

# From Sci-Fi Fantasies to Real-world Desires: Contrasting Visions of a Digital Future

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**Abstract:** Envisioning the future amidst rapid digital transformation is a complex endeavour shaped by diverse perspectives and competing narratives. This paper explores how individuals connected to two different Universities perceive the impacts of digitalization and technological advancements on society. Through a Causal Layered Analysis (CLA) workshop, participants mapped out their predicted and preferred futures, revealing a range of scenarios – from widening economic divides and job losses due to AI, to visions of universal basic income and human-technology integration. The thematic analysis highlighted concerns about unchecked technological progress leading to societal downfall, environmental degradation, and declining mental well-being, contrasted with optimistic futures where empathy and human connection thrive alongside technological advancements. The study underscores people's subjective views on futures and importance of incorporating diverse voices and values when envisioning the future, as responsible innovation demands transparency and pro-active risk assessment.

## 1. Introduction

Advances in digital technology are often portrayed as revolutionary in that they are expected to enable innovative leaps. This is true today, as we are more and more turn to various forms of artificial intelligence (AI) to enhance our capabilities beyond the physical and cognitive limits of humans, better equipping us to shape a promising future.

We argue that the way we envision the future significantly influences how we shape it (Masini 2006) as well as maybe making space for creating it. Drawing on the principles of social constructivism (Wandrei 2001; Burr 2015), we suggest that the ideas of innovators are crucial, and they have the potential to alter perspectives on the future. The consequences of this perspective can introduce problematic or debatable elements (Dmitriev 2016). The assumptions and foundations upon which innovators base these ideas on, become critical, as they serve as the groundwork for envisioned futures. Furthermore, this highlights the importance of the iterative nature of innovation, as decisions made during the process may well need to be reevaluated and adjusted based on new information or evolving circumstances (Rauch and Ansari 2022).

In its most abstracted form, innovation is about creating value by deviating from what has been – about change. Defined by a value-adding novelty, innovation is both a process and the outcome (Van de Ven 1986). Due to its inherent characteristic of novelty, innovation is a relative concept, evaluated within a specific context introducing something new compared to what already exists, and in that way delivers value to someone. As a result, innovation *must* change its defining context - be it incrementally or radically, at a more limited or global scale, temporarily or in eternity. Innovating is a process in which the creation of the novel is interdependently intertwined with the formation of a yet non-existing future.

Innovation is fundamentally a process of intentional change, with a commitment to constructive transformation at its core. Without this desire for constructive change, innovation efforts are largely useless, and any success is likely to be random. True innovation is achieved when it is implemented and brings value to its users, regardless of whether this occurs within the economic or social realms, or whether it manifests as novel products, services, methods, processes, markets, or managerial systems (Crossman and Apaydin 2010). The innovation process consists of interactions among individuals,

between individuals and their context, and between multiple levels of contexts all together spread and orient an evolving change process (Langley et al., 2013). This gives the discipline of innovation a complex, iterative and responsive character, where past, present, and future continuously influence the workflow and decisions.

In this paper we will focus on digital futures, using a futures research method called Causal Layered Analysis (CLA) to opening the present and past to create alternative future scenarios (Inayatullah, 1998). The representation of the future is often built on oppositions, utopian or dystopian. "...when an important element of change (such as a different lifestyle) develops, the people involved may be simply carried along, unable to do anything about it or sometimes not even aware of it. In this sense people are not part of the process and do not choose to change but simply accept it. This process spreads and intensifies because the fewer people there are who opt for change, the less directed and intentional the change becomes within the process itself (Masini 2006).

The acceptance for digital technology is still early stages and holds the potential to profoundly reshape our future. Predicted impact on society is often discussed in grand terms, blending both techno-utopian ideals and realistic projections (Burns 2020) yet, on the other hand, likewise questioned and described in a and techno-dystopian way. Our understanding of how new technologies will influence and impact our future, becomes crucial for deciding how we shape our future. (Masini 2006).

