Design for (*Post-*)Truth: Exploring Interaction Design Educational Tools for Information Literacy

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Abstract

Design for (*Post-*)Truth: Exploring Interaction Design Educational Tools for Information Literacy

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This thesis investigates how interaction design can support information literacy in the context of news online media by equipping designers - understood as intermediaries in the information flow - with tools to critically evaluate and deliberately shape UX interventions against disinformation. Drawing from an ecological metaphor, affordances, a synthesis of existing anti-disinformation strategies, cognitive theory and technocognition, the research-creation process unfolds in two linked contributions: the Design 4 Truth canvas, which stages a pedagogical, value sensitive space for exploring UX interventions, and the Technocognition Matrix, which distills and repackages these situated interventions into a two-dimensional meta-framework organizing interventions by their demands on user autonomy and cognitive effort. Developed as a reflective design tool, the matrix supports design education and practice by helping designers surface value trade-offs, reason about mitigation strategies, and intentionally recalibrate the cognitive and autonomy burdens embedded in online news media interfaces. While exploratory in scope, the work lays a foundation for future empirical validation and position designers as active contributors to healthier, more accountable digital information ecosystems.

For Fabio

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Foreword

'Life is short, and information endless,' Aldous Huxley writes in *Brave New World Revisited*, a thought-provoking essay from 1958. His essay is a companion to the notorious, semi-homonymous dystopian novel *Brave New World*, in which he expands on the themes of the dark ways the world was changing in the early XX century.

In the current times, parsing truth from falsity and weighing the facts starts to feel like a labyrinthine journey fraught with twists, turns, and dead ends. The rise of online disinformation has cast a shadow over our collective understanding, obscuring the boundary between fact and fiction. The fragmentation of the media landscape into digital platforms leaves us inundated with headlines, tweets, and status updates. Associated with their ubiquitous adoption, it subverts the old broadcasting systems, and in this new terrain, propaganda and manipulation have found a new and efficient vector to spread.

Informed societies rely on a complex system, one that lays on a fine balance of information literacy: access to quality information, an audience capable of autonomous thinking, and resistance to propaganda and manipulation resulting in self-governance leading to community good. As in delicate natural environments, information literacy is part of a system, an ecosystem of information. This elegant metaphor proposed by Phillips & Milner is an idea I will borrow for my work: the notion that informed

societies exist in an ecology of information that has been damaged by technological disruptors recently introduced, with a capacity for pollution with a power and reach that we are still learning about.

Within this polluted information landscape, I acknowledge Design as a directional practice: the idea that 'everything designed goes on designing' and goes on having unintended consequences and that 'we live not only with technology but by it', as Tony Fry states in his *Design Futuring* book, and in this context, I propose to study what Interaction Design education may offer for better information literacy as a granular contribution to an ethical stance of the practice. I hope this work adds a fresh look to how designers may play a role toward sustainability and communities that thrive with the abundance of knowledge in a re-balanced ecology. Life is short, and information, endless.

Figure 1: Scanned cover of the 1971 edition of *Brave New World* by Aldous Huxley, originally with an illustration by Leonard Rosoman, juxtaposed with an illustration by generative artificial intelligence (DALL-E) of a baby investigating the world, finding roses.
(Final illustration by the author.)

Part I: Theory

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Chapter 1: Problem Area and Key Concepts

All that is in our power is to be as truthful and rational as circumstances permit us to be, and to respond as well as we can to the limited truth and imperfect reasonings offered for our consideration by others. (Huxley, 1958)

1.1 - Sewage: *Post-truth* and the Polluted Information Landscape

Enter the digital age: a terrain cultivated by the web and propelled by social media platforms, now a breeding ground for information disorders (see figure 2). In this landscape, concepts such as *post-truth* and *fake news* have become present in everyday life, casting shadows over societies at various levels, from national politics to public health. *Dis*-information, *mis*-information, and *mal*-information muddy the waters of our media ecosystem. Their potential for disruption is global (Bradshaw, Bailey and Howard, 2021) and recognized as a threat to democratic societies by civil organizations, academia, corporations, governments, and accredited international political alliances such as NATO (Agarwal *et al.*, 2017).

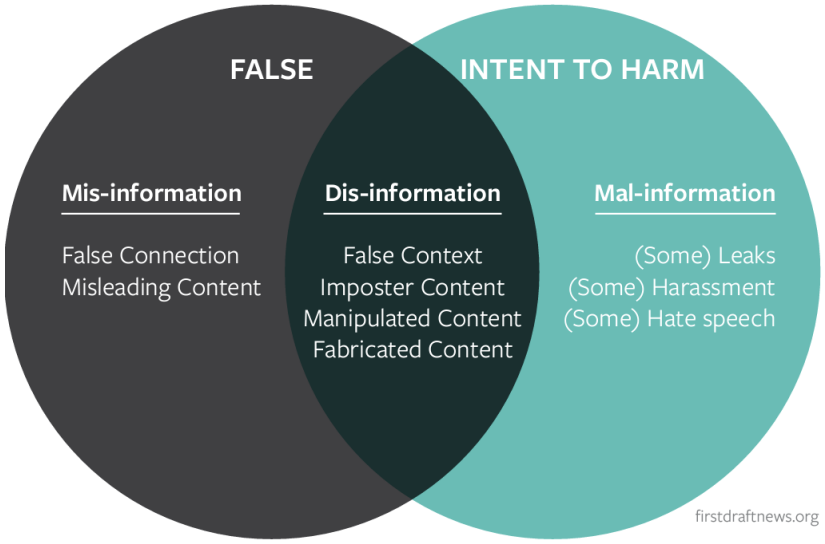

Figure 2: Information Disorders: what are mis-, dis- and mal-information according to recent academic classifications.
(Wardle and Derakhshan, 2018). CC BY-SA 3.0 DEED

While some aspects, like information disorders or propaganda, aren't entirely novel, the escalation of these issues to the status of a disruptive and global threat to society is both timely and concerning. For instance, the term *post-truth* gained notoriety only recently, when the Oxford Dictionaries declared it the 'word of the year' in 2016.

The term has rapidly risen in political discussions and became common in books and headlines within a year (see figures 3 and 4), especially concerning events like the Brexit referendum and the 2016 US presidential election. Notably, it has become linked with the concept of 'post-truth politics' in recent years, illustrating a nuanced shift in the usage of the prefix 'post-': a semantic evolution also observed in formations like 'post-national' (1945) and 'post-racial' (1971), going from denoting a time after a specific event to indicating a period where the concept is considered insignificant or irrelevant, as explained by the Oxford Languages (no date).

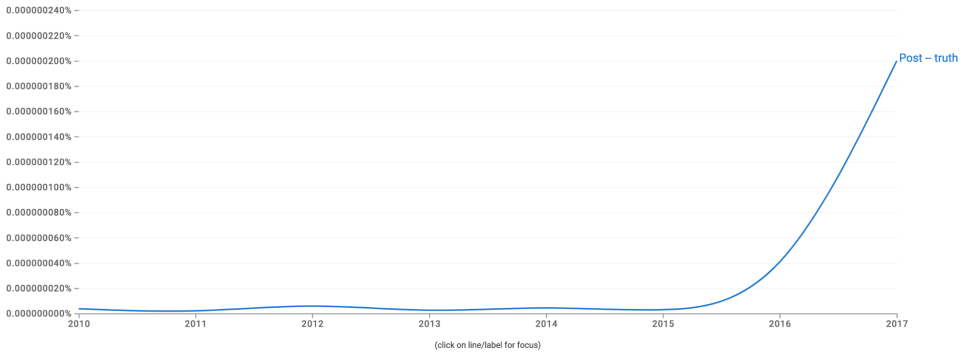

Figure 3: Post-truth: a search for the term in the Google Books Ngram viewer, using an interval from 2010 to 2017.
(Capture by the author).

Figure 4: Post-truth: a search for the term in Google Trends using an interval from 2010 to 2017.
(Capture by the author).

This so-called post-truth era delineates a group of observable societal trends, such as a reduction in trust, cooperation, and social connections within a community or society, as it suggests weakening social bonds, civic engagement, and shared values among individuals and groups, according to Lewandowsky, Ecker and Cook (2017). This is observable in the recent global political rise of 'hyper-polarization,' consequent tribalism, stagnation in governance, and even 'lethal partisanship' when groups not only disagree but attempt to harm one another, in a dangerous erosion of social capital (Hawdon *et al.*, 2020).

Arguably, other indicative trends of this post-truth era are growing economic inequality, increased polarization, declining trust in science, and an increasingly fractionated media landscape (Lewandowsky, Ecker and Cook, 2017). Specifically interesting to this work is the fractioned news media landscape, which will be our focus. The fractionating of news media results partially in response to a 'dislocation of the news journalism,' in which news publishers have diminished influence and become dependent, to varying degrees, on platforms nonproprietary to themselves but provided by social media companies - a shift of power dependencies between *news media* and *platform companies* (Ekström and Westlund, 2019).

And what is the context in which platform companies establish themselves as the nemesis of the news media's monopoly? As told by Gillespie in *Custodians of the Internet* (2018), the early years of the open web were marked by a vision of enhanced prospects for knowledge sharing and social interaction, free from the constraints imposed by traditional gatekeepers. A broader distribution of the power of expression meant lowering barriers and providing increased opportunities for individuals to contribute to online discourse. Originating from this early enthusiasm for the participatory culture of the open web, which '...many hoped, would be more egalitarian, more global, more creative, and more inclusive' (p. 15), new companies started offering services that host, structure, and distribute user-generated content and social interactions on digital *platforms*.

Platforms are computational structures that provide various novel *affordances* compared to traditional news media: they allow access to diverse forms of information and communication and facilitate content creation, publication, and interaction. They are 'sociotechnical assemblages and complex institutions' and 'commercial in different ways' (Gillespie, 2018, p. 18); however, most generate revenue by collecting, analyzing, and selling user data to advertising companies. Their primary goal is to attract a large user base and encourage prolonged engagement on the platform (Gillespie, 2018; Ekström and Westlund, 2019).

Social media platforms have integrated with news media companies, establishing themselves as both collaborators and competitors of news outlets. In the broad context of online news, they collaborate in facilitating new sourcing methods, innovative distribution techniques, and enhanced audience engagement through analytics. However, they compete for attention (see figure 5), data, and advertising revenue (Ekström and Westlund, 2019).

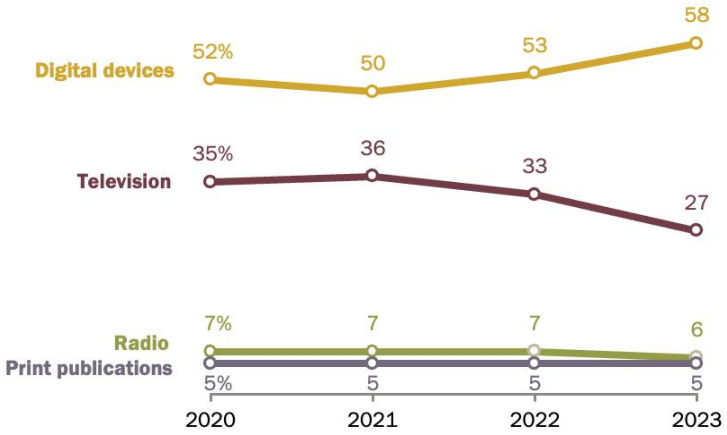

Figure 5: News sources preferences for US adults according to a 2023 survey.
(Source: Pew Research Center, 2023)

Platform companies don't define themselves as creators and publishers of content; instead, these platforms operate on a business model that offers a space for individuals and organizations to share and publish content. They displace content from its original context: in the previous media era, news content was published in a medium the news companies owned (see figure 6). The web has already significantly lowered the costs and barriers for new actors to publish content; with the environment provided by platforms, today's digital media environment hosts a multitude of news producers, reducing the control and revenue of news media companies (Ekström and Westlund, 2019).

Figure 6: The last print issue of the Newsweek magazine, December 31, 2012, for sale online. (eBay, no date)

This dislocation of power impacted journalistic standards of objectivity and impartiality, which emerged as a response of news media to the widespread deployment of propaganda in World War I (including the news media's own involvement) and the emergence of corporate public relations in the 1920s. These norms were sustained by local and national monopolies created by traditional information distribution technologies like print and broadcast, and their professional journalists. However, the fragmented media landscape introduced by the web and platform companies, which typically evade the accountability associated with being traditional publishers, has led to a low adherence to these norms. This poses a challenge to traditional news sources that previously held high levels of trust and credibility among audiences (Lazer *et al.*, 2018).

Besides this decrement of journalistic standards, social media platforms became weaponized for political gains. As observed by Giuliano da Empoli (2019) in *Les Ingénieurs du Chaos*, the powerful machine of social media, being originally commercial motors, were not equipped, or even more, their design carried little interest in preventing abuse or deviation. The decentralization of media that platform companies promote, plus the evasion of the role and responsibility as publishers, plus the slow pace of public regulation, 'coupled with the scale, complexity, and communication abundance' (Blumler cited in Kapantai *et al.*, 2020, p.2) amplify the information disorders in an information ecosystem that becomes substantially *polluted*.

Framing the problem of information disorders as pollution, a 'media landscape overrun by pollution,' comes as a proposition from Philips and Milner in their 'field guide' *You Are Here* (2021). This idea that, as in the biosphere, informed societies exist as part of an ecosystem of information, a system whose balance has been damaged by disruptors recently introduced, presents grounding metaphors and benefits to understand and address the complexities of the problem of information disorders. It imbues the abstract notion of information with materiality: the offline consequences of this pollution can be very palpable - vaccine hesitancy and climate change denial, for example.

The parallel with natural ecosystems draws attention to a holistic understanding of pollution and a broader view of the agents involved. Pollution sources are not always easily traceable. In the same way that precarious, punctual sewage disposal in vulnerable communities can lead to the widespread pollution of large water bodies, the spread of rumours by ordinary citizens - and even journalists' attempts to debunk them - can significantly harm the information ecosystem (Phillips and Milner, 2021). Another useful aspect of framing information disorders as pollution is that it bypasses questions of motives, as '... motives don't always matter to outcomes, and outcomes matter more than motives' (p. 5), to focus instead on the breaches of the systemic balance, on how information disorders leak and spread, and what impact they generate 'downstream.'

Finally, Phillips and Milner's polluted information frame gives, if not a map, a 'place to start.' Thinking ecologically about information disorders points to a route already adopted to address other pollutants. 'A system that damages so much because it works so well requires broad structural solutions' (2021, p. 7) urges 'communitarian ethics' considerations, encouragement of resilience, promotion of collaboration, and systemic change.

1.2 - Information Literacy as Potable Water

> *Reliable information is to civic health what proper sanitation and potable water are to public health. (Smith, Mark et al., 2019)*

Having crossed the polluted waters of disinformation disorders, we'll navigate towards the essence of information literacy—the clear waters that contrast our starting point. I postulate, based on the literature, that information literacy is essential in promoting civic participation and sustainable societies. It is an essential element to be conserved, protected and increased to balance the information ecosystem and, by doing so, to improve individuals' autonomy and informed engagement in communities. Back to the pollution framework, information literacy helps dilute information disorders, and promoting it also works as a mitigation measure, an action to reduce the harmful effects of disinformation flow in networked media.

Information literacy is the ability to access, identify, evaluate, organize, and successfully create, use, and communicate information (Polizzi, 2020). The concept of 'information literacy' was first explicitly suggested by Paul Zurkowski in the 1970s, the pre-internet age, as 'the abilities to use information tools to mould information solutions that address the problems of individuals' (cited by Goldstein, 2019). It germinated from the library science field's efforts to describe a set of skills critical for academic success and lifelong learning, focused on locating, evaluating, and using information effectively within the traditional library context.

A few decades later, the scope of information literacy expanded significantly. It started to be presented as a crucial component for empowering people to find and use information effectively, thus enabling participation in society through informed decision-making. In 1989, the American Library Association described that 'to be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information' (cited in

Addison & Meyers, 2013, p. 3). This period marked a shift to recognizing information literacy not just as a library skill but as a critical life skill, a definition that would further evolve.

The development of the internet and digital technologies broadened the concept of information literacy, incorporating digital skills into its framework. Today, information literacy encompasses a comprehensive set of abilities—embracing critical thinking, ethical use of information, and the proficient use of digital tools—necessary to navigate the complicated information landscape of the 21st century (Addison and Meyers, 2013). This evolution reflects an ongoing response to the challenges and opportunities presented by technology, emphasizing information literacy's role as foundational to education, citizenship, and workforce readiness in a globally interconnected world.

In academia, information literacy is an 'umbrella term' that often overlaps with other concepts, such as media literacy and critical thinking in various fields, including education (Schwarz, 2005; Addison and Meyers, 2013; Wuyckens, Landry and Fastrez, 2022). Overall, the literature discusses information literacy in three main formulations: the development of 'information age' skills, the cultivation of critical thinking, and social engagement in information-rich practices(Addison and Meyers, 2013).

As a side note, I would like to take some lines to explain why this work elected the term *information literacy* to describe its subject. While other similar terms, such as media literacy and critical thinking (or the convergent MIL: media and information literacy; and their many derivatives: critical media literacy, digital media literacy, meta-literacies, etc.), are used intermittently to present a similar idea, there is a nuance that either renders them too broad or too granular for our scope. For example, media literacy may suggest an emphasis on media production, traditional mass media such as TV and radio, content, and aesthetics. Critical thinking is an even broader concept and, while crucial, doesn't delimit the complexities of navigating news online sources. The term *information literacy* seems the most straightforward term for delimiting our scope

(online news content), but also the most effective for hinting to the general public what our subject is (more nuance of this concept regarding individualistic versus communitarian values will be discussed in the following section).

The ability to effectively access, evaluate, and utilize the abundant information in an interconnected society is closely aligned with the United Nations *2030 Agenda for Sustainable Developmen*t (United Nations - Division for Sustainable Development Goals, no date). The Agenda's Sustainable Development Goal number 16 (SDG 16: Peace, Justice, and Strong Institutions) explicitly recognizes the significance of ensuring 'public access to information and protect fundamental freedoms' (SDG 16.10). Information literacy also aligns with the United Nations' SDG 4 for inclusive and equitable quality education and the promotion of lifelong learning.

UNESCO as well has presented *Five Laws of Media and Information Literacy* (IICIIS International, 2018) to establish a human rights framework to facilitate access to information and knowledge in the digital age. In summary, they position information and communication technologies as crucial tools for critical civic engagement and sustainable development (Law 1). They recognize every citizen as a potential creator and communicator of knowledge, emphasizing the right to access information and express oneself (Law 2). However, acknowledging that information is not always neutral and unbiased and that the adoption of information literacy should make this transparent and understandable to citizens (Law 3). The framework also highlights the universal human desire to understand and exchange information (Law 4) and, finally, emphasizes that this literacy is a lifelong learning process encompassing knowledge, skills, and attitudes (Law 5). This includes accessing, evaluating, utilizing, producing, and communicating information across various media and technological platforms.

