From Data to Mind:

Memory and Cognitive Liberty in the Age of Predictive Technologies

by Prashant Vijay Matta

Submitted to OCAD University in partial fulfillment of the requirements for the degree of Master of Design in Strategic Foresight & Innovation

Toronto, Ontario, Canada, April 2024

© Prashant Vijay Matta

Copyright Notice

This work is licensed under the:

Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International. To view a copy of this license, visit https://creativecommons.org/licenses/by-nc-sa/4.0/

You are free to:

Share — copy and redistribute the material in any medium or format.

Adapt — remix, transform, and build upon the material.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for commercial purposes.

ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

With the understanding that:

You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.

No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.

Abstract

As digitalization becomes increasingly integrated into our daily lives, it significantly reshapes our communication habits, relationships with technology, interactions with society and individual and collective memory. With the proliferation of data being recommended to us at an incredible speed and amount, our cognitive liberty is at risk (Farahany, 2023a, 2023b) — a concern that has evolved from early debates over social media impacts to discussions about internet tracking for monetization and current concerns about digital ethics.

This research focuses on how predictive technologies embedded within our current social, political, and economic frameworks influence our thinking processes. These technologies often diminish our capacity for critical and pluralistic thought in favour of simplified, profit-driven content interactions. While these technologies facilitate information exchange across borders, they also promote a homogenized global culture, where views that do not align with the profit motives of digital platforms may be suppressed or manipulated.

The study examines these technologies' systemic behaviour and interactions across individual behaviours (micro), group and community dynamics (meso), and societal structures (macro), analyzing the roles and practices of various actors within the system to understand how they influence decisions and propagate specific worldviews. The primary aim is to explore how predictive technologies, often perceived as neutral, support worldviews founded on user engagement and monetization.

Ultimately, the research provides strategic responses for designing toward resilience to preserve cognitive liberty, aiming to foster a future that supports more worldview diversity and societal discourse. By addressing digital technologies' subtle but pervasive influences, this study contributes to the ongoing dialogue about maintaining human agency and diversity in thought in an increasingly algorithm-driven world.

Land Acknowledgement

As an immigrant student, I am living and writing this report on the ancestral and traditional territories of the Mississaugas of the New Credit, the Haudenosaunee, the Anishinaabe and the Huron-Wendat nations, who are the original caretakers of the land on which we stand and have built our communities, societies, and commerce. Let the land acknowledgement be only a beginning and not the only thing we are asked to learn about indigenous communities and make peace with.

Personal Acknowledgement

Born in Mumbai, Maharashtra, India, I am a descendant of a Sindhi family whose ancestors were originally from present-day Shikarpur, Sindh Province, Pakistan. With the worldviews formed through my life journey till now and with the values ingrained in me by my loving family, even though there may be political and religious tensions between the two nations, I view them as one, as they were in the past. I hope to visit the region one day when we have transformed our systems to truly support equity, diversity, and inclusivity across all our social, economic, and cultural classes and when we can heal together as a pluralistic society.

Thank you to my supervisors: Dr. Tara O'Neil, who encouraged me to explore as freely as possible and helped me focus my research, and Prof. Suzanne Stein, who ensured that I reached the finish line without any trouble. I would also like to thank Dr. Sara Diamond for her continuous support outside my research project.

I want to thank the experts who contributed their time and effort to my project. I appreciate Dr. Paul Pangaro's assistance during the recruiting process, and without their insights and efforts, I would not have reached this point.

Lastly, I thank Debaditya Jena, Brian Sison, Erin Stripe, and Katie Sullivan for their help and support during the project's challenges and for our shared memories.

I recognize that, like any work done by humans, my research carries my biases, perspectives, and worldviews, consciously or unconsciously. I have tried to mitigate these by seeking opinions from experts from different fields and ensuring they have an open platform to interpret the questions and respond according to their lived experiences and worldviews. I also acknowledge that there are limitations to the diversity of experts in ethnicities, and the project is part of academia in a university setting.

Table of Contents

List of Figures

Introduction

This research project investigates the influence of digitalization and predictive technologies on cognitive liberty and societal values, examining how these advancements shape human thought processes and societal norms. At its core, cognitive liberty is defined as the right of individuals to control their mental processes and consciousness, emphasizing the importance of protecting psychological autonomy amid technological advancements (Sententia, 2004).

The overall research question explores how digitalization and predictive technologies might impact cognitive liberty and influence thought patterns and societal values, delving into their effects at various levels. The framework of micro, meso, and macro levels is derived from systems theory, which provides a structured way to examine the dynamic interactions within complex systems across different scales (Jones & Van Ael, 2022). This approach allows for an analysis of how individual behaviours (micro), group and community dynamics (meso), and societal structures (macro) influence and are influenced by digital technologies. By segmenting the analysis into these three levels, the research can explore how digitalization and predictive technologies impact cognitive liberty and societal values, from personal cognitive processes to broader societal norms.

At the Micro Level, it questions the impact on human memory and thought patterns**:**

- How do personalized content feeds and algorithm-driven recommendations affect our ability to engage in critical and independent thought?
- How do these technologies foster deterministic thinking patterns at the expense of generative and pluralistic thinking?

At the Meso Level, it explores the technological Influence on human habits and relationships:

- How have digital technologies and predictive algorithms reshaped our daily interactions with communication tools and platforms?
- In what ways do our digital habits reflect changes in our relationships with information and each other?

At the Macro Level, it analyzes the societal implications and its values within the broader social discourse and against diversity:

- How does the shift towards deterministic thinking, driven by digital engagement, affect societal discourse and values?
- What are the broader societal consequences of a diminished capacity for critical reflection and worldview diversity?

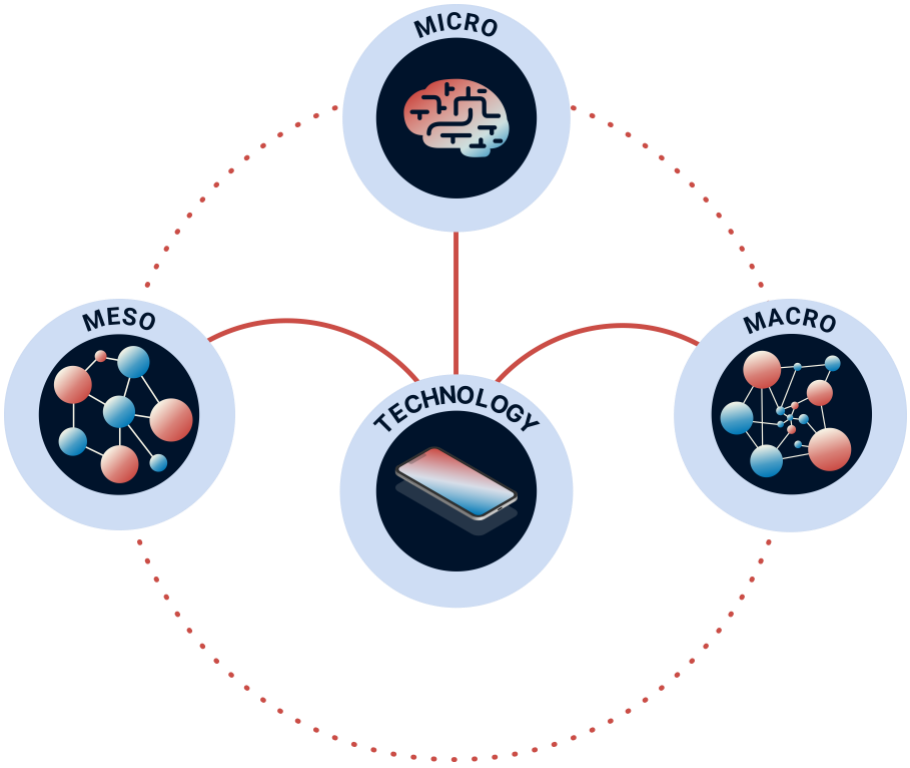

Figure 01: Visual Representation of the Interconnectedness of Technology at Micro, Meso and Macro Levels

The methodology combines design research and environmental scanning techniques to analyze digital technologies.

For Design Research:

- **Literature Reviews & Expert Interviews**: These are used to gather existing knowledge and expert insights into the influence of digital technologies.
- **Affinity Mapping & Thematic Analysis**: These methods organize and synthesize the data gathered, identifying themes and patterns across the literature and interview data.
- **Causal Loop Diagrams** visualize the cause-and-effect relationships within the studied systems and help predict their behaviour over time.

For Environmental Scanning:

- **Signal Scanning & Trends Identification**: These techniques are employed to detect early signs of change and to identify the direction of emerging trends within the digital landscape.
- **DEFT Analysis**: This strategic framework identifies and assesses Drivers, Enablers, Frictions, and Turners (and Blockers) within the system, providing a detailed understanding of how each factor contributes to or impedes the development (Gordon, 2010).

By combining these methodologies, the research aims to offer a well-rounded view of digital technologies' current state and future directions and their effects on society.

This research builds on the understanding that technological evolution — from language development to digitalization — has transformed human cognition and societal structures. By exploring the implications across micro, meso, and macro levels, the study aims to uncover strategic responses that can potentially enhance cognitive liberty in an increasingly digital world.

Chapters Breakdown

Following the methodology chapter, these parts of the paper examine the various dimensions of digital technology's impact on society. The chapters delve into the mechanisms through which digital platforms influence cognitive processes and societal structures, leveraging frameworks and analyses to understand and address the resulting challenges.

Listening to the System

This chapter examines how digital platforms shape memory, narrative, and critical thinking, delving into the changes in memory retention from traditional to digital media. It discusses the broader societal shifts resulting from digital communities and the ethical challenges pervasive digital tracking introduces.

Understanding Drivers of Change

The focus shifts to identifying and analyzing the drivers of change within the digital technology landscape using the STEEP+V+L framework. It categorizes these drivers into social, technological, economic, environmental, political, ethical, and values-based factors and explores their implications for cognitive liberty (Kononiuk & Nazarko, 2014; Nazarko et al., 2017; Ringland, 2007).

Sensemaking and Building Resilience

This chapter connects the findings from the systems map and drivers of change analysis. It synthesizes these insights to address the main research questions, particularly the impact of digitalization and predictive technologies at micro, meso, and macro levels. It also proposes strategic responses and policy considerations to enhance cognitive liberty.

Conclusion

The final chapter synthesizes all findings, reflecting on the research process and limitations faced. It also suggests areas for future research and policymaking to navigate and leverage digital advancements positively.

Methodology

This section outlines the methodologies used to investigate how digitalization and predictive technologies impact cognitive liberty and influence societal values and thought patterns. The research employs a blend of design research techniques and environmental scanning methods to analyze the current landscape and understand the future implications of digital technologies.

1. Design Research

This section of the chapter details the design research methodology employed to explore the influence of digital technologies on cognitive liberty and societal values. It integrates analytical tools and techniques to dissect and understand the interactions within digital environments. The following describes the systematic approach taken through literature reviews, expert interviews, thematic analysis, affinity mapping, and the use of causal loop diagrams to offer a multidimensional view of the digital landscape's current state.

1.1. Literature Review & Expert Interviews

- **Definition of Literature Review:** A literature review systematically searches, evaluates, and synthesizes published academic papers, reports, non-fiction works, and grey literature to understand a specific topic or field. It gathers existing knowledge and identifies gaps in the current research (Creswell & Creswell, 2017).
- **Definition of Expert Interviews:** Expert interviews are qualitative, in-depth discussions with individuals possessing specialized knowledge or experience relevant to the research topic. These interviews capture insights not typically available in published literature, including experiential knowledge and expert predictions about future trends (Rubin & Rubin, 2011).
- **Usage:** Initial literature scanning gathered sources related to digital technologies, societal transformations, and cognitive processes. This informed the development of semi-structured interview questions for discussions with industry professionals and academics. These interviews provided insights into current and emerging practices in the technology sector, the anticipated impacts on users, and potential future developments.

1.2. Thematic Analysis & Affinity Mapping

- **Definition of Thematic Analysis:** Thematic analysis is a qualitative method for identifying, analyzing, and reporting patterns (themes) within data. It involves detailed data coding and identifying broad themes that capture the underlying ideas in the data set (Braun & Clarke, 2006).
- **Definition of Affinity Mapping:** Affinity mapping organizes and categorizes data, ideas, or insights into clusters or themes by grouping similar items. This tool is particularly useful in

managing large volumes of data, helping to identify common patterns and relationships within the information (Holtzblatt & Beyer, 1997).

- **Usage:** Affinity mapping and thematic analysis were applied to collate and synthesize research findings from the literature reviews and expert interviews. These methods helped identify common patterns based on frequency and relevance in the data, which aided in defining the boundaries of the research system. This process was instrumental in organizing the vast amount of information into coherent themes that directly relate to the project's research questions.

1.3. Causal Loop Diagrams

- **Definition of Causal Loop Diagrams:** Causal loop diagrams are visual tools used to illustrate the relationships and feedback loops between various components within a system. They help identify how different variables affect each other and can be used to predict how changes in one area might influence others within the system (Kim, 1992; Meadows, 2008).
- **Usage:** Causal loop diagrams were utilized to understand the relationships, flow, and ongoing narratives within the system being studied. This method allowed for visual scanning of how interconnectedness influences systemic actions and reactions at different levels, identifying central nodes and their connections to the micro, meso, and macro research questions. The diagrams provided a clear visual representation of the dynamics within the digital technology landscape and potential impacts on cognitive liberty and societal values, aiding further research.

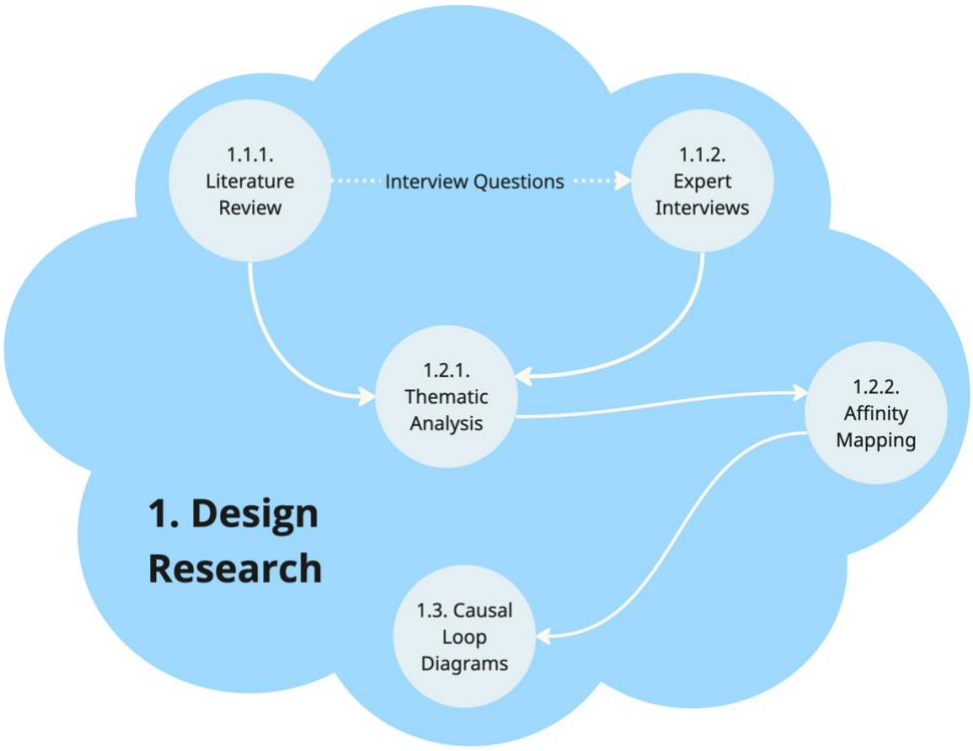

Figure 02: Visual Representation of “Design Research” Methods Employed

2. Environmental Scanning

This section outlines the environmental scanning approach utilized to identify and understand the forces driving changes in the digital landscape. This analysis effectively captures and interprets digital technologies' present dynamics by employing signal scanning, trends identification, and DEFT analysis methodologies. These methodologies provide a structured way to track and analyze developments, offering insights into how these changes might shape future societal and technological landscapes.

2.1. Signal Scanning

- **Definition of Signal Scanning:** Signal scanning monitors and collects data from various sources to identify early signs of change or emerging trends within a specific field. It focuses on gathering small but significant indicators that suggest future developments or shifts in a particular area of interest (Choo, 2003; Hiltunen, 2008).
- **Usage:** Signal scanning involved identifying recent news articles from December 2023 to March 2024 related to the topics highlighted in the causal loop diagrams, which are shaping the future of digital technologies. Over time, these articles were combined into several events spanning over four months and further analyzed. A total of 358 events were cataloged by the end of the exercise. Signals were derived from these events using a

STEEP+V+L lens, covering Social, Technological, Economic, Environmental, Political, Values, and Legal perspectives.

2.2. Trends Identification

- **Definition of Trends Identification:** Trends Identification analyzes data points to identify patterns or trends over time (Voros, 2003).
- **Usage:** Trends Identification in this research involved analyzing the cataloged events to be evaluated against three criteria: whether they are current events, the potential for further emergence or evolution, and future implications. Each criterion was scored on a scale of 0 to 1, totalling a score of up to 3 for each event. Only events that met all three criteria were considered and categorized based on their impact on three levels of the research questions: micro, meso, and macro. After filtering, a total of 46 events were identified, out of which 33 affected the micro level, 19 the meso level, and 35 the macro level, with 30 of them affecting multiple levels. The signals from these events were analyzed to see how they converge into broader societal trends. Based on the frequency of these trends across multiple events and their significant future implications at various levels, they were filtered and converted into drivers of change.

