Designing for Futures at the Intersection of Speculative Design, Storytelling, and Systems thinking

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For my grandpa.

爷爷不要担心啦，你看对未来我一点都不怕。

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ABSTRACT

The future seems like an abstract concept with many disparities between the way designers approach the topic. Why does the future look different to different people? How do we design for something that is unknown? The aim of this study is to expand on the philosophical underpinnings of the future by examining how different disciplines shape our perception and subsequent reaction to the future. This theoretical essay examines the future at the intersection of speculative design, storytelling, and systems thinking, in an attempt to paint the complexity of the future by investigating the underlying philosophy behind each of the disciplines. Storytelling casts the future as a subjective experience due to its phenomenological nature. In speculative design, the future is perceived as non-anthropocentric and demands equality. In systems thinking, future is rooted in the experience of time as an extension of the present. This thesis proposes to examine futures holistically based on the approaches of indigenous cultures, to inspire a sustainable path to the future.

To design for futures, we must recognize the political nature of both the future and design, and what it means to design for a future that is desirable for the generations to come. Designed futures are not bloodless – it is always coloured with a uniquely human warmth. Designed futures are selfless – it is not only about humans as a species but demands fairness for all. Designed futures are rooted – it is not an isolated concept but an extension of the present. To design for these futures, the designer must learn to extend empathy beyond themselves to listen to other's stories, to extend beyond mankind, to give a voice to those without, to extend empathy beyond our own temporality, to design for systems that have existed before us and will continue to exist after us. By dissecting our own understanding of

the future, it becomes possible for us to recognise our own biases and develop our own ethics on the topic of designing for futures and dreaming new dreams.

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ATTESTATION OF AUTHORSHIP

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institutions of higher learning.

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1. INTRODUCTION

In the realm of future studies, the enigmatic nature of what lies ahead has often been a source of fascination and speculation. As Dator (2019) asserts, "the future" cannot be predicted because it does not exist. Despite this inherent uncertainty, the field of future studies has evolved to focus on exploring potentialities and plausibilities. While the concept of the future may evoke thoughts of nebulous conjecture, it is essential to recognise that the discipline of future studies draws upon diverse disciplines, robust methodologies, and deep insights from various sources. As I embarked on my journey of understanding the interplay between design and future studies, I was captivated by the pivotal role that designers play in shaping the collective futures we envision, whether through stories, artefacts, scenarios, or services, it seemed everything designed not for this moment right now, is designed for the future.

The confluence of design and futures emerged as a point of departure for my research and prompted me to delve into how we comprehend the meaning of designing for futures. This inquiry led me to confront the challenge of articulating the very essence of ‘futures’. A closer examination of the existing literature revealed that different authors' perspectives on the future are profoundly influenced by the philosophical underpinnings of their respective disciplines. Thus, for instance, Candy (2016) proposes experiential futures, where future should be becomes something able to be experienced; where the Extrapolation Factory (Montgomery & Woebken, 2016) emphasises design fictions and the creation of artefacts to convey the future through things. Both of these approaches contrast with Meadows (2007), who envisions the future through systems thinking and depicts it in a series of system archetypes. These disparities in approach beckon the question of why such diversity exists and how distinct disciplinary predispositions shape our understanding of the future.

This theorical thesis aims to unravel some of the ontological and epistemological dimensions of futures, spotlighting the roles of speculative design, systems thinking, and storytelling in shaping the discipline. The central hypothesis is that the logic we use to approach the future is determined by the philosophy that underpins our thinking of these three domains. Thus, this thesis hopes to offer a comprehensive exploration of these three domains: their relationships, philosophical foundations, and their collective influence on holistic future comprehension.

1.1. Research question

This research delves into the intersections between speculative design, systems thinking, and storytelling and their role in our attempts to design the future. The core research question guiding this exploration is:

What does it mean to design for the future at the intersection of systems thinking, speculative design, and storytelling?

This central inquiry sets the stage for a multifaceted examination of the roles and interactions among these disciplines. Subsidiary questions include:

- What interrelationships exist between systems thinking, speculative design, and storytelling in the context of future studies?
- How do these disciplines collaboratively generate shared visions of the future?
- In what ways do the distinct characteristics of each discipline influence the overarching perception of the future within their domains?