Such ability as information literacy can serve as a compass for citizens to navigate a polluted landscape, enabling them to sort quality information from general sources. This literacy is an element of civic competence upon which thriving and pluralistic democracies are built, with citizens engaging in public discourse and politics,

participating in communities and influencing decision-making (Smith, Mark *et al.*, 2019; Polizzi, 2020). It is also 'one of several critical literacies which are routes for socio-economic liberation' (Raju, Johnson and Majebe, 2019) and a factor of a person's well-being as an instrument for discerning and navigating misinformation (Walton *et al.*, 2019).

On these grounds, the significance of information literacy in safeguarding against the impacts of manipulation cannot be overstated. As mentioned in the previous section, polluted information indirectly impacts many spheres of civic life, from public health to socio-ecological policies. As citizens attain higher levels of information literacy, they may go from being targets of manipulation to becoming 'nodes of containment' (Bjola and Pamment, 2016). This evolution plays a pivotal role in sustaining conscious and autonomous civic participation. It holds *value* in an ethical dimension - in the sense of providing meaning to individual lives - and even more in a communal sense by bolstering citizens' collective interests and aspirations within their cultural contexts (Friedman *et al.*, 2006). Ultimately, it solidifies its status as a foundational element for active and informed participation in democratic life.

1.3 - Ecological Literacy: The Information, the Experience, and the Designer

> *By embracing a communitarian approach to information - achieved through ecological literacy and network ethics - citizens of good faith can help clean up the pollution already present, minimize the new pollution produced, and, most profoundly, cultivate a different way of being in the world... (Phillips and Milner, 2021, p. 181)*

Where is the Designer positioned in the ecology of information? Philips and Milner introduce, in *You Are Here* (2021), the idea of *ecological* literacy as more inclusive and efficient than *liberalistic* literacies. According to them, liberalistic literacies (such as media literacy and critical thinking) are limited due to a focus on personal ability and skills, often framed through 'the liberal lens' of individual agency and choice (boyd cited in Phillips and Milner, 2021, p. 154), including 'baked-in assumptions about the dangers of censorship' (Phillips and Milner, 2021, p. 154). Their limitation lies in presuming that individuals will reach rational conclusions once all evidence is considered - but it underestimates the fact that people are 'guided by frames as much as facts,' the book continues. Also implied in this idea, others have highlighted how critical thinking's personal skills, such as skepticism, may backfire into generalized distrust, as presented by danah boyd (2018).

Conversely, ecological literacy presents network ethics for the structural problems of information disorders. It 'doesn't fight the affordances of the information ecosystem'; rather, it highlights our interdependence and trades 'negative freedoms for the positive freedoms of communitarian thinking: action designed to secure freedoms for everyone in the collective' (Phillips and Milner, 2021, p. 175). It recognizes that falsehoods aren't merely neutralized through the presentation of facts, nor are falsehoods the sole 'contaminants' in a polluted information landscape. Moreover, ecological literacy refrains from depicting individuals as isolated entities; instead, it acknowledges that

ecological awareness arises from the complexities within networks (Phillips and Milner, 2021).

This conceptualization of information literacy as ecological literacy agrees with the sense of communal *value* discussed in the last section. And how can we address this value from a Design perspective? One option that will be explored in this work is advocating for design education that extends beyond individual-level interventions against information disorders, embracing a systemic approach that considers the interaction with information as a whole. More than *interface* design, *user experience* design.

Access, evaluation/assessment, use, production, and information communication in digital platforms are intermediated by 'interfaces' on which user experiences happen: the human interaction with the technology that hosts the platform. One simple definition of an interface is a 'space for human communication and interaction' (Winograd, 1997, p. 160 cited in Sharp, Rogers and Preece, 2019), a shared space acting as a bridge between the user's world and, in our case, the digital world, enabling communication, control, and information exchange.

Creating interfaces for (normally, satisfactory and successful) experiences is one of the goals of Interaction Design, an action of 'designing interactive products to support the way people communicate and interact in their everyday and working lives' (Sharp, Rogers and Preece, 2019). But Interaction Design is not only about digital interfaces. Rather, it hosts a multitude of components, disciplines, fields and approaches (see figure 7). In the context of Human-computer Interaction (HCI), the meaning of *interaction* itself can be differently framed as in *The Three Paradigms of HCI*: interaction as a transaction; and/or a flow of information between user and system; and/or as a dynamic process situated in context and social factors (Harrison, Tatar and Sengers, 2007). These paradigms are not mutually exclusive and can shift the focus of how we approach the goals and evaluations of designed interactions.

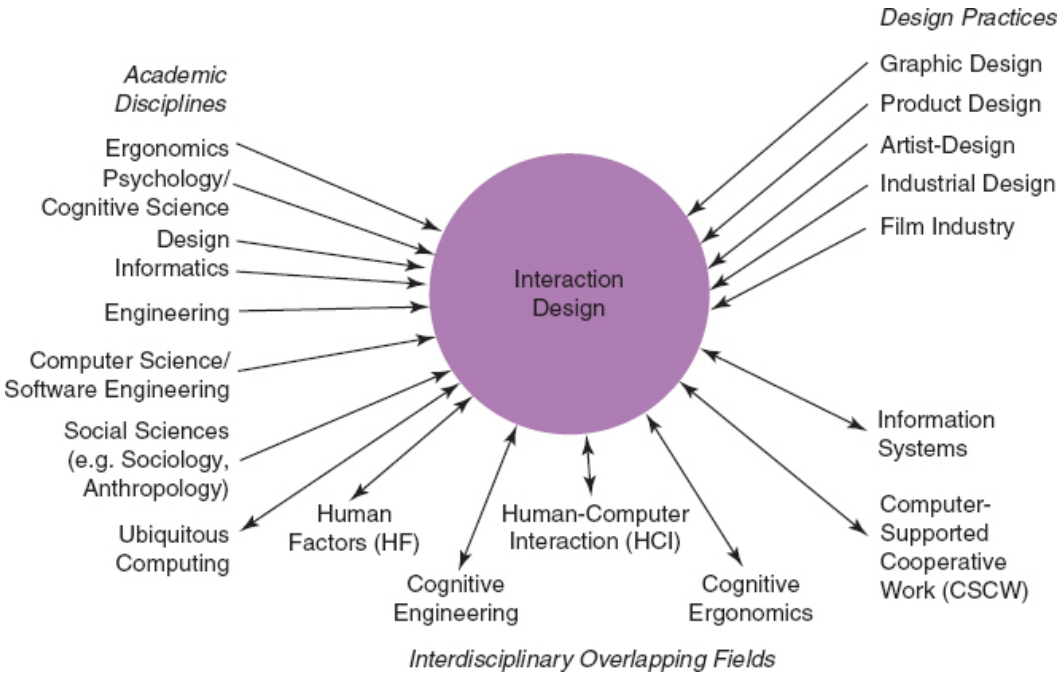

Figure 7: The components of Interaction Design. (Sharp, Rogers and Preece, 2019)

Central to this notion of designed interactions, the term User Experience Design (UX Design) has gained prominence: it encapsulates how a designed artifact responds to and how it is used in real-world settings, and it often corresponds to a user-centred approach to creating artifacts (Sharp, Rogers and Preece, 2019). Beyond usability, UX Design became almost indiscernible from the emotional impact and aesthetics of artifacts (Norman, 2013), the use of psychology principles in the design process (Carroll, 1997; Yablonski, 2020), through an iterative methodology (Gould and Lewis, 1985; Nielsen, 1993). Despite its name, overlooking human agency in user experience design creates a simplistic technologically deterministic viewpoint (McCarthy and Wright, 2007); 'it is important to point out that one cannot design *a* user experience, only design *for* a user experience' (Sharp, Rogers and Preece, 2019). Therefore, discussing the UX Design of online news media, specifically our concern, is to analyze interfaces and their elements but more eminently consider what experiences these designs afford.

The user experience of online news is an interplay of the affordances of the digital world and the cognitive factors that influence human information processing: 'It's

sometimes hard to differentiate between, you know, pundits and journalists and infotainment [sic],' as an interviewee voices his frustration in *Slow News* (2020, sc: 1:44), a documentary about the current state of journalism in response to the dislocation of news media. This digital experience, overall, differs from other news sources in fundamental aspects and affordances, such as accessibility and availability, hyper-textuality and interactivity, social sharing, and information abundance. Yet, it is marked by the consequence of these novel affordances in some factors, often viewed from a pathological perspective, such as cognitive overload, decline in media trust, fragmented attention, algorithmic filtering, bias, echo chambers and emotional arousal, according to the literature (Bawden and Robinson, 2009; Franchi, 2013; Kahneman, 2013; Vosoughi, Roy and Aral, 2018; *Slow News*, 2020).

And, coming back to our initial question, where are Designers positioned in all of this? Designers are intermediaries of knowledge acquisition through news, in that Designers are creators of interfaces. This is true from a classic print media perspective, 'typographic design is the interface to the text' (Bonsiepe, 1999 cited in Dubberly, 2021, p.5), to online news, in which Designers create websites, applications and platforms interfaces for the user experience. Thus, Designers are integrative parts of the information ecological chain. And as such, they can be themselves the 'nodes of containment' (Bjola and Pamment, 2016) that we discussed before - or even multipliers of this containment of information pollution.

And now, again, how do we address ecological literacy as a human value from a Design perspective? Felix Guattari's *The Three Ecologies* (Guattari, 2000) points to the tripartite stance of *ecosophy*, an ethical-political articulation of the environment, society and subjectivity, as the *true* response to the 'ecological crisis' (p. 28). This is the beginning of the answer. From this *ecosophical* standpoint, we can draw an orientation for action: a designer advocates for sustainability not only through improvements in material production but also through a designer's impact on societal and mental patterns. *Ecosophy* invites us to consider more than the material impact of designed artifacts but the immaterial impact on behaviours and values (see figure 8).

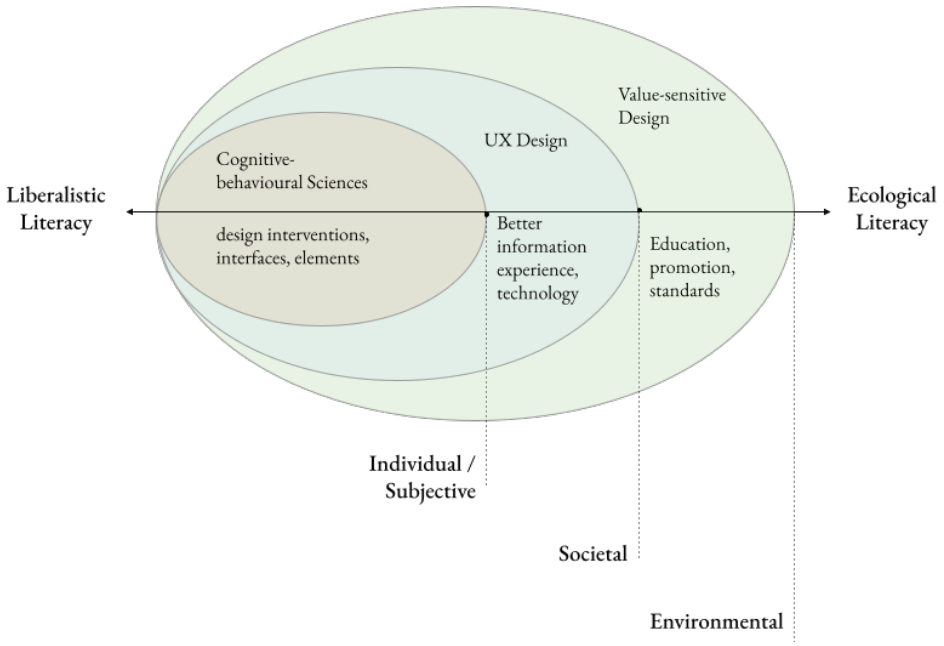

Figure 8: An *ecosophical* approach to interaction design for information literacy. (Diagram by the author.)

Continuing, let us examine how Design, as a discipline and a practice, has responded to the ecological problems overall. In a broad historical arc (arguably since the 19th century's Arts and Crafts movement, passing by the early 20th century's modernism, to date), Design has a long-standing position of tending to the artificial as impactful to human welfare. More recently, in the 1990s, Design ideals expanded to markedly and consistently include the concern for the biosphere as an entity passive of being affected by technology (Dindler *et al.*, 2022). This ethical shift is not native to the Design field; it is adjacent to a more significant philosophical and societal engagement toward sustainability.

From the specific angle of Interaction and UX Design, the emergence of Design theories and practices aligned with an ethical-moral stance is closely related to the HCI community developments in computer ethics. Although research concerning

computational technology and human values developed important work in the 1980s, those developments gained more emphasis in the 1990s following the convergence of three techno-societal innovations: the popularization of the personal computer, the internet, and the World Wide Web (Friedman and Hendry, 2019). In this context, *Value Sensitive Design* is a term articulated to identify similarly oriented initiatives which contain a 'constellation of features' (Davis and Nathan, 2021) that explicitly address the design and engineering challenges associated with responsibility and sensitively incorporating human values into the setting of widespread, diverse computational development and adoption. If *ecosophy* gives an orientation to thinking about the ecological crisis, Value Sensitive Design provides a map for mitigation through design action (we will come back to Value Sensitive Design in the following sections).

A sustainable stance is a fundamental element of ethical Design education and practice nowadays, as we can observe in efforts in energy efficiency, recycling, upcycling, reducing and reuse, participatory practices for social change, service design of governmental services, inclusive design, etc.:

> The intentional attempts at transforming the world in which one is living has become a disciplinary cornerstone of design practice, entailing a professionalization of creative action, specifically through the verbal and material articulation of propositions of alternatives to status quo. Creating proposals for, and sometimes bringing into socio-material existence, things that do not otherwise exist is what we can call design action. (Halse, 2020, p. 24)

Design theorists call for collaboration on more viable futures and growing awareness for the *defuturing* potential of design actions, instead using them to promote *sustain-ability* (Fry, 2009) or to challenge the status quo and existing forces (Costanza-Chock, 2020), just to mention a few. Enabling 'actions of others with others (citizens, for instance)' (Halse, 2020, p. 26) is an approach that suggests both 'Design action' and 'Design *for* action' (p. 26). The interaction of user experiences for transformative actions and inherent agency of individuals and communities may forge pathways

towards a more sustainable, equitable, and harmonious world, where human creativity, ingenuity, and responsibility converge to drive meaningful transformation.

1.4 - Mitigation: Research Purpose and Dissemination

> *We encounter the deep questions of design when we recognize that in designing tools we are designing ways of being. (Winograd & Flores, 1987, p. xi cited in Friedman & Hendry, 2019)*

In a rapidly evolving techno-social landscape, where 'paper newspapers are mutating to intangible services for knowledge' (Franchi, 2013, p. 19), the role of UX designers is crucial. How can they position themselves as catalysts for positive freedoms and communitarian good in the novel spaces of digital media? More importantly, how can we advocate for information (ecological) literacy as a core value for UX Designers and promote education on this topic for the Design community? These questions, which are at the forefront of our research, have led us to refine our research question to:

How can we leverage interaction design educational tools to help designers to create online news media that cultivate information literacy?

To answer this, we'll go on a research-creation road that navigates with a map drafted from *Value Sensitive Design* that takes us to the territories of *affordances*, *choice architectures,* and *technocognition* to inform the topic. Value Sensitive Design is frequently recognized as the most extensive approach to date for addressing human values in technology design (Davis and Nathan, 2021). Its central proposition is that the relationship between technology and human values is fundamentally interactional, and from this standpoint

> In coexisting with technologies as well as with the natural environment, it is beneficial to think of how, instead of focusing exclusively on the creation of novel technologies, we might draw on practices of maintenance, repair, and care for making and remaking lives and worlds. (Forlano, 2020)

For our research, we draw on *The Mechanisms of Affordances* (Davis, 2020), a theoretical framework that provides a nuanced understanding of how design shapes

interaction and allows for a critical analysis of technological artifacts. We also incorporate existing academic research in cognitive and behavioural sciences, such as *choice architectures* and *technocognition*, which provide valuable insights into the mental processes involved in using, creating, and interacting with technology. These frameworks point to demonstrated strategies to contribute to a healthier information landscape, compiled in the *Toolbox of Individual-level Interventions Against Online Misinformation* (Kozyreva *et al.*, 2024), a scientific group effort to collect and present evidence-based individual interventions against information disorders.

A purpose of this research creation is to articulate an actionable design *output* that contributes to disseminating concepts and public discussion on the role of Designers in a polluted information landscape. This problem has been addressed from sociotechnical perspectives in academic works scattered through communication and information studies, sociology, psychology and behaviour science. Still, it is very rarely found in the Design field. It is even more uncommon to find resources that present this topic to designers in a concise, visual medium.

Through this process, we aim to suggest a practical tool for UX Designers to integrate information literacy into their education and practice, in a way that is relevant to 'the real world.' By offering an additional resource and scaffold for educational impact within the design community, implemented within the environment of design practice, our goal is to foster an engaged and informed stance of information literacy as a sustainable value with cascading effects in the information ecology as an *outcome*.

1.5 - Multiplying Containments: An Actionable Design Output

> *Without integrative disciplines of understanding, communication, and action, there is little hope of sensibly extending knowledge beyond the library or laboratory to serve the purpose of enriching human life. (Buchanan, 1992)*

Mitigating the previously discussed polluted information landscape demands the involvement of designers and reevaluating how they approach information literacy. From the outset, this research creation aims to propose a design 'output' that might cater to the UX Design community, including practitioners and students who may need to be more deeply immersed in the concepts and principles of information literacy.

Inspired by Friedman & Hendry's Value Sensitive Design (2019) work, which emphasizes the importance of equipping designers with the language to discuss the social consequences of technology, this research scouts the relationship between UX design and the information landscape of online news, exploring how design choices shape how users encounter information in this context and, ultimately, how design can promote a more autonomous digital experience.

The intention was not to create the ultimate, all-encompassing UX Design tool but to start walking the exploratory path of compiling and organize resources for any designer seeking insights into promoting information literacy - referring yet to the Value Sensitive Design framework; the target was *progress*, not perfection. The overarching intention was to move 'designers toward the language needed to discuss the often immense social consequences of technical innovation with the public at large' (Friedman and Hendry, 2019) from an information literacy standpoint.