2.3. DEFT Analysis

- **Definition of DEFT Analysis:** DEFT (Drivers, Enablers, Frictions, Turners (and Blockers)) Analysis is a strategic framework used to identify and assess the factors that influence change within a given domain. In the context of digital technologies, DEFT helps clarify how various factors interact to propel or hinder developments that affect cognitive liberty (Gordon, 2010).
- **Usage:** DEFT Analysis was applied to the trends identified in this research. The drivers of change were selected based on their strength and their implications at different levels of the research questions. The other trends were compared to these drivers to discern relevant enablers, frictions, and Turners and understand how they interact and what future trajectories they might suggest.

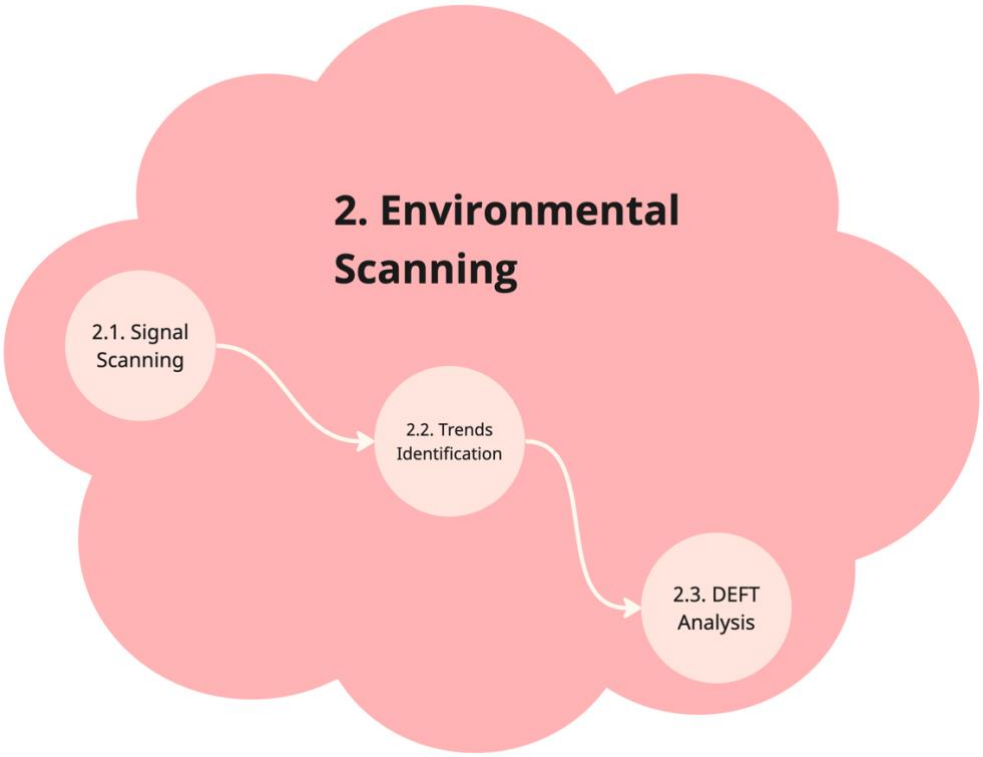

Figure 03: Visual Representation of the "Environmental Scanning" Methods Employed

3. Sensemaking

This section defines the sensemaking process, which involves distilling complex data into understandable and practical insights.

- **Definition of Sensemaking:** Sensemaking is a process that gives context and meaning to complex information. This research involves interpreting and framing data into coherent narratives, actionable insights, and strategies (Klein et al., 2006; Kolko, 2010; Maitlis & Christianson, 2014).
- **Usage:** In this research, sensemaking was applied after the collection and analysis of data through literature review, expert interviews, causal loop diagrams, signal scanning, and trends and DEFT analysis. This process involved taking the drivers of change and system diagrams back to the initial research questions, focusing on how digitalization and predictive technologies impact cognitive liberty at micro, meso, and macro levels. Sensemaking was crucial for deriving potential strategies to create resilience against negative impacts on cognitive liberty, ensuring that strategic responses are well-grounded and effectively address the identified issues.

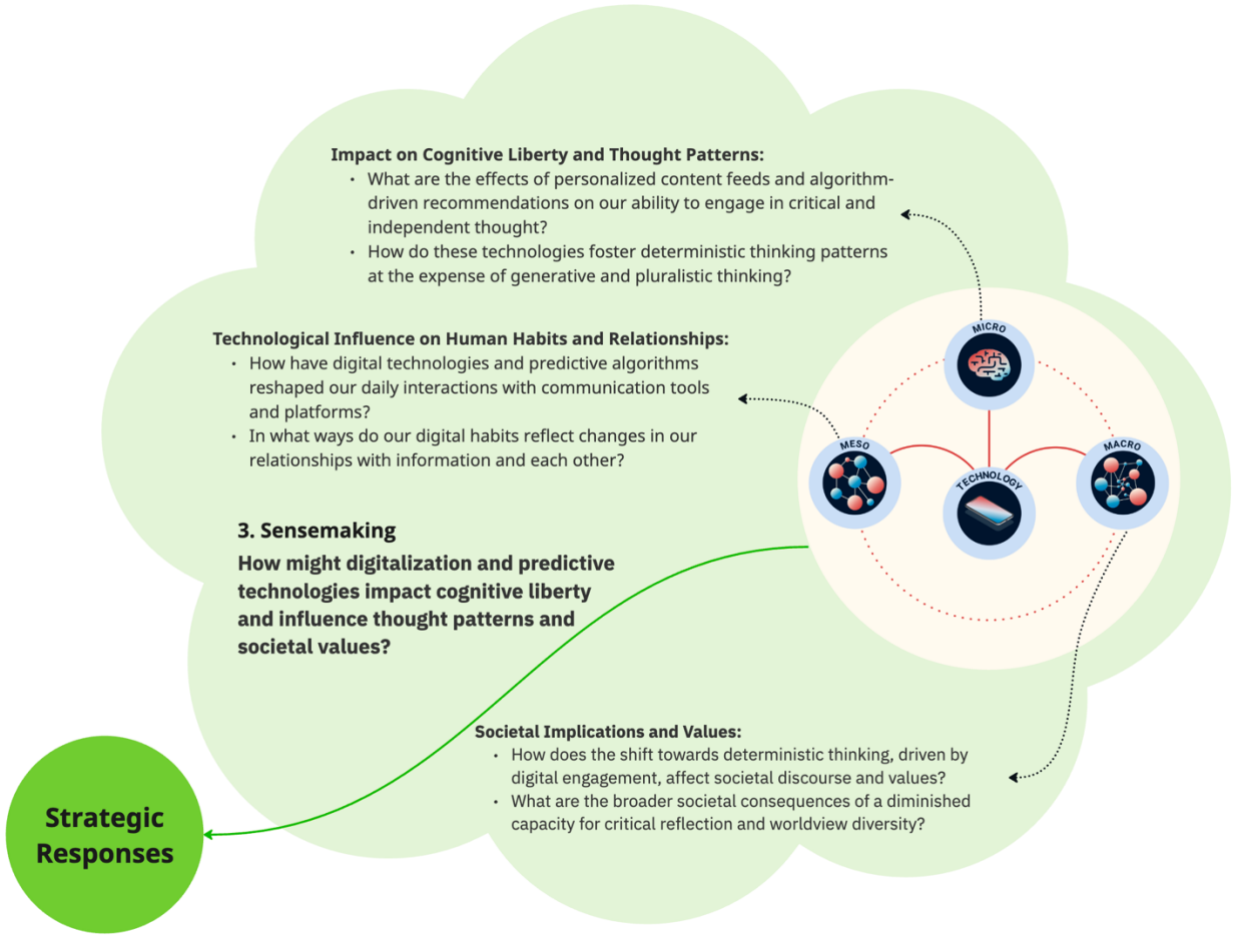

Figure 04: Visual Representation of the "Sensemaking" Method Employed

Conclusion

The study has captured a systemic understanding of the topics under investigation by employing a blend of design research methods and environmental scanning techniques.

- **Design research** methods such as literature reviews and expert interviews established a foundational understanding of the topics and collected firsthand insights from field experts. Affinity mapping and thematic analysis organized and synthesized the collected data, identifying key themes and patterns crucial for understanding the broader context. Causal loop diagrams visually represent complex systems and interactions, highlighting causal relationships and feedback loops.
- **Environmental scanning** techniques such as signal scanning and trends identification monitor and analyze current developments to detect emerging trends and their implications.

These techniques help categorize and evaluate signals and trends at different societal levels, providing insights into how digital transformations influence cognitive liberty and societal values. DEFT analysis further evaluates these trends, identifying key drivers, frictions, and turners.

- **Sensemaking** was utilized to integrate and interpret these findings, relating them back to the initial research questions. This process involved deriving strategies to create resilience for cognitive liberty, ensuring that strategic responses are grounded in empirical data and expert knowledge, and effectively addressing the identified challenges.

The following steps in this research will synthesize the findings from these methodologies to propose strategic responses. These strategies aim to enhance cognitive liberty and foster societal resilience in the face of rapid digital transformations, providing stakeholders with actionable recommendations to navigate the complexities introduced by digital technologies.

Listening to the System

This chapter explores how digital platforms shape memory, narrative, and critical thinking. It examines digital media's role in enhancing and constraining individual and collective agency. The discussion covers the shift in memory retention from traditional to digital media, the formation of echo chambers through algorithmic curation, and the commodification of narratives that impact public discourse. This analysis aims to provide insight into the broader societal shifts prompted by digital communities and the ethical challenges introduced by pervasive digital tracking.

Introduction to System Maps
As the chapter progresses, parts of the system map in the form of causal loop diagrams are introduced as illustrative guides that encapsulate the various factors and their interconnections that define our engagement with digital platforms. They serve as a visual representation of the causal relationships and feedback mechanisms that underlie our digitally mediated experiences. As seen at the end of the chapter, the system map clarifies the narrative in the text, acting as supplementary visuals to understand the systemic influences shaping cognitive liberty in the digital age. They offer a graphical synthesis of the textual discussion, providing a cohesive, integrated approach to analyzing the digital ecosystem's impact on cognition and societal discourse.

1. Evolution of Memory and Narratives

This section explores the transformative effects of digital media on memory and narratives, focusing on how the shift from traditional to digital media impacts cognitive processes and societal memory structures. Subsequent subsections will delve into the specifics of these changes, examining the mechanisms behind the shift in memory retention, the dual role of digital platforms in shaping memory, and the challenges digital media poses to media literacy and public engagement. Each area is complemented by causal loop diagrams that visually summarize the dynamics discussed.

1.1. Shift in Memory Retention

The transition from traditional to digital media represents a significant shift in memory retention and narrative engagement mechanisms. There are three types of long-term memories: memory for information, events, and skills (Genova, 2021). Digital media, with its unique engagement mechanisms, has a more significant impact on memory for information and memory for events compared to other engagement mechanisms, which have lesser influence. Historically, media consumption was characterized by stable, often linear narratives that fostered deep cognitive engagement and long-term memory retention. Traditional formats such as news, literature, and,

to a certain extent, broadcast television supported extended contemplation, embedding these narratives more deeply in the memory.

In contrast, modern digital platforms prioritize rapid content delivery, characterized by brief, high-volume interactions. This "scrolling addiction" fosters immediacy and brevity, encouraging users to skim rather than read and engage with the information (Wolf et al., 2009; Woolley & Sharif, 2022). Such superficial engagement results in poor detail retention as data is processed fleetingly and not ingrained in the long-term memory (Genova, 2021).

This shift not only affects individual memory processes but also has implications for societal memory. As digital media becomes the primary conduit of information, the mechanisms by which narratives are constructed, consumed, and remembered are transformed. The ephemeral nature of digital content may lead to a fragmentation of historical continuity, where only the most engaging or sensational events are retained. Consequently, nuanced developments that require contemplation and deeper cognitive involvement are at risk of being forgotten.

Casual Loop Diagram

The diagram visually represents the interconnectedness between continuous curated content consumption and fast-paced trends, which can not only influence human memory but also impact information credibility, long-term memory, and worldview formation. It emphasizes the need for balancing diverse perspectives and the potential impacts of such trends on long-term memory.

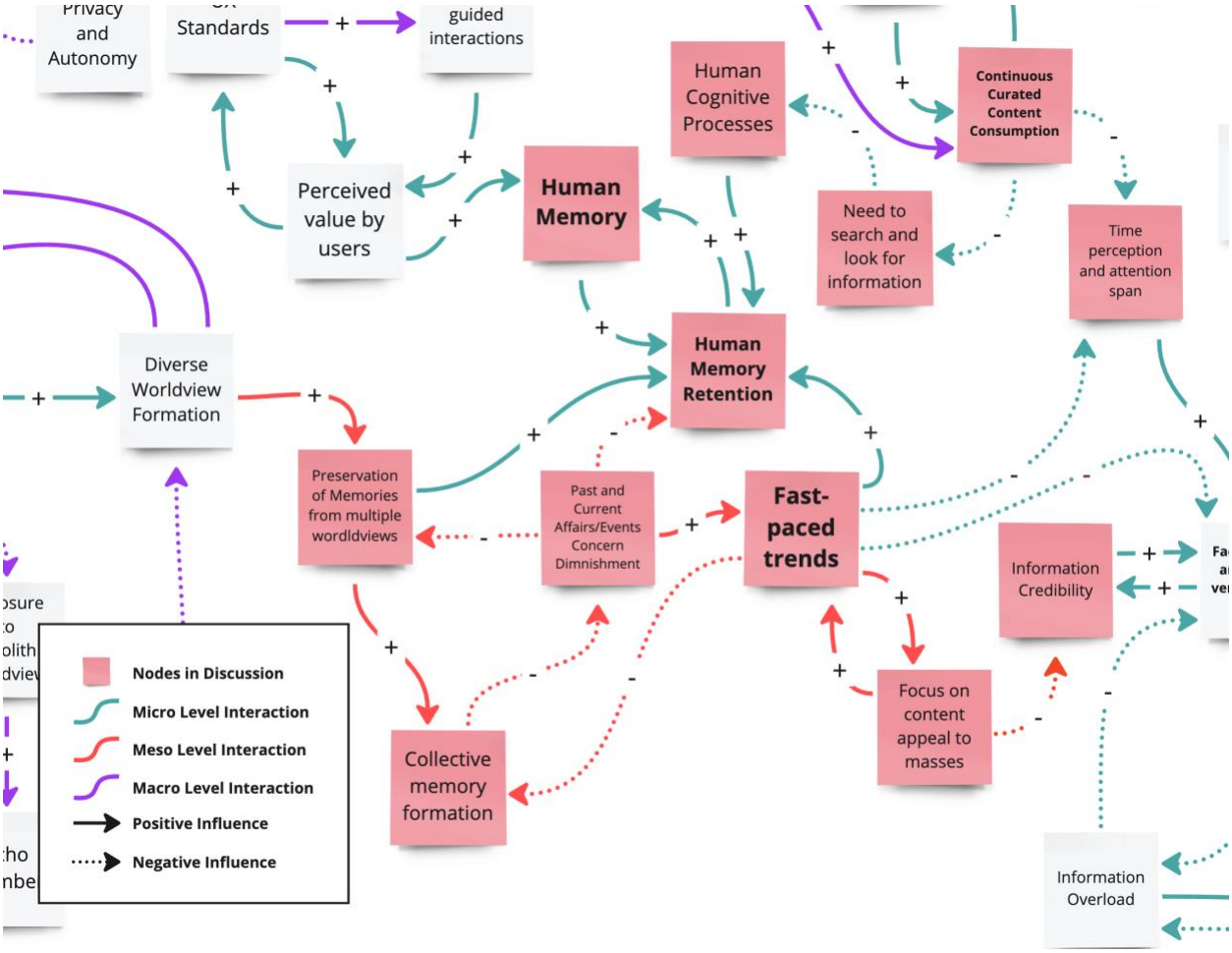

Figure 05: Casual Loop Diagram for Section 1.1. “Shift in Memory Retention”

1.2. Digital Platforms and Memory

Digital platforms serve a dual role in the contemporary landscape of memory. They serve as enablers that provide tools for the easy documentation and sharing of personal experiences, thus broadening the scope of shared experiences. Platforms like social media enable users to capture and share moments with a global audience almost instantly. This allows for a diverse range of experiences to be documented and disseminated, enhancing the collective memory pool.

However, profit-driven values and ideologies influence this ease of creation and sharing of memories, and content that will often deliver the most value for engagement is promoted. Users feel pressured to present only the most appealing or perfected versions of their lives to attract likes and shares (Marwick & Boyd, 2011). This selective representation can potentially distort the authenticity of the original events, influencing individual and collective memory perceptions over time. As a result, a 'highlight reel' culture emerges, where only the most shareable and often sanitized versions of events are remembered and celebrated (Goffman, 1959; Murray,

2019). More mundane or complex realities are selectively forgotten or overlooked, skewing our collective understanding of history and personal experiences (Zelizer, 1998).

Casual Loop Diagram

The diagram explores the trade-offs between increased accessibility to memory-sharing tools and platform commodification of memory. It portrays how user-generated content interacts with algorithmic content management and moderation driven by platform values and the business goals of the organization behind it, resulting in a dynamic content cycle to maximize user engagement.