*Research Question:*

What are the participants' predictions of the futures of digitalization and how does this compare to their preferred future?

## **2. Background**

### **2.1 Innovation as facilitator of change**

Innovation, the process of intentional positive change, requires a continuous cycle of learning, projecting and adapting. This can be seen in one of innovation sciences roots, Herbert Simon's, The Sciences of Artificial (1969), where Simon defines artificial sciences, the sciences which are interested in not only how things are, but with how they could be. Innovation is interested in facilitating this kind of change. Then again, positive change is subjective, as even the concept of what positive change could mean for humans is complex and it is not coherently defined (Gasper 2004). Van den Hoven (2013) emphasizes an aspect of this, the importance of morality and ethics within innovation. To make it positive, means also to make it ethically, and morally justifiable.

### **2.2 Impacts of innovation**

To reach digitalization, we need to start with the industrialization since it is its predecessor, inhibitor and enabler. The start of industrialization fundamentally transformed factories making them key centres for mass manufacturing, and at the same time creating a wage-based worker-class. Then, the growth of Silicon Valley and succeeding digitalization further accelerated these shifts, leading to a widespread adoption of technologies. Currently, digitalization, increased tech adoption, and transformative cultural shifts are reshaping work across many sectors (Iyamu et al. 2021; O'Leary 2023; European Commission, Competence Centre on Foresight, 2022; Carayannis and Morawska-Jancelewic 2022). Looking forward, AI, a probable general-purpose technology, a technology that will impact most parts of our society, is expected to enable innovation that drives disruption across domains (McAfee et al. 2023; Crafts 2021; Cockburn et al. 2019). Innovation has and can impact most parts of the society.

### **2.3 The predefined and alternative futures**

Looking forward, futures studies and foresight, aim to explore diverse ideas and visions, instead of predicting the future (Dator 1995). While the future can be shaped by these beliefs, default futures from

influential sources hold substantial power (Gidley 2017). In critique of these often techno-optimistic futures, the rise of decolonizing futures studies seeks to empower the most affected and promote underprivileged perspectives (Rottinghaus 2021). In evaluating official and differing futures, it is important to critically assess and make room for alternative visions (Inayatullah 2006 and 2013).

Future images are loaded with values, ideologies, assumptions, and biases (Hautamäki 2015). Many of which are heavily influenced by the science fiction we grew up watching (Stross 2023). Fergnani and Song mapped out substantial amount of science fiction movies and presents six archetypes within these (2020) They are defined as: **Growth & Decay**, **Threats & New Hopes**, **Waste worlds**, **The Powers that Be**, **Disarray**, and **Inversion**.

**Growth & Decay:** capitalism flourishes, with corporations expanding control. Government influence diminishes as societal collapse looms, marked by inequality, environmental decay, and moral decline.

**Threats & New Hopes:** impending catastrophe looms—be it from environmental disasters, human-caused destruction, or alien invasion. Status quo which can lead to new opportunities.

**Waste worlds:** global catastrophe leads to harsh survival conditions, societal regression, and exploitation by tyrants. Survivors adapt through barter economies and tribal living or flee to space. Seen in post-apocalyptic cinema.

**The Powers that Be:** catastrophic event(s) leads to reduced population and emergence of totalitarian regimes. Advanced technology is controlled for control, sparking rebellion. Seen in dystopian cinema.

**Disarray:** structural problems plague society: crime, unrest, poverty, and more. Military and policing take central roles as individuals strive for justice and order. Seen in dystopian cinema.

**Inversion:** humanity is outpaced or dominated by a superior force, like aliens. Humans become prey or subjects. Represented in alien cinema but not limited to it.

They also connect the archetypes connected to different projections of time, where Threats & New Hopes are the ones with the shortest time horizon, approximately 50 years, and Growth and Decay having the longest, approximately 329 years. The newer science-fiction movies, with an average production year of 2009, focuses primarily on Threats & New hopes, as well as Disarray (Fergnani and Song 2020).