- What does designing for the future entail?
- How should we navigate the space of designing for the unknown?

This thesis will address these questions in a series of mini essays, each delving into one of the disciplines and their contributions to shaping our understanding of the future. Based on the insights gained from these explorations into the different domains of future studies a synthesised approach to comprehending futures through an interdisciplinary lens is proposed, followed by a discussion of what it means to design for the future. The study ends by offering advice to those who are venturing into the unknown.

1.2. Research methods

The research methodology for this thesis revolves around an interdisciplinary exploration of grey literature. Given the multifaceted nature of future studies and the overarching hypothesis extending across diverse disciplines, an analogous methodology was adopted.

Interdisciplinary research involves the integration of:

> *... information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.* (Committee on Facilitating Interdisciplinary Research, 2004)

In this vein, an examination of grey literature serves as a conduit for uncovering unconventional insights and bridging the gaps between established domains.

Grey literature is defined as “information produced on all levels of government, academia, business and industry in electronic and print formats not controlled by commercial publishing” (National Grey Literature Collection, 1997) and it is a repository of valuable knowledge outside traditional academic channels. This allows the exploration of future studies to extend beyond conventional boundaries and including the latest texts on the subject matter. Practical implementation of this methodology involves a conscientious curation of grey literature (University of Exeter, 2023). Selection criteria for these materials encompass a broad spectrum of sources. Established online databases, such as the 258 repositories offered by the AUT online library service and ResearchGate, were tapped for authoritative information, and Google searches utilising pertinent keywords further enriched the array of resources. Alongside the inclusion of conventional published articles, essays, research, and books, the methodology embraces non-traditional sources like interviews, lectures, and conference papers/talks that encapsulate contemporary perspectives. A selection of core literature is used as the foundation for the topics listed in Table 1.2.1 below, from there stems other grey literature that was found via their bibliography and mentions. With regard to this study, this approach ensured that the analysis remains attuned to the dynamic and evolving nature of the subject matter. Additionally, a preference for content from the past decade underscored the value of contemporary insights and their relevance to the current discourse. The following table lists the literature used in this study and includes the collection of key grey literature the analysis was based on as well as additional texts that informed the findings. These additional texts were sourced through AUT's 258 data base as Research Gate using key words such as "designed future," "speculative design," "design fiction," "storytelling,” “phenomenological futures,” "future scenarios," "indigenous futures," "system theory," and "foresight" in AUT’s 258 database as well as ResearchGate.

Discipline	Title	Author(s)	Year	Reason for selection
Future & Design	Design and futures vol. I & vol. II	S. Candy & C. Potter	2019	Contemporary take on how different aspects of design relate to the future
Systems thinking	Thinking in systems	D. H. Meadows	2009	Foundational to the field of systems thinking
Design Fictions	The Extrapolation Factory operator's manual	E. P. Montgomery & C. Woebken	2016	Insightful hands-on knowledge from applying design fictions in real life
Experiential Future	The futures of everyday life: Politics and the design of experiential scenarios	S. Candy	2010	Foundational to the field of experiential futures
Speculative Design	Speculative everything: Design, fiction, and social dreaming	A. Dunn & F. Raby,	2013	Foundational to the field of speculative design
Futures Studies	Futures (Journal)	Edited by K. Facer & C. Groves	2004-present	Respectable journal which includes a wide variety of published articles on topics related to future studies

Philosophy	The Stanford encyclopaedia of philosophy	Principal Editor: E. N. Zalta	Actively updated online, archived every 3 months	Robust entries that define and expand on various philosophical theories

Table 1.2.1 Table of key texts

However, it is worth noting that grey literature sources can vary in quality as they are not subject to the same rigorous review processes that apply to other academic publications. To ensure a basic level of quality control, the texts were selected based on the CRAAP test to ensure that they are Current, Relevant, Authoritative, Accurate and fit for Purpose (Blakeslee, 2004).

In summary, the research adopts an innovative methodology by using grey literature to explore the interdisciplinarity of future studies. The interdisciplinary journey captured in this study unfolds through unconventional sources, enriching the discourse by uncovering hidden connections and novel insights. As grey literature serves as a conduit between traditional domains, it enables the study to traverse diverse perspectives, ultimately contributing to a comprehensive understanding of future studies' multidisciplinary landscape.