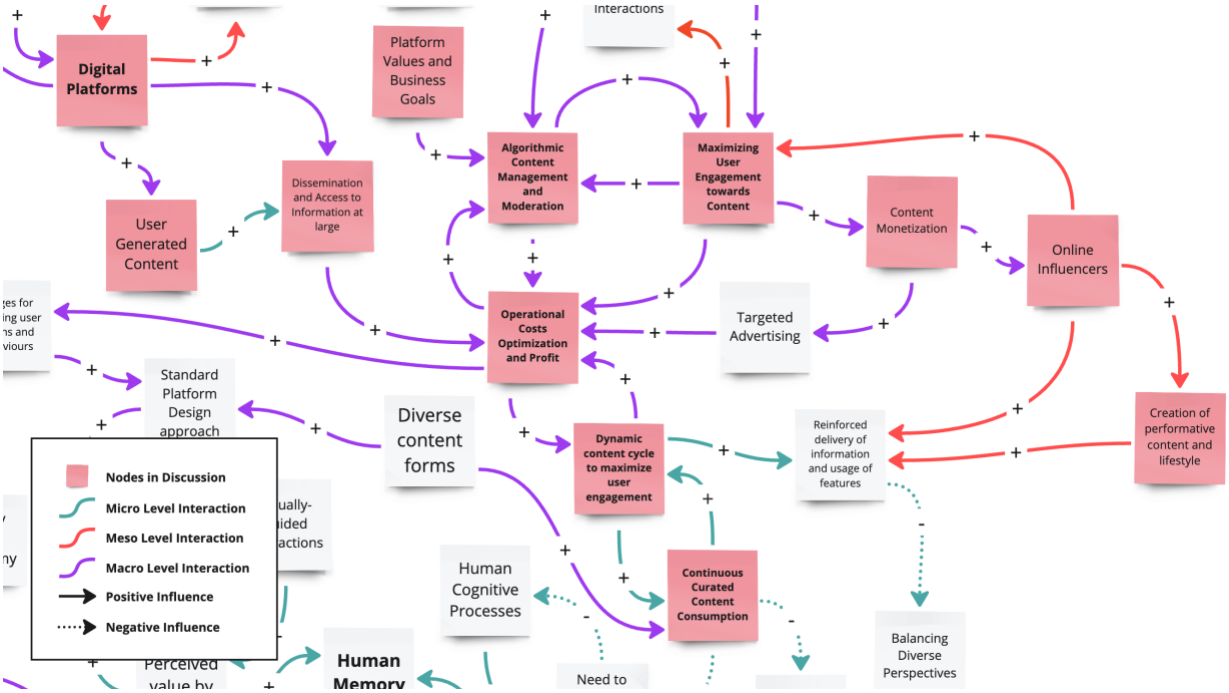

Figure 06: Casual Loop Diagram for Section 1.2. “Digital Platforms and Memory”

1.3. Media Literacy and Reality Apathy

Digital platforms have shifted how media literacy is approached and applied. Media literacy includes skills necessary for interpreting media content effectively, such as recognizing biases and fact-checking (Hobbs, 2011). Despite these skills' importance, there remains a gap in ensuring that individuals can interpret media and are motivated to critically evaluate their own perspectives and the broader systems that shape media narratives.

As digital media becomes the dominant medium for information dissemination, users face an overwhelming volume of content. According to Aviv Ovadaya, this saturation often leads to “reality apathy,” where the abundance of available information makes it challenging to discern credible information from misleading or false content (Forbes, 2023). This phenomenon is

pronounced during critical global events like wars and pandemics, where the rapid spread of information can lead to an overwhelmed public with reality apathy – where individuals may feel a sense of futility about their ability to influence events or discern truth, leading to disengagement from the content and, by extension, from critical civic engagement.

The challenge affects societal discourse. The continuous exposure to a high volume of content without the necessary critical engagement can foster a superficial understanding of complex issues, undermining the depth and quality of public discourse (Pariser, 2011). This situation poses a risk to developing informed opinions and robust democratic debate, as the public may lean towards passivity rather than active participation in societal issues (Couldry et al., 2016).

Casual Loop Diagram

This diagram provides a systemic view of the factors contributing to reality apathy, indicating how media literacy, information credibility, and the prevalence of fast-paced trends interact. It shows how the focus on content appeals to the masses, and the at-large flood of information can lead to disengagement and apathy, thereby impacting critical thinking and engagement with media.

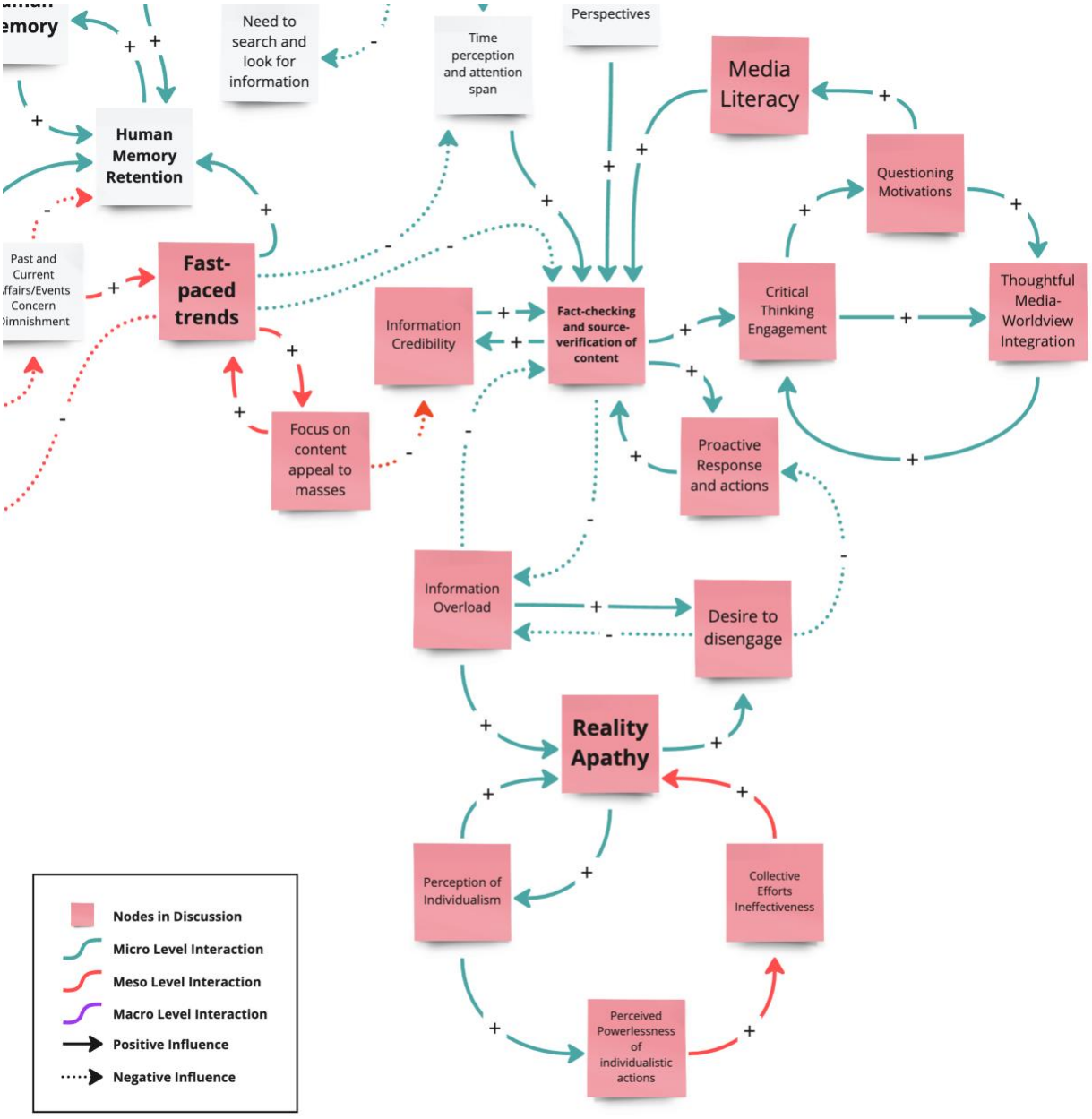

Figure 07: Casual Loop Diagram for Section 1.3. “Media Literacy and Reality Apathy”

Summary

The evolution of memory retention and narrative through digital platforms highlights a transition from deep, contemplative engagement to rapid, surface-level interaction. This shift holds implications for both individual cognitive processes and collective societal memory. By prioritizing immediacy, digital platforms may enhance access but at the cost of narrative depth and historical continuity. As these findings navigate to the broader societal implications, the

challenge becomes reconciling the ease of digital dissemination with the preservation of cognitive complexity and diversity.

2. Implications for Critical Thinking

This section delves into how digital platforms influence critical thinking through the mechanisms of algorithmic curation and content commodification. It examines the formation of echo chambers that reinforce existing beliefs, limit exposure to diverse viewpoints, and commodify narratives, prioritizing engagement over content depth. Each subsection is accompanied by a causal loop diagram that visualizes the dynamics discussed, providing a clearer understanding of the interplay between digital platform strategies and critical thinking processes.

2.1. Algorithmic Influence on Echo Chambers

Digital platforms, driven by predictive technologies like algorithms, play a crucial role in shaping mental landscapes by tailoring user experiences to individual preferences. These technologies are designed to enhance user engagement by presenting content that resonates with personal histories and past interactions. While this personalization can make the consumption of content more relevant and engaging, it also inadvertently results in a filtering bubble that intensifies existing beliefs (Pariser, 2011).

This phenomenon of creating echo chambers occurs when users are predominantly exposed to information that reinforces their pre-existing views, limiting their exposure to conflicting perspectives (Sunstein, 2001). Such environments reduce the diversity of encountered viewpoints, thereby stifling the development of critical thinking skills. Users become accustomed to a homogenized stream of information, limiting their ability to critically process and evaluate different ideas.

The perpetuation of these echo chambers can potentially contribute to a polarized societal landscape, where mutual understanding and willingness to consider alternative viewpoints are markedly diminished if stepping outside the echo chamber (Bail, 2022). This entrenchment in singular perspectives can undermine democratic discourse and hinder the collective capacity for critical debate, posing significant challenges to societal cohesion and informed decision-making.

Casual Loop Diagram

The causal loop diagram illustrates the effects of echo chambers on diverse worldview formation. Echo chambers can impact the formation of long-term collective memory and potentially diminish the importance of past and current events and concerns. The diagram

highlights the negative impacts on human memory and the need for a variety of content to foster a well-informed public.

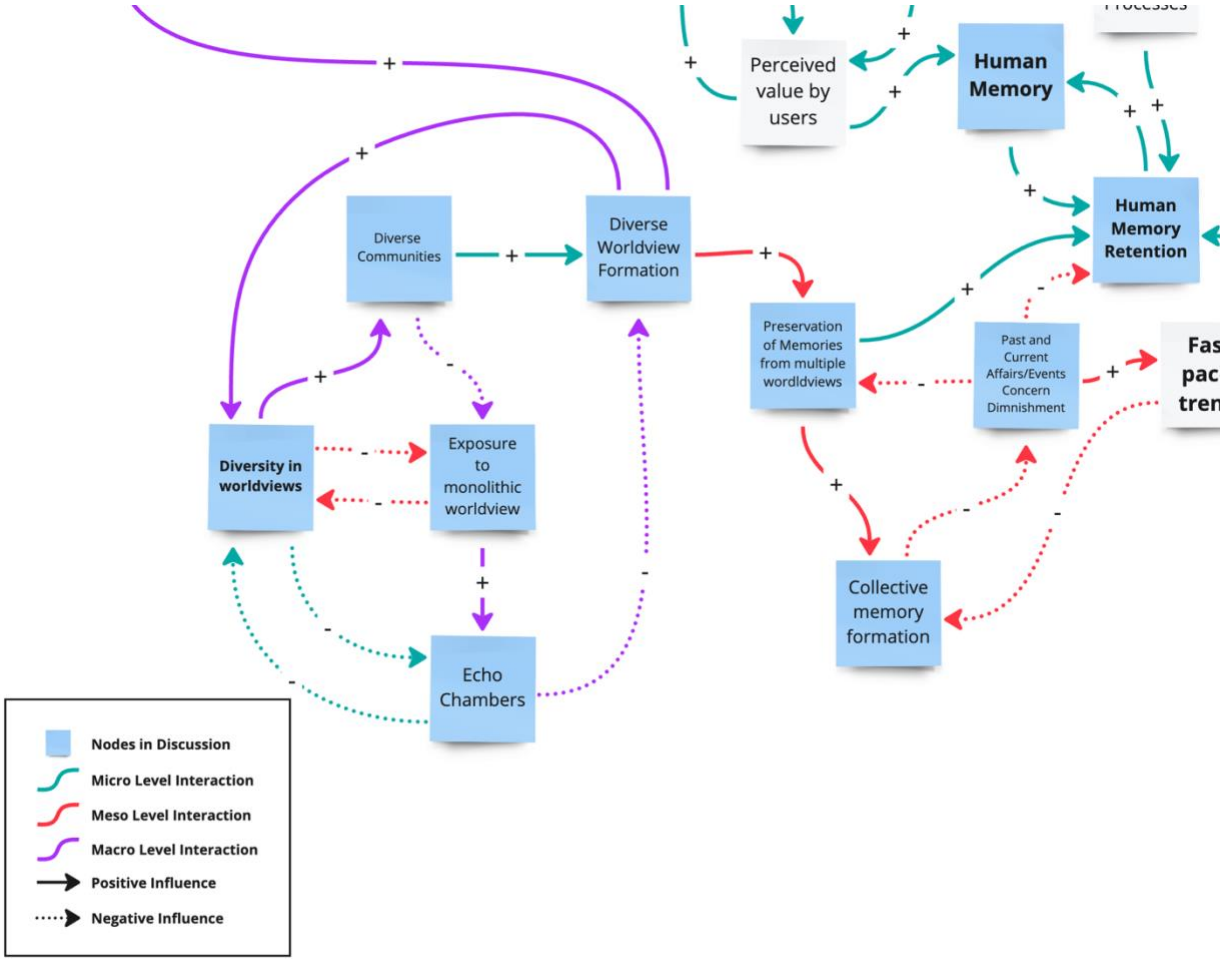

Figure 08: Casual Loop Diagram for Section 2.1. “Algorithmic Influence on Echo Chambers”

2.2. Commodification of Narratives

Digital platforms fundamentally transform the construction, consumption, and valuation of narratives by commodifying content to appeal to the broadest audience possible. This process prioritizes engagement metrics such as views, likes, comments, and shares, often at the expense of depth and accuracy (Napoli, 2019). As a result, complex topics are frequently simplified into digestible, less nuanced content forms, which are presented in easily consumable chunks to fit platform norms (Postman, 2005).

This emphasis on simplified, engaging content shifts public discourse towards sensationalism and superficiality, undermining the intellectual rigour of discussions (Harsin, 2015). The focus on content engineered to attract maximum views and interactions reshapes societal values and

cultural norms, steering them towards a preference for entertainment over enlightenment. This shift dilutes the quality of public conversation and diminishes the space for critical analysis and thoughtful deliberation.

Moreover, reducing narrative complexity for broad appeal risks homogenizing public opinion. This reduction in diversity of thought crowds out critical and varied perspectives, which are essential for healthy democratic societies. Without a range of viewpoints and rigorous debate, informed decision-making and, at a large scale, effective governance is severely compromised.

Casual Loop Diagram

The diagram showcases the feedback loops between the dynamic content cycle to maximize user engagement and fast-faced trends, leading to an imbalance in exposure to diverse perspectives, focus on narrative appeal and simplification. It reflects how platforms' focus on monetizable engagement can dilute the complexity of narratives, leading to a loss of depth in public discourse and a skewed representation of societal values.