## 2.4 Creativity

To find new perspectives, one key competence is creativity. Creativity is often associated with agency, challenging the dichotomy between subjectivity and objectivity. By engaging with the narrative, typically perceived as objective, and then deconstructing it, participants are compelled to adopt their own subjective perspectives. This process, which necessitates a shift in perspectives and an interplay between objectivity and subjectivity through action and agency, is a crucial aspect of creativity (McIntyre 2012). Moreover, the expectations of the future impose constraints on the participants (Tromp and Baer 2022). Glăveanu (2015) outlines four premises for creativity:

*Premise 1. In any given situation there are a multitude of perspectives that can be adopted toward the same reality (object, person, event, etc.).*

*Premise 2. The perspectives adopted have interactive, embodied origins as they are grounded in different positions in the social and material world.*

*Premise 3. Formulating and taking new perspectives involves adopting positions of “others” in relation to the situation.*

*Premise 4. Moving between perspectives makes the difference between positions productive for creative action.*

### 3. Methodology

To explore our participants perspectives on the future(s) of digitalization, we utilize Causal Layered Analysis (CLA) in a half-day hybrid workshop. CLA aims not to predict the future but to generate alternative futures and unpack the underlying structures of the official future (Puglisi, 2001; Inayatullah 2017). Using the metaphor of an iceberg, CLA distinguishes four layers of analysis: the litany, representing the ‘official’ description of the problem/system/future; underlying systemic causes identified through short-term analyses; worldviews, values, and paradigms shaping the problem framing; and metaphors and myths supporting these structures and worldviews (Inayatullah, 2017).

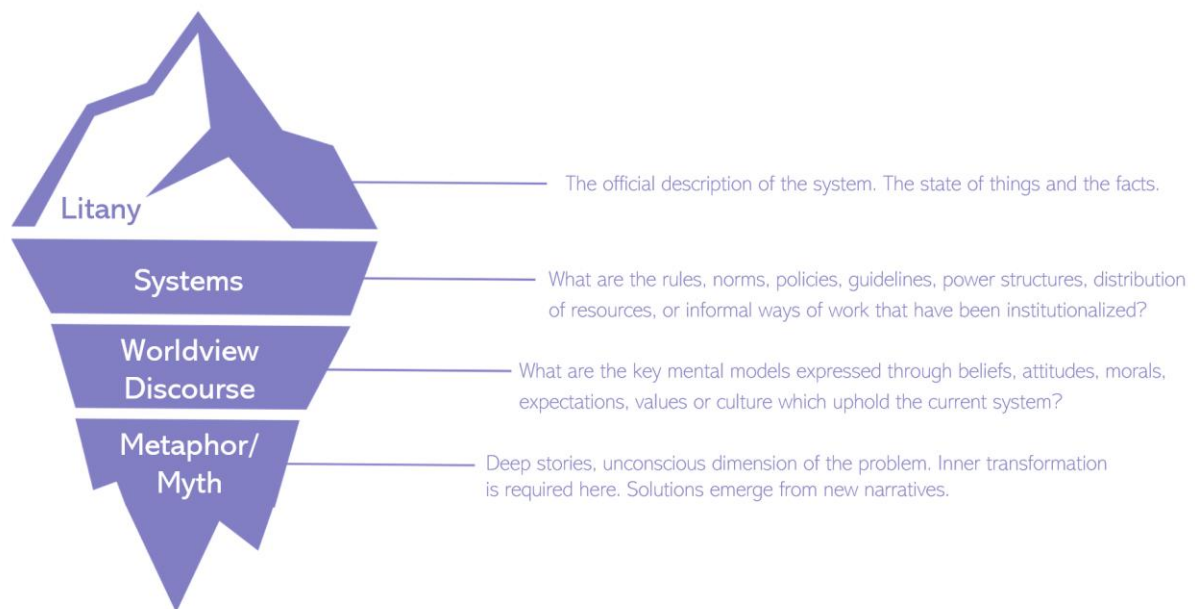


Figure 1. Overview of CLA used in the workshop, adapted from Systems Innovation Network (n.d).