1.3. Researcher’s motivation and ethics

I first encountered future studies during my professional career as a service designer when I had to compile trend reports to guide strategic decision-making. Later, I took on the role of an

educator, teaching in the area of futures and design. In my teaching, I formulated my approach to the future through systems thinking, speculative design, and storytelling. Despite the plethora of tools and methodologies that these disciplines offered, a pivotal question persisted: why do the various approaches to the future yield such different outcomes? This conundrum was the impetus for my academic pursuit. In order to fully understand and examine the ethical implications of designing for futures, we need to be aware of the philosophies that underpin the different approaches involved. This is foundational to our perceptions of futures. Without it, designers are unable to recognise their own biases and blind spots or justify their decisions.

The aspiration for this research is to unravel the doctrines behind these key disciplines that seek to determine our future. A close examination of the often-unspoken assumptions underpinning these fields serves to reveal the philosophies that guide them. My hope was that the philosophies themselves would become discernible through abstraction, and that this would pave the way for a more comprehensive and nuanced comprehension of the future.

As such, I am forced to take a rationalist approach in this thesis. Rationalism differs markedly from empiricism, which believes that “all knowledge originates in experience” (Merriam-Webster, n.d). However, here is simply no way of gaining knowledge of the future through experience, as the future does not exist. Rationalism, on the other hand, argues that innate knowledge and concepts are a part of our nature (Markie & Folescu, 2023), which I believe to be true for the case of future. Even without formal education on the subject, we are able to conceive the idea of “future” regardless of how vague or simplified this idea may be. Moreover, without being able to experience the future directly, all theories and knowledge we have around it can only be deduced logically. This is also reflected in my work as I

conceptualise the future as the logical extension of our current reality. As a result, I apply the same theories that conceptualise how we perceive reality to how we perceive the future. However, it is worth noting that the demarcation between rationalism and empiricism is not devoid of challenges, primarily due to the fact that hardly any author can be neatly classified within either camp (Markie & Folescu, 2023). Similarly, I acknowledge that not all arguments made in this thesis are completely rational as my understanding of the future is also shaped by my lived experience of the world (as discussed further in section 3.3 on phenomenology), which makes it impossible to examine the topic of future (and the literature on this topic) completely objectively.

In conclusion, my journey into future studies was propelled by a desire to unveil the intricate philosophies shaping the way we perceive and design for the future. This endeavour, rooted in a rationalist perspective, seeks to expose the philosophies behind systems thinking, speculative design, and storytelling, in order to enhance our collective comprehension of the multifaceted landscape of futures.

1.4. Current Knowledge Gaps

Robust research exists for each individual topic that sits under the umbrella of future studies, including the work by prominent futurists such as Slaughter, Inayatullah, Candy, etc. Slaughter's contribution is mostly around future education, in addition to releasing works like "Future Concepts and Potent Ideas" (1991) and "Future Tools and Methods" (1991), which have significantly progressed our understanding of amalgamating notions and concepts. These publications have established the essential theoretical and practical foundation for educators to foster the advancement of futures education. Inayatullah is mostly known for his

work on casual layered analysis (1998) and creating the six pillars of future studies (2007) as well as other theoretical discussions framed around the nature of future itself. He was also the first chair of the UNESCO future studies. Candy is well-known for pioneering the field of experiential future as well as developing the theoretical underpinnings of future studies in the context of design and politics (Candy, 2010). In recent years, he has focused his attention more on combining design and futures.

There are many more futurists (Auger, 2013; Dator, 2019; Dunagen 2007; Dunn & Raby, 2013, Malpass, 2013; Montgomery & Woebken, 2016, McGonial, 2019 etc.) who contributed to the field of future studies, all with unique perspectives and tools to enrich the discipline. However, these researchers mostly focused on future itself; only few have actively reflected on or explored the philosophy on the nature of future itself. This leaves us with marked gaps in our knowledge on the following issues:

Epistemological Uncertainties

One of the foremost challenges in future studies lies in the epistemological domain - how and why does our conception of the future, and the subsequent design for the future, change depending on the methodology and framework we choose to approach it. This epistemic gap poses a challenge to the credibility of future studies and demands further research.