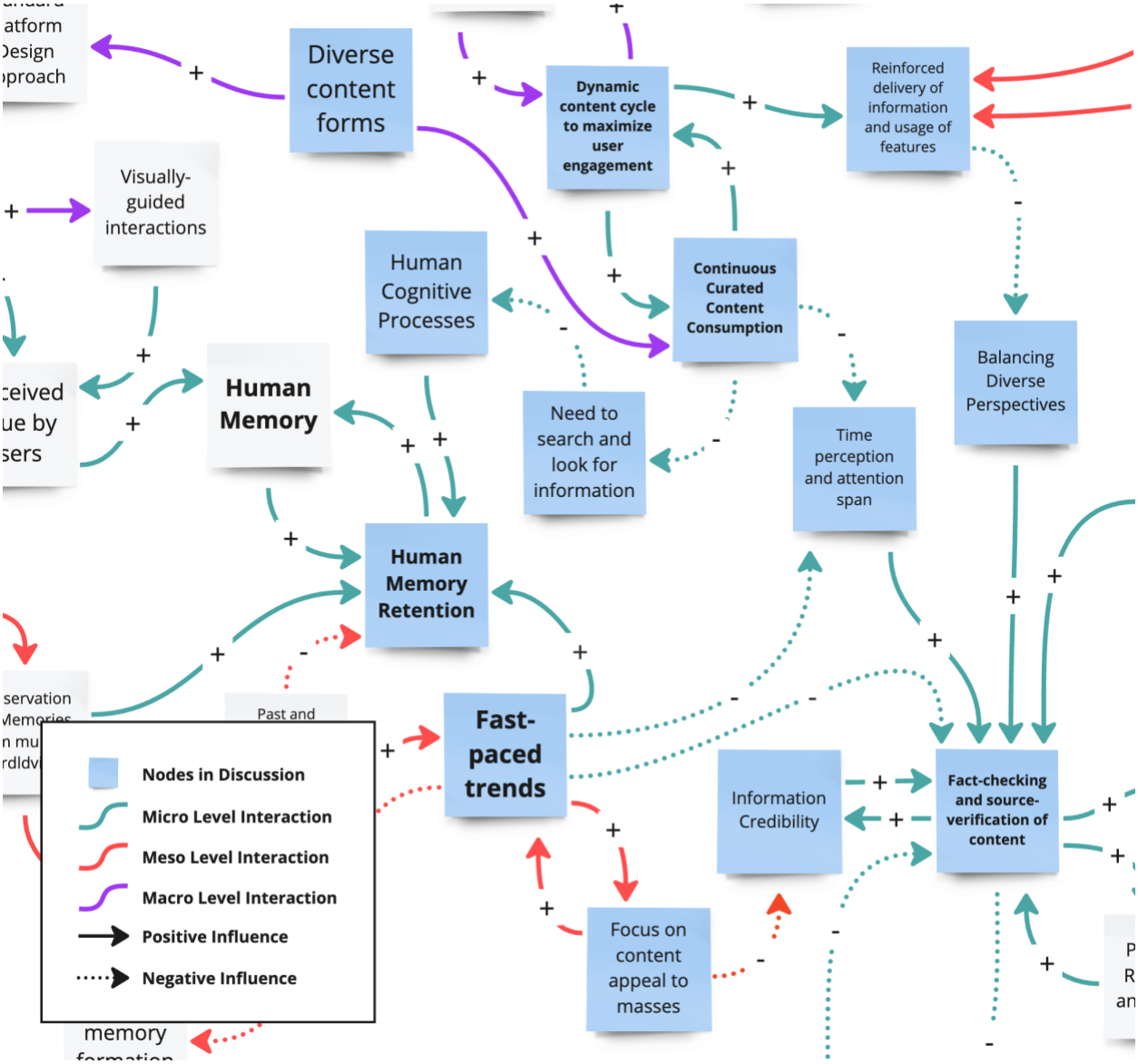

Figure 09: Casual Loop Diagram for Section 2.2. “Commodification of Narratives”

Summary

In summarizing this chapter, the effects of digital platforms on the critical thinking landscape are addressed. By examining the reinforcing cycles of echo chambers and the simplification of public narratives, the need for diverse, critical engagement in the digital realm is identified. The insights and visualizations provided articulate the challenges in preserving critical thinking amid the influence of digital technologies. Addressing these issues by fostering an environment that encourages the expression of multiple perspectives and supports informed discourse and democratic principles is essential.

3. Societal Shifts

This section examines the transformations in societal structure and dynamics due to the pervasive adoption of digital technologies. It discusses how these changes influence community interactions at local and global levels and their broader implications for civic engagement and societal cohesion. Subsections will explore the shift from physical to digital community dynamics and the impact of algorithmic selection on community discourse, each supported by causal loop diagrams that visualize the systemic effects of these transitions.

3.1. Digital and Physical Communities

The evolution of digital platforms has significantly influenced the traditional dynamics of community engagement, transitioning from local, tangible interactions to online, virtual environments (Wellman, 2001). This shift provides convenience and extends reach beyond geographical boundaries but challenges the integrity of local communal life.

Civic engagement and local activism could decline as community narratives and engagements increasingly move online (Putnam, 2000). Community members might shift their focus towards broader or international issues, overshadowing local concerns and cultural practices by dominant global narratives. This shift reduces face-to-face interactions, which are crucial for fostering a sense of community belonging and accountability, foundational to physical communities' social fabric (Turkle, 2011).

Furthermore, the commercial internet's initial vision as a unified global network is fragmenting due to regional regulatory and geopolitical influences, suggesting a potential evolution into separate regional networks (Mueller, 2017). This could lead to varied internet access rules and the emergence of region-specific content, mirroring the concept of region-locked media. This fragmentation, influenced by varying regional perspectives on data use and its impact on cognitive liberty, complicates global connectivity. The reliance on market mechanisms to regulate platform influences without specific policies to prevent platforms from shaping perceptions and thought highlights the need for more effective governance to preserve cognitive liberty.

Causal Loop Diagram

The causal loop diagram highlights the interconnectedness of digital globalization with local and regional community practices. It illustrates the tensions between global digital accessibility, regional technology solutions development and adoption, and the preservation of local community engagement, pointing to the need for balance in nurturing both global connections and local civic life.

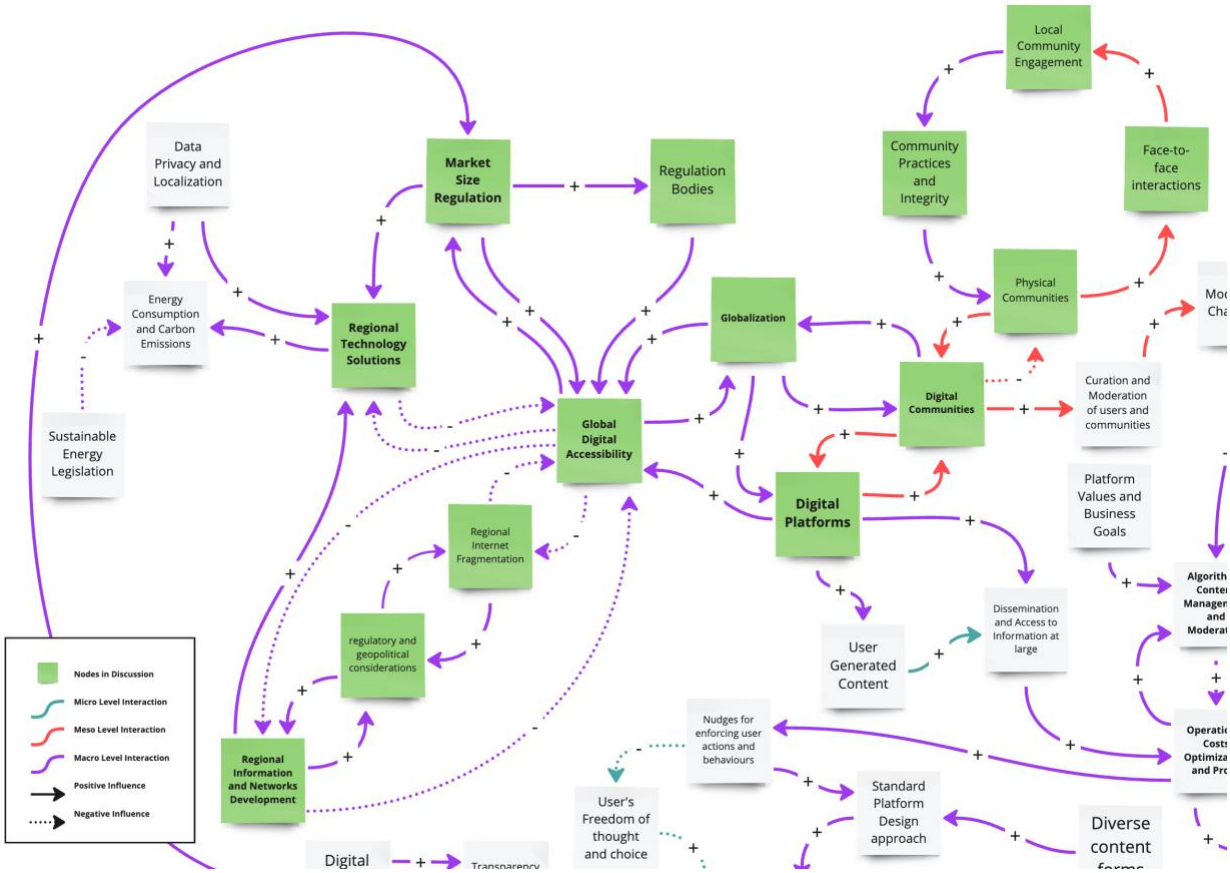

Figure 10: Casual Loop Diagram for Section 3.1. “Digital And Physical Communities”

3.2. Impact of Algorithmic Selection on Community Discourse

Algorithmic timelines on digital platforms represent a significant shift in how information is disseminated and consumed, influencing community interactions. These algorithms are programmed to prioritize content statistically likely to engage users for extended periods, often emphasizing sensational or emotionally charged posts that can rapidly increase viewer interaction (Gillespie, 2014). This strategic focus on high-engagement content tends to marginalize less spectacular but equally or more critical community-focused discussions (Pariser, 2011). Such discussions, crucial for nurturing local solidarity and civic responsibility, are often overshadowed by content designed to provoke immediate and strong emotional reactions. The result is a virtual environment where the significance of community issues is diminished in favour of content that drives engagement and controversies.

Furthermore, the algorithmic selection often filters out diverse viewpoints vital for a well-rounded community dialogue. This reinforcement of homogeneous perspectives stifles the pluralism essential for vibrant community discourse (Sunstein, 2018). The selective visibility and emphasis on controversial content erode the fabric of community interaction, leaving local issues and voices underrepresented in the digital realm. This alteration in the mechanisms of

community engagement challenges the very notion of community, transitioning it from a cohesive, supportive network into fragmented groups driven more by controversy than by constructive communication.

Casual Loop Diagram

This diagram elucidates algorithmic content management and moderation's cyclical nature and impact on online interactions. It demonstrates how digital platforms can influence users to interact carelessly, promoting bad actors that foster toxic cultures and ultimately reinforcing these interactions towards content that maximizes user engagement, often at the expense of balancing diverse perspectives.

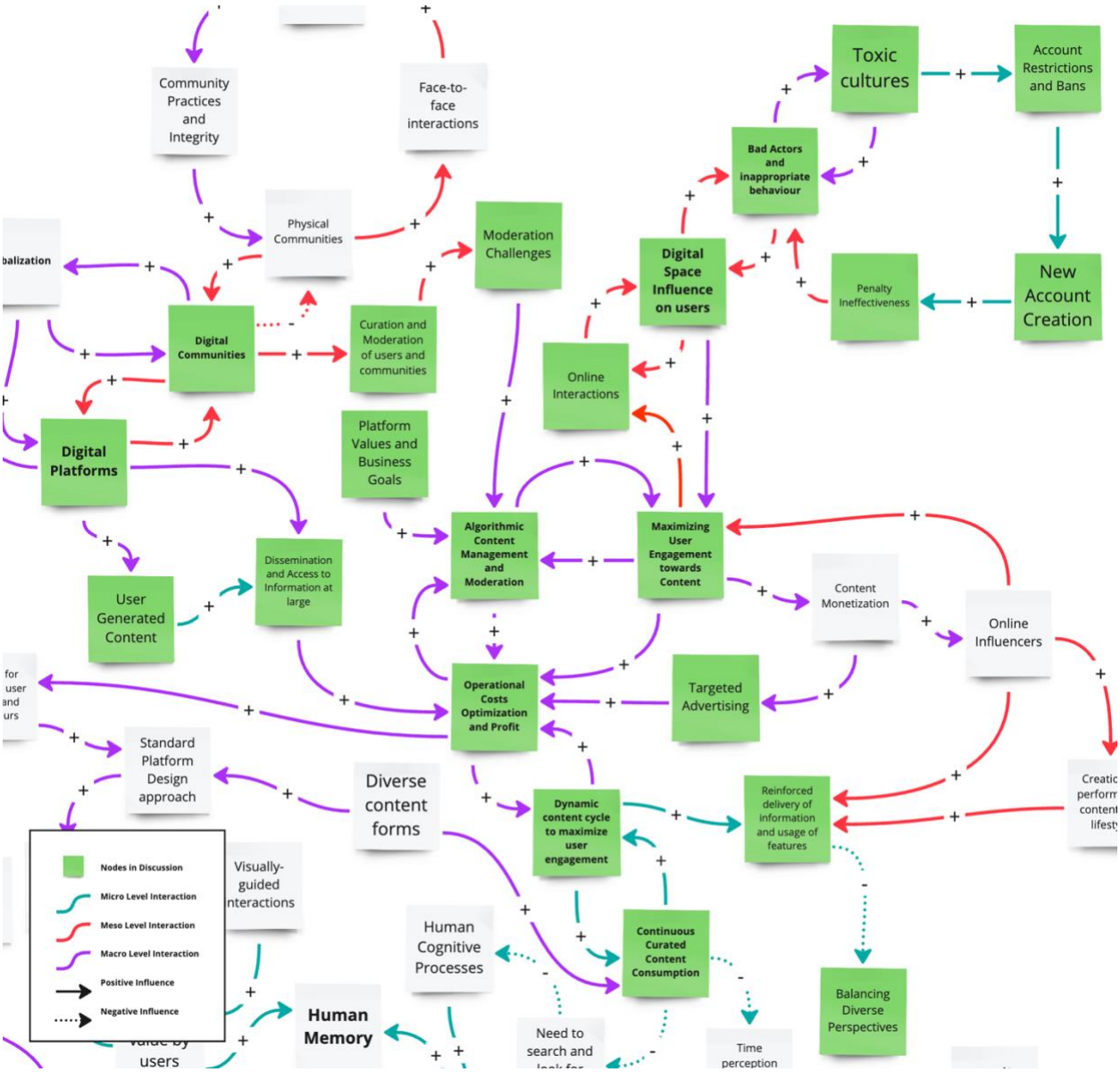

Figure 11: Casual Loop Diagram for Section 3.2. “Impact of Algorithmic Selection on Community Discourse”

Summary

The transition to a digital society presents an interplay between enhanced connectivity and the potential erosion of cognitive diversity and community cohesion. Through the visual aids and analyses in this section, the balance required to maintain robust community dynamics in the digital age is appreciated. As the discussion proceeds, the challenge lies in ensuring that the increasingly digital world supports a diverse, vibrant civil society that honours both global interconnectivity and the integrity of local communal life.

4. Digital Tracking

This section delves into the complex dynamics of digital tracking and its implications for user autonomy, privacy, and ethical standards within digital platforms. The discussion is structured around two critical areas: the commercial exploitation of personal data and its impact on user autonomy and the broader ethical concerns necessitating transparency and oversight in data practices. Each subsection is supported by a causal loop diagram, visually representing the systemic interactions and feedback mechanisms that underline the issues discussed.

4.1. Commodified Surveillance and User Autonomy

Digital tracking tools embedded within platforms are not passive observers; they actively shape user behaviour by analyzing and commodifying personal data. These tools monitor user interactions, preferences, and habits, transforming this data into valuable insights for platform optimization and targeted advertising (Zuboff, 2023). The pervasive nature of this surveillance extends beyond commercial interests, influencing users' autonomy and privacy.

By gathering comprehensive profiles of users, digital platforms can craft highly tailored experiences that predict and subtly influence user decisions, often without explicit consent (Van Dijck, 2013). This continuous monitoring enables platforms to direct users toward certain behaviours or choices, thereby challenging the essence of cognitive liberty. Users are subtly guided by algorithms that dictate content exposure and choices, shaping their perceptions and behaviours.

The commodification of personal data raises ethical concerns. It questions the ownership and control of personal information and the boundaries of user consent (Cohen, 2019). The transactional nature of data, where personal details are exchanged for services, often obscures the extent and implications of surveillance, leaving many users unaware of the depth of data intrusion into their lives.

Causal Loop Diagram

The causal loop diagram details the feedback systems within digital tracking to maximize user engagement and optimize profits. It highlights the exchange of user privacy and autonomy for tailored digital experiences. It outlines how platforms use personal data to shape consumer behaviour with user experiences that influence human memory, emphasizing the ethical need for transparency and user control over their personal information.

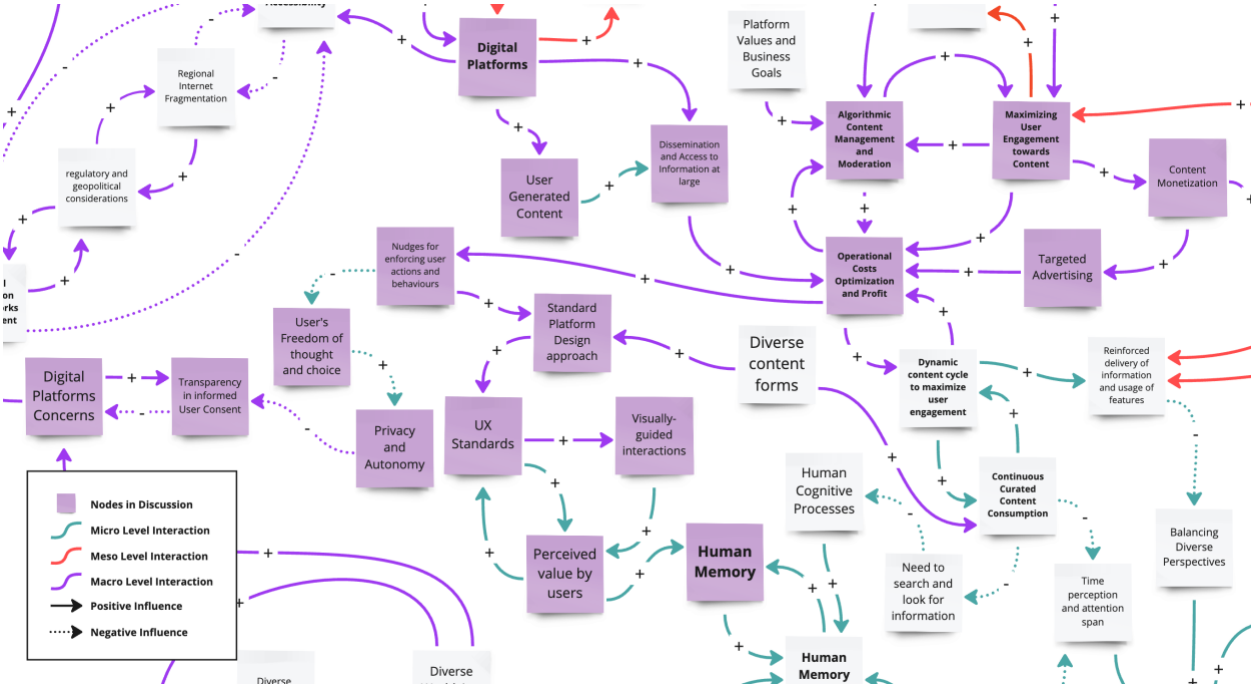

Figure 12: Casual Loop Diagram for Section 4.1. “Commodified Surveillance and User Autonomy”

4.2. Ethical Concerns and the Need for Transparency

The implications of digital tracking on cognitive liberty extend beyond surveillance to directly influence user autonomy and decision-making. This influence manifests in feedback loops where user behaviour is monitored and manipulated to align with predetermined outcomes favoured by platform algorithms (Pasquale, 2015). Such manipulation can narrow users' informational landscapes, as they are repeatedly exposed to content that reinforces their preferences and beliefs, reducing the likelihood of encountering diverse viewpoints.