#### 3.1 Participants

The workshop brought together approximately twenty participants, aged between 18 and 40, linked to a Swedish and/or an Albanian university. The selection as well as communication process, was facilitated through university channels and external social medias. The group which attended showcased a diverse blend of backgrounds, nationalities, ethnicities, being a diverse representation within the scopes of the universities. However, the diverse makeup of the group also introduced challenges. Varying levels of agency and cultural expectations among participants required guidance and adaptation periods, possibly affecting the efficiency of the workshop's proceedings. Despite efforts to create a common ground and understanding for the workshop and the scope, it was clear that bridging cultural gaps required additional time and support (Reich and Reich 2006).

#### 3.2 Procedure

The half-day, hybrid workshop was initiated with an introduction to Causal Layered Analysis (CLA) through a short video by Inayatullah (2013). After which, another example was presented using Norse mythology, describing how e.g., the act of dying in combat (Litany) was upheld through the belief that there is a life after this one (Worldview) and the myth that dying in battle is the ticket to Valhalla. This example provided a less value riddled case than a more contemporary one to which the participants could familiarize themselves with the theory and method.

Participants on campus formed groups based on their physical location, either physically on campus or digitally on zoom, and to the people sitting close to them, and as the digital students were assigned break-out rooms with limited participants in each. All participants received the same instructions, while hands-on support was provided in the respective forums. Two facilitators were present on-site, and a third facilitator managed the online participants.

The workshop was designed as a three-step process, with the first two steps being done in groups and the last step individually. In groups, the participants were initially instructed to map out the current state of things of digitalization in one of their own choosing areas, examples of which are digital finance management and extracurricular activities.

Participants formed groups freely, to familiarize themselves with the method. They collectively mapped out the layers in a predictive state. Then, participants individually created iceberg maps for their preferred future, recognizing the subjective nature of these visions. By changing one of the aspects of the CLA during the second iteration of the workshop, we introduce constraints shaped by the participants' own will and wish (Tromp and Baer 2022), as well as opportunities to influence the future. These opportunities are grounded in the premises for creative action.

### 3.3 Themes

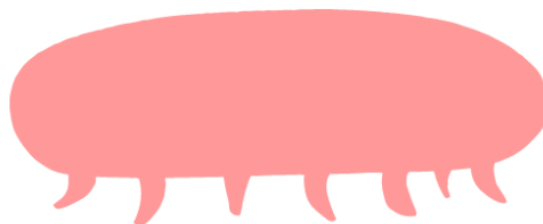
Using the themes from Fergnani and Song (2020) to sort and categorize the transcripts from the workshop, the categorization was refined through iterations. After reiteration the transcripts were put into tables, the tables are colour coded, with green for positive or optimistic, yellow for neutral and red for negative or dystopian statements. The thematic analysis, and the coding showed how the participants envisioned, both predicted and preferred futures, as well as how these related to each other.

### 3.4 Thematic analysis.

The themes are presented with brief excerpts from the transcriptions, followed by discussions and a summary of the findings. The themes are from Fergnani and Song (2020), and divided into several aspects, Predicted, Preserved (by headline), Positive/Neutral/Negative (colour).

#### **Growth & Decay**

##### **Predicted:**



Visual representation of the groups predicted futures Growth & Decay.