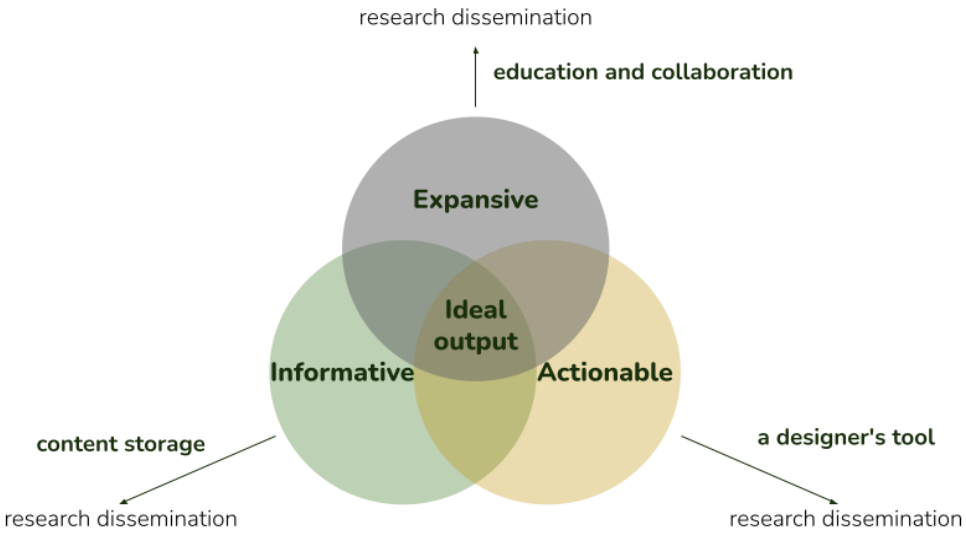

Figure 9: A diagram of the initial plan. Part of a presentation to the faculty at Concordia University. Diagram by the author.

Advancing, a foundational plan was drafted to delineate the concept and the aspirations for the optimal design output (see figure 9). These overarching intentions were threefold: first, to ensure that the resultant product is *informative* and capable of grouping and disseminating information effectively; second, to make the output *actionable* and beneficial for design practitioners; and third, to imbue it with an *expansive* quality that communicates its content effectively and encourages active participation. In summary, the target is an output that helps designers to act as multipliers of the containment of information pollution in their practice.

2

Chapter 2: Literature Review

When designing products and semiotic artifacts, we want to seduce, that is foster, a positive—or according to context, negative—predisposition towards a product and sign combination. Depending on intentions, design leans more to one pole or the other, more to autonomy or more to heteronomy. (Bonsiepe, 2006)

2.1 - The Practical Turn of Value Sensitive Design

A 'practical turn' in Design studies, Value Sensitive Design is an effort to integrate values into design processes (Davis, 2020a). Value Sensitive Design offers a proactive and flexible approach to technological innovation, emphasizing the central role of human values in the design process. It commits to human well-being, ethical considerations, and social responsibility in the realm of technology design and development (Friedman *et al.*, 2006; Friedman and Hendry, 2019). By foregrounding these commitments, Value Sensitive Design addresses the imperative to create technology that respects and enhances human dignity, autonomy, and privacy, thereby contributing to the broader ethical discourse in design and technology (Davis and Nathan, 2015). This historic review explores Value Sensitive Design's core principles, origins, and relevance in interaction design and UX design and discusses how the concept of *value* is presented.

The concept of Value Sensitive Design emerged in the late 1990s with the pioneering work of Batya Friedman. The foundational text, *Value Sensitive Design* (Friedman, 1996), laid the groundwork for a theoretical framework that originated from the intersection of HCI, computer science, and ethical inquiry, focusing on how designers can integrate human values into the design process. The argument is that design decisions inherently embody values, shaping not just the functionality of a product but also its impact on individuals and society; therefore, encouraging designers to consider these embedded values explicitly would foster technology that aligns with human and societal well-being.

This framework suggests a tripartite methodology involving conceptual, empirical, and technical investigations to evaluate how technologies affect human values comprehensively. According to the authors, conceptual investigations explore central research questions and constructs through analysis, theory, or philosophical inquiry. However, conceptual investigations often require further exploration: depending on the research focus, empirical investigations using quantitative or qualitative social science methods can provide insights into the human context surrounding the technology.

Technical investigations focus on the technology itself as the primary unit of analysis. Finally, integration and iteration are key: no single investigation type is sufficient. All three investigations inform and refine each other iteratively, and a design process can begin with any of these investigations (Friedman and Hendry, 2019).

Value, as understood in Value Sensitive Design, is multifaceted. Initially, Friedman did not explicitly define *value* in Value Sensitive Design but instead outlined broad areas of concern that included human dignity and welfare (Friedman, 1999, cited in Davis and Nathan, 2015). Subsequently, specific values were mentioned, such as 'trust, accountability, freedom from bias, access, autonomy, privacy, and consent' (Friedman, 1999, p. 3 cited in Davis and Nathan, 2015, p. 14). In a later article, in 2006, a definition of value is presented as 'what a person or group of people consider important in life.' This wide definition was accompanied by a specific list of values 'with ethical import that are often implicated in system design' (Friedman et al., 2006a, p. 349 cited in Davis and Nathan, 2015, p. 14). These 'values cannot be motivated only by an empirical account of the external world,' rather depending 'on the interests and desires of human beings within a cultural milieu' (Friedman et al., 2006, p. 2):

> Our particular list comprises many of the values that hinge on the deontological and consequentialist moral orientations noted above: human welfare, ownership and property, privacy, freedom from bias, universal usability, trust, autonomy, informed consent, and accountability. In addition, we have chosen several other values related to system design: courtesy, identity, calmness, and environmental sustainability. (Friedman *et al.*, 2006)

In essence, the literature on Value Sensitive Design illustrates that it arises from the limitations of solely user-centred design approaches in the digital age and a growing recognition and incorporation of ethical reasoning in design practices, highlighting a shift towards more responsible technology development. By emphasizing human values, social responsibility, and moral sensitivity, Value Sensitive Design empowers designers to create digital artifacts that are not only usable but also contribute to a more equitable, just, and sustainable digital future.

2.2 - A Brief Look at Affordances

The concept of *affordances* offers a cardinal point for studying Design artifacts, and it is even more substantial for a holistic analysis of digital design, particularly Interaction and UX Design. In this review, we will briefly present the historical evolution of affordances, specifically focusing on Jenny Davis's influential contribution, *The Mechanisms of Affordances* (Davis, 2020b), for a nuanced view of interactions.

The roots of the concept of affordances was first introduced within ecological psychology, where James Gibson first introduced the idea in the 19060s and 1970s. Gibson's ecological psychology emphasizes the dynamic relationship between organisms and their environment (Davis, 2020a). Affordances, in Gibson's context, are the 'action possibilities' that the environment offers an organism based on its perception and capabilities (Nye and Silverman, 2012). At the core of this perception-action cycle lies the notion that affordances are not fixed properties of objects, but rather possibilities that emerge through the dynamic relationship between an organism and its environment (Norman, 2013). The evolution of this concept is a trajectory that we will trace in this review.

The concept of affordances moved from psychology to design and human-computer interaction in the late 1980s with Don Norman's prominent book, *The Design of Everyday Things* (2013). Norman highlights the importance of designing interfaces that clearly communicate their affordances: a well-designed button, for example, should afford to click through its visual design and interaction cues, making its function evident to the user without explicit instructions. This perspective emphasizes aspects of user-centred design and intuitive interaction and brings the theory of affordances of digital interfaces.

Critiques on the concept of affordances emerged while its initial application in digital design focused on core usability, mainly because this view of affordances was too simplistic and binary, failing to capture the complexities of human-computer

interaction. Theorists at this point were concerned with *what* affordances were, which disregards the weight of social context and cultural background in shaping *how* affordances impact the interaction with digital interfaces (Davis and Chouinard, 2016).

Jenny L. Davis, in her book *How Artifacts Afford: The Power and Politics of Everyday Thing*s (2020a), addresses these limitations by introducing the 'mechanisms of affordances' framework (chapter 4). This framework delves deeper than simply identifying what an interface affords, to how it affords an action, and for whom, under specific circumstances. She proposes six key mechanisms that shape how affordances work:

- *Request*: the interface actively prompts the user to take a specific action. This could be through visual cues, labels, or micro-interactions;
- *Demand*: the design dictates a specific action, potentially limiting user choice. For example, a dropdown menu that only allows selecting one option;
- *Encourage*: the interface subtly suggests an action but allows for alternative interactions. A visual design or the placement of a design element might hint at a functionality without being overly prescriptive;
- *Discourage*: the design dissuades the user from taking a particular action. This could be achieved through disabled buttons or prompt messages;
- *Refuse*: the interface prevents the user from taking a certain action. For example, a password field that requires a specific format;
- *Allow*: The design offers freedom for the user to interact in their own way. This is often seen in open-ended design tools or creative software, such as CAD or design tools in which customization of the interface is offered;

The mechanisms framework provides designers with a nuanced language to analyze and create affordances when designing for experiences. It acknowledges that interfaces don't simply offer action possibilities but rather communicate those possibilities through a set of designed mechanisms. This framework invites designers to consider the power dynamics inherent in interface design. A website might 'request'

users to sign up for a newsletter, but it could also 'demand' it by making it a prerequisite for accessing valuable content. Understanding these mechanisms empowers designers to understand how user behaviour can be intentionally shaped and, if used benevolently, could guide users toward desired actions ethically and transparently. This aspect of the framework is particularly important for fostering ethical and socially responsible design practices.

Davis further explores the *conditions* of affordances: not only *how* affordances work, but *for whom* and *under which circumstances*. This refinement of the concept of affordances is important for a critical approach to digital systems, uncovering potential biases and power imbalances embedded in the interface. She further acknowledges that affordances are not universally experienced. The conditions of affordances are shaped by three key factors:

- *Perception* refers to an individual's ability to perceive the affordances offered by an interface. This is influenced by factors like skill level, technology literacy, and cultural background. For example, a complex interface might be perceived as less affording for someone unfamiliar with similar technologies;
- *Dexterity* refers to an individual's physical and cognitive abilities to interact with the interface. Physical limitations or cognitive impairments can affect how someone perceives and utilizes the affordances presented;
- *Cultural and institutional legitimacy*: This considers the social and cultural context in which the interaction takes place. Social norms, cultural expectations, and institutional frameworks can influence which affordances are deemed appropriate or acceptable within a specific context. For instance, the affordance of 'liking' a social media post might be considered acceptable in a personal context but discouraged in a professional setting.

In conclusion, Davis's framework, with its mechanisms and conditions, offers a powerful lens for analyzing and shaping affordances. Analyzing interactions with these

lenses expands the role of designers to think more systemically and to design experiences that foster user autonomy and promote ecological literacy.

2.3 - From Behavioural and Cognitive Sciences to Design: The Toolbox of Interventions

Understanding behavioural and cognitive sciences is an integrative part of designing user experiences that promote information literacy, as these fields provide valuable insights into how people process and interact with information. By leveraging this knowledge, designers can incorporate evidence-based interventions against information disorders.

The *Toolbox of Interventions Against Online Misinformation and Manipulation* (Kozyreva *et al.*, 2022)[1] stands as a central reference in this research-creation, given its comprehensive and globally collaborative nature. This collective work of 30 scientists from 27 universities and research centres, presents a current compilation of 81 scientific papers on individual interventions. These interventions are specifically designed to mitigate the harm caused by information disorders. The toolbox not only categorizes various intervention approaches (nudges, boosts, and refutation strategies) but also provides summaries of empirical evidence and highlights limitations in current research. This robust toolbox serves as a solid foundation to explore specific interventions and inform the prototype of this project.

This toolbox argues that psychological science is crucial to designing ways to address the challenges associated with the polluted information landscape, and it proposes four entry points to focus on this problem (see figure 10): law and ethics, technology, education and psychological and social sciences, through behavioural and cognitive tools. These are interdependent and can inform each other.

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[1] In this thesis, I relied on the earlier version of the *Toolbox of Interventions Against Online Misinformation and Manipulation*, which compiled and categorized ten major types of cognitive and behavioural interventions (e.g., accuracy prompts, friction, lateral reading) based on 42 empirical studies. This version was developed as a collaborative expert resource and circulated prior to its formal peer-reviewed publication. Subsequently, the toolbox was published in *Nature Human Behaviour* entitled *Toolbox of Individual-level Interventions Against Online Misinformation* (Kozyreva et al., 2024) as a landmark review article, with essentially the same taxonomy and intervention categories but framed with greater methodological rigour and positioned as an interdisciplinary reference for future research and policy.

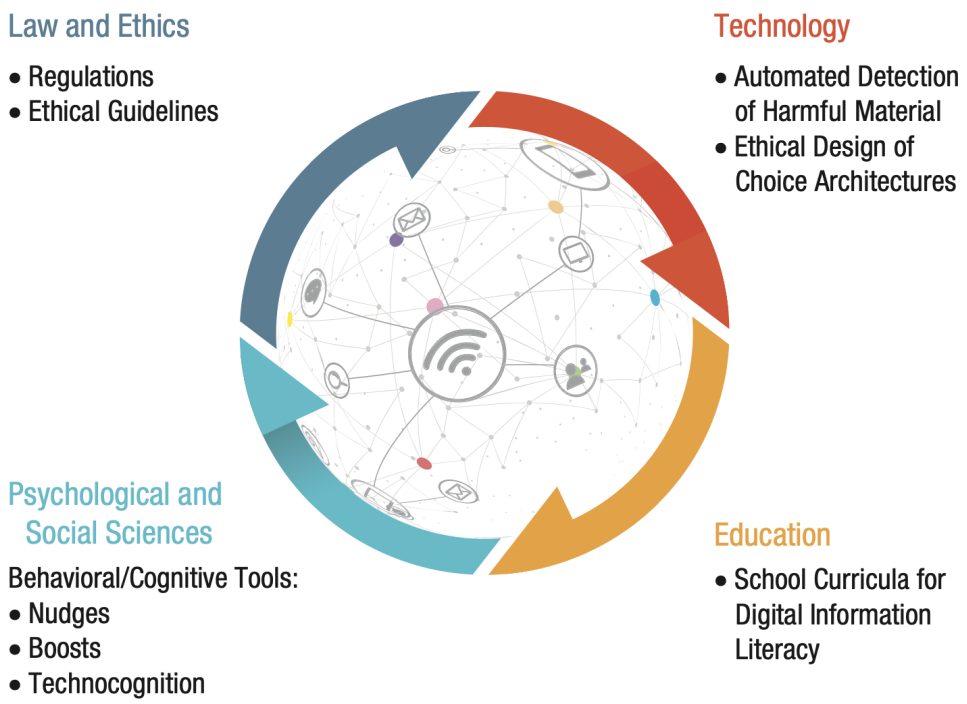

Figure 10: Four entry points for policy interventions in the digital world.
(Source: *Toolbox of Interventions Against Online Misinformation* (Kozyreva *et al.*, 2022))

Now, from the entry point of *psychological and social sciences*, the conceptual toolbox highlights three behavioural and cognitive tools for design interventions against disinformation disorders: *nudging,* which primarily targets behaviour (e.g., sharing information), *boosting* and educational interventions focus on enhancing user competencies (e.g., evaluating information), and *refutation strategies,* which targets beliefs (e.g., increasing critical thinking) (Kozyreva *et al.*, 2022).

These three conceptual approaches orient interventions against information disorders into nine distinct categories: (1) accuracy prompts, (2) debunking and rebuttals, (3) friction, (4) inoculation, (5) lateral reading and verification strategies, (6) media literacy tips, (7) social norms, (8) source-credibility labels, and (9) warning and fact-checking labels. Interventions target different aspects of human behaviour and cognition, and they can fall into more than one of the three conceptual approaches (Kozyreva *et al.*, 2022).

2.4 - Choice Architectures: Nudging and Boosting

The propositions of the *Toolbox of Interventions Against Online Misinformation* (Kozyreva *et al.*, 2022) are closely aligned with the concept of *choice architecture*, the design of different ways in which choices can be presented to consumers, with the aim of influencing the decisions they make. Choice architectures can be created to prioritize profits, retain user attention, profit from user data, and anticipate and shape future actions. They can be benevolent, for example, when they increase the user's control and autonomy, or they can be manipulative, reducing autonomy (Kozyreva, Lewandowsky and Hertwig, 2020). When persuasive choice architectures tend to be manipulative, ethically dubious and malicious, they are normally addressed as *dark patterns* (Mathur et al., 2019, p. 1 cited in Kozyreva, Lewandowsky and Hertwig, 2020, p. 113). For this research, our focus is on benevolent choice architectures for improved information literacy.

Nobel laureate Richard Thaler and Cass Sunstein popularized the term *choice architecture* in their seminal book *Nudge: Improving Decisions About Health, Wealth, and Happiness* (2009). They argue that individuals often make suboptimal choices due to cognitive biases and limited information processing capabilities. According to Thaler and Sunstein, choice architecture aims to address these limitations by designing the context in which choices are made, subtly influencing behaviour without restricting freedom of choice. Two disciplines inform the design of choice architectures: behavioural and cognitive science: while behavioural science explores how humans make decisions in real-world settings, cognitive science sheds light on how memory, attention, and biases influence our choices. Choice architecture can be classified into three basic categories: decision information, decision structure and decision assistance (Münscher, Vetter and Scheuerle, 2016).

Nudging is seen as a gentle push to steer users toward specific options for the greater individual or public good without restricting their ability to choose otherwise (Thaler and Sunstein, 2009 cited in Kozyreva, Lewandowsky and Hertwig, 2020), for

example, adopting pre-selected privacy settings by default. In this context, educative nudges are a category that transparently provides additional information or education to users, engaging with their faculties and preserving the autonomy of choice. Studies have shown that people generally prefer educative nudges over non-educative ones and suggested that nudges can be particularly effective in digital environments, where user choices are heavily influenced by how information is presented (Kozyreva, Lewandowsky and Hertwig, 2020).

Boosting represents another approach within choice architecture. It aims to empower individuals to make better decisions by enhancing their decision-making skills. Unlike nudging, which changes the environment to make certain choices more likely, boosting focuses on improving an individual's internal decision-making process. This concept suggests a more participatory role for individuals in making decisions, as it relies on their ability to process information and make choices that align with their goals and values (Kozyreva, Lewandowsky and Hertwig, 2020).

While benevolent choice architectures offer tools for empowering individuals, ethical considerations are important. Nudges and boosts should be transparent and avoid manipulating users into making choices that are not in their best interests. The ultimate goal of using choice architectures in UX Design for information literacy should be to help people make well-informed decisions, leading to a constructive usage of technology.