This cycle restricts cognitive diversity and promotes a form of digital determinism, where user behaviour is increasingly influenced by algorithmic design rather than individual choice. The strategic application of collected data refines platform algorithms further, enhancing their ability to engage users while subtly steering behaviours and thought patterns.

Ethically, these practices raise concerns regarding the transparency of data usage and the extent of user consent. Many users are unaware of how their data is collected and used or the extent to which it influences their daily interactions and long-term worldview formation (Zuboff, 2023). This lack of transparency undermines trust and highlights the need for oversight to ensure technological impacts support user autonomy. Furthermore, considerations for legislation connect data localization with adopting sustainable energy solutions as policy, illustrating how data privacy regulations have broader implications for energy use and carbon footprints, adding another layer of complexity to the ethical debate.

Casual Loop Diagram

This diagram illustrates the interplay between digital platform concerns, such as lack of informed use consent and diverse worldview formation, and regulations enforced by national and regional markets on the platforms, increasing tensions between them to control information and data localization. It emphasizes how micro-level effects at a large scale become macro-level concerns for regulators.

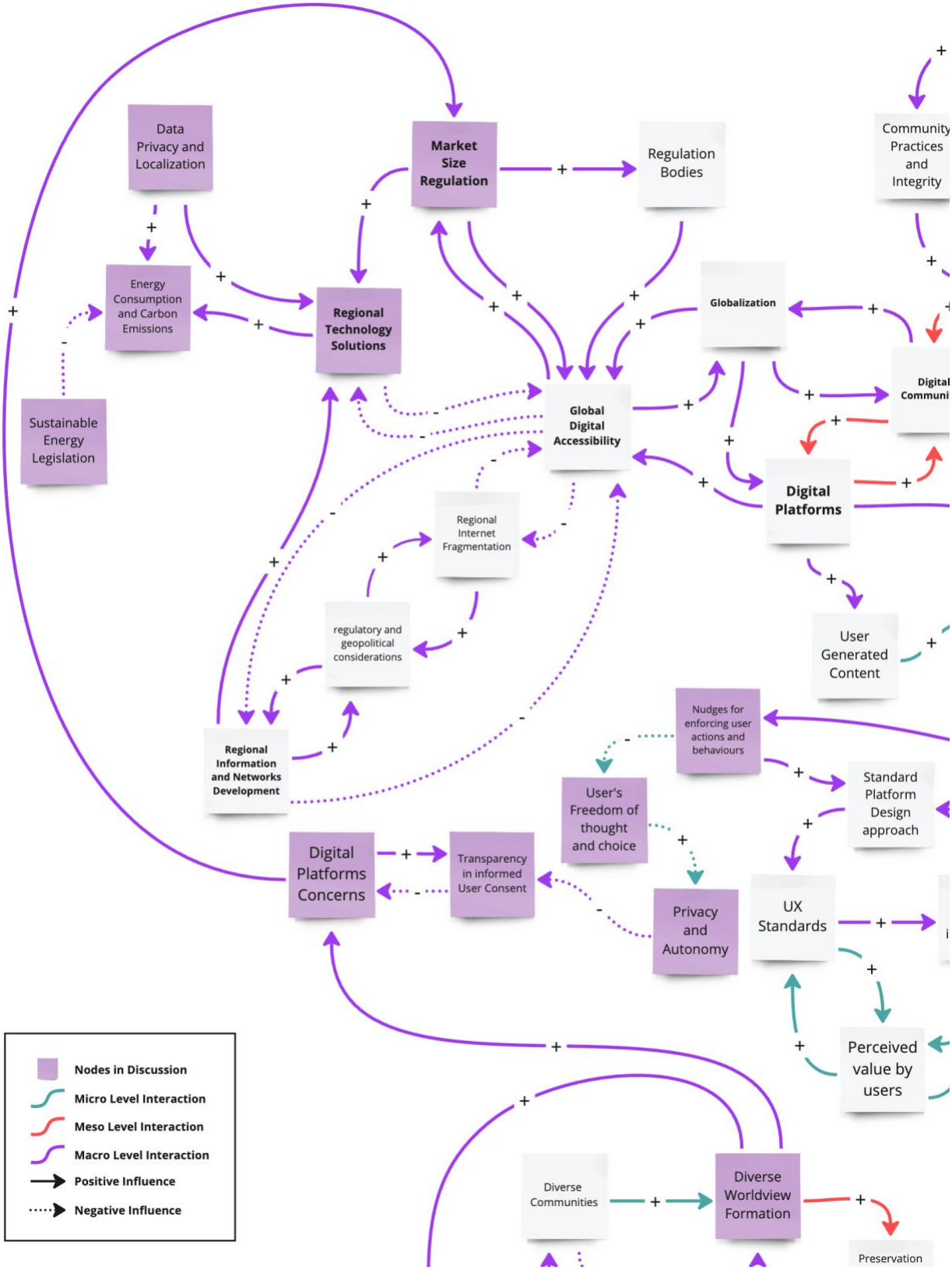

Figure 13: Casual Loop Diagram for Section 4.2. “Ethical Concerns and the Need for Transparency”

Summary

This chapter has revealed the intricate relationship between the conveniences of digital tracking and the infringement on cognitive liberty. The visualizations provide a systemic perspective on the nuanced interplay between user data commodification and the ethical implications for individual autonomy and privacy. As the digital age advances, ensuring user consent and transparency in data usage becomes paramount in safeguarding cognitive freedom and maintaining trust in digital ecosystems. The insights offered here will inform subsequent discussions on the future trajectories of digital technology governance.

It is also essential to understand the breadth and depth of systems at play, as while several of them are covered, this research project only looks at these systems from one lens with boundaries defined. Due to the boundaries set to ground the research, complex systems are often also supported by external systems not mentioned in the research. This leads to the notion of a ‘wicked problem — “a problem whose social complexity means that it has no determinable stopping point” (Tonkinwise, 2015).

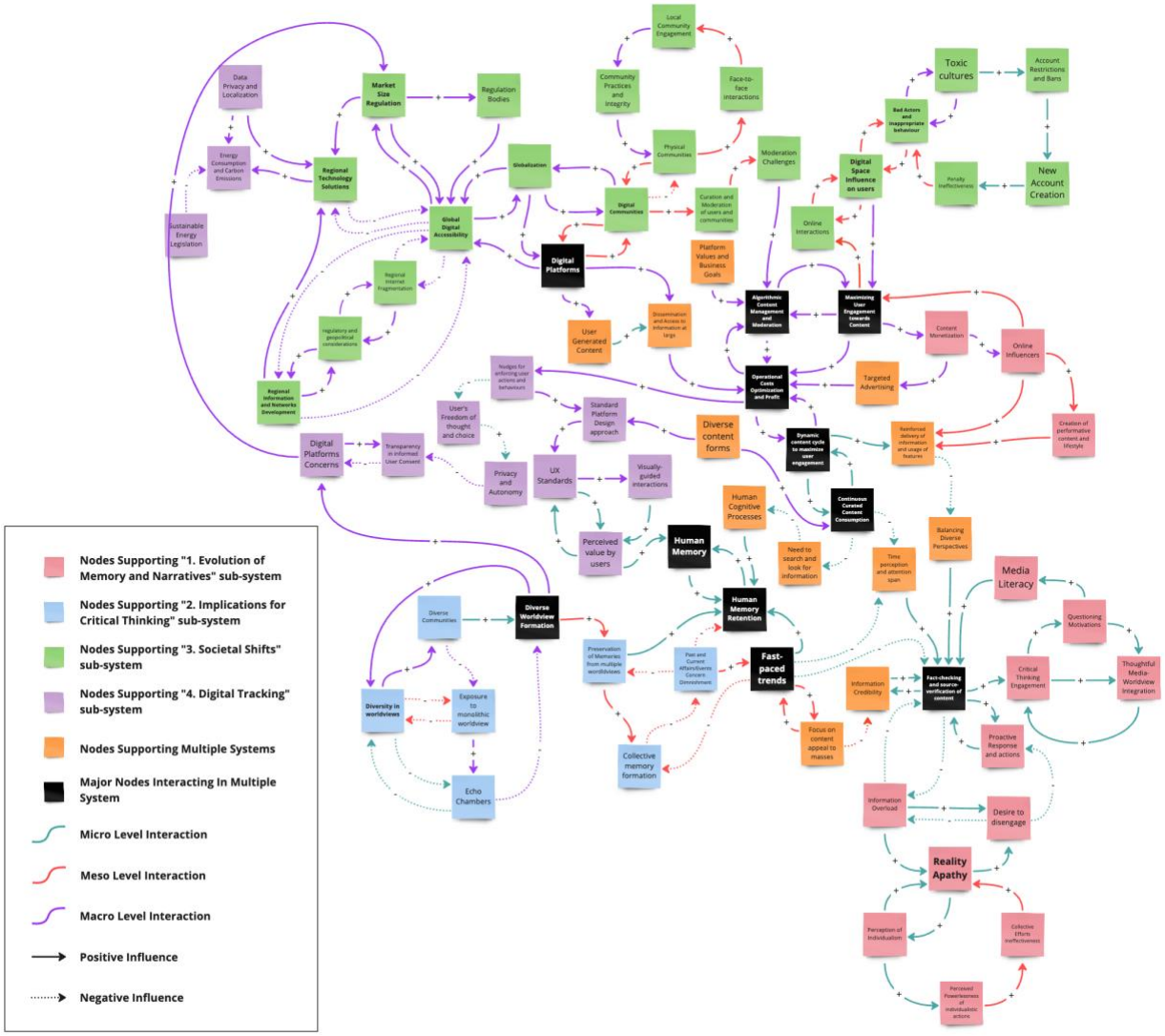

Figure 14: Overview of Casual Loop Diagrams Forming a Systems Map consolidating the effects of predictive technologies on the evolution of memory and narratives, its implications on critical thinking, and the societal shifts caused by them with the support of digital tracking

Conclusion

The analysis within this chapter outlines the interconnections between digital technology and cognitive processes and reveals a dynamic interaction between connectivity and cognitive constraints. Digital platforms redefine how memory is retained, narratives are constructed, and critical thinking is developed, altering public discourse and community engagement. The transition from physical to digital communities, alongside the ethical implications of digital tracking and data commodification, presents challenges to autonomy and privacy. The various causal loop diagrams serve as visual representations highlighting these complex interactions

and underscore the need for strategies that balance engagement with depth and authenticity. The analysis provided in this chapter lays the groundwork for understanding these shifts, setting the stage for further analysis by exploring the drivers of change and their broader implications on society.

Understanding Drivers of Change

The landscape of digital technologies is continuously evolving, influenced by many factors that drive change across various levels of society. This chapter delves into the drivers of change identified through a comprehensive analysis of trends based on the STEEP+V+L framework, categorizing them into social, technological, economic, environmental, political, ethical, values-based, and legal factors (Kononiuk & Nazarko, 2014; Nazarko et al., 2017; Ringland, 2007). By examining the relevant events in the technological space identified from December 2023 to March 2024, a better understanding of the undercurrents shaping the future of digital technologies and their impact on cognitive liberty is gained.

Applying DEFT analysis to these trends helps identify the drivers of change and the associated enablers, frictions, and turners (and blockers). It is a strategic framework used to assess the various forces that impact the trajectory of developments within a specific domain.

- **Drivers** are the primary forces that propel change within the system, pushing the development of new trends or the evolution of existing ones.
- **Enablers** are factors that facilitate the effect of drivers, often enhancing their impact or speeding up their implementation.
- **Frictions** are obstacles or challenges that slow down or hinder the progression of drivers, potentially altering their path or diminishing their effects.
- **Turners** (and Blockers), also commonly known as threats, are pivotal elements that can significantly shift the direction of a trend or completely stop a driver, respectively.

This offers insight into how these elements interact with the identified drivers and the potential future trajectories they suggest.

1. Ease of Information Generation and Dissemination

The ability to generate and disseminate information has significantly expanded due to technological advancements in synthetic content creation and the integration of creative processes with technology. These developments facilitate a more efficient and widespread exchange of information, influencing how individuals and communities interact with digital media.

Enablers: Technologies such as Generative AI can synthetically generate content nearly indistinguishable from that made by humans. Integrating digital tools with creative processes enables swift content creation and distribution. These technologies are supported by humans generating information with various intentions and spreading it to the public, leading to more integrated technology use in daily activities and communication.

Frictions: Operational costs associated with advanced AI systems and regulations mandating the disclosure of AI-generated content act as significant moderating factors. These elements help control the expansion of information dissemination and ensure a level of transparency in the process.

Turners: Major turners related to this driver include covert surveillance practices by digital platforms and increasing reliance on technology, which pose risks to privacy and autonomy. These turners highlight the need for ongoing monitoring and regulatory measures to balance technological innovation with ethical considerations and protect individual rights.

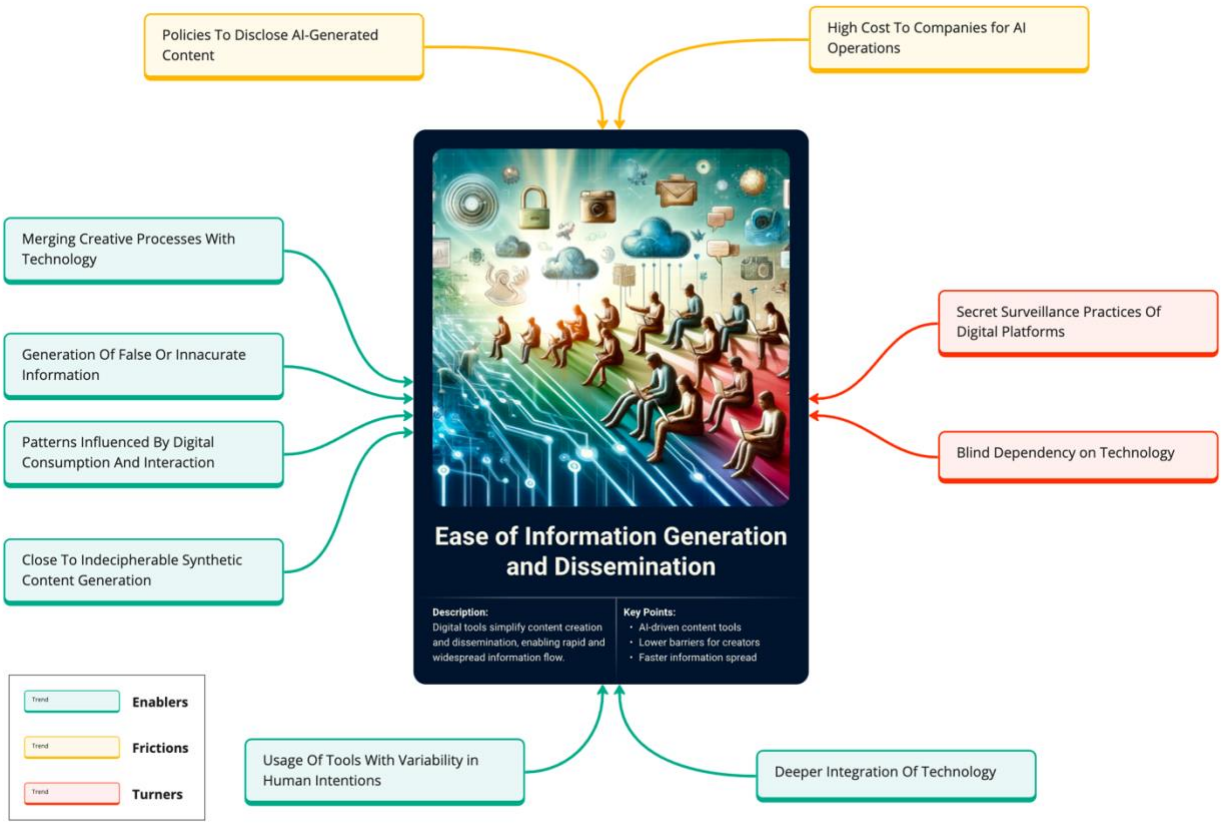

Figure 15: Visual Representation of Enablers, Frictions and Turners for "Ease of Information Generation and Dissemination" Driver

2. Human Cognition Influenced by Technological Advancement

The influence of digital technologies on human cognition is a significant driver of change, integrating deeply into daily life. Technological advancements shape this driver by affecting how individuals process and perceive information.

Enablers: Continuous advancements in technology that tailor and filter the types of information individuals receive and interact with are central to this driver. Technologies that simulate human-like interactions or produce deceptive content impact cognition significantly. These technologies shape user experiences and expectations, affecting cognitive patterns and behaviours over time.

Frictions: Competitive conduct in the tech industry often tests ethical boundaries but is countered by stringent data protection and privacy laws. These laws ensure that integrating these technologies into daily life does not infringe upon individual privacy or disseminate misleading information.