<b>Some few rich.</b>	<b>Unemployment because of AI.</b>	<b>AI took all our jobs.</b>	<b>Economic uncertainty.</b>	<b>Big economic gaps.</b>	<b>High rate of depression.</b>
<b>Decrease in mental health.</b>	<b>Digital zombies.</b>	<b>Obesity.</b>	<b>Depression leading to more suicides.</b>	<b>Privacy intrusion.</b>	

**Preferred:**



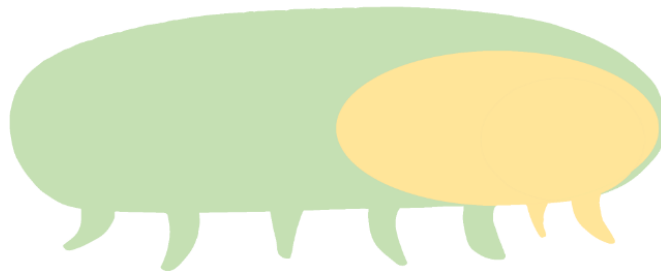
Visual representation of the Individual thoughts of preferred futures of Growth & Decay.

<b>Overreliance on AI solutions.</b>	<b>Automation and AI take over the world.</b>
<b>Being an early adopter is the key to digital success.</b>	<b>Cashless economy.</b>

AI job losses worsen economic inequality. A growing digital divide isolates people, while dependence on technology increases. Societal collapse and environmental degradation worsen mental health, fostering isolation. Fear arises from unchecked technological advancement.

**Threats & New hopes:**

**Predicted:**



Visual representation of the groups predicted futures of Threats & New Hopes.

<b>Universal basic income.</b>	<b>Empathetical human, help providers.</b>	<b>Touch of human, demand for it.</b>	<b>We get more intelligent food, extra brains, part of the body.</b>	<b>Smarter and greener ways to travel.</b>
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Developing new technologies- for people with speaking, hearing and vision problems.	AI and robotic development are helping people with disabilities.	Fully automated digital research.	Loss of competence, easy life.	Automatic vehicles.
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**Preferred:**



Visual representation of the Individual thoughts of preferred futures of Threats & New Hopes.

Humans will (finally) learn what it means to be human.	Connections in many forms, connection creates, AI creates connections in many forms.	Teleportation, be wherever you want instantly.
No more hard work/physical work.	Social inclusiveness of AI.	Cyborgs and digital nomads.
Digital work is implemented, future jobs are not a risk.	More connectivity to people and places, closer to the world, fewer borders.	More efficient tech.
Focus on creating/developing new technologies for those who are in need most, not for people in general.	Embodied AI chips, VR, "AI" Eye-lenses, "AI" clothes.	People will be more global.
Social inclusiveness from the rise of the AI.	The fate of mankind could be decided by AI... and it may not be a happy ending.	Cyborgs.
Law of intelligence and critical thinking.	Virtual world.	Seamless communication.
It pays off being human, we are not a burden on the system.	Human rights, animal rights, equality, AI as facilitator.	Critical perspective on what the role of technology is, enhancing our human abilities.
AI is a tool to help us to be human.	Giving back to the community.	Attaining self-actualization and the survival needs.
Lots of problem-solving skills and cognitive aptitudes.	Time control and usage central of tech like learning experiences.	Less fear and more openness towards new technological innovations.

AI should be regulated and limited to certain sectors.	Human designed and controlled digital systems.	Physical socialising will become something you actively have to pursuit to not miss its benefits.
Fully trusting and depending on AI in research could result in quick published papers with not strong or accurate evidence-based research due to a mix of data and bias.	Tools will help me to solve problems and stay connected.	The data generated in future research could have the gap of a human centred participation.
Greater trust and transparency in financial institutions.	Security in financial management.	Appreciation for the potential of Web3 and blockchain technology in finance.
AI-powered financial management tools.	The rise of open banking.	Use of biometrics.

In a future with universal basic income, AI drives a shift towards human-centric services, blurring the lines between man and machine. While greener travel and digital connectivity foster global unity, overreliance on AI threatens human autonomy. Yet, efforts aim to enhance human capabilities, especially for those with disabilities. This shift may lead to machines taking on more tasks, reducing the need for physical labour among humans, potentially even for cyborgs.