2.5 - The Trust Project

The Trust Project is a consortium that has developed a set of transparency standards named as the 'Trust Indicators' to help the public assess the quality and credibility of journalism. They are eight in total: 'Best Practices' ,'Journalist Expertise' ,'Labels,' 'References' ,'Methods' ,'Locally Sourced' ,'Diverse Voices', and 'Actionable Feedback'.

These indicators intend to provide clear disclosures about a news organization's ethics, fairness, accuracy, the reporter's credentials and the process of producing the story. The Trust Indicators have been adopted by over 300 news sites globally (see figure 11) and, according to this organization, they are recognized as the first global transparency standard for news (*The Trust Project*, no date).

Figure 11: Countries of news organizations adopting The Trust Indicators (*The Trust Project*, no date)

The Trust Project's standards were developed by an international consortium of news organizations led by award-winning journalist Sally Lehrman. The project was founded and led by Lehrman, and it was initially funded by Craig Newmark, the founder of *Craigslist*, through the *Trustworthy Journalism Initiative of Craig Newmark Philanthropies*.

Their guiding principles are rooted in the commitments developed by the Hutchins Commission in 1947, emphasizing the need for a free and responsible press to provide truthful, verified news and forums for civil exchanges. They are funded by philanthropic foundations and technology companies, including Craig Newmark Philanthropies, the Democracy Fund, Facebook, Google, the John S. and James L. Knight Foundation, and others (*The Trust Project*, no date).

The *Trust Project* has commissioned research to assess the impact of the indicators on user perception of news credibility. An in-person, eye-tracking study has shown that, while determining the credibility of online news is a complex process, the presence of transparency indicators positively influenced users' perceptions of credibility (Wojdynski and Varnum, 2023).

2.6 - Bridging the Gap with Technocognition

The digital information landscape presents opportunities for connection, information access, and innovation; however, as we have discussed, it also poses challenges related to information overload, cognitive biases, and the spread of information disorders. *Technocognition*, an 'alternative approach' that goes 'beyond cognitive science and incorporates technological solutions' (2019, p. 80), is a field championed by cognitive scientist Stephan Lewandowsky and offers a valuable concept for understanding the interplay between technology and human cognition. This review will explore the concept of technocognition, focusing on key contributions and applications to interaction design and UX design.

Technocognition is, in some ways, a straightforward term that articulates ideas of cognitive and behavioural science and the propositions of the *Toolbox of Interventions*. While it is not a widely adopted term in the academic field, it summarizes and represents the initiative of designing technology for better information literacy, bridging the gap between psychology and design. The concept of technocognition is centred around the intersection of cognitive science and technology design to mitigate the effects of information disorders and enhance information integrity in digital environments, as Lewandowsy, Ecker, and Cook (2017) write:

> In a nutshell, the idea of technocognition is to design better information architectures that can build bridges between the socially-defined epistemic islands that define the post-truth era. If technology can facilitate epistemic fractionation in the first place (Persily, 2017 cited in Lewandowsky, Ecker and Cook, 2017), then it stands to reason that it might also contribute to the solution. (p. 362)

In summary, technocognition suggests leveraging cognitive and behavioural insights to design information systems that are more resistant to polluted information, effectively reinforcing users' autonomy (Lewandowsky, 2019). It highlights the critical need for information architectures that support factual accuracy and foster user resilience. This involves creating environments where manipulation through digital

platforms is minimized and where users are equipped with the tools to critically assess and engage with online information (Kozyreva, Lewandowsky and Hertwig, 2020).

Some propositions the authors have arrived at are, for example, promoting content diversity and mitigating algorithmic bias, information correction strategies, fact-checking integration (embedding fact-checking tools directly within interfaces empowers users to verify information encountered on the platform itself), and visual design for mitigating misinformation (design principles that minimize clutter, prioritize essential information, and visually differentiate fact from opinion can reduce cognitive load and enhance information retention).

Part II: Explorations

3

Chapter 3: Research-creation

'Making is a thinking in its own right.' (Manning, 2016)

3.1 - Research Method: Integrative and Iterative Research-creation

Research-creation is a practice that integrates creative processes, experimental aesthetics, and artistic works into academic studies (Chapman, 2012). It is one of the 'methodological' approaches for pairing creative and scholarly research practices. It works as a tool for exploring complex questions within and across various disciplines by blending theoretical exploration with practical application in design's speculative and pragmatic aspects.

Considering the *Ten Propositions for Research-Creation* (Manning, 2016) specifically applied for research in UX and Interaction design, the research-creation methodology encourages to transcend traditional interfaces through principles such as rendering formative forces, making beyond the object, and activating 'new forms of life' by inventing at the interstices. It equips Design research with the possibility to enquiry past conventional metrics and techniques, cultivating new forms of knowledge from adaptable and transformative experiences. 'Research-creation is not about objects; it is a mode of activity that is at its most interesting when it is constitutive of new processes,' Erin Manning says in her presentation of the ten propositions, 'let us be up to the challenge of radical empiricism.'

Building upon the foundations of empiricism, the research methodology for this work is also oriented by Value-Sensitive Design ideas. Research-creation and Value Sensitive Design are complementary and synergetic, emphasizing the importance of exploration, experience, and evidence in guiding knowledge creation and designing technology that aligns with human values. Value Sensitive Design's tripartite methodology proposes conceptual, empirical and technical investigations in an *integrative* and *iterative* way, as none 'is sufficient on its own; rather, all three investigation types are needed to inform and shape and reshape each other' (Friedman and Hendry, 2019).

Both frameworks will guide the process of (1) creating a design output to (2) experiment with design education (empirical investigations), (3) explore existing technologies, existing research, and refine its value-alignment and potential impact on Design (conceptual investigations) and (4) study how the artifact may contribute to the desired outcome through usability testing to reveal how technical constraints and creative choices might affect user experience and ultimately, the value alignment of the design (technical investigations).

Two of the seventeen specific Value Sensitive Design methods are worth highlighting as they are closely related to this work: (1) *Value-Oriented Mock-up, Prototype, or Field Deployment*, and (2) *Value-Sensitive Action-Reflection Model*. The first method, *Value-Oriented Mock-up, Prototype, or Field Deployment*, explores the potential of existing technologies with our identified stakeholders: design academics and practitioners. This deployment in a 'real-world' setting is expected to improve the development and analysis of the design output.

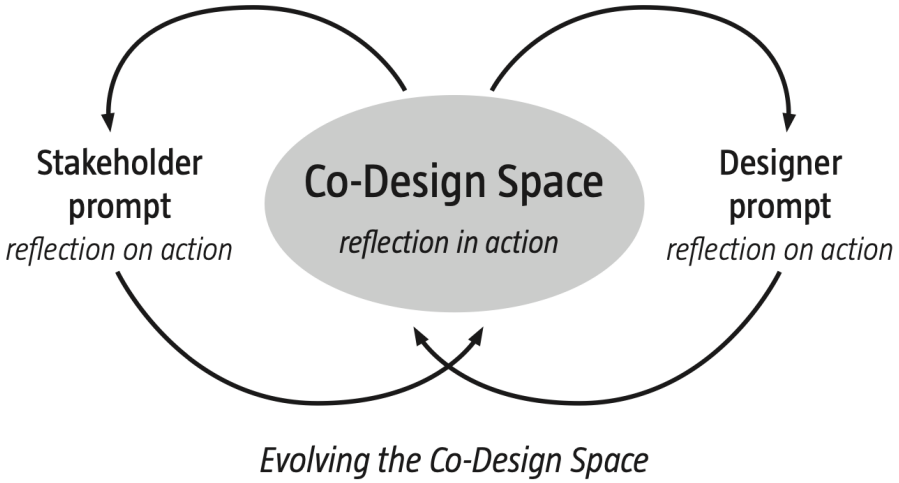

Figure 12: Value sensitive action-reflection model.
(Friedman and Hendry, 2019). CC BY-SA 3.0 DEED

The second specific method, the *Value-Sensitive Action-Reflection Model*, focuses on integrating human values into the design process through a process of action and reflection. This model involves stages for implementing or modifying the design based on identified values, fostering a value-centred development cycle. This model is represented by the participation of the stakeholders in the design process in a think-aloud study, inviting reflections that go beyond the usability of the design output to embrace its core and values (information literacy). This discussion aims to encourage thoughtful, ethically aware decision-making throughout the design process.

Contrary to linear research, research-creation and Value Sensitive Design methods value non-linearity and the potential for unexpected insights to reshape its process. This methodology bridges creative practice with academic inquiry and provides a framework for innovation and knowledge production, especially in fields where conventional methods are inadequate.

Subsequent sections of this chapter will delve into the description and concept of the design output, its initial practical implementations, and the preliminary results of the iterative research-creation process with the round of user consultation executed for this Master's research.

3.2 - Rooting Practice - Initial Prototype

The *Design 4 Truth: A Practical Guide to Designing Experiences for Information Literacy* board is the departure point of this research. It is a digital visual resource created as an educational tool for designers seeking guidance on interactions that promote digital information literacy. To explore this area, we articulated it through explorations in publicly accessible *Miro* boards (to be offered in *Miroverse*, their online repository/community for sharing boards). The intention was for this board to have an educational facet, integrating and presenting crucial concepts in a collaborative and replicable visual form. This section presents the processes behind it and describes the board.

One of the core strengths of creating a publicly available *Miro* board template lies in the possibility of disseminating the knowledge collected and created through this research, bridging the gap between theory and practice. *Miro* (www.miro.com) is a SaaS (Software as a Service) delivered as an online platform. It is intended for visual collaboration among teams and is primarily used for brainstorming, ideation, and project planning. It provides a virtual whiteboard where participants can generate, share, and collaborate on multiple content formats, including diagrams, drawings, and documents.

Miro also offers real-time collaboration features, allowing members to collaborate synchronously regardless of location (Zaveri, 2022; *What is Miro?*, 2023; *Miro*, n.d.). It is subscription-based, offering a limited free plan for prospective users, and it has an estimated 60 million users worldwide (*About Miro*, no date). Educationally, it has been successfully used in various academic settings (*Miro for Academic Research?*, 2020; Lorts, 2022).

The Miro board template is not just a static resource but a dynamic tool that can foster the co-creation of resources for workshops and classes. It can be duplicated and adapted for collaborative activities as a scaffold for real-world information literacy

initiatives. Designers can customize and adapt content to specific projects, ensuring continuous progress. Even in its initial iteration, the template can be a valuable resource for information dissemination. As it is copied, duplicated, and developed with additional features, its potential for impact increases, leading to a more impactful design intervention over time.

Miro provides a service named *Miroverse*, a digital repository and discovery system specifically for *Miro* boards, containing 500 boards under the search term 'design' and 490 under 'education' in April 2024. This public repository allows users to replicate their boards to be used as they are or to be adapted and improved, with a cumulative and scaffold potential for shared knowledge, aligning with the hope of favouring information literacy by multiplying 'nodes containment' (Bjola and Pamment, 2016) of information disorders.

3.2.1 - Comparative Analysis

As a first creative step, the design process was informed by an exploration of existing educational *Miro* boards (grouped under the 'education' tag)—this comparative analysis aimed to understand further how *Miro* was being utilized for educational purposes. The first analyzed project was the *Coded Fairness Toolkit* (Lehmann, Rost and Schindler Zins, 2021), part of a Master's project at the University of Applied Design Schwäbisch Gmünd. This toolkit intends to provide a structured, workshop-based approach for fostering bias-aware development of machine learning systems.

According to the authors, this toolkit is mainly intended for teams in the early stages of algorithm design in fields where bias mitigation is critical. It comprises three modules—*Bias & Impact Awareness*, *Diversity & Inclusion*, and *Scenario Building & Testing*—each addressing specific facets of bias, ethical objectives, and inclusive practices. Through textual content, promoted discussions, and scenario-based assessments, the toolkit intends to teach teams to spot potential ethical impacts

proactively, equipping them to identify and address risks of discrimination. Figure 13 shows an overview of how the toolkit's board is visually and sequentially structured and how the workshop flow is presented from one module to the next. This resource was relevant in informing the design by offering an example of structuring a practical, team-centred learning activity for a value-sensitive approach to technology.

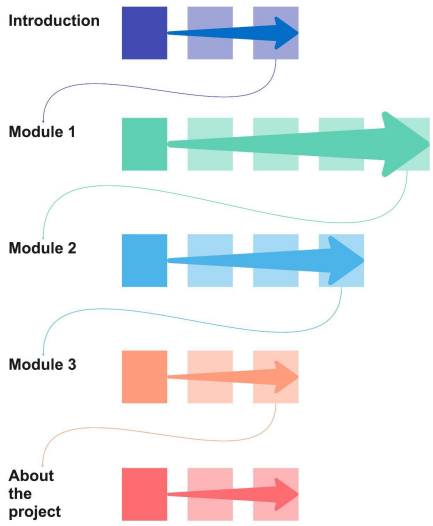

Figure 13: *Coded Fairness Toolkit* navigation flow. The diagram illustrates its structure, which guides participants through the workshop-based activities.
(Diagram by the author.)

Another project analyzed was the *Sustainable UX Toolkit* developed in 2021 by *Sustainable UX - SUX*, a design community, self-proclaimed non-profit, for promoting what they entitle as the *Sustainable UX Manifesto*. According to its *Miroverse* description, it intends to provide a framework for UX designers and teams to align their work with the United Nations Sustainable Development Goals (SDGs). This toolkit, structured around the *Can Know, Can Do & Should Do* framework, intends to guide designers to build a knowledge base on specific SDGs (see figure 14), identify sustainable design opportunities, and periodically revisit goals to ensure ongoing alignment with sustainable values, according to the authors. It relies on a collaborative exploration of sustainable practices through a four-step co-creation process (grounding, analyzing, creating, and presenting). The resource offers another example of an activity-oriented

approach to integrating sustainability values in design practices, this time being specifically developed for UX design.

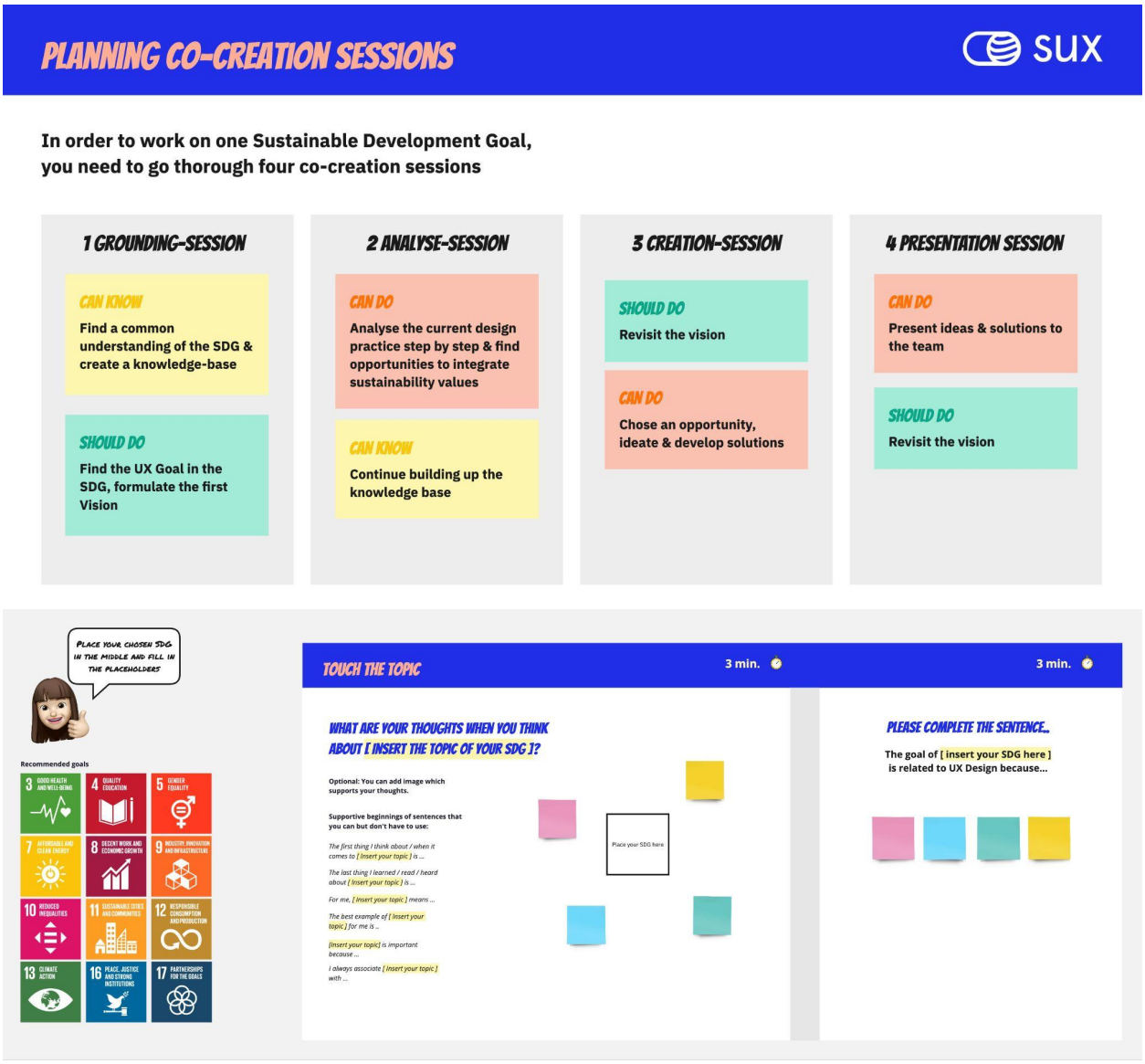

Figure 14: Excerpts from the *Sustainable UX Toolkit* board. These screenshots provide an example of how the board is presented in levels, following the ' *Can Know, Can Do & Should Do*' framework, and an example of how the activity is proposed using the *Miro* platform's affordances of drag-and-drop, fill-in sticky notes and online discussions.
(Screenshots by the author.)

Both examples make use of the *Miro*'s platform's affordances to optimize their educational goals: textual and visual information about the content (and about how to navigate the board), interactive features such as drag-and-drop shapes and images, zooming in and out, and mimicking materiality in digital space through the use of sticky notes (a way to signal the same informality of their paper-version use), and the real-time promotion of remote online discussion among groups of people.

3.2.2 - Description of the Initial Prototype

The initial *Design 4 Truth* prototype was inspired by the examples presented before, and intended to create a template that would summarize and present the topics investigated in this dissertation (mainly information literacy and concepts deemed relevant to it) in a way that would introduce them in a workshop format to be held in groups or individually, and tie them both to practitioners and to a Design audience (see figure 15).

