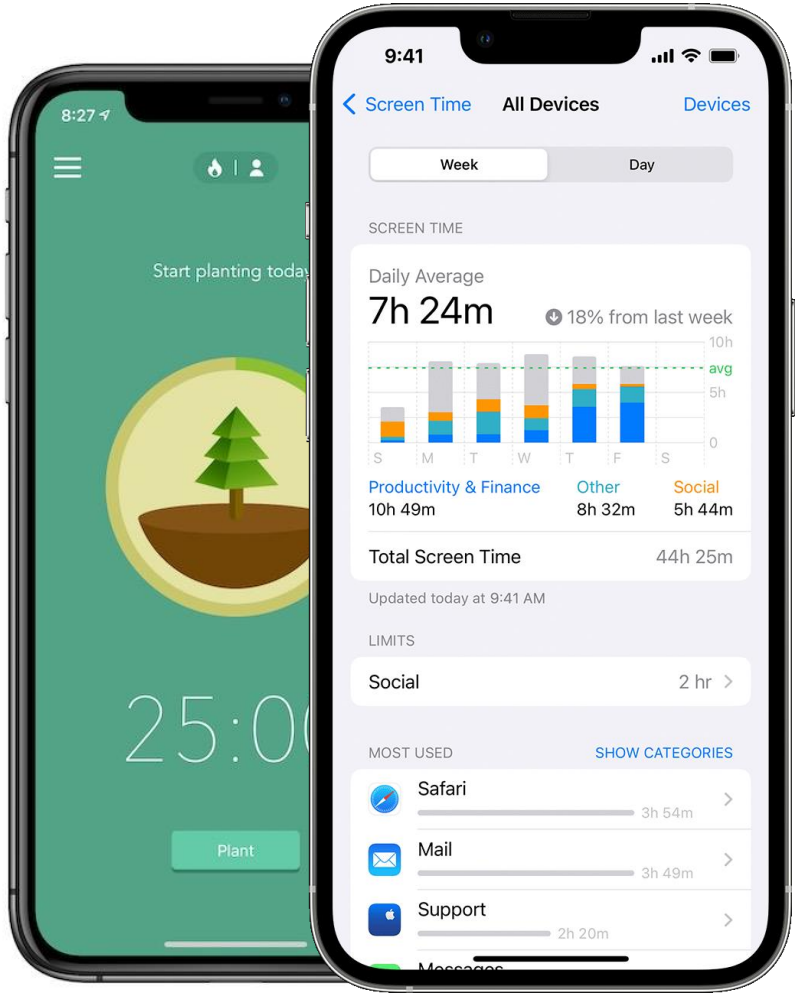
Academic Year 2024/2025

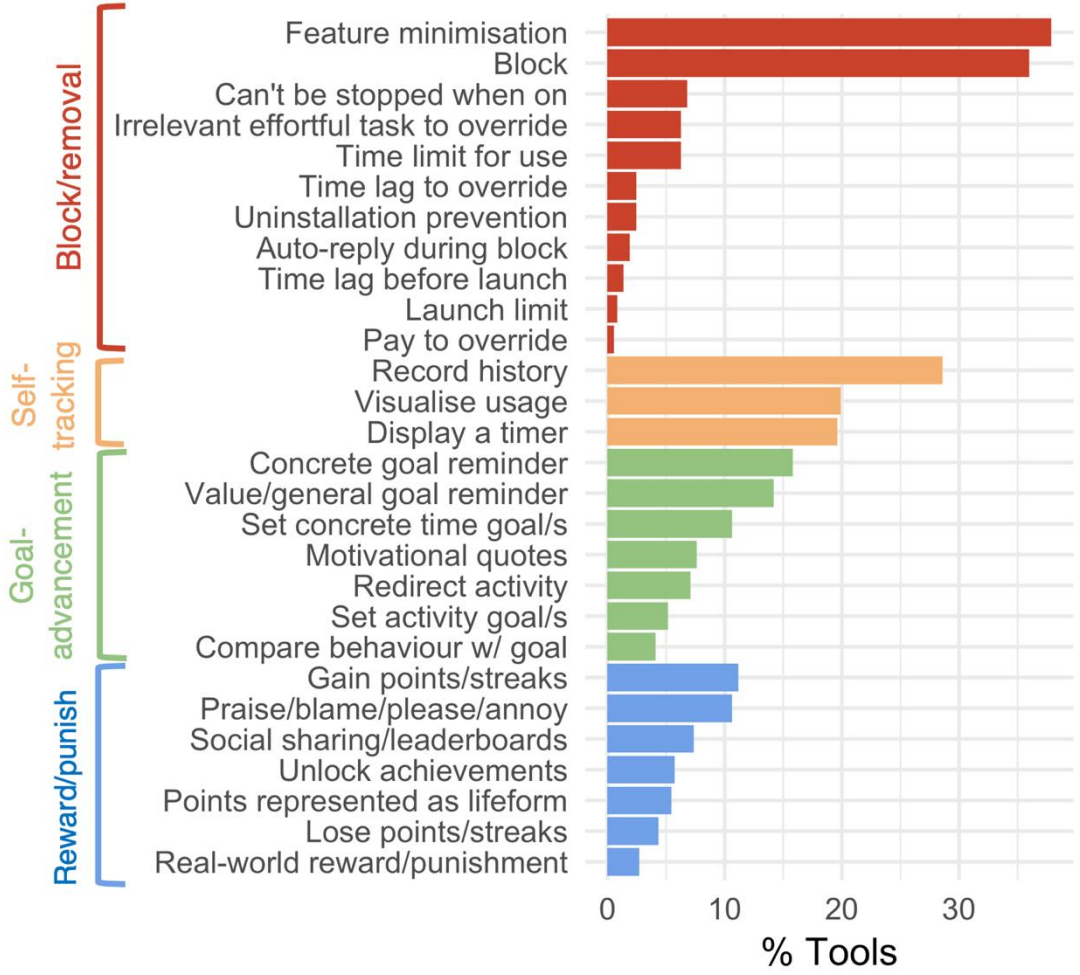
e-Lite

Outline

- Designing for the Good
- The Digital Attention Heuristics
- Digital Wellbeing Design Support Tools

Promoting Digital Wellbeing: the End-User Perspective



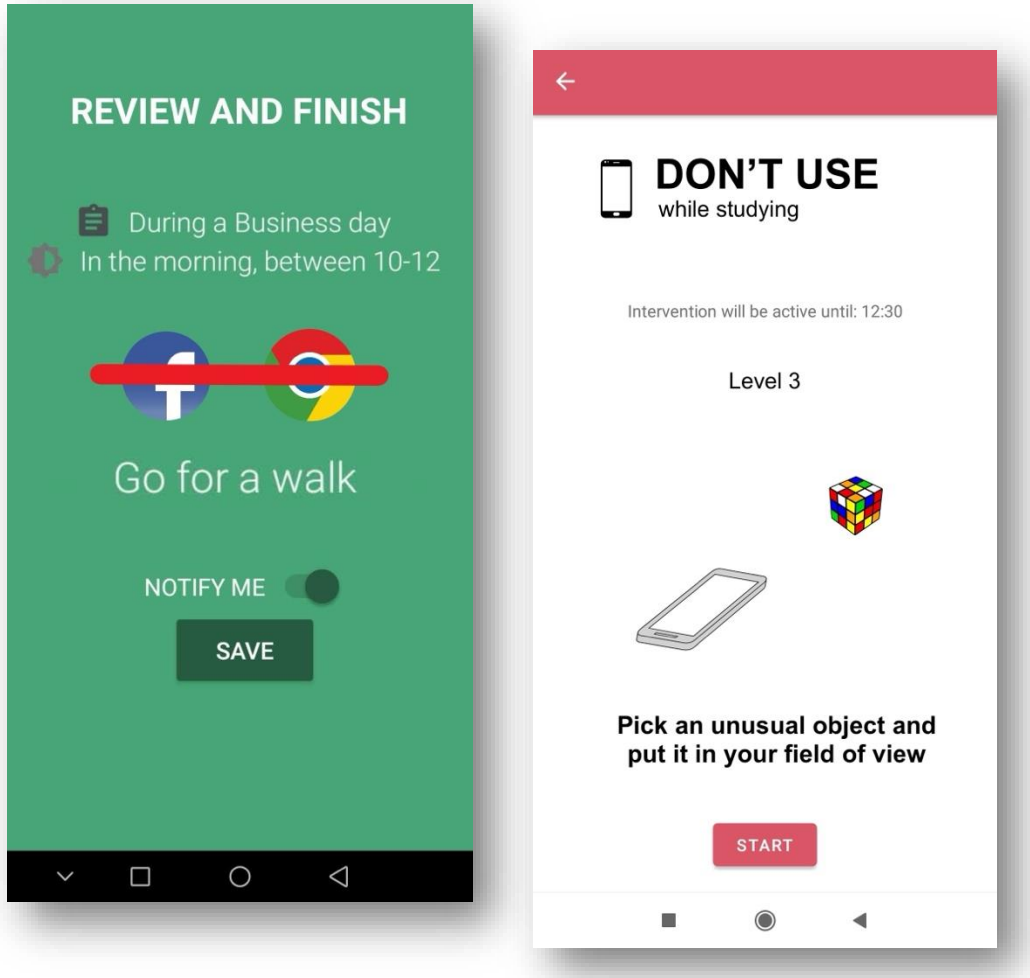


Lyngs et al., *Self-Control in Cyberspace: Applying Dual Systems Theory to a Review of Digital Self-Control Tools*, CHI 2019, https://arxiv.org/abs/1902.00157

Known Gaps in Contemporary DSCTs

1. **self-monitoring nature:** through contemporary DSCTs, people need to figure out for themselves the causes of their problems and possible solutions;
2. **short-term effectiveness:** contemporary DSCTs are not effective in the long term, as they do not promote the formation of new habits;
3. **focus on (single-device) screen-time:** is reducing screen time the right way to support people's digital wellbeing?
4. **theoretical gap:** DSCTs and the digital wellbeing research area are not sufficiently grounded in HCI and behavioral theories.

Known Gaps in Contemporary DSCTs



Having "smarter" and more proactive DSCTs does not resolve the **underlying contradictions** of these tools.