**Waste Worlds:**

**Predicted:**

None fit within this theme.

**Preferred:**



Visual representation of the Individual thoughts of preferred futures of Waste Worlds.

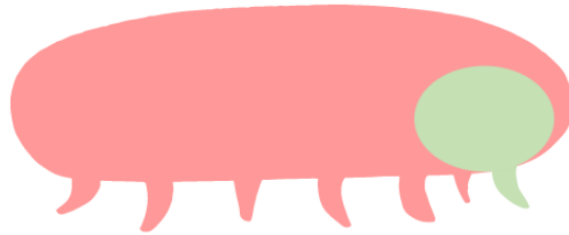
Earth might become unfit for habitat.	Humanity will struggle on earth.	Finding new habitat.
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Earth's worsening condition exacerbates challenges, rendering habitats unsuitable for human life. This dystopian outlook depicts a world where societal structures collapse due to technological progress and economic inequality, prompting humanity to seek new habitats.

**The Powers that Be:**

**Predicted:**





Visual representation of the groups predicted futures of The Powers that Be.

<b>AI is the master.</b>	<b>You must pay for the human touch.</b>
<b>Ruled by robots, humans are powerless.</b>	<b>Some few rich.</b>
<b>All needs are sufficed by tech.</b>	<b>People won't need to get out of their homes.</b>
<b>Feeling of helplessness. Unable to write efficiently without the computer.</b>	<b>Depend only on technology. A world ruled by robots.</b>

**Preferred:**



Visual representation of the Individual thoughts of preferred futures of Waste Worlds.

**The danger of AI**

AI ruling most aspects of life, there remains a demand for human touch and connection, however at a premium price. This archetype reflects a world where the lines between human and machine blur, raising questions about the nature of identity and control in a technologically driven society. In this scenario, the future appears bleak, marked by a widening gap between the rich and the rest of society.

**Disarray.**

None fit within this theme.

**Inversion:**

None fit within this theme.

## 4. Discussion & Conclusions

Discussing the future with individuals from diverse backgrounds highlighted the influence of personal views on future perspectives. Those with more varying ideas often drew from a broader base of information, combining multiple perspectives to build their visions. Interestingly, participants with the most varied, or defined perceptions belonged to separate demographic groups, and they tended to be among the most active contributors to discussions. Themes such as Growth & Decay mapped concerns about AI-induced inequality, while Threats & New Hopes portray optimism regarding universal basic income and human-technology integration. Participants' backgrounds shape their visions, highlighting the need for diverse voices in envisioning the future. Many of the scenarios and futures were connected to AI, and AI becomes a sort of metaphor for technological advancements. The connection to AI could be seen as a manifestation of the current narratives of future. Ongoing dialogue and collaborative efforts are beneficial for a balanced future.

The difference between what futures the participants had as their preferred contra their perceived, was not as substantial as the difference between the individual participants. We can see a difference between utopian versus dystopian futures, as the preferred contains far more positive visions of the future. Some which were in fact dystopic, focused more on the regulation of the dystopian perception, which also could be seen positively even though the projection is negative they are trying to change what they don't like within it. While others, used their opportunity to choose and investigate their visions. However, a notable dissonance exists between predicted and preferred outcomes.

While conducting, creating, and facilitating the workshop, we as researchers could not predict its outcome. By employing a method for running a future-focused workshop (CLA), we were able to test the process to empower participants and give them agency to explore their desired futures. We observed some variations in outcomes among different groups and individuals. On one hand, these differences might stem from changes in agency between predicting and preferring future outcomes. On the other hand, they might be due to fewer group restrictions, increased autonomy, or simply because participants were more familiar with the process the second time around. Regardless, our workshop showed a clear difference between predictions and preference, and the change was primarily positive.