Turners: The potential for technologies to manipulate user behaviours and perceptions for commercial gain poses a significant turner. Techniques that subtly guide user actions or shape beliefs exploit cognitive vulnerabilities, posing risks to personal autonomy and the integrity of individual decision-making processes.

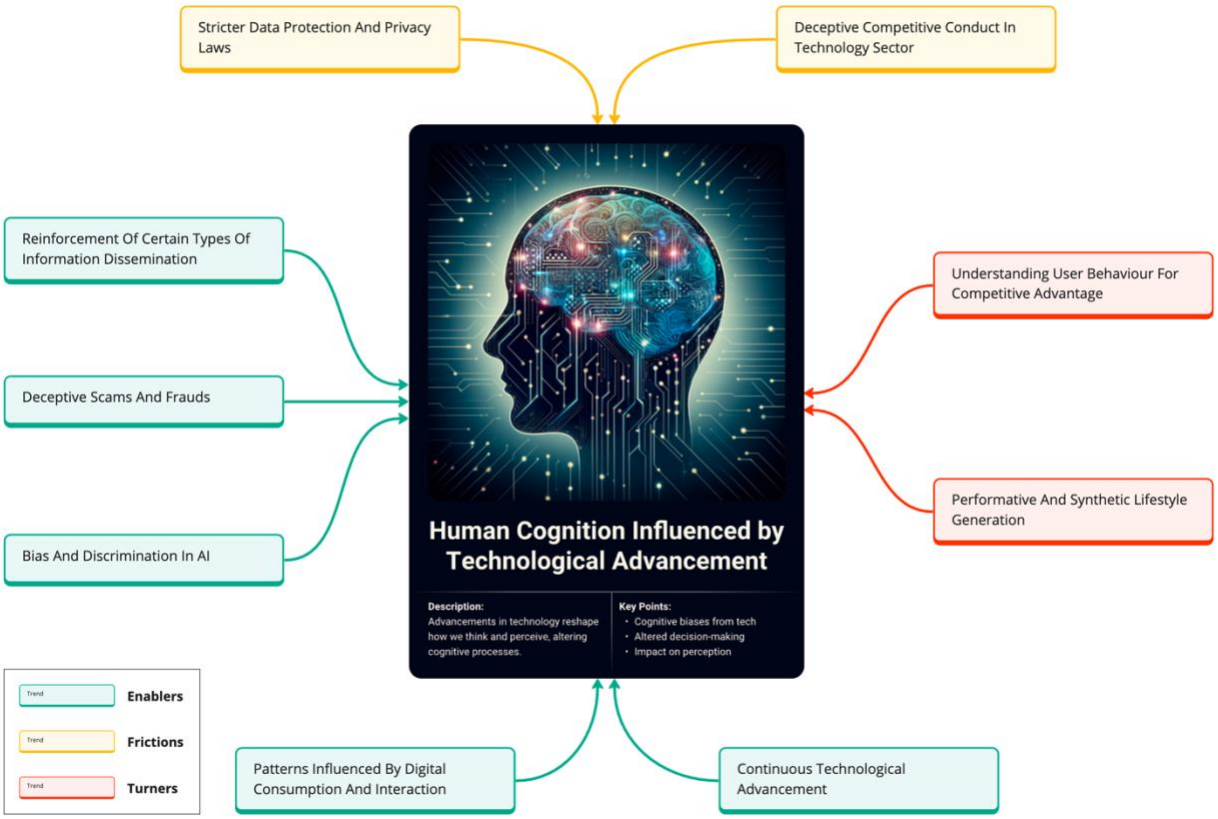

Figure 16: Visual Representation of Enablers, Frictions and Turners for " Human Cognition Influenced by Technological Advancement" Driver

3. Cost Optimization Reducing Human Labour

The drive to optimize costs while potentially reducing the reliance on human labour is a significant economic force within the digital technology landscape. This trend is driven by integrating advanced technologies that enhance efficiency and automation in various sectors.

Enablers: Key enablers include the proliferation of service-based models that generate recurring revenue streams and the adoption of AI-driven decision-making and generative processes. These technologies streamline operations and reduce the need for human intervention, thereby decreasing labour costs and increasing productivity.

Frictions: Despite these advancements, frictions exist, such as the potential for synthetic and performative lifestyles that may not truly reflect economic realities, coupled with regulatory efforts to maintain a levelled business environment. These factors balance the rapid adoption of cost-saving technologies, ensuring that economic benefits do not come at the expense of employment and social stability.

Turners: The potential monopolization by national digital platforms and the increased power consumption required for these technologies pose a blocker to the sustainability of this driver. As digital platforms grow more prominent and influential, they can dominate market sectors, reducing competition and potentially leading to higher consumer costs. Additionally, the environmental impact of increased energy consumption required for advanced digital technologies can undermine the long-term sustainability of these practices.

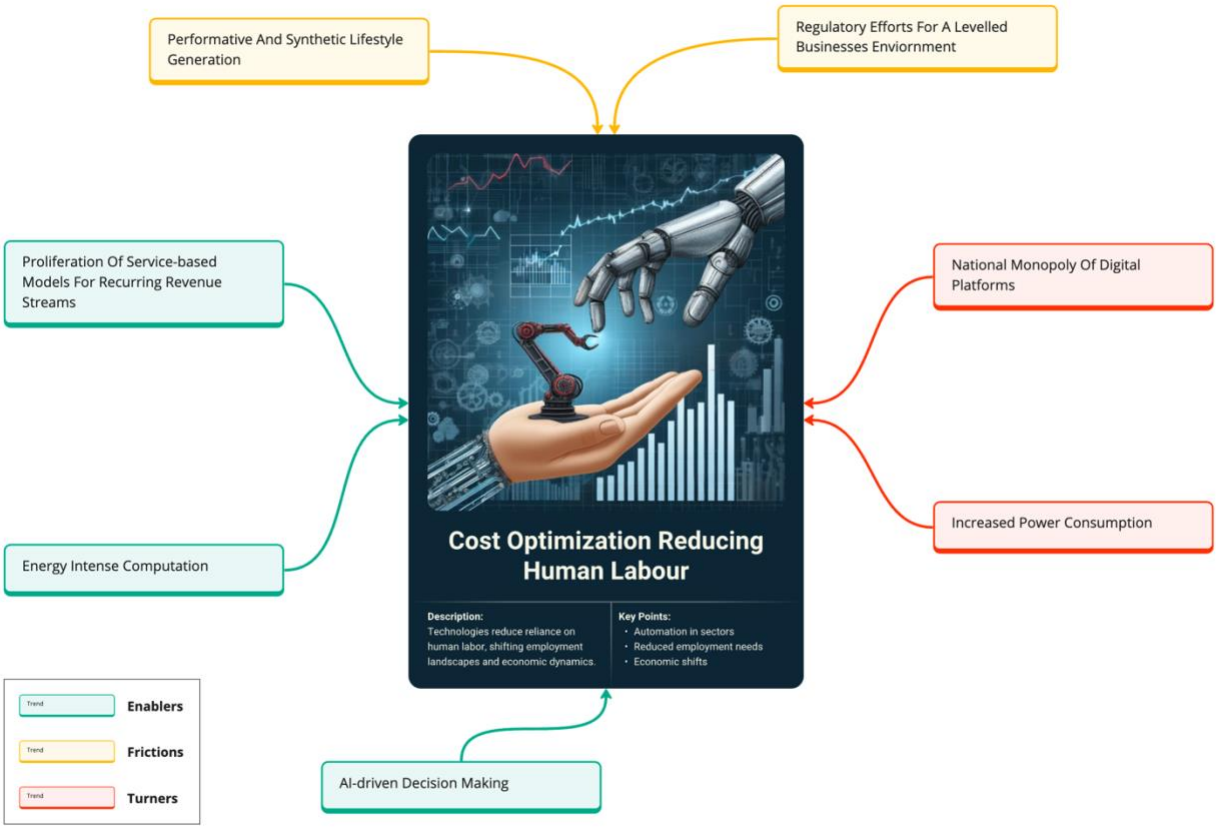

Figure 17: Visual Representation of Enablers, Frictions and Turners for "Cost Optimization Reducing Human Labour" Driver

4. Adoption of Trends at a Global Scale

The global adoption of digital trends is accelerated by the expanding demand for reliable energy and the capabilities of energy-intensive computational technologies. These trends are deeply influenced by digital transformation, which allows rapid dissemination and adoption across different regions and cultures.

Enablers: The growth in demand for reliable energy sources to support digital infrastructures and the utilization of energy-intensive computations are primary enablers. These factors facilitate the broader and faster adoption of digital trends worldwide, enabling technologies to permeate various sectors at an unprecedented scale.

Frictions: Significant frictions include the bargaining power imbalance with big tech platforms, which can dominate local and regional markets. Additionally, the deeper integration of technology challenges traditional industries and can disrupt local economies. Regulatory efforts

to manage these imbalances and integration challenges are crucial to ensuring that global adoption does not lead to negative impacts on local cultures and economies.

Turners: The primary turners involve regulatory tensions between technology giants and governmental bodies, which can impede the smooth global rollout of new technologies. Furthermore, the competition for global technological competitiveness can lead to disparities in technology access and benefits, exacerbating global inequalities.

Figure 18: Visual Representation of Enablers, Frictions and Turners for "Adoption of Trends at a Global Scale" Driver

5. Global Competitiveness in Technology

Global competitiveness in technology is a key driver influencing how nations and corporations strategize and invest in digital innovations. This competition shapes the technological landscape, influencing both development and policy decisions on an international scale.

Enablers: The presence of national digital platforms that dominate the technology market in various countries acts as a significant enabler. These platforms push the boundaries of

technological advancements, driving innovation through competition. Continuous technological advancement, fueled by investment in research and development, also supports nations and corporations in maintaining or gaining a competitive edge in the global market.

Frictions: Regulatory efforts to protect privacy and ensure fair competition introduce necessary frictions. These regulations help to prevent monopolistic behaviours and ensure that the benefits of technology are widely distributed. Accountability issues, such as the non-response to user complaints and the lack of transparency in technological operations, challenge the integrity and trust in these digital platforms, necessitating stricter oversight.

Turners: The turners in this area include potential regulatory pushbacks that may arise as nations seek to protect their economic interests against dominant foreign tech companies. Additionally, a lack of interest in news and political content among users can undermine the informed use of technology, reducing the potential for technology to contribute positively to civic engagement and informed decision-making.

Figure 19: Visual Representation of Enablers, Frictions and Turners for "Global Competitiveness in Technology" Driver

Interactions Between Drivers

1. **Ease of Information Generation and Dissemination** and **Adoption of Technological Trends at a Global Scale** enables **Human Cognition Influenced by Technological Advancement**. This highlights the relationship between digital content's rapid production and spread and its impact on individual cognition. Digital platforms' ability to influence cognitive processes is intensified by the speed and methods employed for disseminating information in the digital age.
2. **Cost Optimization Reducing Human Labour** often challenges **Human Cognition Influenced by Technological Advancement**. The push for automation and efficiency can lead to reduced human labour, affecting employment opportunities and, subsequently, social stability and individual psychological health.
3. **Adoption of Trends at a Global Scale** and **Global Competitiveness in Technology** are closely linked. Nations and corporations leverage emerging technologies to enhance their competitive stance, influencing the speed and extent of technology adoption worldwide.
4. **Global Competitiveness in Technology** also drives developments in **Ease of Information Generation and Dissemination** by fostering innovations that enhance information technologies' capabilities, further accelerating the global reach of digital platforms.

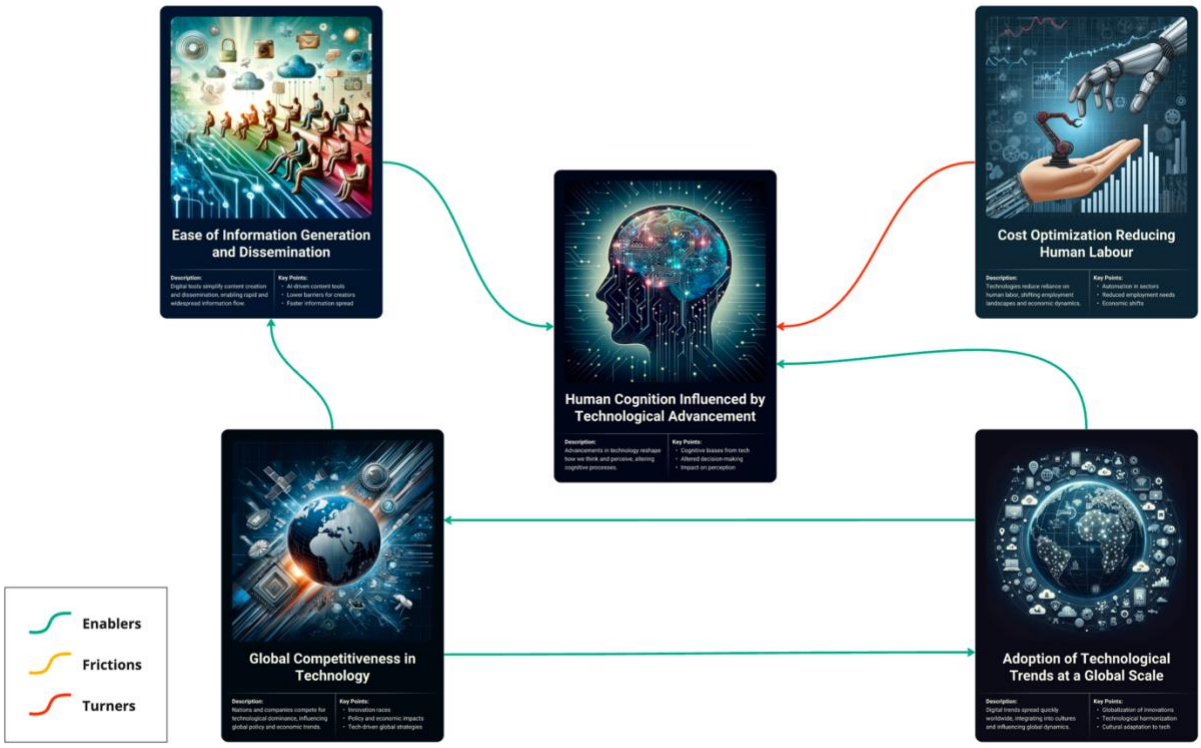

Figure 20: Visual Representation of Interactions Between Drivers of Change Acting as Enablers, Frictions and Turners Amongst Each Other

As a result, the primary force driving these interconnected changes is the rapid advancement and integration of digital technologies into every aspect of daily life and global commerce. The implication is a world increasingly shaped by digital interfaces, where technological innovations continually influence cognitive liberty and societal norms. These dynamics underscore the need for oversight, regulatory frameworks, and public engagement to ensure that the benefits of digital transformation are balanced with the protection of fundamental human rights and freedoms.

Sensemaking & Building Resilience

This chapter aims to connect the findings from the systems map and drivers of change to address the main research question: How might digitalization and predictive technologies impact cognitive liberty and influence thought patterns and societal values? It explores the impact of digital technologies at various levels: the micro level, focusing on individual thought patterns and memory; the meso level, examining changes in human habits and interpersonal relationships; and the macro level, considering broader societal implications and shifts in cultural values.

Integrating these analyses provides a comprehensive view of how technology interacts with cognitive processes and how this interaction moulds society. This synthesis highlights digital technologies' opportunities and challenges in conceptualizing strategic responses and potential actions the actors in the system can take.

This sensemaking process aims to develop a clear understanding of digital technology's current state and future directions of influence on society. It aims to guide policymakers, educators, technologists, and citizens in making informed decisions and implementing effective strategies to maximize the benefits of digital advancements while mitigating potential adverse effects. This chapter will offer actionable insights and forward-looking perspectives that respond to the initial research questions, providing a roadmap for navigating the evolving landscape of digital technologies.