Going Beyond DSCTs

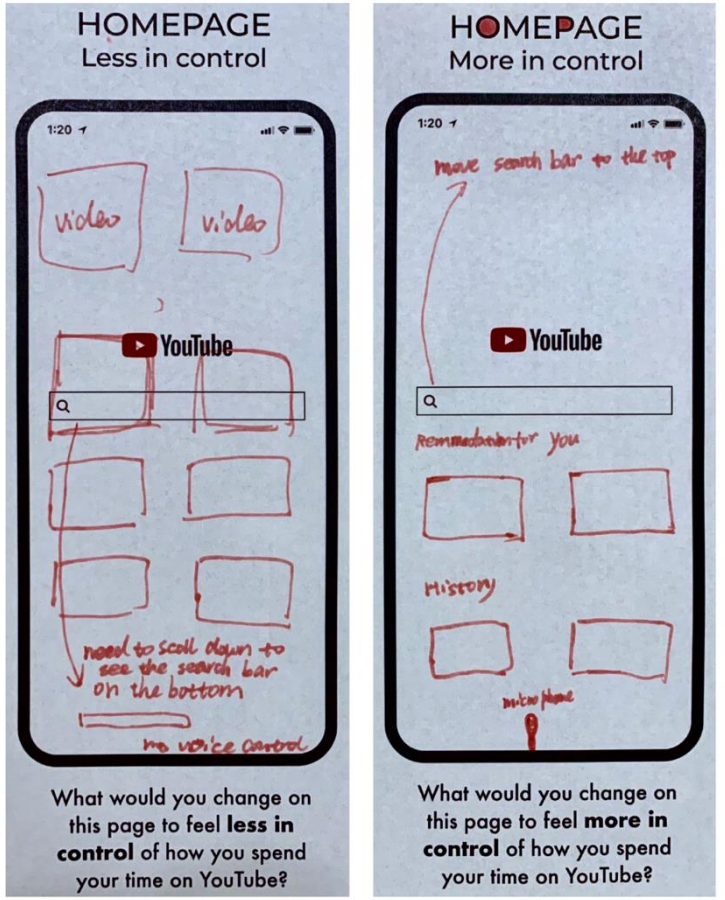
- A more radical change (business model, regulations and policies, ...) would undoubtedly offer benefits to users:
  - while technology companies are often blamed for not doing enough against problems such as violence and radicalization on social networks, achieving digital wellbeing has traditionally been seen as a responsibility that belongs to the user alone;
  - **promoting digital wellbeing is a responsibility of tech companies, too!**

Going Beyond DSCTs

- For example, a business model that focuses on the user's digital well-being (rather than attention):
  - may initially result in **lower user engagement and profitability** in the short term
  - it could increase **user loyalty** in the long term.

Designing for the Digital Wellbeing

- Instead of "blocking" possible interactions through DSCT, HCI researchers are trying to re-design the internal mechanisms used by digital platforms:
  - usage of **human-centered design processes;**
  - development and promotion of **guidelines** for designing/evaluating technologies that respect people's digital wellbeing.



How the Design of YouTube Influences User Sense of Agency
https://arxiv.org/abs/2101.11778

Designing for the Good

Positive Design, Value-Sensitive Design, and the Wellbeing Supportive Design toolkit

Non-Design

- Compared to DSCTs, the other end of the spectrum is perhaps the notion of **«non-design»** (Baumer and Silberman, 2011)
- It challenges the pervasive assumption that technological interventions are always the solution through three questions:
  - *Could the technology be replaced by an equally viable low-tech or non-technological approach to the situation?*
  - *Does a technological intervention result in more trouble or harm than the situation it's meant to address?*
  - *Does a technology solve a computationally tractable transformation of a problem rather than the problem itself?*

Positive Design

- The concept of **integrating wellbeing** into technology design is not a novel idea; rather, it has been a topic of discussion among designers and researchers for several years.
- The **Positive Design** framework (Desmet and Pohlmeyer, 2013) emphasizes creating products and experiences that enhance users' quality of life, encouraging designers to consider the broader impact of their work on individuals and communities.

Value-Sensitive Desing

- **Value-Sensitive Design** (Friedman, 2019) focuses on incorporating ethical considerations and human values into the design process, ensuring that the outcomes align with the needs and aspirations of users.
- Steps:
  - *Establish the users' values*
  - *Connect the design to the values*
  - *Design with those values in mind*
  - *Confirm that the design has succeeded in capturing the users' values*

The Wellbeing Supportive Design toolkit

- A toolkit for technology-makers interested in applying wellbeing psychology to design.
- It includes (among other things):
  - Guidelines and design strategies for supporting psychological wellbeing in User Experience (Peters, 2023)
  - The Motivation, Engagement and Thriving in User Experience (METUX) scales (Peters et al., 2018), which includes 5 questionnaires for measuring basic psychological need satisfaction and frustration within 5 spheres of technology experience (*adoption*, *interface*, *task*, *behavior*, and *life*)

The Digital Attention Heuristics

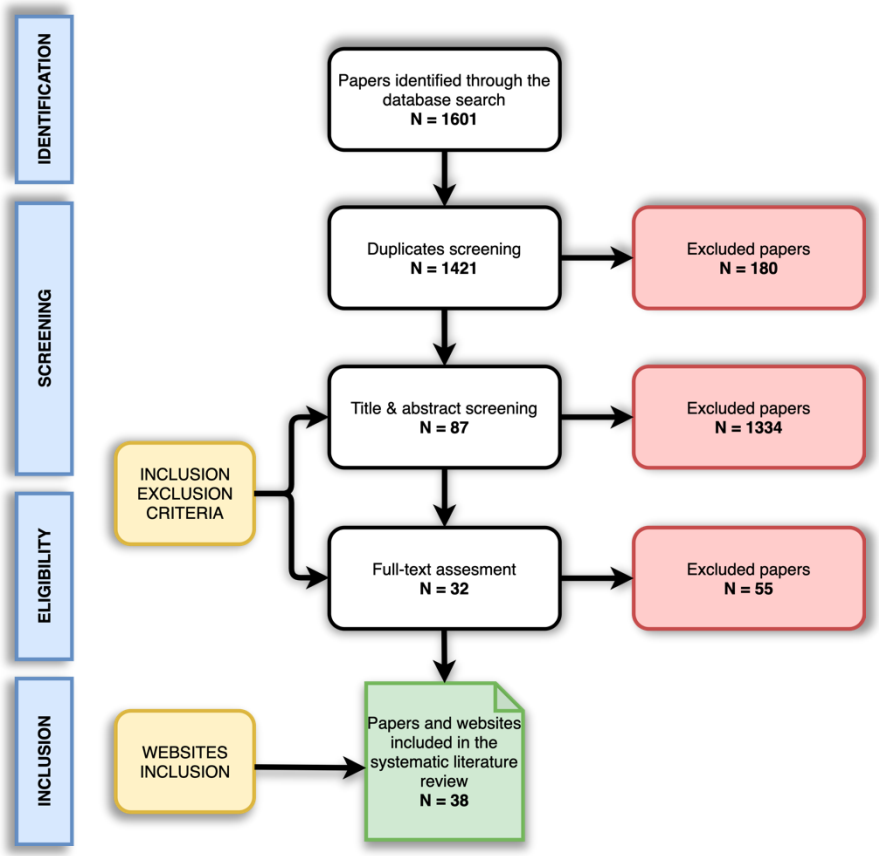
Respecting the user's time and attention by design

Designing for the Digital Wellbeing

Table 2. The search queries used to search the electronic database of the ACM Guide to the Computing Literature. All the searches included manuscripts published from January 2000 to December 2021 whose "content type" was "Research Article."

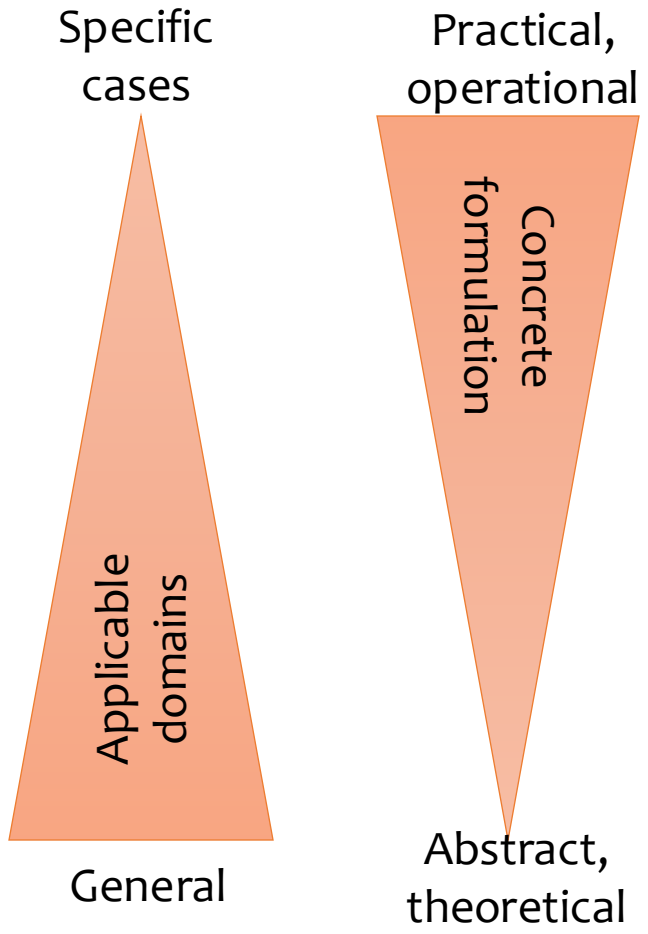
Search Query	# Results
("internet addiction" OR "smartphone addiction" OR "social media addiction" OR "technology addiction" OR "app addiction") AND ("design" OR "guideline" OR "principle")	571
("digital intervention" OR "digital nudge" OR "digital self-control) AND ("design" OR "guideline" OR "principle")	314
("attention economy" OR "attention-capture") AND ("design" OR "guideline" OR "principle")	230
"dark pattern" AND ("design" OR "guideline" OR "principle")	184
("digital wellbeing" OR "digital well-being") AND ("design" OR "guideline" OR "principle")	88
("digital overload" OR "digital overuse" OR "technology overload" OR "technology overuse") AND ("design" OR "guideline" OR "principle")	60
("smartphone overload" OR "smartphone overuse" OR "phone overload" OR "phone overuse") AND ("design" OR "guideline" OR "principle")	50
"digital distraction" AND ("design" OR "guideline" OR "principle")	36
("internet overload" OR "internet overuse") AND ("design" OR "guideline" OR "principle")	32
("unethical interface" OR "evil interface" OR "manipulative interface") AND ("design" OR "guideline" OR "principle")	20
("digital break" OR "digital diet") AND ("design" OR "guideline" OR "principle")	10
("social media overload" OR "social media overuse" OR "social networks overload" OR "social networks overuse") AND ("design" OR "guideline" OR "principle")	6

Digital Attention Heuristics:
a Systematic Literature Review



Designing for the Digital Wellbeing

- **Guidelines**: Low-level focused advice about good practices and cautions against dangers.
- **Principles/Heuristics**: general principles or rule of thumbs that can guide a design decision or be used to critique a decision that has already been made.
- **Theories**: High-level widely applicable frameworks to draw on during design and evaluation, as well as to support communication and teaching.