## 5. References

- Balsmeier B. and Woerter M. 2019. "Is this time different? How digitalization influences job creation and destruction." *Research Policy*, 48 no.8: 103765-. <https://doi.org/10.1016/j.respol.2019.03.010>
- Billoski T.V. 1992. *Introduction to Paleontology*. 6th ed. New York: Institutional Press.
- Boix C. 2019. *Democratic capitalism at the crossroads: technological change and the future of politics*. Princeton: University Press.
- Bresnahan T. F. and Trajtenberg M. 1995. "General purpose technologies 'Engines of growth'?" *Journal of Econometrics*, 65 no.1: 83-108., doi:10.1016/0304-4076(94)01598-T.
- Braun V. and Clarke V. 2006. "Using thematic analysis in psychology." *Qualitative Research in Psychology*, 3 no.2: 77–101.
- Brynjolfsson E., Rock, D. and Syverson, C. 2021. "The Productivity J-Curve: How Intangibles Complement General Purpose Technologies." *The American economic journal*, 13 no.1.
- Burns, R. (2020). A COVID-19 panacea in digital technologies? Challenges for democracy and higher education. *Dialogues in Human Geography*, 10(2), 246–249.
- Coelho M. and Menezes I. 2020. "University social responsibility as a driving force of change: students' perceptions beyond the ivory tower." *On the Horizon*, 28 no.2: 93-100.
- Dickel, S., Schrape, J., (2017) The renaissance of techno-utopianism as a challenge for responsible innovation, *Journal of Responsible Innovation*, 4:2, 289-294
- European Commission, Competence Centre on Foresight. 2022. "Digital transformation. Knowledge for policy." May 3, 2024. [https://knowledge4policy.ec.europa.eu/foresight/digital-transformation\\_en](https://knowledge4policy.ec.europa.eu/foresight/digital-transformation_en)
- Fergnani, Alessandro and Zhaoli Song. 2020. "The Six Scenario Archetypes Framework: A Systematic Investigation of Science Fiction Films Set in the Future." *Futures : the journal of policy, planning and futures studies*, 124: 102645–102645.
- Gidley J. M. 2017. *The future: a very short introduction*. Oxford: University Press.
- Glăveanu V. P. 2015. "Creativity as a Sociocultural Act." *The Journal of Creative Behaviour*, 49 no.3: 165–180. <https://doi.org/10.1002/jocb.94>
- Grunwald H. 2014. "The hermeneutic side of responsible research and innovation." *Journal of Responsible Innovation*, 1 no.3; 274-291
- Inayatullah S. 2017. *Causal Layered Analysis: A Four-Level Approach to Alternative Futures*. The Prospective and Strategic Foresight Toolbox. [\(PDF\) Causal Layered Analysis A Four-Level Approach to Alternative Futures RELEVANCE AND USE IN FORESIGHT \(researchgate.net\)](#)
- Inayatullah S. 2009. "Causal Layered Analysis: An integrative and transformative theory and method." In *Futures Research Methodology*, editor J. Glenn and T. Gordon,
- Iyamu Ihoghosa, Alice X. T. Xu, Oralia Gómez-Ramírez, Aidan Ablona, Hsiu-Ju Chang, Geoff Mckee, and Mark Gilbert. 2011. "Defining Digital Public Health and the Role of Digitization,

Digitalization, and Digital Transformation: Scoping Review.” *JMIR public health and surveillance*, 7, no. 11: e30399–e30399.

Masini E. 2006. “Rethinking Futures studies.” *Futures*, 38 no.10: 36-60.

McIntyre P. 2012. “Constraining and enabling creativity: the theoretical ideas surrounding creativity, agency and structure.” *The International Journal of Creativity & Problem Solving*, 22 no.1: 43-.

Morehouse S.I. and R.S. Tung. 1993. “Statistical evidence for early extinction of reptiles due to the K/T event.” *Journal of Paleontology*, 17 no.2:198-209.