This *Design 4 Truth* Miro board was organized into several sections, each providing further insights and resources related to the topics presented. Most of the information presented attempts to synthesize the concepts in chunks of easily understandable texts, sometimes followed by visual aids, such as icons, examples, or diagrams, to better communicate and support the present activities.

The sections of this board (see figure 16) could be divided into the following: *Introduction and background information*; *Content and presentation of the topic*; and *Exercises*. They were primarily presented in left-to-right navigation, although they may span to the bottom when developing a theme in more depth or to the top for extra information. Bellow, there is a more detailed description for each section:

Figure 15: *Design 4 Truth*'s board initial illustration. Illustration by the author.
The board is available online at https://miro.com/miroverse/design-truth-project-template/?social=copy-link

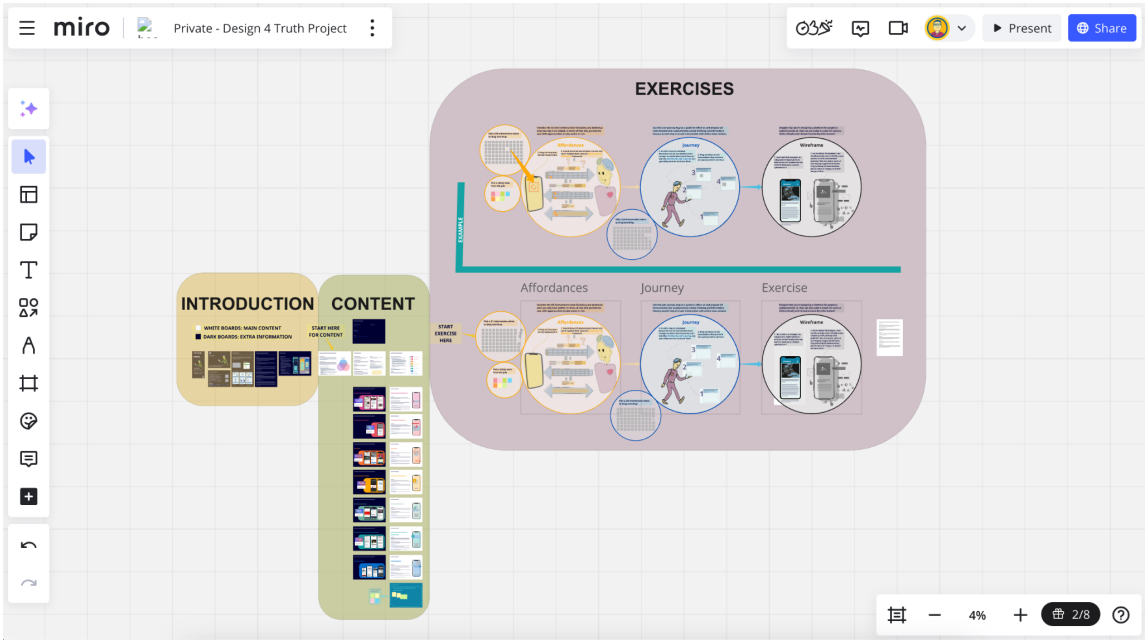

Figure 16: *Design 4 Truth*'s board initial illustration. The coloured highlights delimiting the sections were added in this excerpt only for explanatory purposes.
The board is available online at https://miro.com/miroverse/design-truth-project-template/?social=copy-link

- *Introduction and background information*: the board begins with an introduction that sets the stage for the workshop and the subject to follow. It provides background information about the project, its author and affiliation with the post-graduate program. This section sets the project's purpose, introduces the topic's relevance, and pitches the added value of this tool. It also mentions its limitations, namely, its experimental and non-exhaustive nature and accessibility limitations due to the platform that hosts it. Some instructions on navigating the board are for people unfamiliar with *Miro* (see figure 17).

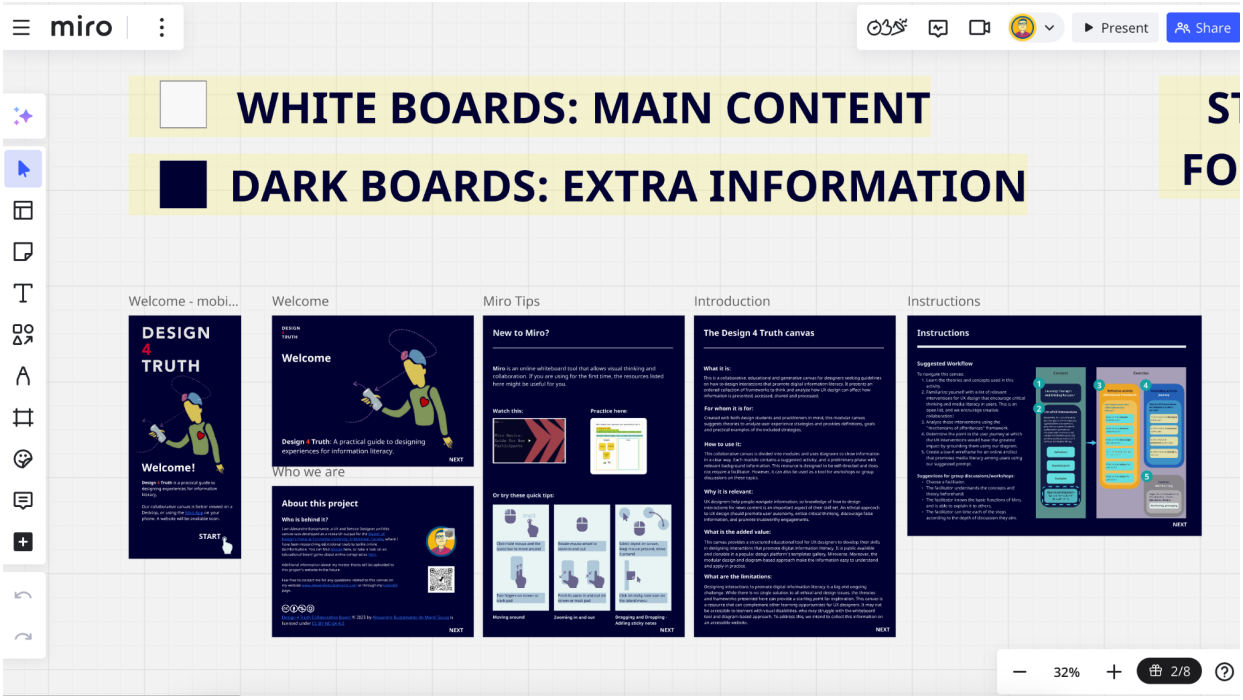

Figure 17: *Design 4 Truth*'s board introduction section overview. The highlighted text states that white boards are used for the main workshop content, and the dark boards support extra information.
The board is available online at https://miro.com/miroverse/design-truth-project-template/?social=copy-link

- *Content and presentation of the topic*: The content section of the board is divided into two subsections that cover aspects of designing for information literacy: one delve into the concepts and theory of UX Design for information and media literacy, and the second focuses on specific examples and is named *List of UX Interventions* (see figure 18).

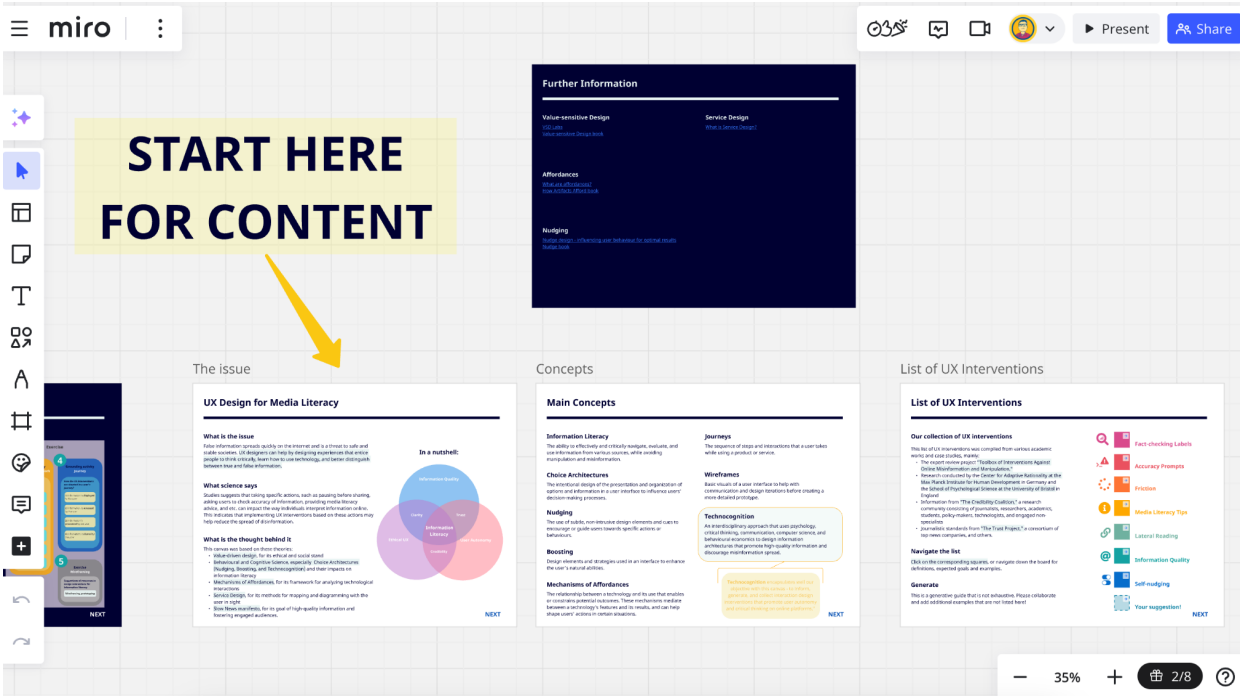

Figure 18: *Design 4 Truth*'s board content section overview. Two frames present concepts and theories that will be addressed on the board. The third frame introduces the list of UX interventions - practical examples of how interaction design has attempted to address the topic.
The board is available online at https://miro.com/miroverse/design-truth-project-template/?social=copy-link

The List of UX Interventions subsection compiles a curated set of UX strategies targeted explicitly at addressing information disorders synthesized from the body of literature reviewed for this dissertation. These interventions, documented by field experts, were selected based on their demonstrated or theorized impact on user interaction, the user interface, or the overall experience of navigating content. Only those strategies with a clear integration into UX or interface design were included. For instance, while some sources advocate the strategy of inoculation — exposing audiences to controlled cases of misinformation to foster critical evaluation—this approach is often structured as a standalone educational campaign rather than an embedded UX component. Such strategies were excluded as they do not directly modify the interaction or interface within the scope of UX design. This selective process thus ensured that the listed interventions contribute directly to enhancing information literacy through UX design elements rather than through broader educational or organizational standards.

The resultant list covers the following interventions: fact-checking labels, accuracy prompts, friction, media literacy tips, lateral reading, information quality, and self-nudging (see figure 19).

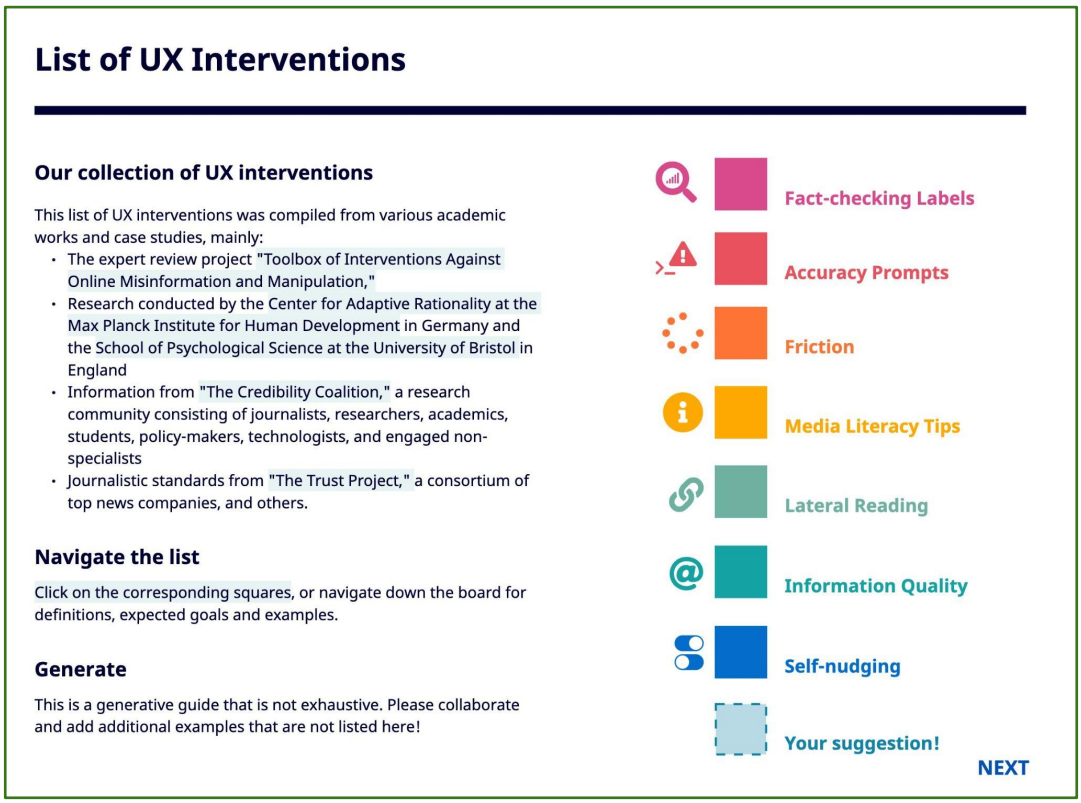

Figure 19: *List of UX interventions* from the *Design 4 Truth*'s board. Each intervention is linked to a frame containing detailed information.
(Screen capture by the author).

Each intervention is accompanied by two dedicated frames, one containing its detailed description, expected goals, and real-world examples of its implementation (see figure 20), and another containing images that visually represent each UX intervention, showcasing design elements and illustrating their application, to enhance the understanding of the content (see figure 21).

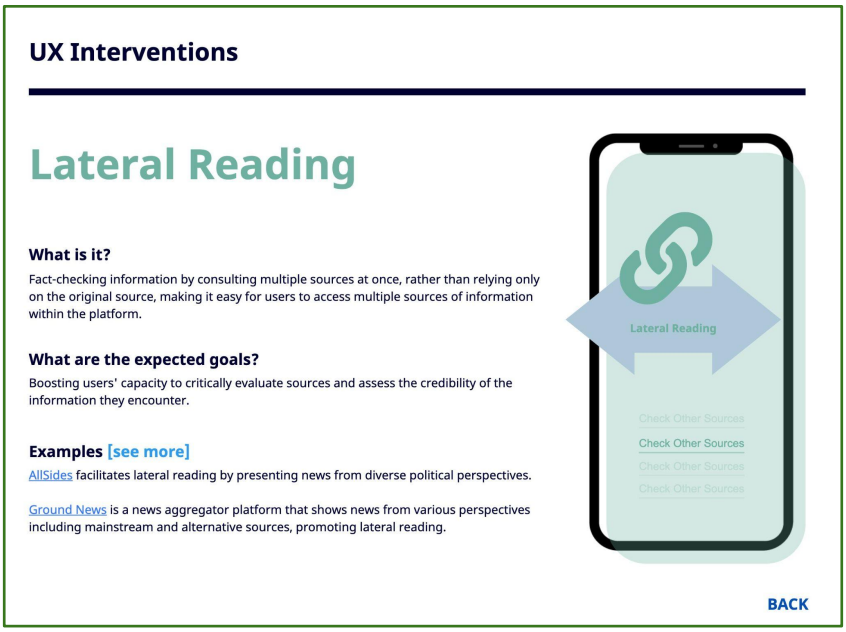

Figure 20: An example of the *List of UX interventions* from the *Design 4 Truth*'s board. The intervention, Lateral Reading, is presented with a brief description, intended goals, and examples. Its respective icon illustration accompanies it.
(Screen capture by the author).

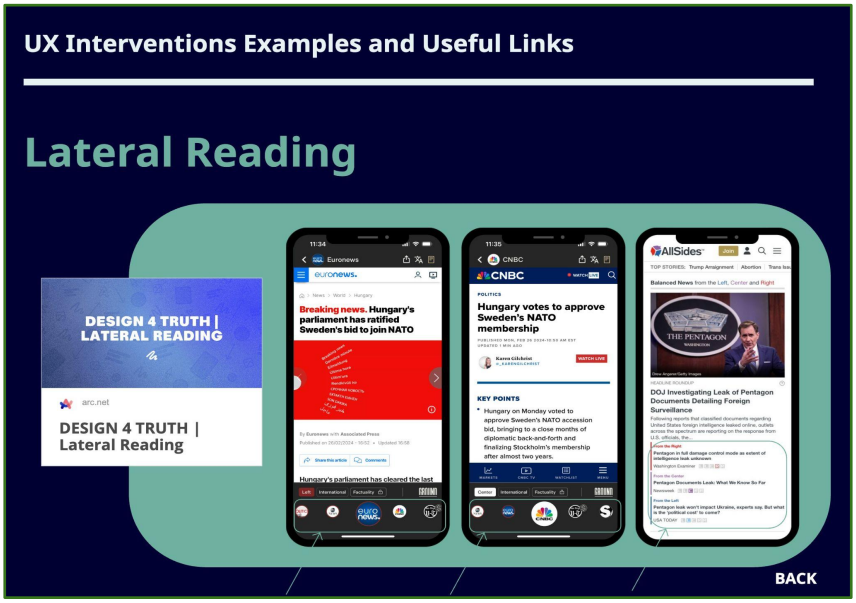

Figure 21: An example of the *List of UX interventions* from the *Design 4 Truth*'s board. On this dark board, images showcasing real-world examples are presented. A link to a dedicated page (supported by the free browser *Arc*'s easel feature) with the living examples.
(Screen capture by the author).

- *Exercises*: In this section, the board proposes three activities for a practice session. This workshop provides a structured way of thinking critically about UX Design for information literacy through an exercise of applying the *Mechanisms of Affordances* framework, a User Journey Map diagram about interaction with online news content, and a prototyping activity for a mobile app (see figure 22). A semi-filled exercise example at the top of this section indicates how it could be used.