The Self-Determination Theory

- The Self-Determination Theory defines SDT defines three “basic psychological needs”:
  - **autonomy:** a sense of willingness/endorsement, acting in accordance with one’s goals and values;
  - **competence:** feeling able and effective;
  - **relatedness:** feeling connected to and involved with others.
- It has been applied to HCI within various domains and is distinctive for providing a foundational core – a minimum set of wellbeing requirements that can be applied to all technologies, regardless of context or activity.

The Self-Determination Theory

- All designers should, at minimum, ensure that three fundamental psychological needs are met within the user experience:
  - where a design frustrates these needs, there are likely to be negative impacts on wellbeing.
- We developed 8 digital wellbeing heuristics by categorizing them under a given need modeled by STD, i.e., autonomy, competence, and relatedness.

Support Autonomy (Heuristics #1, #2, #3, and # 4)

- Supporting autonomy means supporting people to act **willingly**, in ways they endorse and in accordance with their **goals** and **values**:
  - Users who can't influence an interface in alignment with their goals get frustrated, and their sense of autonomy is undermined.
- Autonomy lies at the heart of many usability guidelines.
- When people act autonomously, they are, above all, self-endorsing this action. Autonomy is linked to **goals** and **values** and connects a usage session to a **sense of meaning and purpose**.

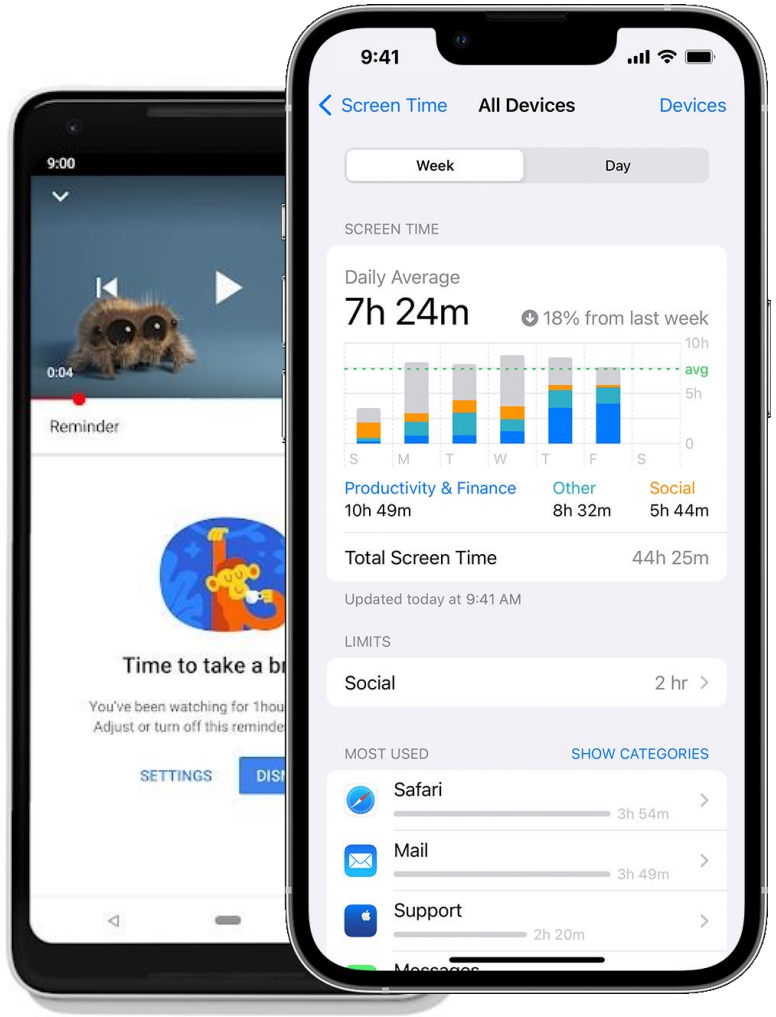
Heuristic #1

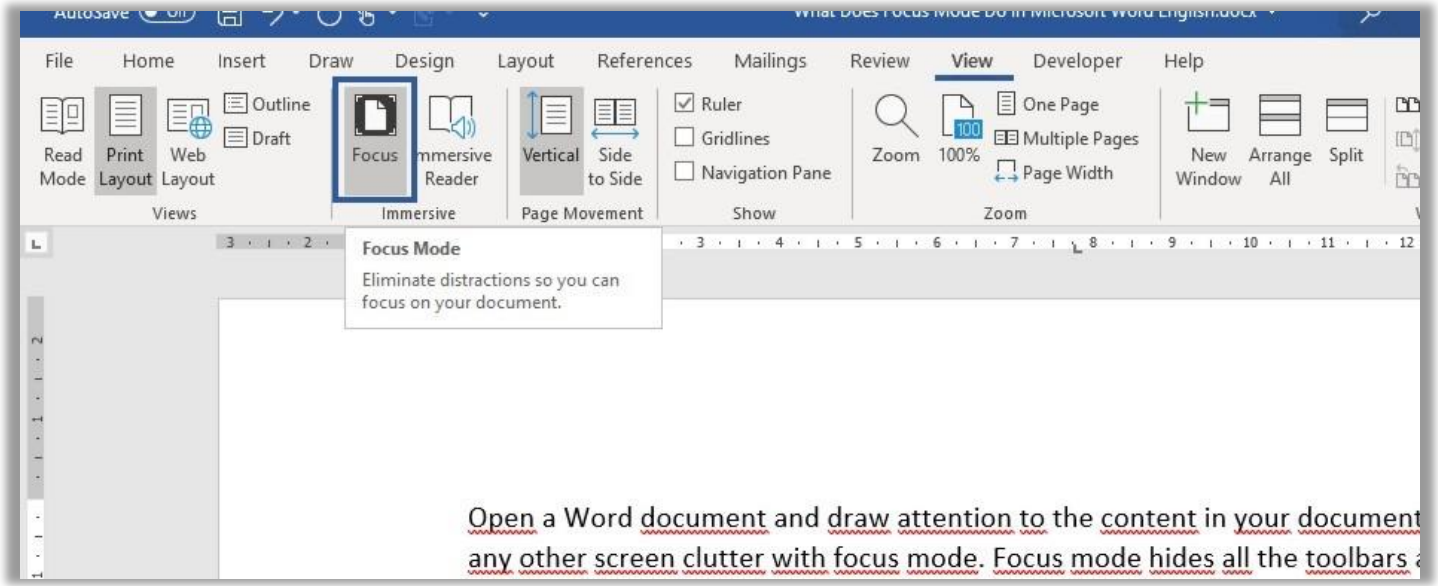
- **Support mindful attention and sense of agency**
- Design to support volitional experiences of focus, mindful awareness, and attention, breaking the link between users' time spent/interactions on the platform and profit.

Heuristic #1: Strategies

- Simplify the interface to support focus and avoid distractions that may disrupt attention.
- Minimize distractions and help people reclaim and retain autonomy over their attention.
- Provide users with tools for supporting self-regulation, e.g., usage dashboards, timers, and lock-out mechanisms.
- Use positive friction mechanisms like confirmation dialogs to help users reflect upon their usage behaviors, prevent errors, avoid unintentional actions, and promote critical thought and healthier digital habits.