O’Leary Daniel E. 2023. “Digitization, Digitalization, and Digital Transformation in Accounting, Electronic Commerce, and Supply Chains.” *Intelligent systems in accounting, finance & management* 30, no. 2: 101–110.

Rauch M. and Ansari S. 2022. “From ‘Publish or Perish’ to Societal Impact: Organizational Repurposing Towards Responsible Innovation through Creating a Medical Platform.” *Journal of Management Studies*, 59 no.1: 61–91. <https://doi.org/10.1111/joms.12737>

Reich S. M. and Reich J. A. 2006. “Cultural Competence in Interdisciplinary Collaborations: A Method for Respecting Diversity in Research Partnerships.” *American Journal of Community Psychology*, 38 no.1–2: 1–7. <https://doi.org/10.1007/s10464-006-9064-1>

Rottinghaus A. R. 2021. “Smart Homes and the New White Futurism.” *Journal of Futures Studies*, 25 no.4: 45–56. [https://doi.org/10.6531/JFS.202106\\_25\(4\).0004](https://doi.org/10.6531/JFS.202106_25(4).0004)

Schwartz M.T. and T.V. Billoski. 1990. “Greenhouse hypothesis: effect on dinosaur extinction.” In *Extinction*, edited by B.T. Jones and N.V. Lovecraft, 175-189. New York: Barnes and Elli.

Simon Herbert A. 1996. *The Sciences of the Artificial*. 3. ed. Cambridge, Mass: MIT Press.

Spaniol M. J. and Rowland N. J. 2022. “Anticipated innovations for the blue economy: Crowdsourced predictions for the North Sea Region.” *Marine Policy*, 137.

Stross C .2023. “Tech Billionaires Need to Stop Trying to Make the Science Fiction They Grew Up on Real.” *Scientific American*. May 3, 2024.

Tromp C. and Baer J. 2022. “Creativity from constraints: Theory and applications to education.” *Thinking Skills and Creativity*, 46, 101184-. <https://doi.org/10.1016/j.tsc.2022.101184>

Van den Hoven J. 2013. “Value Sensitive Design and Responsible Innovation.” In *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, edited by richard Owen, John Bessant and Maggy Heintz, 75-83. Chichester, West Sussex: John Wiley & Sons Inc. 10.1002/9781118551424.ch4.

Van de Ven A. H. 1986. “Central Problems in the Management of Innovation.” *Management Science*, 32 no.5: 590–607. <https://doi.org/10.1287/mnsc.32.5.590>

Wandrei M. L. 2001. “Agency, Constructivism, and Social Constructionism: Evolution or Revolution?” Paper presented at *the Annual Convention of the American Psychological Association, August 2021*. <https://files.eric.ed.gov/fulltext/ED459402.pdf>

Zhang Y. and Li Y. 2023. “Society 5.0 versus Industry 5.0: An examination of industrialization models in driving sustainable development from a normative stakeholder theory perspective.” *Sustainable Development*, 31 no. 5: 3786–3795. <https://doi.org/10.1002/sd.2625>



**Attachments:**

CLA workshop protocol: ~25 people: Groups of 4-5.

1. Food, introduction, and video instructions (30 minutes)
2. Form groups – Any considerations to make here? (15 minutes)
3. Map out the contemporary canvas and then the predicted iceberg. (1 hour)
4. Coffee - Collect the material and break groups up into individuals.
5. Allow them to map out a future preferred iceberg. (Remaining time ~ 45 minutes)

The leading author took the leading role during the workshop, which included presentation, instructions, and grouping. The remaining researchers took a more observatory and supportive role, wherein they took note of especially interesting discussions, spurred discussions where otherwise lacking, and ensured smooth running.

We had printed ‘icebergs’ see figure 1, which the groups could fill in using sticky notes, drawings, or other creative inputs (Inayatullah, 2017). Participants were purposely directed towards deeper reflection. As group discussions eased down, we introduced another iceberg which was to represent the future of how participants could see these aspects in XX years.