For the *Mechanisms of Affordances* subsection, users are invited to drag-and-drop tokens with icons representing each UX intervention and place them on the screen of an illustrated smartphone. They are invited to a process of reflection-discussion to analyze UX interventions according to the *Mechanisms* framework (see figure 23). The mechanisms of affordances are presented in three large groups represented by directional arrows between a device and a user. This categorization is the same as in the original theory (Davis, 2020a): *initiated* by the digital platform, *responding* to the platform, and *allowed* by the platform. Users can pick pre-tagged sticky notes and place them on a chart to add their thoughts during the workshop.

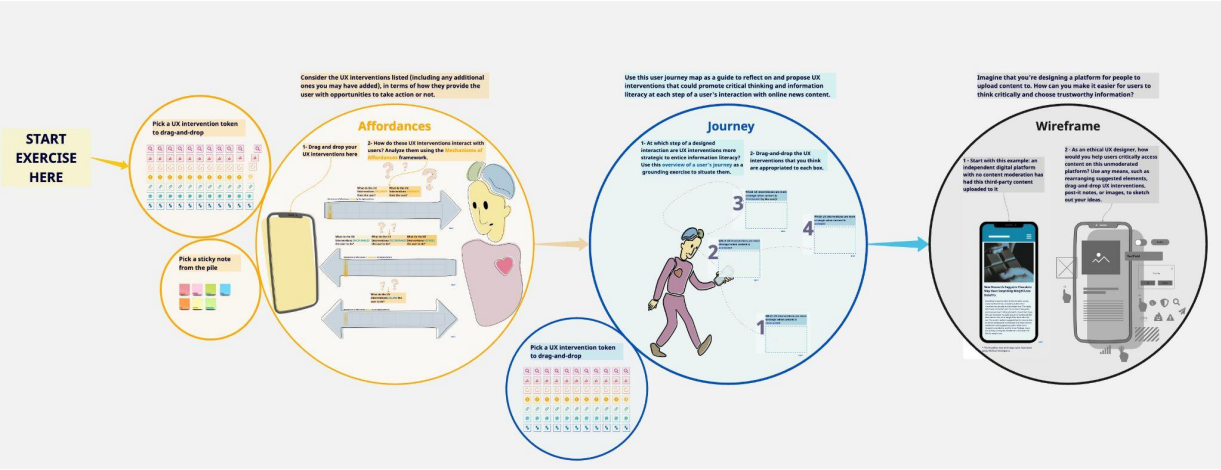

Figure 22: *Design 4 Truth*'s board exercise section.
(Capture by the author).

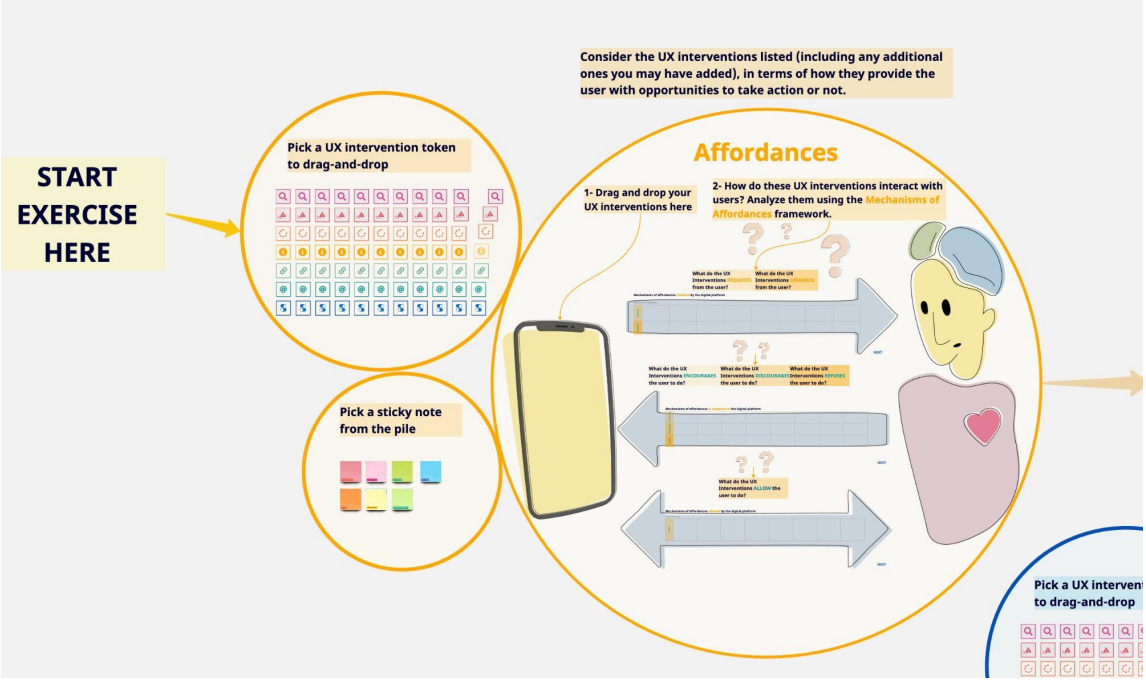

Figure 23: *Design 4 Truth*'s board exercise section. Focus on the Affordances subsection. (Capture by the author).

For the User Journey subsection, the board provides a user journey map and tokens with icons representing the UX interventions. This exercise asks the user to reflect on and select suitable UX interventions for each step of the interaction with online news content (how it is displayed, accessed, processed, and shared) (see figure 24).

For the Prototype subsection, board users are invited to wireframe a mobile phone interface for news content quickly. There is one example, and by its side, some elements suggested can give a quick start on a simple wire framing exercise. The purpose is to introduce a design activity to be discussed and performed by the team, resuming and consolidating some of the concepts discussed in the previous activities of the Miro board (see figure 25). This is intended to be a digital sketch and by no means to generate a finalized design product.

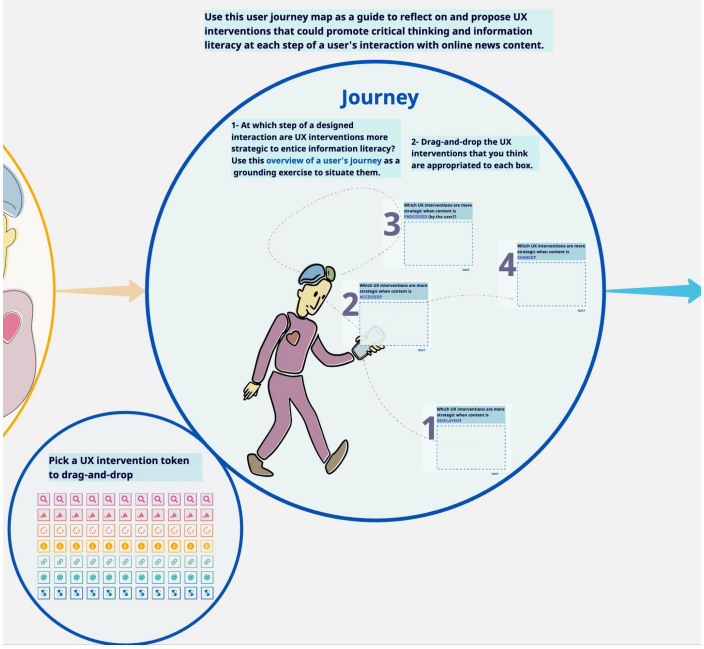

Figure 24: *Design 4 Truth*'s board exercise section. Focus on the User Journey subsection. (Capture by the author.)

Figure 25: *Design 4 Truth*'s board exercise section. Focus on the Wireframing subsection. (Capture by the author.)

3.3 - User Study

As an initial application of the iterative Value Sensitive Design method, a user study with five participants from the identified stakeholder group was conducted. Given the scope and duration constraints of the Master's program, this research was deliberately limited, but designed to be 'formative' in nature (Nielsen, 1993): it would inform the design process by aligning with Value Sensitive Design's action-reflection cycle.

The user study pursued two interconnected objectives: First, it sought to explore how the *Design 4 Truth* prototype was perceived by users, including its potential as a learning tool, the resonance of its core values and ideas with the participants, and its capacity to stimulate discussions about the role of Design in promoting information literacy. Second, the study aimed to gather actionable feedback on improving the board's usability, structure, and presentation.

Questions that guided this study were: How familiar are designers with the concepts presented in the project (information literacy, affordances, user journeys, technocognition)? How do designers perceive the educational board's effectiveness in conveying concepts related to UX design and information literacy? What specific learning experiences and challenges arise during user interactions? How easily can users navigate the board, and where do they encounter barriers to its usability? By incorporating this feedback through an action-reflection process, the project intended to progressively enhance the product's effectiveness and alignment with its educational goals.

The study planned a mixed-method approach to address these questions, comprised of semi-structured interviews with think-aloud sessions, followed by content analysis. Semi-structured interviews would enable participants to express their perceptions and values about the *Miro* Board, hopefully returning rich qualitative data on individual experiences and values. Think-aloud sessions would allow participants to

articulate their thoughts as they navigated the board in real-time, hopefully revealing usability points. This planned approach would align with Value Sensitive Design's Value-Sensitive Action-Reflection Model by engaging users in a reflective process to uncover implicit values, cognitive processes, and usability concerns. Data from interviews and think-aloud sessions would then be analyzed to identify themes, insights, and patterns relevant to the outcomes of this thesis.

The five participants represented a group of design practitioners and students with a range of experience levels. All sessions were conducted online to ensure convenience and increase the chance of participation, lasting 40 to 50 minutes to accommodate structured tasks and open reflection. Additional background information was gathered on participants' current roles, industry, and experience with *Miro* to contextualize user feedback. Participants signed informed consent forms acknowledging the study's purpose, procedures, and their rights. All participants remained anonymous and were given generic IDs (participant 1, participant 2, etc.) for the analysis step.

Given the relatively small sample size, adopting a simplified thematic analysis approach was sufficient to identify key themes and patterns in user feedback; quantification was neither practical nor fruitful in bringing out the findings. A qualitative method following general steps of the thematic analysis, paired with an interpretation of the findings, was suitable for displaying the nuances and gaining insights into user experiences.

3.4 - Analytical Process

In an attempt to make this analysis process more systematic, the following steps were taken:

1 - Transcriptions: using a limited, free version of a SaaS video-to-text tool (*Dovetail*, 2024), anonymous, full-text of the user interviews were obtained from the recorded sessions - except for one, which, due to a mistake in the recording, the researcher's recollections were used to reconstruct the conversation;

2 - Familiarization: from the conversations, transcripts and notes, initial potential labels were emerging, for example, recurring mentions of being 'lost' and 'layout confusion' highlighted potential *navigation* issues, and then became a label (see Table 1);

Quotes	**Codes**
'It helped me think about how I might include some of these in my own work, even outside of news platforms.' 'These examples are useful... I could see friction or lateral reading being relevant in e-commerce too.' 'Friction was interesting as a UX concept... I like the list, how there were examples of the interventions. I think that cleared up a lot of my questions.' 'I like the idea of evaluating design strategies, but wasn't sure how to choose the right intervention for each case.'	UX, UX Design, UX interventions
'Technocognition... I was not even aware that there was a term for it. That's fascinating.' 'I know a lot about UX. I know a lot about service design and I know nothing about digital literacy. So this is a brand new field for me, which I think is very cool.' 'I don't really know what affordances are. So I'm kind of curious to learn more about that.' 'I think I understand what affordances are, but I wouldn't feel confident explaining them without an example.'	Affordances, technocognition, information literacy.

'Making it a little bit more linear and left to right... I do see the need of clarifying the sections and kind of like creating like a more structured *start here and go there.*' 'It looks like dark boards are extra information. So I would put that like bottom, right? Since it seems less important... a flow from left to right.' 'It might help to move in one direction only. I didn't know if I should [illegible]'	Navigation issues, layout confusion.
'There's a bit of a gap between starting the exercise and understanding the objective and theory behind it... there was too much text and information to process.'	Instruction clarity, exercise flow.
'It took a while to understand what each exercise wanted me to do. Once I did, it made sense, but the beginning was unclear.' 'Some of the terms feel very academic.' 'It was a bit confusing at first, but once I found the icons and examples, I got into it.'	Engagement, exercise flow, icon labels.
'The yellow on white was hard to read on my laptop. I had to zoom in a lot.' 'It could be more accessible with clearer contrasts. On some screens, it's hard to distinguish the text from the background.'	Colour scheme, visual contrast.

Table 1: Example of the thematic analysis for the user research - labeling transcripts.

3 - Coding: still using *Dovetail* (2024), transcripts were summarized and excerpts linked to previously generated labels. The tool's automated tagging proved unhelpful—likely designed for larger datasets—so it was not used ;

4 - Themes: From the coded data, five overarching themes emerged (see Table 2). As thematic analysis is inherently subjective (see Table 2). As thematic analysis is inherently subjective (Guest, M.MacQueen and E.Namey, 2012): the clustering reflects my dual role as both creator of the board and facilitator of the study.

Codes	Themes
UX interventions, friction, lateral reading, etc.	UX Interventions
Affordances, technocognition, information literacy, etc.	Concepts
Navigation issues, layout confusion, instruction clarity, etc.	Usability
Engagement, exercise flow, icon labels, etc.	Learning Experience
Colour scheme, visual contrast, etc.	Accessibility

Table 2: Example of the thematic analysis for the user research - finding themes.

3.5 - Actionable Insights

The dual perspective of creator and researcher that undoubtedly shapes the thematic analysis also influences the strategic recommendations based on the diagnosis of the Miro board for future steps of this research-creation. The user study reveals it to have positive features and foundational problems. It is praised while presenting the list of UX interventions as a practical reference for design work. Other positive aspects are that participants show appreciation for the topic of information literacy, and for the opportunity to reflect on ethical UX interventions, and they are positively engaged with the interaction on Miro. It is problematic when the prototype exposes its limitations due to a cognitive overload, and results in gaps of understanding of key theoretical points (such as technocognition and the mechanisms of affordances). There are also the usability issues, but those are circumscribed to a sphere that is more operational than of foundational concern.

The qualities and limitations observed during the user study are, nevertheless, instructive. Notably, the List of UX Interventions emerged as a particularly strong and successful feature of the board. Participants demonstrated significant interest in this section, with findings indicating it was the part of the board where participants spent considerable time. The list was praised for effectively bridging the gap between theoretical ideas and tangible design strategies. It elicited enthusiastic responses, as participants could readily relate to these interventions, recognizing their practical application within UX design and seeing beyond their suggested use: participants suggested expanding the scope of this list beyond the context of news media, noting its potential relevance and applicability in various design domains like e-commerce and other content platforms.

At this point, I will introduce a slant to the research-creation. Again, relying on my dual vision of a creator and researcher, I begin to understand the initial prototype of the Miro board, in the format of an online workshop/educational piece, as a 'design probe', rather than a final product. As a design probe, it is a situated artifact that has its own

merits, but one that reveals a more important untouched potential. It signals an opportunity to develop its strongest feature as a new contribution to the field of interaction design: improving the List of UX Interventions into a practical and referential tool for UX Design that could better support designers in their role of containment of information pollution.

3.6 - From Prototype to Reflection

The List of UX Interventions, as discussed before, emerged from a curated cross-analysis of sources mentioned in the Literature Review, but with a focus on design strategies that demonstrably impact the user experience of navigating online news (see Table 3).

UX Interventions	Description
Fact-checking labels	Visual annotations or tags applied to content, often from third-party evaluators, to indicate its accuracy or reliability based on verification.
Accuracy prompts	Design elements that prompt users to consider the accuracy of information, sometimes by introducing a pause or drawing attention to it.
Friction	The deliberate design choice to increase the difficulty or time required for a specific action, encouraging users to slow down and think.
Media-literacy tips	Guidance or advice provided to users aimed at improving their skills in evaluating online content and recognizing potential misinformation.
Lateral reading	A strategy where users investigate the credibility of a source or claim by consulting external websites and information instead of solely analyzing the original content.
Information quality	Design approaches that highlight aspects contributing to the trustworthiness or reliability of content, such as source transparency, author information, or clear visual presentation.
Self-nudging	Tools or methods that allow individuals to modify their own interfaces to better manage information exposure and improve self-control.

Table 3: The List of UX Interventions from *Design 4 Truth*.

Subsequently, while the compilation of UX interventions was incorporated into the initial prototype as illustrative activities, a systematic and critical analysis of each intervention had not yet been undertaken within the scope of this thesis. These interventions influence distinct stages of the user's journey through online news

content, and they operate through diverse mechanisms of affordance. Adding to this analysis, we can note that they have varying levels of autonomy and cognitive engagement. As part of the analysis in this research-creation process, I propose re-examining them through these parameters.

In the Toolbox of Interventions Against Misinformation their interventions were categorized differently, according to what they considered 'policy interventions': nudges, boosts, and refutation strategies (Kozyreva et al., 2022, p. 3). For our own analysis, I propose breaking the Design 4 Truth UX interventions analysis in terms of the exercises used on the prototype, user journey stage, affordance mechanism, with extra two parameters surfaced during the user study: cognitive demand, and user autonomy to provide added dimensions.

Intervention	**User Journey Stage**	**Affordance Mechanism**	**Cognitive Demand**	**User Autonomy**	**Comments**
Fact-checking labels	Processing / Evaluation	Allow / Encourage	Low	Passive	Provides passive support for judgment without requiring user action.
Accuracy prompts	Accessing / Navigation	Request / Encourage	Medium	Passive	Momentarily interrupts flow to prompt reflective thinking.
Friction	Sharing	Demand / Discourage	High	Active	Inserts cognitive or interactional cost to deter impulsive actions.
Media-literacy tips	Display / Encounter	Allow / Encourage	Low-Medium	Passive	Offers educational support, often unobtrusively; uptake depends on user motivation.

Lateral reading	Processing / Evaluation	Encourage	High	Active	Actively pushes users to verify claims by navigating away—requires initiative.
Information quality	Display / Encounter	Allow	Low	Passive	Interface transparency features such as author or date give subtle cues for trust.
Self-nudging	Acessing / Navigation	Allow / Request	Low	Active	Empowers user to set their own friction or structure; requires deliberative engagement.

Table 4: The *List of UX Interventions* tabbed across journey, affordance and cognition.

On further reflection, the possibility for the next steps for this research-creation was considering refining the *List of UX Interventions* into a static guide for designers, for example, taking as a reference the book *Laws of UX* (Yablonski, 2020), a curated collection of psychological principles that guide the user experience and interaction with interfaces, translating cognitive science into actionable design practices through concise explanations and visual examples. But this would result in the list functioning as a reference guide, informative yet static. Heuristic-based lists like the *Laws of UX* offer valuable tactical advice as a guide, but guides, or lists in our case, are discrete and categorical. They lack the granularity required to guide ethical and cognitive decisions in the context of information literacy for UX design: they privilege isolated best practices over the relational and systemic orientation of ecological literacies. For this reason, continuing to iterate the list alone could not sufficiently address the need for a structure capable of integrating interdependencies, highlighting reflective value, and patterns of influence while designing user experiences for the information ecosystem.