Heuristic #1: Examples





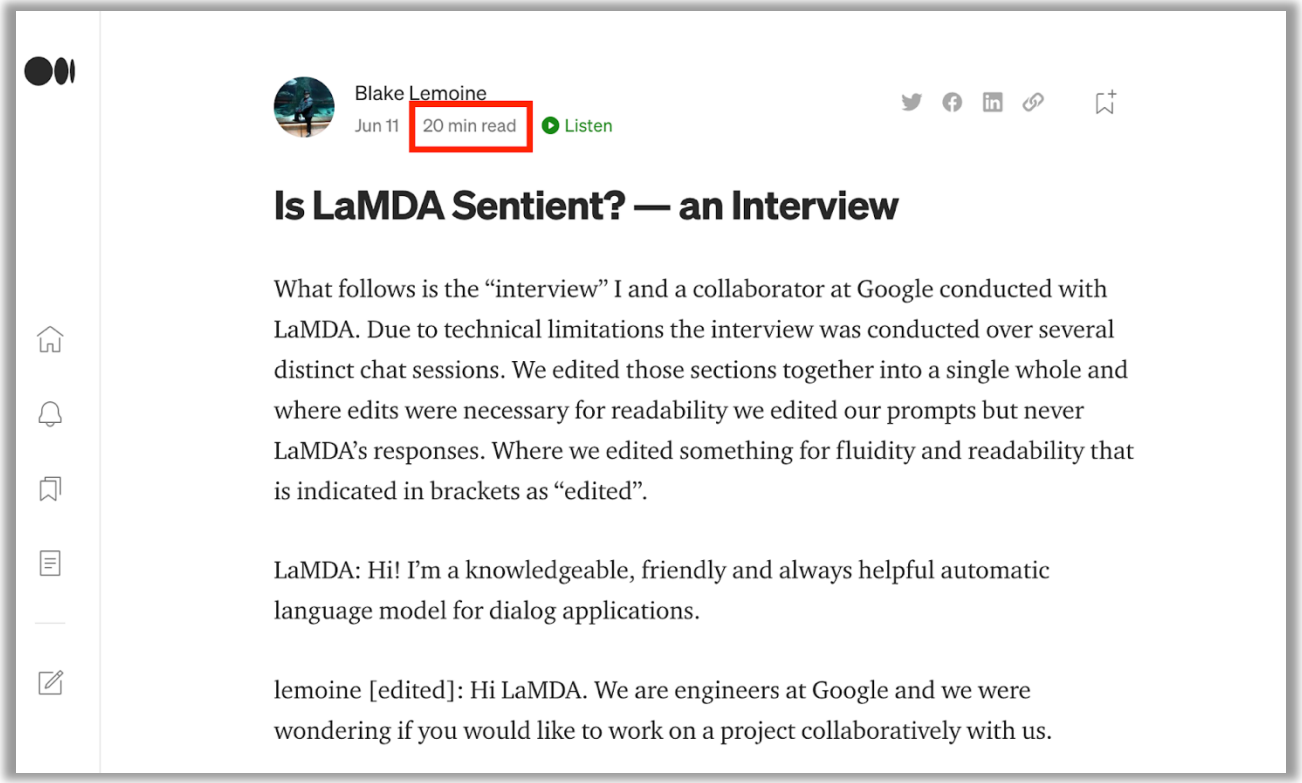
Heuristic #2

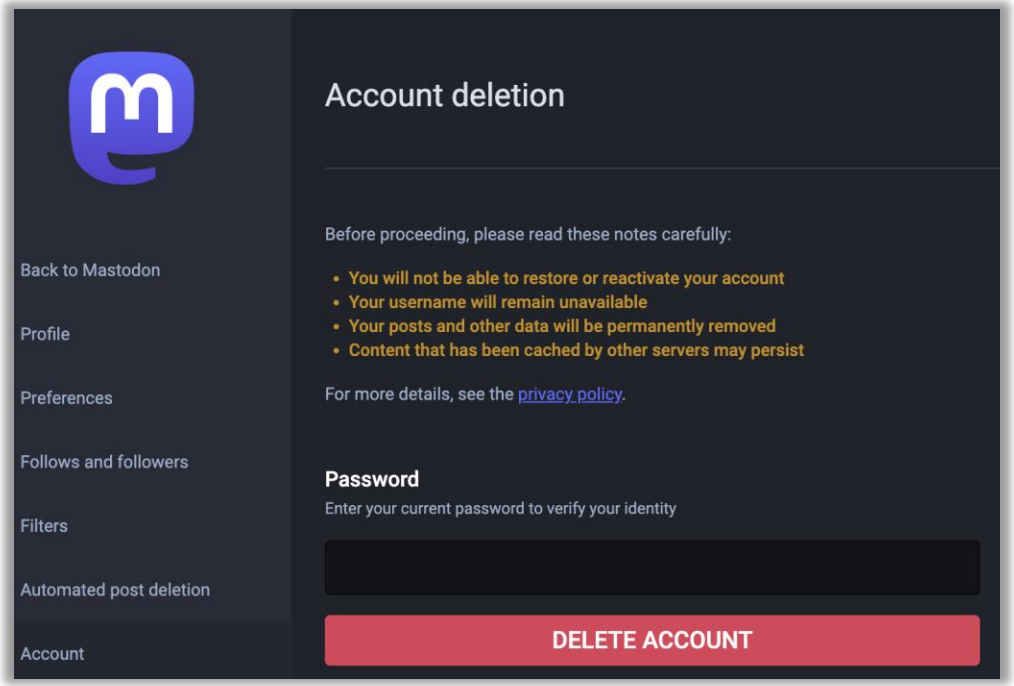
- **Support informed usage sessions**
- Provide the user with the information necessary for making choices for deciding whether it's worth starting or continuing a usage session, making sure to adopt a transparent design that is clear about intentions and honest in actions.

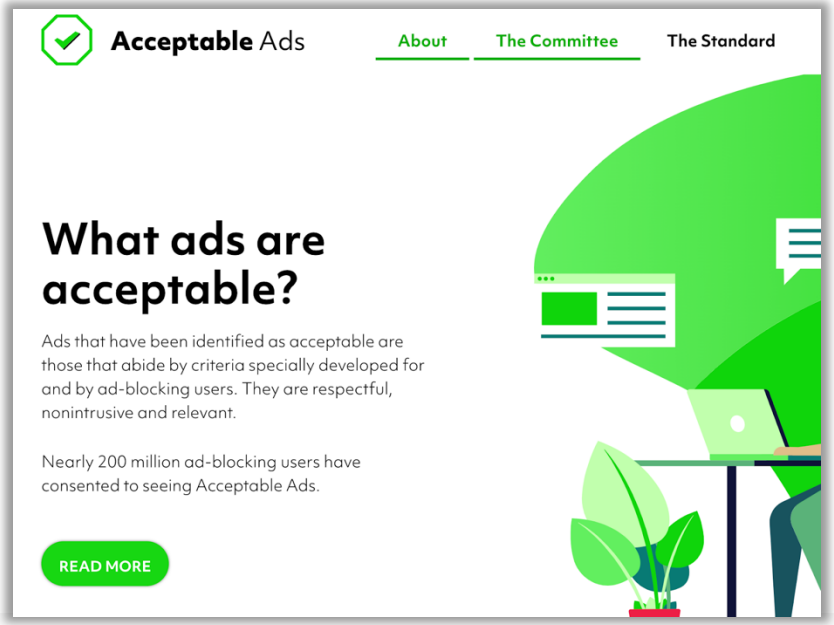
Heuristic #2: Strategies

- Provide a preview of the status of newly available content.
- Allow users to preview what would happen if they made a particular choice, confident that they can undo or change their mind without cost.
- Give an indication of how much time is needed to consume it so that users can avoid opening an app or a website if there is no new content or if they do not have enough time.
- Prevent redirection, e.g., by enabling users to read and manage the content of a notification directly from the notification itself without the need to open the app.
- Ensure that advertisements are relevant, transparent, and clearly distinguishable from other content.
- Ensure that users can easily find the option to log out, unsubscribe, or delete their account if they choose to do so.

Heuristic #2: Examples







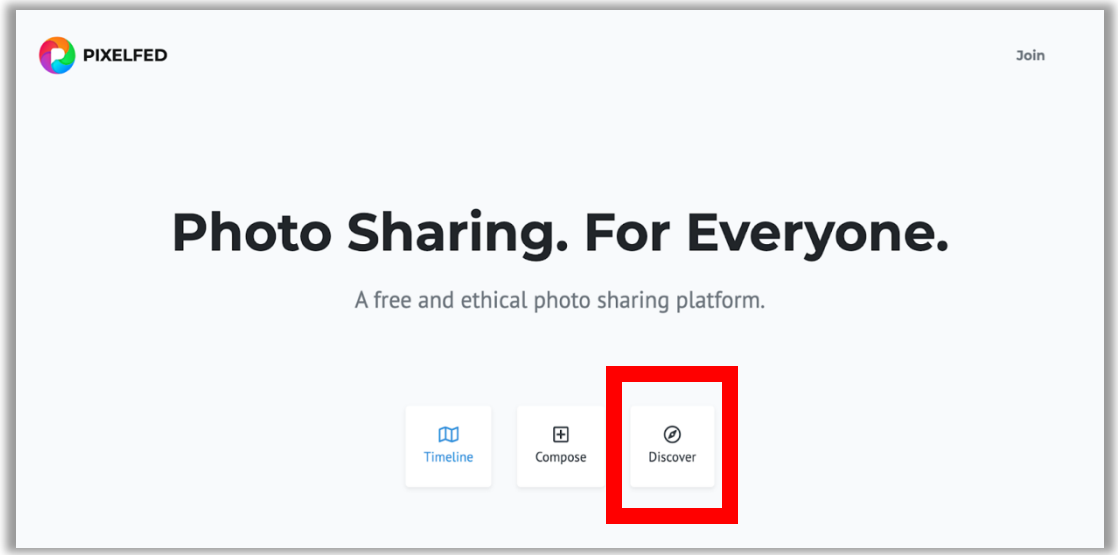
Heuristic #3

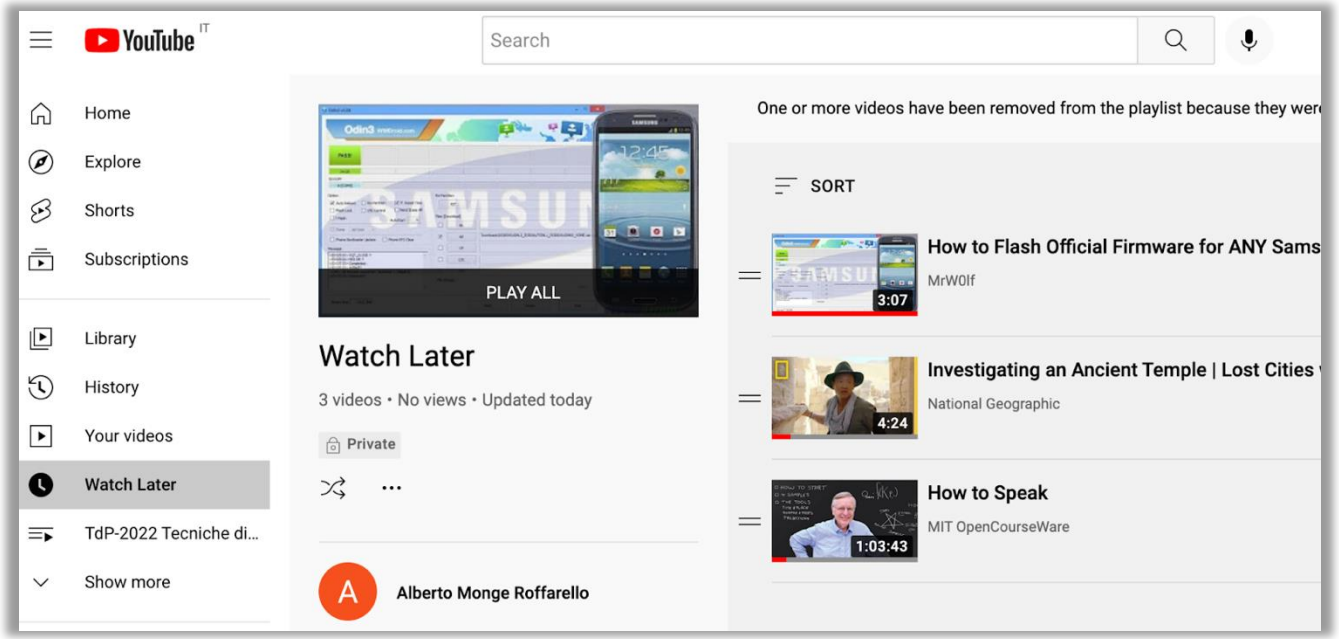
- **Promote content quality and instrumental use**
- Adopt designs that allow users to maximize the overall quality of time spent rather than the quantity by prioritizing instrumental use, i.e., goal-directed use to gratify informational needs, rather than ritualistic use, i.e., open-ended use to gratify diversionary needs.