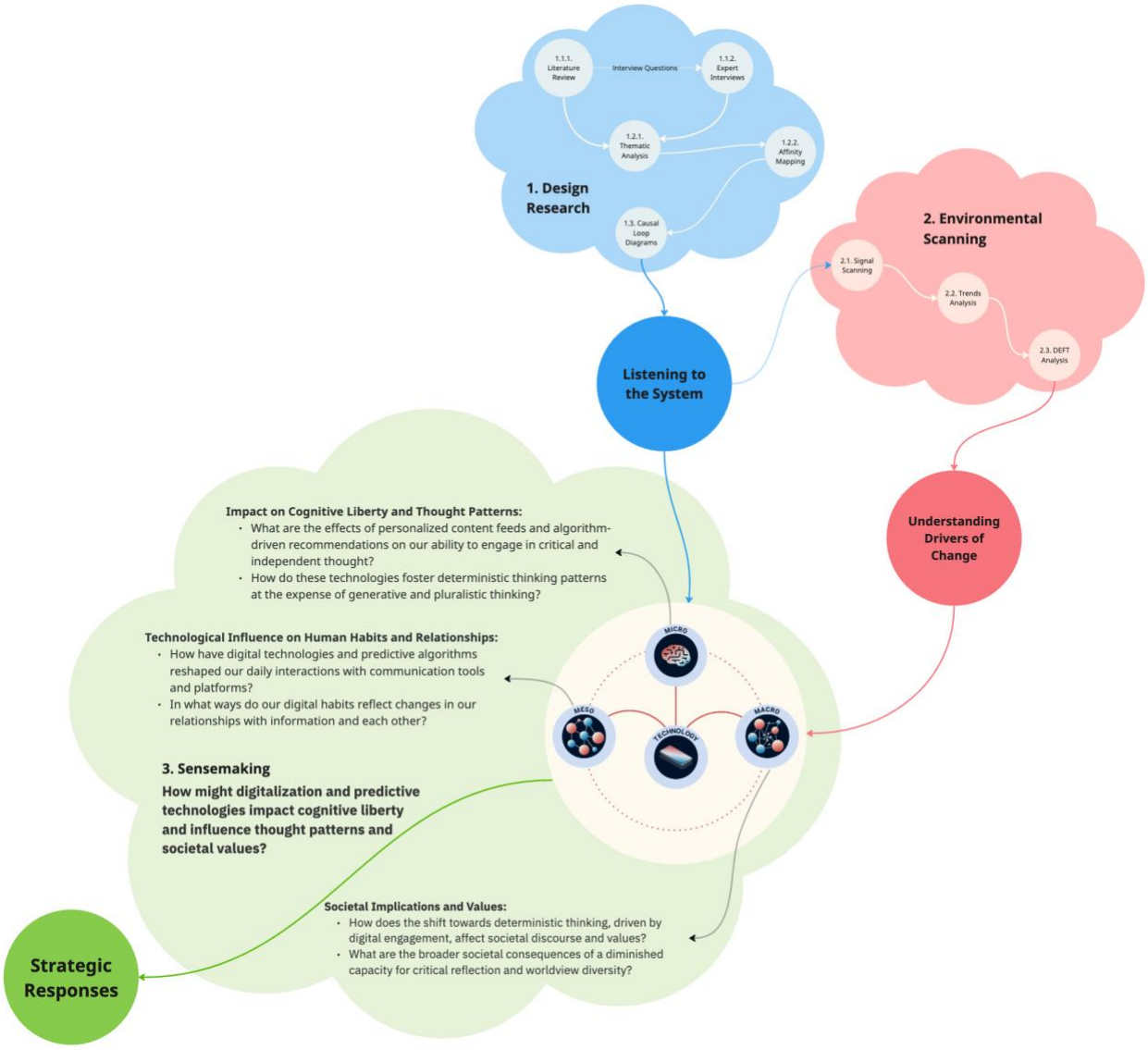

Figure 21: Overview of Research Methodology With data for the “Sensemaking” Method Derived From “Listening to the System” and “Understanding Drivers of Change”

1. At Micro Level

At the micro level, examining digitalization and predictive technologies involves assessing their direct effects on individual cognitive processes, particularly human memory and thought patterns.

1.1. Influence on Cognitive Processes

1.1.1. Personalized Content Feeds and Algorithm-Driven Recommendations

- **Reduction in Cognitive Liberty:** Relying on personalized algorithms can limit cognitive liberty by narrowing the information range presented to individuals. This selective exposure constrains opportunities to engage with diverse content, which is crucial for developing robust critical thinking. Personalized feeds often offer content that reinforces existing beliefs, reducing the cognitive effort to process new or challenging information and potentially fostering passive consumption behaviour.
- **Promotion of Deterministic Thinking Patterns:** Predictive technologies designed to anticipate user preferences based on past interactions may lead to deterministic thinking, stopping individuals from asking difficult questions and exploring uncomfortable territories. Instead, they act as a "brake on creativity and motivation" (Shanker, 2019). Thus, individuals feel less agency in exploring new intellectual territories. This can inhibit generative and pluralistic thinking, as users might not encounter or seek diverse viewpoints or contradictory information, leading to homogenized thought.

1.1.2. Memory Consolidation and Recall

- **Impact on Memory Retention:** The transient nature of digital content consumption, characterized by brief and frequent interactions, affects how memory is consolidated and recalled. The fleeting engagement with content does not promote the deep cognitive processes required for long-term memory storage, potentially diminishing the ability to recall information independently without digital prompts.
- **Dependency on Digital Tools:** As individuals grow accustomed to the cognitive support provided by digital tools, there is a risk of diminished internal memory capabilities. This dependency can reduce cognitive resilience, making individuals more reliant on technology for basic cognitive tasks such as remembering information or making decisions.

1.2. Strategic Responses and Implications

1.2.1. Enhancing Content Diversity

Implementing platform designs that systematically expose users to a broader array of content could counteract the echo chamber effect. This strategy would challenge users' pre-existing beliefs and promote critical thinking, thereby supporting a more dynamic cognitive environment.

Potential actors and actions:

- **Tech companies**, particularly new and emerging platforms, could innovate by designing algorithms that prioritize content diversity over user engagement.
- **Policymakers** could encourage digital platforms to demonstrate content diversity as part of their operating licenses.

Real-life examples: *Ground News*, a news aggregator, uses algorithms designed to classify third-party news articles on the same topic and expose users to opposing viewpoints. This model aims to ensure that users encounter diverse perspectives, promoting a balanced understanding between the left, centre, and right opinions.

1.2.2. Educational Initiatives on Algorithm Awareness

Developing educational programs that inform users about how algorithms shape their content consumption can enhance cognitive autonomy. By understanding these mechanisms, individuals can better navigate their digital environments, making choices that foster independent thought rather than conform to algorithmically determined patterns.

Potential actors and actions:

- **Educational institutions** could incorporate digital literacy into their curricula, teaching students how to use technology and critically assess its influence on their information consumption.
- **Community centers**, **libraries**, and **non-profits** could host workshops that enhance public understanding of digital environments. These workshops could be sponsored by **local government** initiatives or **private philanthropists** focusing on education and technology.

Real-life examples: Non-profit organizations such as the *Electronic Frontier Foundation* (EFF) offer workshops and resources that educate the public about digital rights and privacy, including how algorithms influence what individuals see online. Internet Freedom Foundation (IFF) is another digital rights organization based in India that promotes strategic litigation, policy engagement, and civic literacy in the digital age. Such initiatives can serve as a model for more widespread educational efforts.

2. At Meso Level

At the meso level, the focus shifts to how digital technologies and predictive algorithms reshape daily interactions with communication tools and platforms. This analysis extends from individual implications to examine how these technological influences permeate social habits and interpersonal relationships.

2.1. Influence on Social Interactions and Community Dynamics

2.1.1. Reshaping Communication Tools and Platforms:

- **Normalization of Digital Interactions:** Digital communication tools have normalized remote interactions, shifting the typical dynamics from face-to-face to digital mediums. This shift influences social dynamics, potentially weakening local community bonds while enhancing global connections.
- **Modification of Social Norms:** Predictive algorithms influence communication patterns by recommending specific types of interactions and responses. This standardization can dilute the richness of social exchanges, potentially overlooking individual and cultural nuances.

2.1.2. Changes in Digital Habits and Relationship Dynamics:

- **Consistency in Digital Behavior:** As individuals adapt to algorithm-driven environments, their digital habits often reflect high consistency, influenced by underlying algorithms. This consistency can limit spontaneous or creative interactions, reinforcing predictable patterns that may restrict the diversity of social behaviours.
- **Alteration of Relationship Dynamics:** The integration of digital technologies into everyday life changes how relationships are maintained. For example, the ease of staying connected through social media can sometimes substitute for more meaningful, in-depth interactions, leading to relationships that might lack deep emotional connections.

2.2. Strategic Responses and Implications

2.2.1. Designing for Inclusivity

Platforms should be designed to accommodate and celebrate diverse communication styles and cultural backgrounds, promoting inclusivity and preventing the homogenization of social interactions. This approach can help maintain the authenticity and depth of social exchanges across digital spaces.

Potential actors and actions:

- **Tech developers** can prioritize inclusivity in platform design, ensuring that platforms can be easily used and accessed by people from various cultural backgrounds and with different abilities.
- **Civic organizations** and **local governments** can advocate for adopting inclusive and decentralized platforms to enhance community engagement and ensure public services and discussions are accessible to all community members.

Real-life examples: Platforms like *Mastodon* foster inclusivity by encouraging interactions that reflect local norms and cultural nuances. *Appropedia*, a wiki site for collaborative solutions in sustainability, poverty reduction, and international development, provides a platform where

diverse cultural knowledge is shared and discussed, enhancing global community engagement without a profit motive.

2.2.2. Supporting Meaningful Interactions

Encouraging platforms to foster environments that promote meaningful social interactions can counter the trend toward superficial relationships. Features that encourage deeper dialogue and genuine connections can potentially enhance the quality of relationships formed or maintained digitally.

Potential actors and actions:

- **Social platforms** could implement features that promote longer, more thoughtful interactions, such as tools for hosting virtual group discussions or collaborative projects that require sustained engagement.
- **Non-profit organizations** focused on mental health, and social cohesion can collaborate with tech companies to create digital spaces that support well-being and meaningful social interactions, using technology to bridge rather than build walls between individuals.

Real-life examples: *Library of Things*, a community-driven service that allows people to borrow items, fosters interactions around shared resources and sustainability. This model promotes social bonding and encourages discussions about communal living and environmental consciousness. Another example is *Front Porch Forum*, a regional platform that enables neighbours to connect and help each other in daily tasks, fostering a sense of community and belonging.

3. At Macro Level

At the macro level, the focus shifts to examining the broader societal implications of digital technologies, particularly how deterministic thinking driven by digital engagement affects societal discourse and values. This level of analysis considers the collective impact of digital technologies on societal structures and cultural norms.

3.1. Influence on Societal Discourse and Values:

3.1.1. Shift Toward Deterministic Thinking

- **Impact on Societal Discourse:** The prevalence of deterministic thinking patterns, influenced by algorithm-driven content consumption, can lead to a societal discourse that is less diverse and more predictable. As individuals become accustomed to receiving information that aligns with their existing beliefs, societal discourse may become polarized, with fewer opportunities for constructive dialogue across differing viewpoints.

- **Reduction in Thought Diversity:** The reinforcement of specific thought patterns and the suppression of pluralistic thinking can diminish thought diversity within society. This reduction may lead to a homogenization of viewpoints, where novel or minority perspectives are less likely to be heard or valued.

3.1.2. Consequences of Diminished Critical Reflection

- **Weakening of Democratic Processes:** A societal shift away from critical reflection and towards more passive content consumption can weaken democratic processes. When the public is less engaged in critical thinking and more inclined to accept information without scrutiny, the quality of democratic deliberation and decision-making can suffer.
- **Alteration of Cultural Values:** As digital technologies shape individuals' interactions and thought processes, they influence society's broader cultural values. This can lead to shifts in what societies value, such as moving from valuing diversity and debate to prioritizing efficiency and consensus, potentially at the expense of depth and authenticity in public and private discourse.

3.2. Strategic Responses and Implications

3.2.1. Promoting Digital Pluralism

Encouraging digital platforms to promote a wider array of viewpoints and to facilitate access to diverse content can help counteract the trend toward worldview homogenization. This strategy involves technological solutions and policy frameworks that support media diversity and pluralism.

Potential actors and actions:

- **Policymakers** can develop and enforce regulations that ensure digital platforms provide balanced and varied content, support cultural diversity, and prevent the dominance of any single narrative.
- **Educational institutions** and **libraries** can partner with non-commercial technology platforms to integrate diverse digital resources into academic curricula, enhancing students' exposure to various perspectives.

Real-life examples: *Internet Archive* and *Project Gutenberg* are non-commercial platforms that provide free access to a wealth of digital books, movies, software, and music from diverse cultures and periods, promoting a pluralistic approach to digital content. These platforms demonstrate how digital resources can be utilized to preserve and share a wide array of cultural and intellectual materials, fostering a richer, more diverse information landscape.

3.2.2. Strengthening Civic Education

Enhancing civic education to include critical digital literacy can empower citizens to engage more actively and critically with digital content. Education programs focusing on understanding media and digital content strategies can improve the public's ability to discern and critically evaluate the information they consume.

Potential actors and actions:

- **Educational policymakers** and **school boards** can incorporate digital literacy into all levels of education, ensuring that students are equipped to navigate and critically assess digital media.
- **Non-profits focused on digital rights and education** can develop workshops and resources that support public education on digital literacy, reaching a broader audience beyond traditional classrooms.

Real-life examples: *Civic Online Reasoning* by Stanford Education Group provides resources that educators can use to teach students how to evaluate online information critically. This initiative helps build essential skills for navigating today's digital information environment, promoting a well-informed citizenry.

3.2.3. Regulatory Oversight on Algorithm Transparency

Implementing stricter regulatory oversight to ensure transparency in how algorithms curate and recommend content can help maintain a healthy public discourse. Regulations could require platforms to disclose the logic behind content recommendations, thus allowing users to understand and potentially challenge the curated nature of their digital environments.

Potential actors and actions:

- **Government bodies** can enforce transparency requirements for algorithms to ensure users understand how content is selected and presented, fostering greater consumer trust and agency.
- **Consumer advocacy groups** can play a crucial role in monitoring regulatory compliance and advocating for consumer rights in the digital space.

Real-life examples: In the European Union, the *Digital Services Act* aims to increase transparency and accountability of online platforms' algorithms, setting a precedent for how regulatory measures can enforce greater transparency in digital services.

Looking Forward

As digital technologies continue to evolve, the interaction among micro, meso, and macro levels will likely become more complex, culminating in new challenges and opportunities for society. This complex interplay requires proactive and dynamic strategies that adapt continuously to new developments. Future research should remain agile, constantly integrating new data and insights to refine our understanding of digital impacts on society. Policymaking, too, must be responsive, leveraging fresh academic and industry insights to craft regulations that not only address current realities but also anticipate future changes. To harness the full potential of digital advancements, a broad coalition of actors and stakeholders — including technologists, policymakers, educators, community leaders, and users — must engage in sustained collaboration. This collaborative effort is essential for fostering a society that values cognitive liberty, embraces cultural and worldview diversity, and maintains robust democratic processes in an increasingly digital world. This chapter sets the stage for ongoing discussions and actions that have the potential to shape the trajectory of digital technologies. Providing areas for intervention and collaboration offers guidance for navigating the evolving digital landscape in ways that promote an informed, inclusive, and resilient society.

Conclusion

This research explored the influences of digital technologies on cognitive liberty and societal values. Employing design research, environmental scanning, and DEFT analysis, the study dissected how digital advancements interact with human cognitive processes at various levels: micro (individual cognitive processes and memory), meso (interpersonal relationships and community dynamics), and macro (broader societal implications and cultural shifts). Each research phase is aimed to provide a detailed understanding of systemic changes driven by digitalization.

Synthesis of Key Insights

The study highlighted that while digital technologies enhance access to information and connectivity, they also direct user experiences into narrow pathways. Central to this research, algorithmic curation emerged as both a personalizer of content and a sculptor of a homogenized information landscape that stifles thought diversity and critical engagement. This presents a challenge: balancing the benefits of digital technologies against their potential to constrain cognitive freedom.

Reflection on Challenges Encountered

Distinguishing the direct impacts of digital technologies from broader societal shifts posed significant challenges. The pervasive integration of digital platforms into everyday life makes it difficult to separate technological effects from social evolution. Moreover, navigating a range of expert opinions required a balanced approach, ensuring the research remained anchored in empirical evidence and thorough analysis.

Implications and the Stakes of Inaction

If proactive measures are not taken, the potential of digital technologies to enrich human life could be overshadowed by their capacity to diminish cognitive liberty and mould public discourse. The gradual erosion of diverse thought processes and the entrenchment of algorithmic determinism could become irreversible, affecting democratic processes, cultural diversity, and individual autonomy.

Call for Further Research

This study opens avenues for further investigation into the complex interactions between digital technologies and societal structures. Future studies could explore how digital platforms can support cognitive diversity and robust democratic engagement. Longitudinal studies are also necessary to assess the long-term impacts of digital technologies on the evolution of cognitive

processes and societal norms. These studies will help pave the way for developing strategies that mitigate risks and enhance the positive impacts of digitalization on society.

Bibliography

Alegre, S. (2022). Toward an International Agenda to Protect the Forum Internum. Centre for International Governance Innovation, 176. Link to article

Bail, C. (2022). Breaking the social media prism: How to make our platforms less polarizing. Princeton University Press.

Baraniuk, C. (n.d.). Why human brains were bigger 3,000 years ago. Retrieved March 13, 2024, from Link to news article

Bartleman, M., & Dubois, E. (2023). The Political Uses of AI in Canada. Pol Comm Tech Lab, University of Ottawa. Link to report

Berry, D. (2012). Understanding Digital Humanities. Palgrave Macmillan.

Blacklaws, C. (2018). Algorithms: Transparency and accountability. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2128), 20170351. Link to article

Blili-Hamelin, B., Hancox-Li, L., & Smart, A. (2024). Unsocial Intelligence: A Pluralistic, Democratic, and Participatory Investigation of AGI Discourse (arXiv:2401.13142). arXiv. Link to paper

Bolte, L., Vandemeulebroucke, T., & van Wynsberghe, A. (2022). From an Ethics of Carefulness to an Ethics of Desirability: Going Beyond Current Ethics Approaches to Sustainable AI. Sustainability, 14(8), Article 8. Link to article

Borenstein, J., & Howard, A. (2021). Emerging challenges in AI and the need for AI ethics education. AI and Ethics, 1(1), 61–65. Link to article

Bratton, B. (2016). The Stack: On Software and Sovereignty. The MIT Press.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101.

Bridle, J. (2018). The New Dark Age: Technology and the end of the future. Verso.

Burr, C., & Leslie, D. (2023). Ethical assurance: A practical approach to the responsible design, development, and deployment of data-driven technologies. AI and Ethics, 3(1), 73–98. Link to article

Carr, N. (2010). The Shallows: What the internet is doing to our brains. W. W. Norton & Company.

Castells, M. (2010). The Rise of the Network Society. Wiley-Blackwell.