In contrast, analyzing another reference used for this work, it is possible to see that the Mechanisms of Affordances framework (Davis, 2020b) plants the seeds of a scalar logic: in Affordances it is not only about what certain user actions afford, but how they afford - and one could argue, to what degree they afford. Reading these analysis and finding through the Value Sensitive Design action–reflection model, the Design 4 Truth board and the List of UX Interventions began to appear less as an endpoint and more as an action phase whose insights needed to be re-articulated in a more abstract, reflective - and, a scalar form.

In contrast with the List of UX Interventions, a scalar reference would offer a more reflective point, by providing a structured reference for UX interventions by their degree of influence on user interaction. The Miro toolkit operationalized this position pedagogically, staging a value sensitive and technocognitive design space in which designers could surface, contest, and reconfigure how UX interventions act upon user cognition and autonomy. Adopting a scalar logic instead of an static guide could then condense these situated explorations into a compact decision framework that organizes conceptual parameters that are innate for the analysis and building of news interfaces, making them explicit to designers.

This is where this research-creation will land on now: how we could embed and integrate the theory behind these UX interventions within a familiar and cognitively accessible format - and a scalar one - to reduce complexity and support actionable reflection for design practitioners.

3.7 - Branching Out: A Technocognition Meta-framework

The potential behind the initial prototype becomes the new branch of this research-creation: a technocognition scale. While the Design 4 Truth board offered a broad and integrative canvas - one that combined ecological literacy, information-literacy concepts, affordances, user journeys, and real-world UX interventions - the user study revealed a recurring tension. Participants expressed strong engagement with the curated List of UX interventions, yet the analysis and reflection after the user study pointed to an untouched potential of evolving to a reflective tool adequate to the relational and systemic characteristics of an ecological literacy. This signalled that the challenge to follow the guiding question of this research was no longer one of iterating in a linear form, rather, the challenge was on reframing it.

Following the iterative logic of research-creation and the reflective cycles embedded in Value Sensitive Design, the next step was not to refine the board as an artifact, but to abstract and distill the conceptual relationships that the board attempted to hold. As Phillips and Milner argue, ecological literacy requires systemic thinking: identifying patterns, flows, and networked responsibilities rather than discrete skills. If designers are to operate as effective actors - or, in Bjola and Pamment's terms, nodes of containment - then they require tools that help them reflect on the decisions they take in the design process.

This realization guided the shift toward a meta-framework. Borrowing this term from the field of front-end development, where it is used to categorize popular examples like React, Next.js, Angular and others, 'as the name implies, a meta-framework is a system one level above that stitches multiple frameworks together' (Holmes, 2022). In other words, it is a higher-order structure that organizes and integrates existing frameworks or models, providing a unified approach to complex domains. In the context of this research-creation, meta-framework describes the synthesis and integration of research on technocognition onto an existing model that reduces cognitive overload by leveraging a common scalar pattern.

This meta-framework links UX interventions to dimensions shaping user experience in information literacy. The insight emerging from the reanalysis of the List of UX interventions, particularly when examined with the lenses of affordance mechanisms and the user-journey model combined, was that two parameters could consistently structure dimensions: (1) cognitive effort required and (2) the degree of user autonomy. These dimensions are also deeply compatible with VSD's ethical orientation (autonomy, agency, accountability) and with technocognition's call to marry cognitive science with interaction design.

The technocognition scale positions interventions along these axes, helping designers assess the appropriate level and purpose of intervention while fostering users' ability to access, evaluate, and communicate information effectively. By combining Cognitive Effort and User Autonomy, it offers a systematic yet accessible tool for reflective, informed decision in analyzing and designing for digital news environments. Therefore, this branch of the research-creation marks not a rupture from the Design 4 Truth board, but its conceptual consolidation. The Miro board mapped the terrain; the technocognition scale distills it. Together they reflect a design-thinking trajectory that goes from convergence to divergence to convergence again, and support the broader ecological argument of this thesis: that equipping designers with adequate educational tools enables them to intervene meaningfully in polluted information flows.

The next section presents the skeleton of this matrix. Building on Value Sensitive Design, affordance mechanisms, and technocognition, it serves as a scalar framework to evaluate and guide UX interventions, complementing existing heuristics with contextual and reflective judgment to advance information literacy.

3.8 - Drafting a Matrix

The initial skeleton for this matrix is conceptualized as a two-dimensional grid, with each axis representing a critical dimension of intervention design:

- Cognitive Effort (0–5): The degree of mental engagement required from the user, ranging from fully passive (0) to highly active, critical engagement (5);
- User Autonomy (0–5): The extent to which the user exercises choice and control, from system-driven and mandatory (0) to fully self-initiated and customizable (5).

The choice to employ a 0–5 scale for both axis of the scale is informed by the following theoretical, practical, and pedagogical considerations:

- Clarity and discriminative power: a 0–5 scale offers a balanced granularity that enables meaningful differentiation among interventions without overwhelming the user with excessive options. Each step on the scale represents a distinct qualitative shift in either cognitive effort or autonomy, allowing for nuanced yet interpretable placement of interventions;
- Alignment with established models: the use of Likert-type scales is well-established in both behavioral research and design evaluation, providing a familiar and validated structure for rating subjective constructs (Joshi *et al.*, 2015). This familiarity facilitates adoption by both students and practitioners, supporting the scale's intended role as a reflective and actionable tool;
- Including edge cases: by including both endpoints (0 and 5), the scale accommodates a full spectrum of possible interventions—from those requiring no cognitive engagement or autonomy (0) to those that are maximally demanding or user-driven (5);
- Visual simplicity: a 0–5 scale is visually and cognitively manageable, lending itself well to placing (or plotting) interventions in a matrix or grid. This enhances the tool's usability in collaborative settings, such as workshops or curriculum modules, aligning with the user feedback received for the initial prototype.

Following this 0-5 format, the initially suggested dimensions for the *Cognitive Effort* axis are as follows (Table 5):

Level	Cognitive Effort	Examples
0	No conscious engagement	Passive exposure to content (e.g., auto-playing headlines in a feed)
1	Minimal awareness	Glancing at a label or credibility indicator
2	Momentary reflection	Pausing briefly to consider accuracy before sharing
3	Task-level engagement	Completing a short prompted task (e.g., answering a quiz, verifying a single claim)
4	Active critical analysis	Comparing claims within an article, cross-referencing multiple tabs or sources
5	Systematic investigation	Deliberate lateral reading across multiple sources to evaluate credibility and context

Table 5: The matrix initial scale for Cognitive Effort.

And the suggested dimensions for the *User Autonomy* axis could be as follows (Table 6):

Level	User Autonomy	Examples
0	No choice	Forced prompt requiring acknowledgment to proceed
1	Limited opt-out	Option to dismiss or skip a prompt, but no further choice
2	Basic selective response	User can choose to engage or skip (e.g., click "Yes/No" on accuracy prompt)
3	Choice among alternatives	User can select from multiple content options or verification tools
4	Configurable experience	User can adjust settings for prompts, filters, or verification frequency
5	Fully self-initiated	User independently seeks, configures, and applies tools for information evaluation

Table 6: The matrix initial scale for Cognitive Effort.

In summary, the adoption of a 0–5 scale for the *Design 4 Truth* matrix is justified by its balance of granularity, clarity, and alignment with both research and pedagogical best practices. It would support the scale's dual roles as an evaluative and educational tool in the evolving landscape of information literacy and interaction design. This structure enables designers and educators to position interventions not only by their intended effect, but also by the demands they place on users and the degree of agency they afford. It provides a reflective scaffold for aligning design choices with the values of information literacy and ecological responsibility. Based on this initial idea, when crossing the axis we would have a matrix similar to this draft in figure 26:

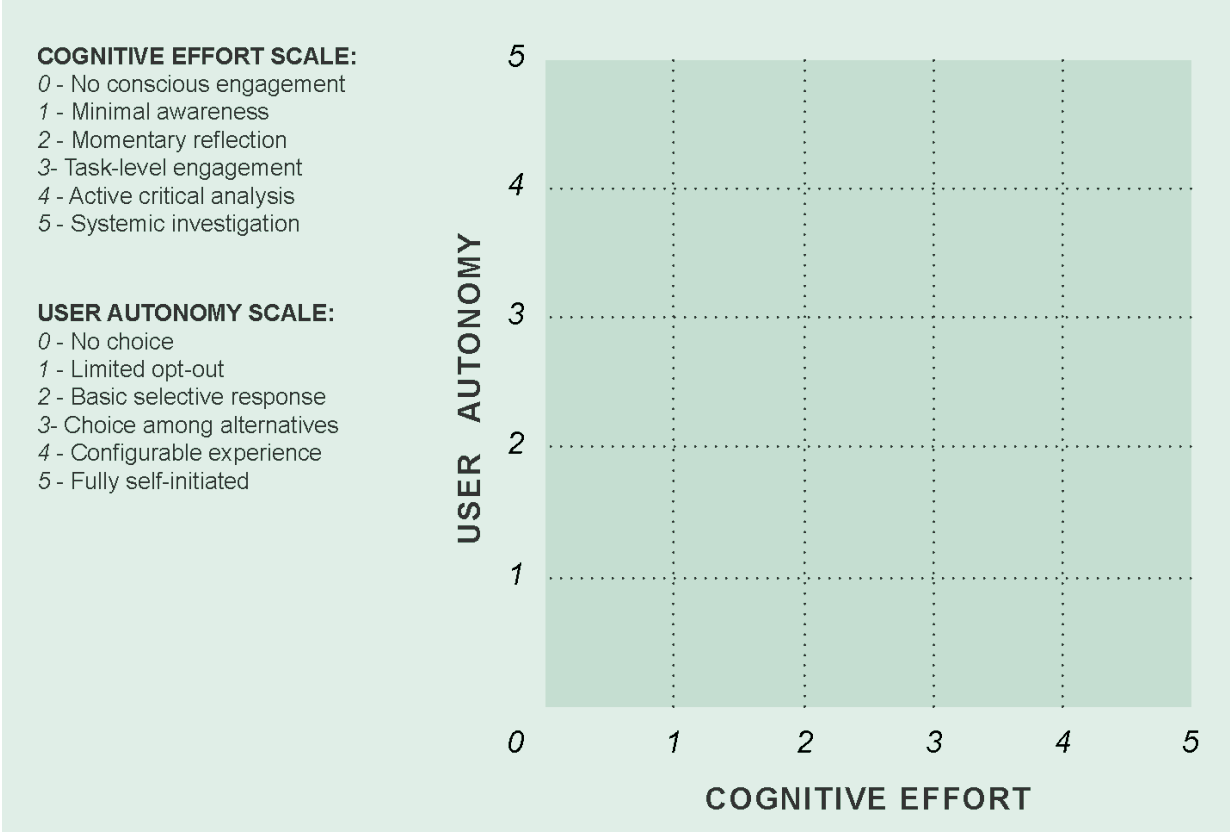

Figure 26: The visual skeleton of the matrix.

3.9 - Case Studies

3.9.1 - Case Study 1: Mapping Fact-checking Labels

To illustrate a possible application of this proposed technocognition matrix, we can take, for example, *Fact-Checking Labels* as a case study, examining how this intervention occupies different areas of the matrix depending on its implementation across platforms and contexts. Consider *Facebook*'s third-party fact-checking labels from 2016 as a concrete example. *Facebook* first introduced third-party fact-checking labels in December 2016, partnering with independent fact checkers (and has since updated from time to time their responses to disputed content, the latest policies can be found in their *Transparency Center*, https://transparency.meta.com, which was last updated on April 7, 2025 and explains how fact-checking labels and panels are implemented across *Facebook* and *Instagram*).

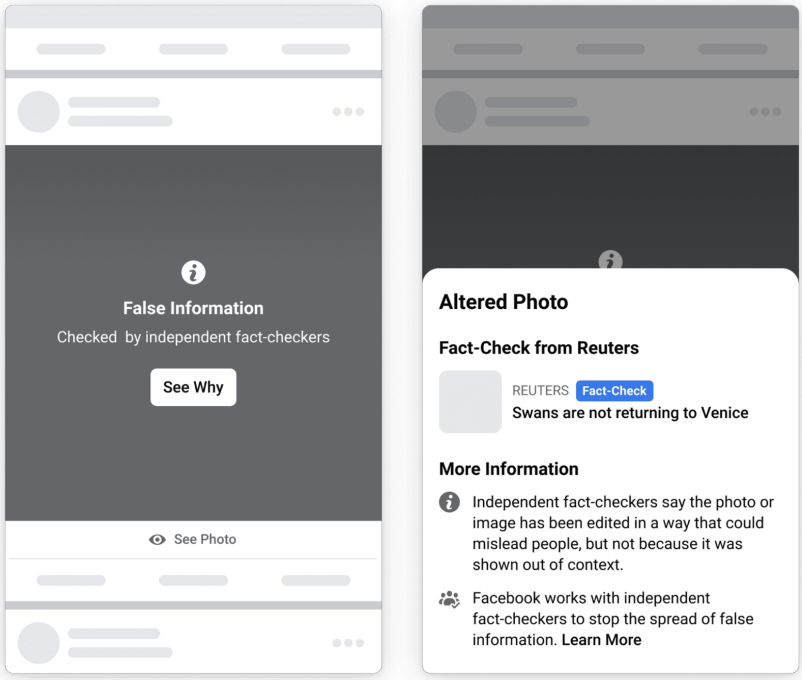

Figure 27: *Facebook*'s 2016 fact-check labels.
(Source: Meta *How fact-checking works* | *Transparency Center*, no date)

According to 2016 *Meta*'s Transparency Center, posts flagged as 'False' or 'Partly False' by independent fact-checkers are covered with a warning overlay, which includes a label (e.g., 'False Information – Checked by independent fact-checkers'), and often a 'See Why' button that links to a source explaining the rating. Users may choose to view the original content by clicking through the overlay, but they cannot dismiss, hide, or turn off the label. Here's a sample screenshot illustrating the intervention (see figure 27).

This intervention helps clarify how a single feature can occupy different areas of the matrix depending on its implementation and user context, and can be mapped within the technocognition matrix by examining its cognitive and autonomy demands across typical user interactions. For a visual example of using the matrix (see figure 28) in three identifiable user interaction stages (see table 7):

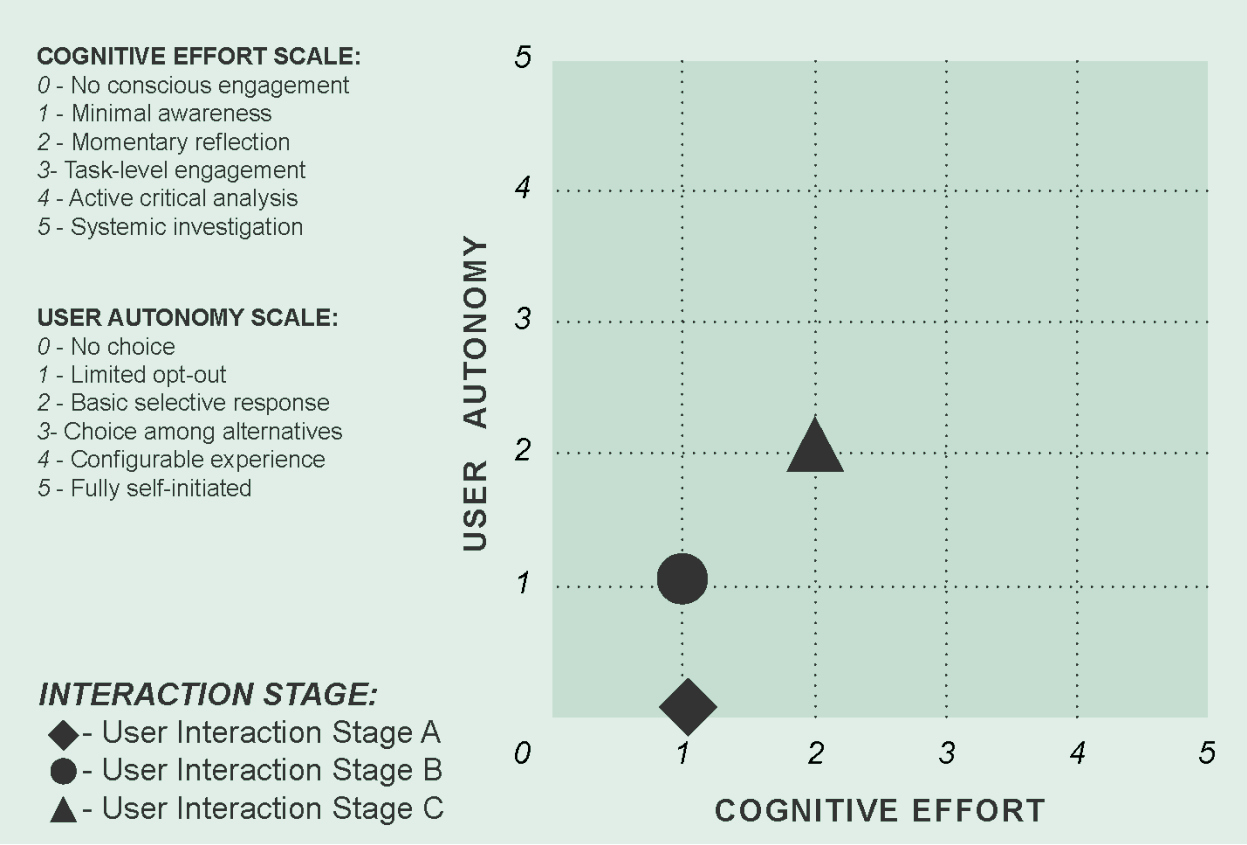

Figure 28: Mapping *Facebook*'s 2025 fact-check label intervention on the Matrix, visually.

User Interaction Stages	Cognitive Effort	User Autonomy	Matrix Coordinates
(A) The user sees a blurred post labeled "False Information" with no action taken	1	0	(1,0)
(B) The user clicks "See Why" and reads the third-party explanation	2	2	(2,2)
(C) The user continues scrolling or decides to view the flagged content without engaging	1	1	(1,1)

Table 7: Explanation of the mapping the fact-check labels in the matrix.

- (1,0): This represents the default encounter — the user is shown a content warning without any interaction. The system imposes the label automatically, requiring no cognitive investment or decision from the user;
- (2,2): If the user clicks 'See Why', they are exposed to a third-party summary, prompting a brief reflective engagement with the source credibility. This action requires moderate cognitive effort and offers limited autonomy (the user chooses whether to engage, but cannot configure the intervention);
- (1,1): In cases where the user simply scrolls past or opens the original post without engaging with the explanation, the system provides only minimal interruption and the user passively tolerates the intervention. Some agency is preserved in the form of being able to continue browsing.