Heuristic #3: Strategies

- Allow users to make lightweight plans that guide their usage behaviors, thus enabling them to make some kind of investment that persists beyond the isolated usage session.
- Let the user switch between low and high-control interfaces, e.g., switching between an Explore Mode and a Focus Mode.

Heuristic #3: Examples





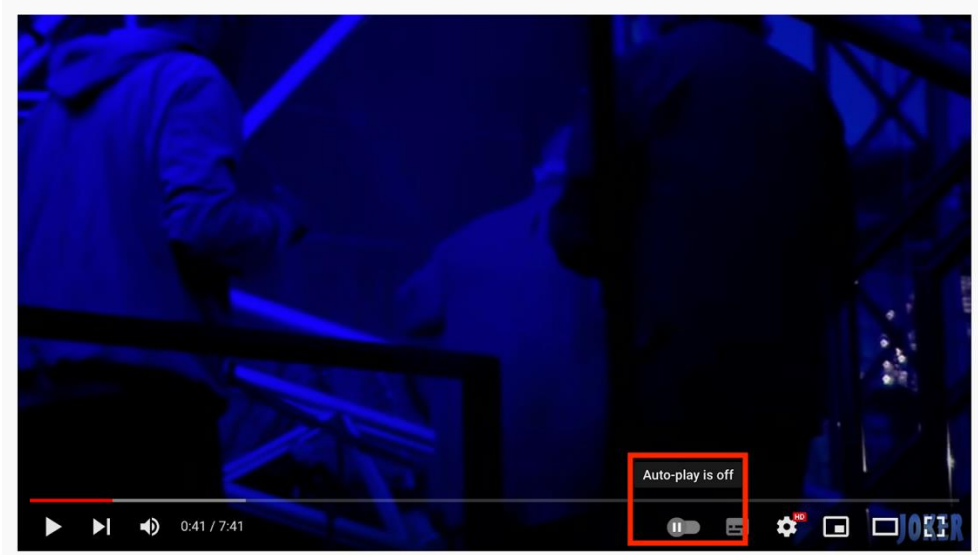
Heuristic #4

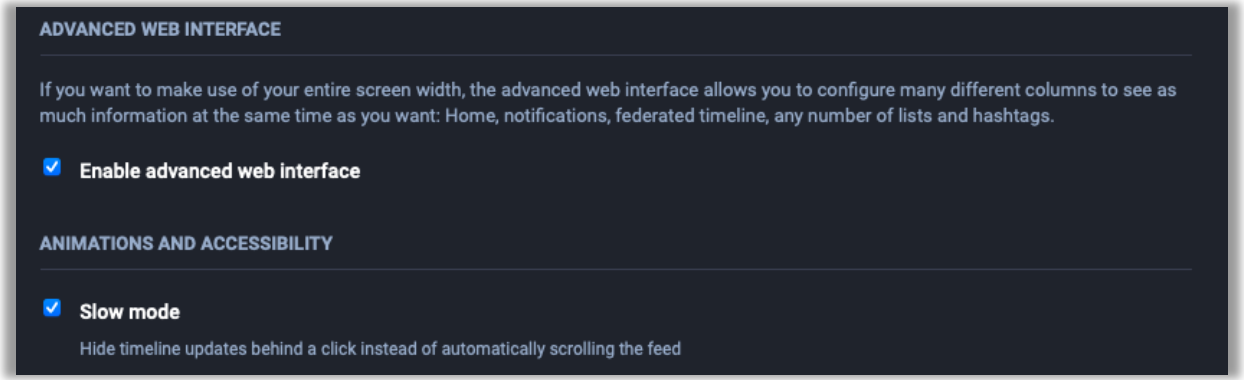
- **Support personalization**
- Ensure that users can understand and personalize the digital environment they are interacting with to better suit their goals, values, and digital wellbeing.

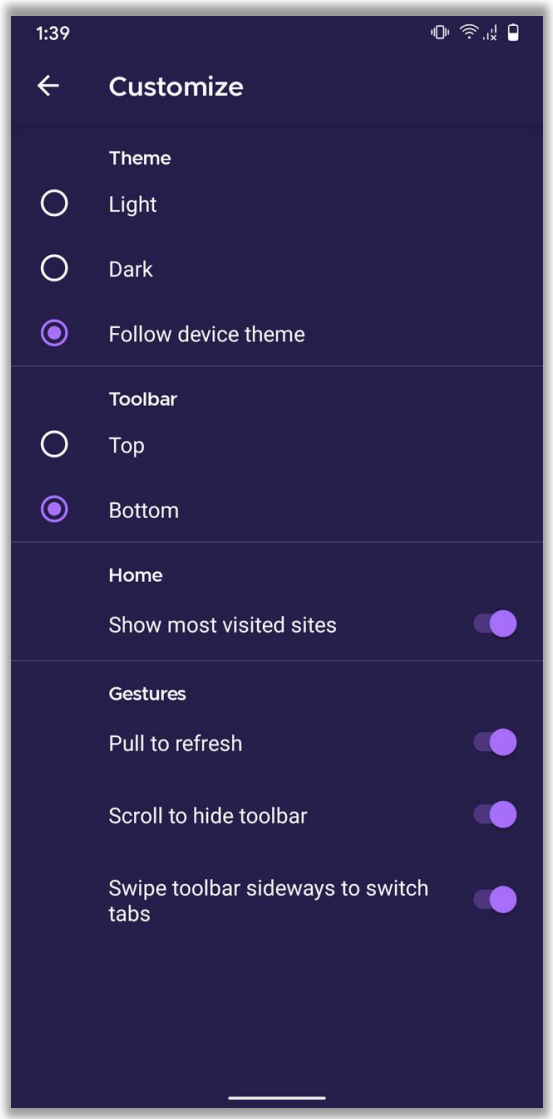
Heuristic #4: Strategies

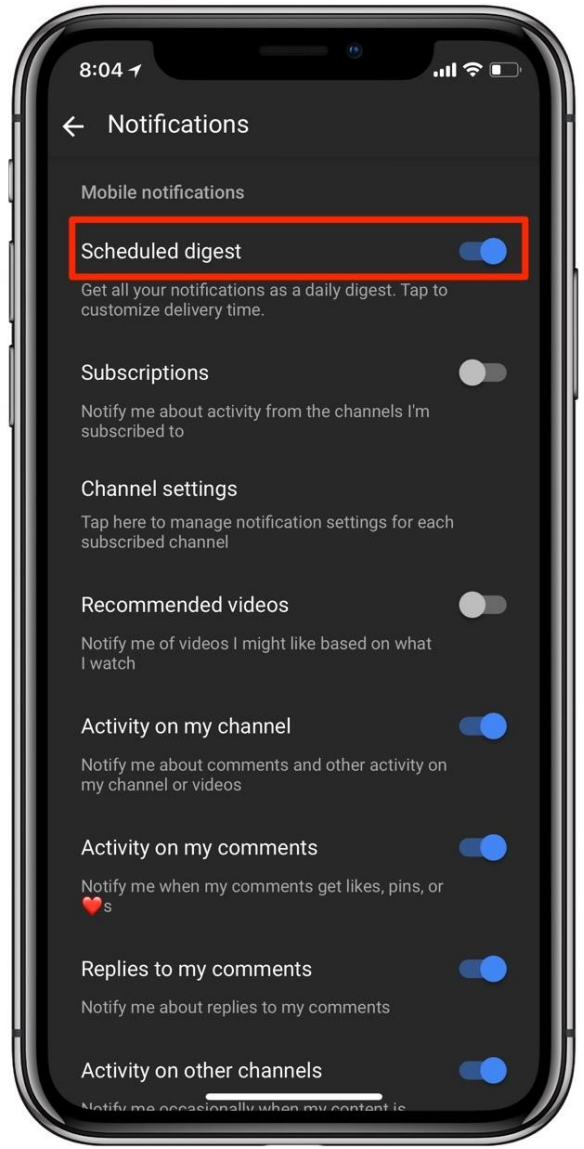
- Offer options for users to personalize or disable a design or functionality which may be perceived as distractive or attention-capture.
- Give users tools for giving feedback on attention-capture content, strategies, and interaction modalities adopted by the digital platform.

Heuristic #4: Examples









Support Competence (Heuristics #5 and # 6)

- Competence is defined as feeling **capable** and **effective** and involves the intrinsic drive for self-efficacy, growth, learning, and mastery:
  - "feelings of competence come about when people have opportunities to apply skills and effort to tasks that are moderately difficult, allowing them to experience efficacy and success and thus to derive feelings of mastery and competence." (Ryan & Deci, 2017, p. 513).
- Supporting competence means providing **optimal challenge, positive feedback, and opportunities for learning**:
  - even when someone is not engaged in learning, competence frustrations emerge when they feel incapable or ineffective.