Cath, C. (2018). Governing artificial intelligence: Ethical, legal and technical opportunities and challenges. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2133), 20180080. Link to article

Centre for International Governance Innovation (Director). (2022, September 14). Technological Threats to Our Freedom of Thought [Video]. Link to video

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. International Journal of Educational Technology in Higher Education, 20(1), Article 1. Link to article

Chan, C. K. Y., & Lee, K. K. W. (2023). The AI generation gap: Are Gen Z students more interested in adopting generative AI such as ChatGPT in teaching and learning than their Gen X and millennial generation teachers? Smart Learning Environments, 10(1), Article 1. Link to article

ChatGPT (4) [Large language model]. Link to website

Chiu, T. K. F., Moorhouse, B. L., Chai, C. S., & Ismailov, M. (2023). Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot. Interactive Learning Environments, 0(0), 1–17. Link to article

Cho, J., Ahmed, S., Hilbert, M., Liu, B., & Luu, J. (2020). Do Search Algorithms Endanger Democracy? An Experimental Investigation of Algorithm Effects on Political Polarization. Journal of Broadcasting & Electronic Media, 64(2), 150–172. Link to article

Choo, C. W. (2003). The art of scanning the environment. Reframing Environmental Scanning, 7. Link to article

Cohen, J. E. (2019). Between truth and power. Oxford University Press.

Concannon, S., & Tomalin, M. (2023). Measuring perceived empathy in dialogue systems. AI & SOCIETY. Link to article

Couldry, N., Livingstone, S., & Markham, T. (2016). Media consumption and public engagement: Beyond the presumption of attention. Springer.

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

Deleuze, G. (1992). Postscript on the Societies of Control. October, 59, 3–7. Link to article

Dignum, V. (2019). Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way. Springer International Publishing. Link to article

Escobar, A. (2018). Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds. Duke University Press.

Essel, H. B., Vlachopoulos, D., Essuman, A. B., & Amankwa, J. O. (2024). ChatGPT effects on cognitive skills of undergraduate students: Receiving instant responses from AI-based conversational large language models (LLMs). Computers and Education: Artificial Intelligence, 6, 100198. Link to article

Falk, S., & van Wynsberghe, A. (2023). Challenging AI for Sustainability: What ought it mean? AI and Ethics. Link to article

Farahany, N. A. (2023a). *The Battle for Your Brain: Defending the Right to Think Freely in the Age of Neurotechnology* (First edition). St. Martin's Press, an imprint of St. Martin's Publishing Group.

Farahany, N. A. (2023b, June 26). *"Cognitive Liberty" Is the Human Right We Need to Talk About*. TIME. Link to news article

Felzmann, H., Fosch-Villaronga, E., Lutz, C., & Tamo-Larrieux, A. (2019). Robots and Transparency: The Multiple Dimensions of Transparency in the Context of Robot Technologies. IEEE Robotics & Automation Magazine, 26(2), 71–78. Link to article

Felzmann, H., Fosch-Villaronga, E., Lutz, C., & Tamò-Larrieux, A. (2020). Towards Transparency by Design for Artificial Intelligence. Science and Engineering Ethics, 26(6), 3333–3361. Link to article

Felzmann, H., Villaronga, E. F., Lutz, C., & Tamò-Larrieux, A. (2019). Transparency you can trust: Transparency requirements for artificial intelligence between legal norms and contextual concerns. Big Data & Society, 6(1), 2053951719860542. Link to article

Fischbach, F., Vandemeulebroucke, T., & van Wynsberghe, A. (2023). Mind who's testing: Turing tests and the post-colonial imposition of their implicit conceptions of intelligence. AI & SOCIETY. Link to article

Forbes (Director). (2023, February 17). Generative AI Is About To Reset Everything, And, Yes It Will Change Your Life [Video]. Link to Video

Genova, L. (2021). Remember: The Science of Memory and the Art of Forgetting. Harmony Books.

Gillespie, T. (2014). The relevance of algorithms.

Goffman, E. (1959). The Presentation of Self in Everyday Life. In The Presentation of Self in Everyday Life (pp. 17–25). New York: The Overlook Press.

Gordon, A. (2010). A DEFT approach to trend-based foresight. Foresight, 16(17), 13–18. Link to article

Greenfield, A. (2017). Radical Technologies: The Design of Everyday Life. Verso.

Greenfield, S. (2015). Mind change. Random House.

GZERO Staff. (2024, February 28). Norway's school phone ban aims to reclaim "stolen focus", says PM Jonas Støre. Link to news article

Haenlein, M., & Kaplan, A. (2019). A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. California Management Review, 61(4), 5–14. Link to article

Han, B.-C. (2015). The Transparency Society. Stanford Briefs.

Han, B.-C. (2022a). Hyperculture. John Wiley & Sons.

Han, B.-C. (2022b). Infocracy. John Wiley & Sons.

Han, B.-C., & Butler, E. (2017). Psychopolitics: Neoliberalism and New Technologies of Power. Verso.

Harsin, J. (2015). Regimes of posttruth, postpolitics, and attention economies. Communication, Culture & Critique, 8(2), 327–333. Link to article

Hiltunen, E. (2008). Good sources of weak signals: A global study of where futurists look for weak signals. Journal of Futures Studies, 12(4), 21–44.

Hobbs, R. (2011). Digital and media literacy: Connecting culture and classroom. Corwin Press.

Hogg, R. (2024, April 12). Millennial boss of OpenAI challenger says AGI predictions driven by "very religious" ideals. Fortune Europe. Link to news article

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. European Journal of Education, 57(4), 542–570. Link to article

Holtzblatt, K., & Beyer, H. (1997). Contextual design: Defining customer-centered systems. Elsevier.

Hubinger, E., Denison, C., Mu, J., Lambert, M., Tong, M., MacDiarmid, M., Lanham, T., Ziegler, D. M., Maxwell, T., Cheng, N., Jermyn, A., Askell, A., Radhakrishnan, A., Anil, C., Duvenaud, D., Ganguli, D., Barez, F., Clark, J., Ndousse, K., … Perez, E. (2024). Sleeper Agents: Training Deceptive LLMs that Persist Through Safety Training (arXiv:2401.05566). arXiv. Link to article

Hughes, C. (2023, May 15). Critical Thinking and Generative Artificial Intelligence | International Bureau of Education. Link to article

Jameson, F. (1991). Postmodernism, or, The Cultural Logic of Late Capitalism. Duke University Press. Link to article

Jarrahi, M. H., Newlands, G., Lee, M. K., Wolf, C. T., Kinder, E., & Sutherland, W. (2021). Algorithmic management in a work context. Big Data & Society, 8(2), 20539517211020332. Link to article

jaydayl. (2022, December 12). Will ChatGPT make humanity more dumb? [Reddit Post]. R/ChatGPT. Link to discussion

Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. Nature Machine Intelligence, 1(9), 389–399. Link to article

Jones, P., & Van Ael, K. (2022). Design Journeys through Complex Systems: Practice Tools for Systemic Design. BIS Publishers.

Kahneman, D. (2011). Thinking, Fast and Slow. Farrar, Straus and Giroux.

Kember, S., & Zylinska, J. (2012). Life after new media: Mediation as a vital process. The MIT Press.

Kim, D. H. (1992). Systems archetypes I. Pegasus Communications.

Klein, G., Moon, B., & Hoffman, R. R. (2006). Making sense of sensemaking 1: Alternative perspectives. IEEE Intelligent Systems, 21(4), 70–73.

Kohnke, L., Moorhouse, B. L., & Zou, D. (2023a). ChatGPT for Language Teaching and Learning. RELC Journal, 54(2), 537–550. Link to article

Kohnke, L., Moorhouse, B. L., & Zou, D. (2023b). Exploring generative artificial intelligence preparedness among university language instructors: A case study. Computers and Education: Artificial Intelligence, 5, 100156. Link to article

Kolko, J. (2010). Sensemaking and framing: A theoretical reflection on perspective in design synthesis.

Kononiuk, A., & Nazarko, J. (2014). Scenariusze w antycypowaniu i kształtowaniu przyszłości. Wolters Kluwer.

Krafft, P. M., Young, M., Katell, M., Huang, K., & Bugingo, G. (2020). Defining AI in Policy versus Practice. Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society, 72–78. Link to article

Lancaster, T. (2023). Artificial intelligence, text generation tools and ChatGPT – does digital watermarking offer a solution? International Journal for Educational Integrity, 19(1), Article 1. Link to article

Lovink, G. (2012). What Is the Social in Social Media? E-Flux Journal, 40. Link to article

Lovink, G. (2013). After the Social Media Hype: Dealing with Information Overload. E-Flux Journal, 45. Link to article

Maitlis, S., & Christianson, M. (2014). Sensemaking in organizations: Taking stock and moving forward. Academy of Management Annals, 8(1), 57–125.

Manyika, J. (2022). Getting AI Right: Introductory Notes on AI & Society. Daedalus, 151(2), 5–27. Link to article

Manyika, J., Silberg, J., & Presten, B. (2019, October 25). What Do We Do About the Biases in AI? Harvard Business Review. Link to article

Markelius, A., Wright, C., Kuiper, J., Delille, N., & Kuo, Y.-T. (2024). The mechanisms of AI hype and its planetary and social costs. AI and Ethics. Link to article

Marwick, A. E., & Boyd, D. (2011). I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience. New Media & Society, 13(1), 114–133. Link to article

Mayer-Schonberger, V. (2009). Delete. Princeton University Press.

McLuhan, M. (2003). Understanding media. Corte Madera, CA : Gingko Press.

McLuhan, M., & Fiore, Q. (2008). The Medium is the Massage. Penguin Modern Classics.

Meadows, D. H. (2008). Thinking in systems: A primer. Chelsea Green Publishing.

Mohammadkarimi, E. (2023). Teachers' reflections on academic dishonesty in EFL students' writings in the era of artificial intelligence. Journal of Applied Learning and Teaching, 6(2), Article 2. Link to article

Moorhouse, B. L., Li, Y., & Walsh, S. (2023). E-Classroom Interactional Competencies: Mediating and Assisting Language Learning During Synchronous Online Lessons. RELC Journal, 54(1), 114–128. Link to article

Mueller, M. (2017). Will the internet fragment?: Sovereignty, globalization and cyberspace. John Wiley & Sons.

Murray, S. (2019, July 8). Yes, Social Media Is a Highlight Reel—And That's Okay. Verily. Link to news article

Nader, K., Toprac, P., Scott, S., & Baker, S. (2022). Public understanding of artificial intelligence through entertainment media. AI & SOCIETY. Link to article

Napoli, P. (2019). Social media and the public interest: Media regulation in the disinformation age. Columbia university press.

Nazarko, J., Ejdys, J., Halicka, K., Nazarko, Ł., Kononiuk, A., & Olszewska, A. (2017). Factor Analysis as a Tool Supporting STEEPVL Approach to the Identification of Driving Forces of Technological Innovation. Procedia Engineering, 182, 491–496. Link to article

Newlands, G. (2021). Algorithmic Surveillance in the Gig Economy: The Organization of Work through Lefebvrian Conceived Space. Organization Studies, 42(5), 719–737. Link to article

Okemwa, K. (2024, March 27). Is an overreliance on Microsoft Copilot and ChatGPT negatively impacting our cognitive skills and making us dumber? Windows Central. Link to news article

Pariser, E. (2011). The filter bubble: How the new personalized web is changing what we read and how we think. Penguin.

Pask, G. (1961). An Approach To Cybernetics. Hutchinson & Co.

Pasquale, F. (2015). The black box society: The secret algorithms that control money and information. Harvard University Press.

Postman, N. (2005). Amusing ourselves to death: Public discourse in the age of show business. Penguin.

Putnam, R. (1995). Bowling alone: The collapse and revival of American community.

Qin, C., Zhang, A., Zhang, Z., Chen, J., Yasunaga, M., & Yang, D. (2023). Is ChatGPT a General-Purpose Natural Language Processing Task Solver? (arXiv:2302.06476). arXiv. Link to article

Reddy, E., Cakici, B., & Ballestero, A. (2019). Beyond mystery: Putting algorithmic accountability in context. Big Data & Society, 6(1), 2053951719826856. Link to article

Ringland, G. (2007). UNIDO Technology Foresight for Practitioners. A Specialised Course on Scenario Building, Prague, 5(8).

Robbins, S., & van Wynsberghe, A. (2022). Our New Artificial Intelligence Infrastructure: Becoming Locked into an Unsustainable Future. Sustainability, 14(8), Article 8. Link to article

Rubin, H. J., & Rubin, I. S. (2011). Qualitative interviewing: The art of hearing data. sage.

Sætra, H. S. (2023a). Generative AI: Here to stay, but for good? Technology in Society, 75, 102372. Link to article

Sætra, H. S. (Ed.). (2023b). Technology and Sustainable Development: The Promise and Pitfalls of Techno-Solutionism. Routledge. Link to article

Sætra, H. S. (2023c). The AI ESG protocol: Evaluating and disclosing the environment, social, and governance implications of artificial intelligence capabilities, assets, and activities. Sustainable Development, 31(2), 1027–1037. Link to article

Samman, N. (2023). Dark Arts. In Poetical of Encryption Art and the Technocene (pp. 5–11). Hatje Cantz.

Schneier, B. (2015). Data and Goliath. W. W. Norton & Company.

Schwartz, P. (2012). The art of the long view: Planning for the future in an uncertain world. Crown Currency.

Sententia, W. (2004). Neuroethical Considerations: Cognitive Liberty and Converging Technologies for Improving Human Cognition. Annals of the New York Academy of Sciences, 1013(1), 221–228. Link to article

Shanker, S. (2019, June 20). The Power of Paradigms. Psychology Today. Link to article

Shaw, J. (2016). The Memory Illusion. Random House.

Silberg, J., & Manyika, J. (2019). Notes from the AI frontier: Tackling bias in AI (and in humans). Link to article

Simon, F. M., Altay, S., & Mercier, H. (2023). Misinformation reloaded? Fears about the impact of generative AI on misinformation are overblown. Harvard Kennedy School Misinformation Review. Link to article

Steyerl, H. (2016). A Sea of Data: Apophenia and Pattern (Mis-)Recognition. E-Flux Journal, 72. Link to article

Strickland, E., & Harris, M. (2022, February 15). Their Bionic Eyes Are Now Obsolete and Unsupported—IEEE Spectrum. Link to article

Sunstein, C. R. (2001). Republic. Com. Princeton university press.

Sunstein, C. R. (2018). #Republic: Divided democracy in the age of social media. Princeton university press.

Tarafdar, M., Teodorescu, M., Tanriverdi, H., Robert, L. + "Jr," & Morse, L. (2020, September 27). Seeking Ethical use of AI Algorithms: Challenges and Mitigations. Link to article

Terren, L. T. L., & Borge-Bravo, R. B.-B. R. (2021). Echo Chambers on Social Media: A Systematic Review of the Literature. Review of Communication Research, 9. Link to article

Tonkinwise, C. (2015). Design for Transitions – from and to what? Design Philosophy Papers, 13(1), 85–92. Link to article

Turkle, S. (2011). Alone Together. Basic Books (AZ).

Van Dijck, J. (2007). Mediated memories in the digital age. Stanford University Press.

Van Dijck, J. (2013). The culture of connectivity: A critical history of social media. Oxford University Press.

van Otterlo, M. (2015). The Libraryness of Calculative Devices—Artificially intelligent librarians and their impact on information consumption. In L. Amoore & V. Piotukh (Eds.), Algorithmic Life (p. Ch. 2). Routledge. Link to article

van Wynsberghe, A. (2021). Sustainable AI: AI for sustainability and the sustainability of AI. AI and Ethics, 1(3), 213–218. Link to article

von Eschenbach, W. J. (2021). Transparency and the Black Box Problem: Why We Do Not Trust AI. Philosophy & Technology, 34(4), 1607–1622. Link to article

Voros, J. (2003). A generic foresight process framework. Foresight, 5(3), 10–21. Link to article

Weick, K. E., & Weick, K. E. (1995). Sensemaking in organizations (Vol. 3). Sage publications Thousand Oaks, CA.

Weir, C., Dyson, A., Jogunola, O., Dennis, L., & Paxton-Fear, K. (2024). Interlinked Computing in 2040: Safety, Truth, Ownership, and Accountability. Computer, 57(1), 59–68. Link to article

Wellman, B. (2001). Physical place and cyberplace: The rise of personalized networking. International Journal of Urban and Regional Research, 25(2), 227–252. Link to article

Williams, Z. (2022, November 12). Nobel peace laureate Maria Ressa: 'In 2024, democracy could fall off a cliff.' The Guardian. Link to article

Wilson, C. (2022). Public engagement and AI: A values analysis of national strategies. Government Information Quarterly, 39(1), 101652. Link to article

Wolf, M., Barzillai, M., & Dunne, J. (2009). The importance of deep reading. Challenging the Whole Child: Reflections on Best Practices in Learning, Teaching, and Leadership, 130, 21.

Woolley, K., & Sharif, M. A. (2022, January 31). The Psychology of Your Scrolling Addiction. Harvard Business Review. Link to article

Zawacki-Richter, O., & Bozkurt, A. (2022). Research Trends in Open, Distance, and Digital Education. In Handbook of Open, Distance and Digital Education (pp. 1–23). Springer Nature. Link to article

Zelizer, B. (1998). Remembering to forget: Holocaust memory through the camera's eye. University of Chicago Press.

Zerilli, J., Knott, A., Maclaurin, J., & Gavaghan, C. (2019). Transparency in Algorithmic and Human Decision-Making: Is There a Double Standard? Philosophy & Technology, 32(4), 661–683. Link to article

Zuboff, S. (2023). The age of surveillance capitalism. In Social theory re-wired (pp. 203–213). Routledge.