This mapping highlights the narrow zone of cognitive engagement and user control afforded by Meta's fact-checking design. The intervention is low-autonomy by design: users cannot disable it or tailor how often they see it, nor can they customize the fact-checking sources referenced. The decision to intervene is made entirely by the platform, and the interaction design prioritizes consistency and scalability over individual configurability.

Cognitive engagement, while somewhat flexible, also remains constrained. The 'See Why' link may prompt momentary reflection, but rarely extends to deeper analysis or lateral reading. For example, the fact-check summaries are curated and brief, often summarized in a sentence or two. There is no prompt to compare multiple sources or evaluate the rating method. While effective in signalling misinformation to a broad audience, this design limits opportunities to foster higher-order critical thinking or self-guided investigation.

3.9.2 - Case Study 2: Mapping Accuracy Prompts

A more recent example of a UX intervention in digital journalism can be observed in *Newsweek*'s trustworthiness widget, which appears at the bottom of selected articles. This intervention operates loosely as a type of *Accuracy Prompts,* as listed in our list of UX interventions. To illustrate how we can analyze this by plotting it on the Technocognition Matrix, we examine its application in a specific article reporting on the U.S. government's '*Making Federal Architecture Beautiful Again*' executive order. Upon scrolling to the end of the article, readers encounter a widget that asks: '*Is this article trustworthy?*' (see figure 29).

Figure 29: *Newsweek*'s 2025 accuracy prompt.
(Source: Newsweek *Trump wants to scrap "terrible" modern buildings—architects have thoughts*, 2025)

The interaction is structured as a binary scale with a slider, where users drag a circular button closer toward either "yes" or "no." After voting, the widget reveals the aggregated median response from all previous readers, suggesting a form of crowdsourced credibility judgment (see figure 30).

Figure 30: *Newsweek*'s 2025 accuracy prompt after the interaction.
(Source: Newsweek *Trump wants to scrap "terrible" modern buildings—architects have thoughts*, 2025)

While the feature appears to foster participatory feedback, its value is limited. The prompt is presented in a frictionless, non-explanatory format: no contextual information is provided on how to assess trustworthiness, no supporting sources are highlighted, and no educational framing is offered. It does not guide the user toward lateral reading, fact-checking, or critical engagement with the text (except for leaving a comment). As such, the feature risks simulating epistemic engagement while contributing little to the actual development of information literacy. From an affordance perspective, it *allows* participation, *encourages* superficial feedback, and *demands* no justification, exploration, or deeper consideration.

Using the Technocognition Matrix, this intervention is mostly positioned at lower quadrants, except for a task-level engagement (a 3 on the cognitive effort scale) of voting. It represents a system-driven gesture toward trust evaluation that lacks reflective or pedagogical scaffolding. The table and figure below analyses this placement:

User Interaction Stages	Cognitive Effort	User Autonomy	Matrix Coordinates
(A) The user sees a box with a question as part of the scrolling, with no action taken	1	1	(1,1)
(B) The user decides to rank or not the article based on their own perception	3	2	(3,2)
(C) If ranking, the user sees an acknowledgement, the readers' average, and a link to comment	1	2	(1,2)

Table 8: Explanation of the mapping accuracy prompts in the matrix.

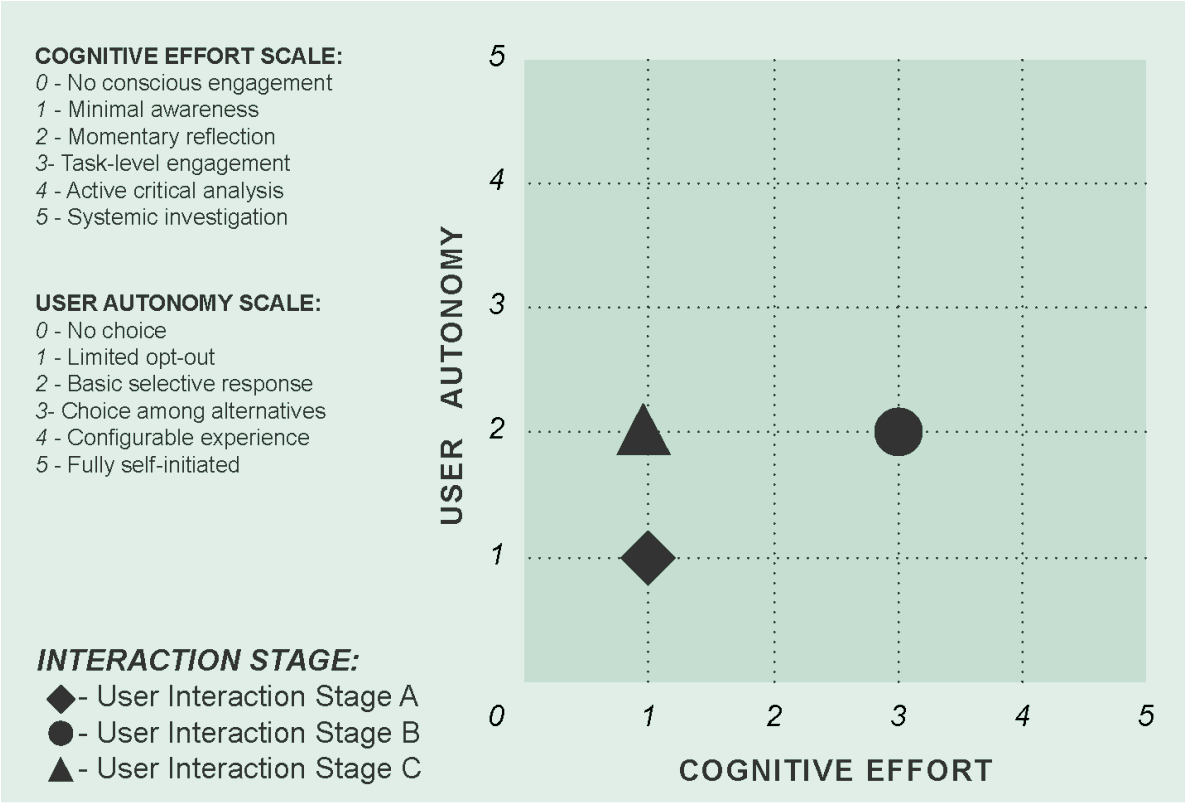

Figure 31: Positioning of the *Newsweek* trustworthiness prompt on the technocognition matrix.

This case underscores how design choices that appear participatory and highly interactive may, in practice, have limited effectiveness as tools for cultivating information literacy. If used in a design education context, this example could serve to challenge students to rethink how highly interactive and engaging formats may not necessarily equate meaningful engagement with complex informational content.

3.9.3 - Observations From the Case Studies

In terms of the technocognition matrix, in a first glance, the case studies presented here may suggest that common real-world interventions tend to cluster toward the lower-left quadrant: low effort, low autonomy (with the exception of the interactive element needed engagement). This may be by necessity, given platform constraints and user tolerance for interruption, as an assumption. For a more sound conclusion, this experiment would have to consider a larger representative sample of news interfaces, which is a limitation of this Master's thesis (other limitations will be addressed further on).

At the same time, the convergence of otherwise different designs in the low quadrants is instructive. It shows how interventions that look distinct in form - whether an authoritative overlay or an interactive widget - end up sharing similar cognitive and autonomy constraints. This also points to opportunities for design innovation. Interventions allowing more flexibility, such as giving users the option to explore multiple fact-check sources at once, or customizing the level of the analysis (or perhaps, the meta-data) of the information viewed, could begin to shift designs toward higher-autonomy and deeper cognitive engagement.

4

Chapter 4: Results

Equality was not an end to attain, but a point of departure, a supposition to maintain in every circumstance. Never would truth speak up for it. Never would equality exist except in its verification and at the price of being verified always and everywhere. (Rancière, 1991)

4.1 - Fruits: The *Design 4 Truth* Technocognition Matrix

Across the project, we're reminded that designers can act as 'nodes of containment' (Bjola and Pamment, 2016) in the post-truth information ecosystem: they sit at critical junctures where values, cognitive constraints, and interactional mechanisms are translated into concrete interaction patterns. The *Design 4 Truth* board operationalizes this position pedagogically, staging a value sensitive and technocognitive design space in which designers can visualize, learn, surface, and reflect on how a list of UX interventions act upon user cognition and autonomy. Through a process of action-reflection invited by the Value Sensitive Design model, the *Design 4 Truth* board becomes the ground for the emergence of a *technocognition matrix*. This matrix then condenses the situated explorations from the board into a compact decision framework that organizes interventions along axes of Cognitive Effort and User Autonomy, thereby making explicit the cognitive load and containment responsibilities that designers assume when building news interfaces.

In doing so, the thesis directly addresses the research question and its initial propositions: by treating designers as responsible mediators and equipping them with tools that both educate, reflect and structure their choices, the work contributes to the mitigation of information pollution not only at as end-user competencies, but also at the level of the design through which information literacy is made possible. Summarizing the culmination of this research-creation project, the skeleton for a *technocognition matrix* emerged as an original conceptual synthesis that bridges interdisciplinary theory and design practice. This proposed meta-framework was developed through integrating the technocognition theory from cognitive psychology, to other academic studies in the field, and insights gleaned from our user research.

In essence, the matrix would be a two-dimensional schema that organizes various UX design interventions for countering disinformation along two axes: Cognitive Effort and User Autonomy. It is intended not as a simple checklist or guide, but as a reflective map to help designers and educators evaluate and compare strategies against

disinformation in a structured way. By situating known intervention tactics (e.g. friction, accuracy prompts, etc.) within this space, the matrix provides a high-level overview of how different interventions can be characterized, and to what degree they can be positioned relatively to the chosen dimensions. It essentially translates abstract ideas from technocognition theory and our own research-creation process into a tangible design tool proposition that can be further developed in future studies. The result is a skeleton of a meta-framework for design for (post-)truth – one that is grounded in the exploratory findings of this thesis and in the broader literature, remaining adaptable and subject to further refinement.

It should be emphasized that the technocognition matrix is proposed as a preliminary construct – a starting point for discussion and further inquiry rather than a finalized, empirically validated model. Its development was grounded in exploratory findings from our limited user studies and an extensive synthesis of literature, but it has not yet been tested at scale. We view it as a reflective meta-framework: its value lies in providing a language and structure for designers to think about interventions against misinformation, rather than in any claim of predictive power. The concept draws legitimacy from the theories it integrates (e.g. Lewandowsky et al.'s technocognition principle that marrying technology design with cognitive science is key, and Kozyreva et al.'s comprehensive taxonomy of intervention types), as well as from the on-the-ground insights of practitioners (our participants) who highlighted practical challenges and considerations.

However, the exact placement of interventions on these axes, and the effectiveness of different regions of the matrix (for example, do high-effort interventions have greater long-term impact than low-effort ones?) remain open questions. Indeed, when talking about the UX interventions in the board user study, one participant noted a need for evidence about whether "more demanding *ones* [interventions] have higher success rates than passive requests" in changing user behaviour. This kind of inquiry was beyond the scope of our initial research-creation process, but it points to how the matrix could be

used as a scaffold for future research (e.g. experimental comparisons of interventions classified by the matrix).

In short, we present the technocognition matrix as an exploratory contribution – a way to consolidate and visualize insights from technocognitive theory, empirical intervention studies, and UX design knowledge into a form that can aid designers and educators in the fight against misinformation. It is offered with cautious optimism: as a meta-framework that is tentative yet thought-provoking, and which we hope will be refined through subsequent scholarship and practical experimentation.

4.2 - Limitations

While the development of the technocognition matrix and the *Design 4 Truth* prototype toolkit yielded promising insights, it is important to acknowledge the limitations of this study. First, the participant sample for our user research was very small in size, intended for an exploratory study in research-creation, and not demographically representative. We conducted in-depth sessions with five individuals, the majority of whom were design professionals (and one a student in the field). This means that the qualitative feedback, though rich, may not generalize to the broader population of learners or designers.

Therefore, the findings largely reflect the perspectives of experienced practitioners who might already possess above-average media literacy awareness; novice students or users from different backgrounds could respond differently. Future evaluations will need to involve a more diverse and larger cohort to verify which insights hold broadly, but such significant investment in time and research for this investigation is out of the scope of a Master's research.

Second, the matrix itself, as a conceptual skeleton of a framework, also remains unvalidated in terms of educational impact: we do not yet have evidence of instructors or students using the Technocognition Matrix over time to study their outcomes. This is a natural consequence of the project's scope, but it means any claims of effectiveness are speculative. The matrix should therefore be viewed as a hypothesis or concept awaiting further testing, rather than a proven solution.

Third, there are methodological constraints inherent to the research-through-design (research-creation) approach we adopted. This project prioritized creative design and qualitative insight-gathering over controlled experimentation. While this approach is appropriate for exploratory innovation, it does come with trade-offs. There is a lack of a formal baseline or control condition to quantitatively measure improvement in information literacy skills attributable to our intervention. Moreover, research-creation

often produces an integrated artifact plus reflection, rather than isolating variables – this can blur the clarity of results in a traditional sense.

We acknowledge these limitations in rigour and recommend that follow-up studies adopt complementary methods to more systematically evaluate the outcomes suggested by our work. Finally, during the first round of user testing, participants reported feeling overwhelmed by the density of information and instructions. This information overload indicated that our initial design demanded excessive cognitive effort from users all at once. In the context of this thesis, the recognition of the overload problem suggests that future deployments of the matrix will require careful user-centred design refinements and possibly training or scaffolding, especially if introduced to novice audiences.

In summary, these limitations – small sample size, lack of real-world deployment, the nature of research-creation methods, and early usability challenges – define the scope within which our results should be interpreted. None of these negate the potential contributions of the work; rather, they provide important context and guideposts for building upon this foundation in a rigorous manner for future work.

4.3 - Suggestions for Future Work

While the technocognition matrix introduced in this thesis is a novel and promising framework, further research is essential to validate its effectiveness and expand its scientific contribution. Moving forward, other Master's and PhD-level investigations can leverage both traditional empirical methods and design-specific methodologies to rigorously test and refine this outcome.

Given the exploratory nature of this project, there are several clear avenues for future work to extend and validate the findings. Here are some examples:

- Formally evaluate the Technocognition Matrix in educational settings. This could involve deploying the framework in design school classrooms or professional workshops and studying its impact on learning outcomes. For example, an instructor could integrate the matrix as part of a curriculum on information literacy in a UX design course, and researchers could then assess whether students trained with the matrix approach exhibit improved ability to devise or critique interventions against mal/mis/disinformation. Such classroom testing would provide practical feedback on the matrix's pedagogical value and reveal any adjustments needed to make it more accessible to learners;
- Controlled experiments or user studies could be designed to test the efficacy of interventions across the matrix's spectrum. Researchers might select interventions that represent different quadrants (e.g. a high-effort/high-autonomy lateral reading task vs. a low-effort/low-autonomy warning label) and compare their effects on users' false information discernment, trust behaviours, or information literacy in general;
- Refine the matrix's taxonomy and axes based on ongoing research. The specific categories of interventions and the definitions of the axes in our framework should not be seen as fixed. As new intervention techniques emerge (for example, AI-driven credibility assistants or community-based verification systems), they may challenge or expand the current taxonomy. An interdisciplinary approach was foundational to the technocognition concept, and it remains essential for its

refinement: future iterations of the matrix should be co-informed by design pedagogy research (to maximize its educational usefulness), cognitive science (to align with how people process information and change beliefs), and even social psychology (to account for factors like trust and compliance in user behavior). By working across disciplines, research can test if the meta-framework remains both theoretically sound and practically relevant;

- Expanding the scope of application for the matrix and toolkit. Our project focused primarily on news media and disinformation contexts, but participants noted that the core ideas could transfer to other domains of digital information. One user suggested that *design for truth* principles might well be applied to arenas like online product reviews, e-commerce ratings, or any context where the veracity of information is in question. This points to a broader potential: developing domain-specific adaptations of the matrix for, say, health information platforms, educational media, or civic engagement apps. Future work could involve case studies where designers in various sectors use the matrix to brainstorm and evaluate interventions tailored to their domain's misinformation challenges (e.g. combating medical misinformation in a health app through high-autonomy educational prompts, or increasing transparency in political discourse forums with certain friction mechanisms). These explorations would test the versatility of the meta-framework and likely contribute new insights to the taxonomy (perhaps identifying unique intervention types or considerations in those contexts).

4.4 - Final Reflections

This dissertation started with a walk through the polluted information landscape and its implications for contemporary societies. Through the lens of design, it sought to explore venues where designers might contribute to fostering information literacy in an increasingly fragmented news media ecosystem. Considered together, the *Design 4 Truth* board and the *technocognition matrix* represent two stages of the same research-creation trajectory: an initial mapping of the polluted information environment and a subsequent synthesis that makes this complexity pedagogically workable. Overall, this project represents one small contribution toward the broader goal of embodying the belief that designing is about shaping ways of living.

The creation process illustrates the complexity of translating information literacy principles and the abstract and theoretical ideas that orbit them into a practical educational tool. It underscores the congruence in the iterative nature of Research-creation, Value Sensitive Design, and UX Design, where outcomes are provisional and invite remodelling, recreation and rethinking. What I hope the artifacts have achieved is not the status of an all-encompassing tools for UX Design education, but vehicles for circulating ideas to audiences that may have yet to have access to them in other ways, as well as pointing to a direction for deeper future research, aiming at an original contribution to the field.

Returning to the *ethos* of this work, the ecological literacy framework raises essential questions about the role of designers as innate agents in our future information landscape. If we accept that Design can foster user autonomy and community resilience, how do we prioritize these values in a field often driven by commercial interests? What responsibilities should designers carry as parts of the information systems? As we reflect on these questions, it becomes clear that the work of design in the context of information literacy is not simply combating malicious agents or information disorders but working to cultivate more reflective and equitable digital experiences in the context of HCI. This requires a shift to recognize designers as active participants in the

information ecology - there is still a lack of studies initiated in the Design field specifically on these rounds.

Finally, this dissertation is not written to sort a way out of the polluted landscape; rather, it is an invitation to dig deeper into its jungle with a curious mind. The challenges presented here—polluted information, fragmented trust, and the ethical complexities of design—are vast and evolving. Yet, through sustained inquiry and collective action, Design can continue to contribute meaningfully to a more equitable and resilient world. Sustaining ecological literacy is an ongoing journey, and its success depends on continually accessing where we are.

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