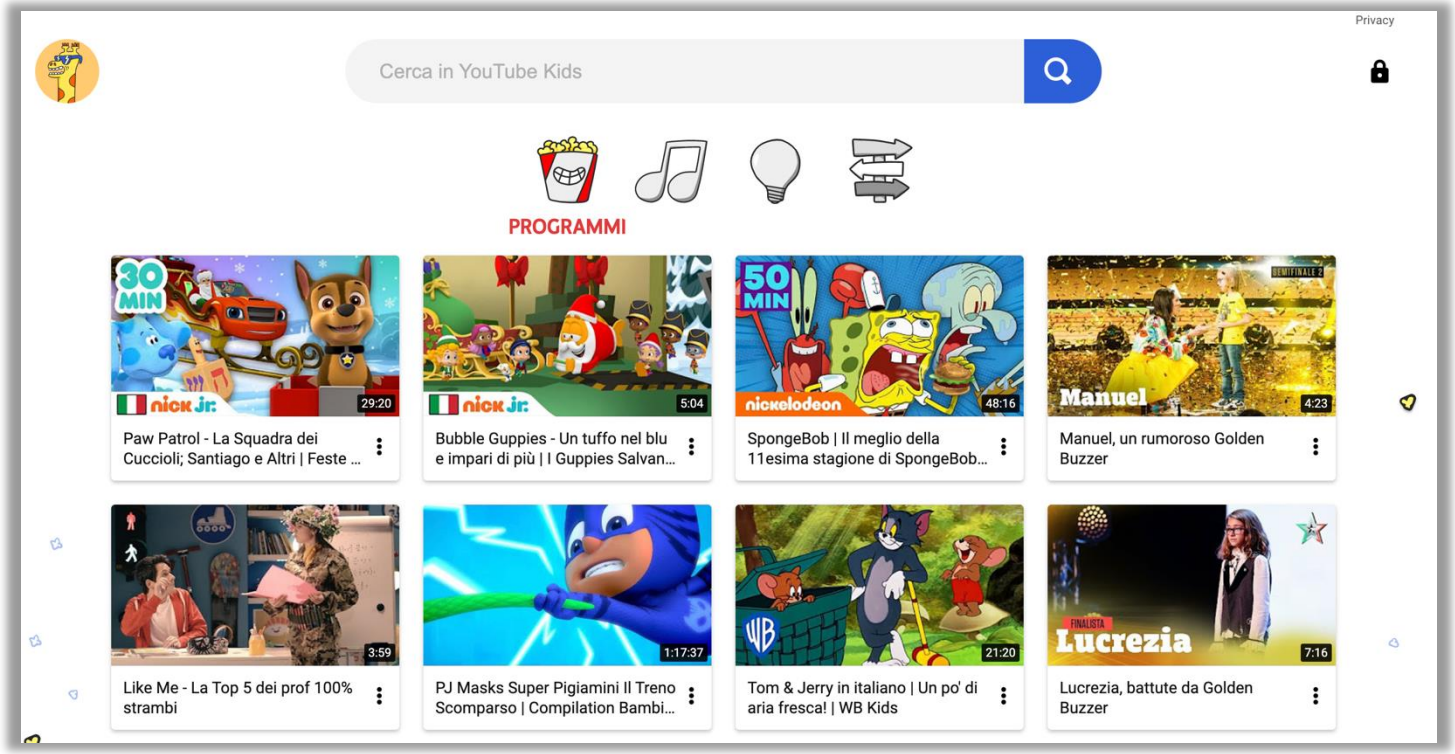
Heuristic #5

- **Tailor usage to users and contexts**
- Ensure the level of complexity or challenge required to start, perform, or end a usage session with a digital service is appropriate for the user and context.

Heuristic #5: Strategies

- Offer different levels of control for ritualized and instrumental use, e.g., by providing users with higher-control mechanisms when they have a specific intention in mind and lower-control ones when they have a non-specific intention.
- Change the user interface based on a personalized prediction model, e.g., present a search-only interface and hide all recommendations for instrumental use.
- Break down big tasks into manageable parts - In education, this is called “chunking” or “segmenting,” and in behavior change, it has sometimes been framed as breaking behaviors down into “tiny” habits.

Heuristic #5: Examples



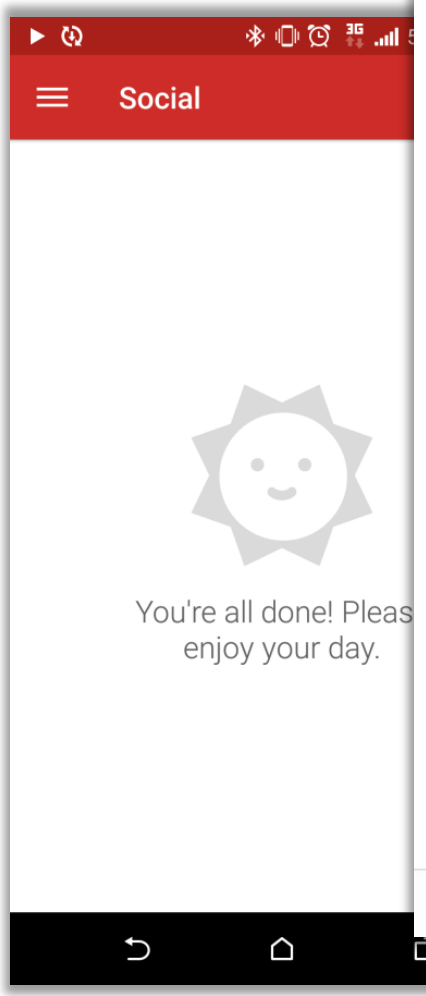
Heuristic #6

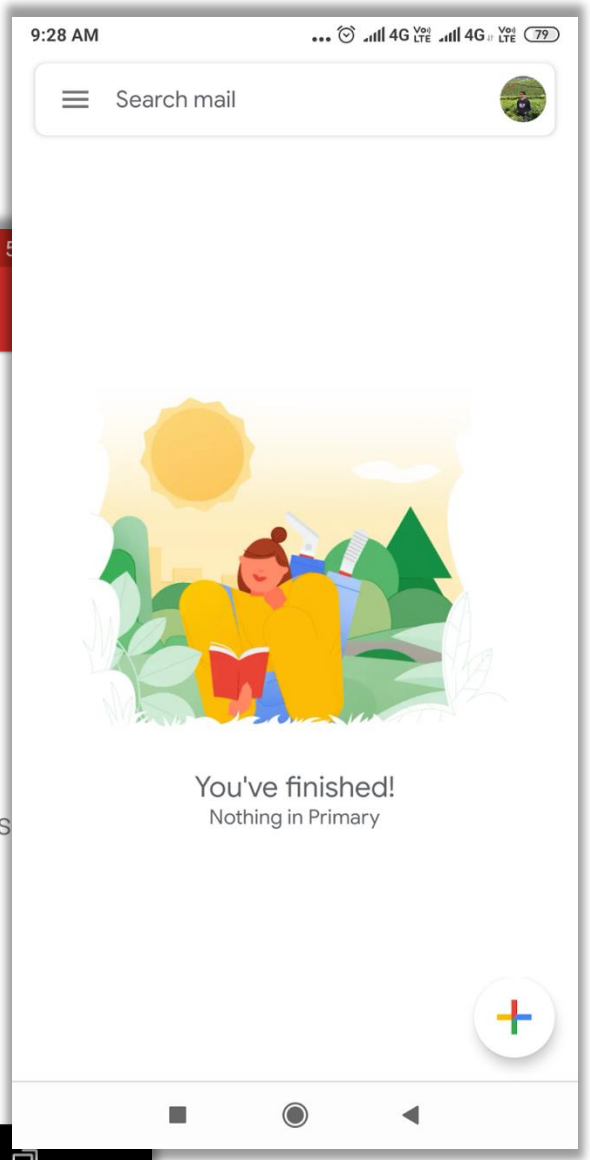
- **Offer effectance-relevant digital-wellbeing feedback**
- Provide feedback that informs a pathway to improvement toward digital wellbeing and a more sustainable technology use, by informing users about their negative behaviors as well as their progress and achievements.

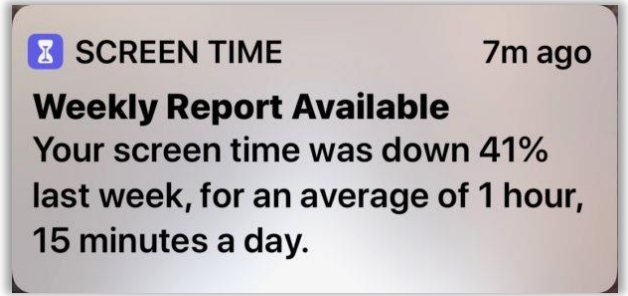
Heuristic #6: Strategies

- Use rich feedback mechanisms to inform users about their "digital wellbeing" progresses (see the three type of rich feedback mechanisms proposed by Rigby and Ryan in 2011 - granular, sustained, and cumulative).
- Promote instrumental use and reduce temptations to prolong usage sessions, e.g., by encouraging users to move on when their original purpose is achieved or by proposing alternative behaviors.

Heuristic #6: Examples







Support Relatedness (Heuristics #7 and # 8)

- Relatedness is described as a sense of **belonging** and **connectedness** to others and is central across wellbeing theories.
- Technologies increasingly support social connection. However, not all social interaction (technologically-mediated or otherwise) helps us feel a greater sense of connectedness.

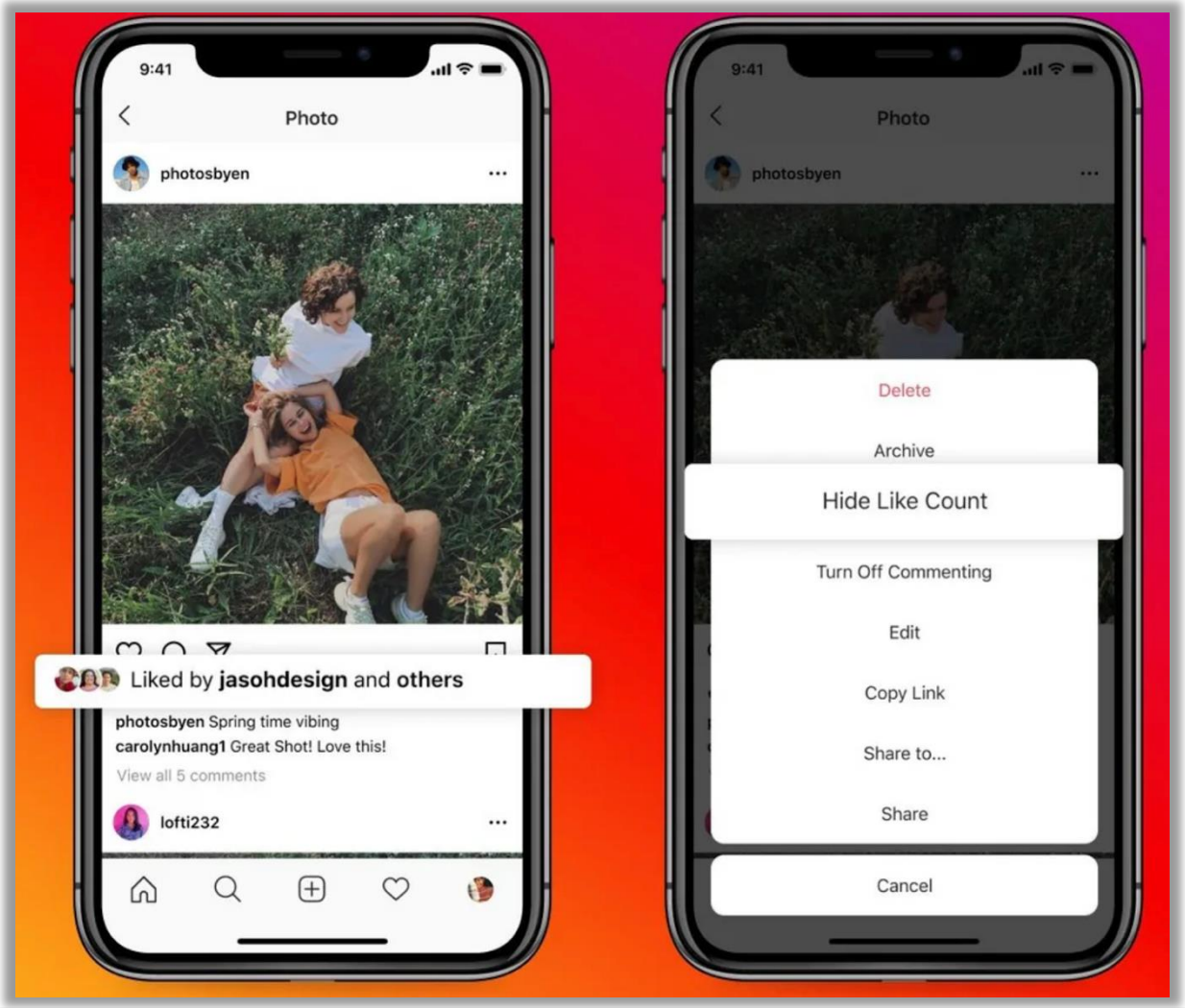
Heuristic #7

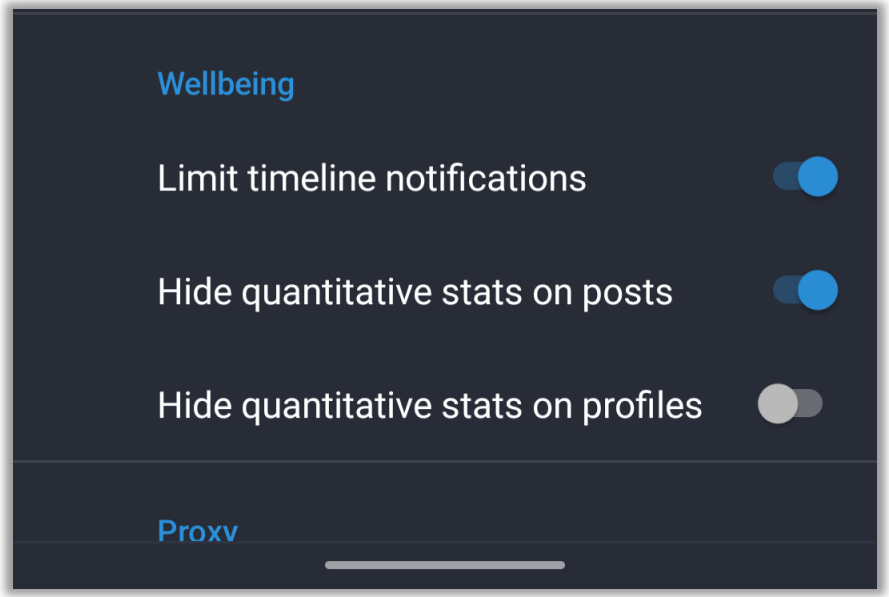
- **Support meaningful connections**
- Support experiences of meaningful and fair connection to others, respecting one's preferences and vulnerabilities and those of others.

Heuristic #7: Strategies

- Focus feedback on intrinsic vs extrinsic relatedness goals: for example, pushing users to increase followers, likes, or other status symbols is unlikely to support relatedness as effectively as supporting goals to, for example, help others or connect more deeply.
- Ensure that users have the possibility to avoid social comparison with others.

Heuristic #7: Examples





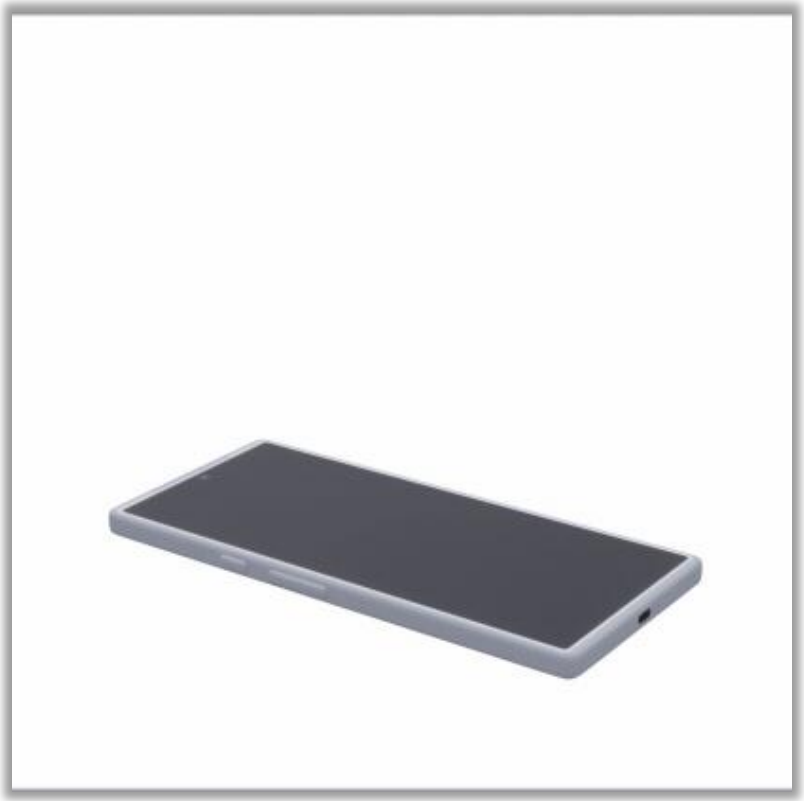
Heuristic #8

- **Support real-world connections**
- Provide tools that facilitate real-world experiences and connections that go or may go "beyond the screen."

Heuristic #8: Strategies

- Disrupt social engagement as minimally as possible and facilitate smooth, intuitive, and responsive social experiences.
- Ensure that users can keep their attention in the “real world” and avoid social problems like phubbing, e.g., by facilitating the organization of in-person (nonvirtual) meet-ups and activities.
- Give more importance to posts, comments, and interactions from close ties.

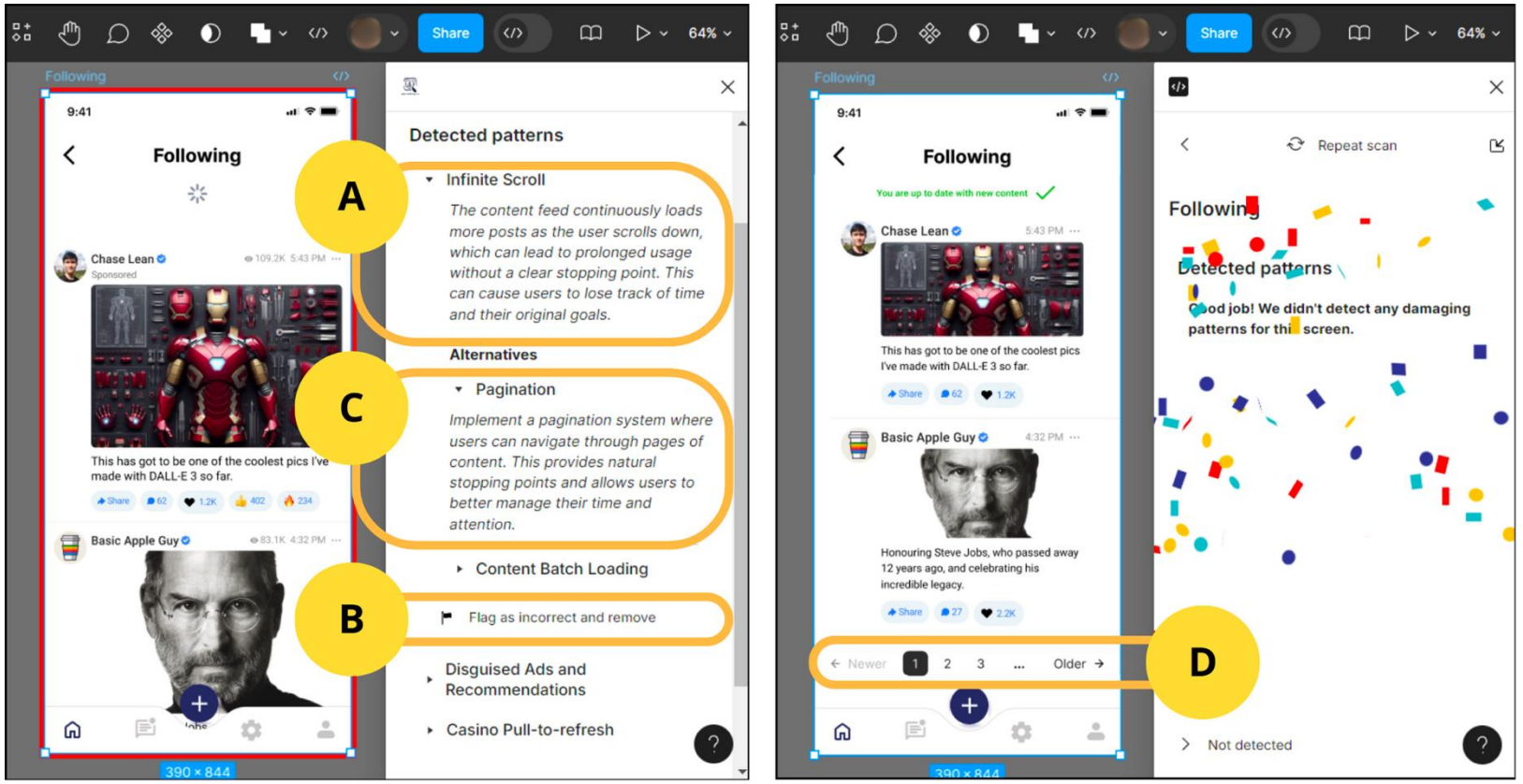
Heuristic #8: Examples



Digital Wellbeing Design Support Tools

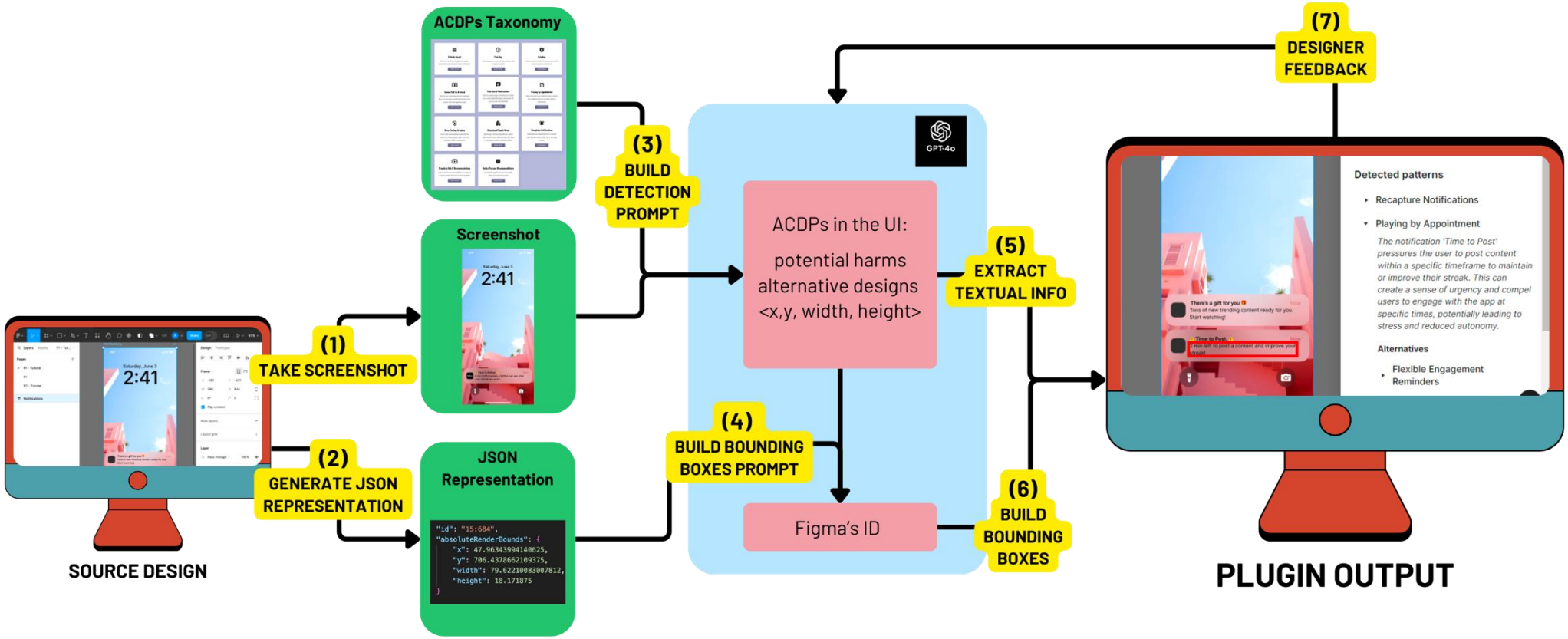
Supporting designers to prioritize digital wellbeing while designing

Digital Wellbeing Lens: a Figma Plugin



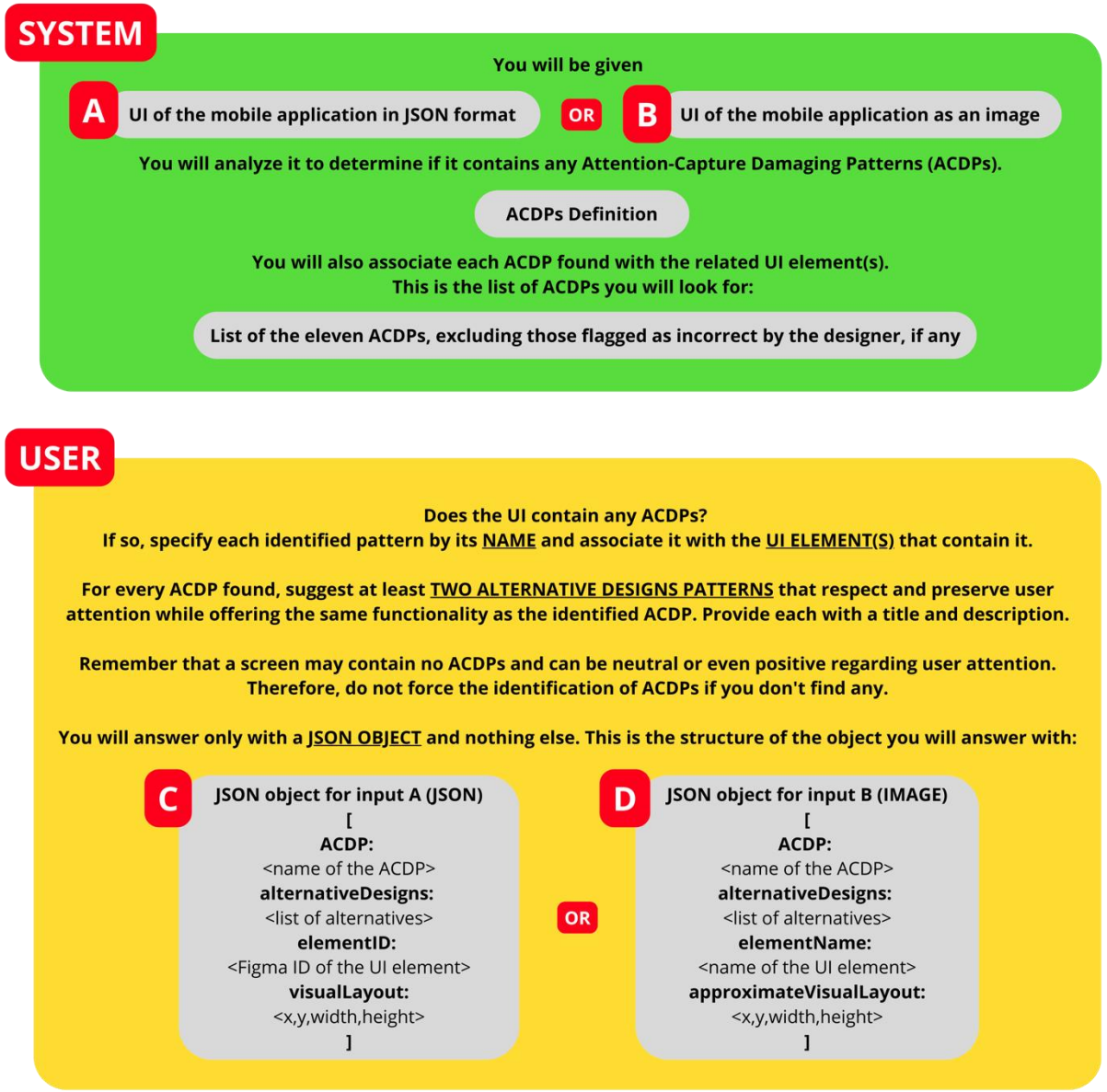
Monge Roffarello et al., *Digital Wellbeing Lens: Design Interfaces That Respect User Attention*, https://dl.acm.org/doi/10.1145/3656650.3656674
Pellegrino et al., *Safeguarding End-Users' Time and Attention by Design: an LLM-powered Figma Plugin*, **under review**

Digital Wellbeing Lens: a Figma Plugin



Digital Wellbeing Lens

- We used OpenAI GPT-4o to analyze Figma prototypes
- We devised a multi-modal prompting technique, using images to detect attention-capture design patterns and JSON representations to identify their position in the Figma's project
  - Prompts are available at https://osf.io/smzuv/?view_only=b5a2f928095f4deb85e2f50df424a492



Digital Wellbeing Lens: a Figma Plugin

- Try it on Figma: https://git.elite.polito.it/public-projects/digital-wellbeing-lens
- With Yarn:
  - Run ***yarn*** to install dependencies
  - Run ***yarn build:watch*** to start webpack in watch mode
  - Open Figma -> Plugins -> Development -> Import plugin from manifest... and choose ***manifest.json*** file from the repo

License

- These slides are distributed under a Creative Commons license "**Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)**"
- **You are free to:**
  - **Share** — copy and redistribute the material in any medium or format
  - **Adapt** — remix, transform, and build upon the material
  - The licensor cannot revoke these freedoms as long as you follow the license terms.
- **Under the following terms:**
  - **Attribution** — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
  - **NonCommercial** — You may not use the material for commercial purposes.
  - **ShareAlike** — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.
  - **No additional restrictions** — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.
- https://creativecommons.org/licenses/by-nc-sa/4.0/