Temporal Dimension

Future studies inherently involve a temporal dimension as the future does not occur in the here and now, yet our understanding of time and its various interpretations remain an underexplored territory. Questions surrounding the nature of time, the interplay between

present and future, the implications of different perspectives on time, especially regard to the future, remain unexplored

Ethical Implications

Future and design often grapple with political undertones (Candy, 2010): as we envision various potential futures, the question which futures are desirable becomes a point of ethical contingency. Considering that decisions on how we want to live in the future are crucial for everyone on the planet, the role of value judgements in shaping narratives of the future demands closer scrutiny.

The field of future studies continues to evolve in response to the complexities of our ever-changing world. However, these knowledge gaps underscore that there is much left to uncover and explore. Bridging these gaps requires interdisciplinary research. Accordingly, this thesis aims to address not only the technical aspects of future studies but also its philosophical and ethical dimensions. As we endeavour to shape the futures that lie ahead, confronting and closing these knowledge gaps becomes essential to develop a more holistic and informed approach to navigating the unknown.

1.5. Key Definitions

The future is interdisciplinary, and the study of the future has become more robust over the years by borrowing insights and tools from other disciplines. To deconstruct their relationship and see the futures in a more holistic way, the first step is to define each discipline and the role they play in shaping and interacting with the future.

The future

The future is a commonly used word in everyday life, and most widely understood as “a time that is to come” (Merriam-Webster, n.d.). Candy (2010), who described the future as “the problem of imagination” (p.131), considered both the breadth and depth of the future: the breadth concerns the limitless possibilities of the future, and the depth concerns the change that happens in time. However, the purpose of future studies differs from futurist to futurist. Slaughter (2020), upon reflecting on his decades spanning list of contributions to the area of future studies, proposed that future study is a quest for meaning, where the search eventually turns to a personal quest. Dator (2019), on the other hand, proposed that the field “studies ideas about the future--what I usually call "images of the future"--which each individual (and group) has ” (Dator, 2019. p.3) and sees future studies as something that concerns the public and majority. More critically, Nandy (1996) proclaimed that “futures studies are basically a game of dissenting visions. They are an attempt to widen human choices” (p.637), highlighting the political nature of future studies. All these definitions focus on different aspects – from personal to communal to political, and so it may seem as if there is no common ground between the definitions, but I believe they all have something to do with making sense of the future. Moreover, most of the definitions mention the plurality of the future – be it in forming the images of the future, the breadths, or choices, the future seems to contain multitudes of possibilities. The future seems to be plural, and based on these considerations, this thesis uses the singular 'the future' to refer to the future as a concept, and the plural 'futures' when referring to the multitudes of possible futures.

Design

The notion of what design is constantly changing, making it near impossible to find an all-encompassing and definitive definition. For the purpose of this study, Simon’s (1969)

definition of design will be used. According to Simon (1969), design "devise[s] courses of action aimed at changing existing situations into preferred ones". (p.112). This definition of design is commonly used in the context of future studies as it gives space to explore other dimensions of design. Similarly, Buchanan (1989) argued that design is a rhetoric as it is capable of shaping society, changing the course of individuals and communities, and setting patterns for new actions… designers have directly influenced the actions of individuals and communities, changed attitudes and values, and shaped society in surprisingly fundamental ways. (p. 93) In other words, Buchanan (1989) regarded design as a key driver that has the potential to play a role in actively shaping the future. This point is further illustrated by Dunagen et al. (2019), who claimed that design is inherently about the future as "the practice of design brings new "things" into the world that had not existed before" (p. 59). Within the discipline of design, speculative design focuses specifically on the development and designs of future situations that do not yet exist (Dunne & Raby, 2013), echoing the previous point that design is "changing existing situations into a preferred one", even if the preferred situation is not yet defined (Friedmann, 2002). Practically, this implies that design has the potential to make futures tangible, actionable, and turned into reality by following established design processes.

Systems thinking

While a system is clearly defined as "an interconnected set of elements that is coherently organized in a way that achieves something… [and] must consist of three kinds of things: elements, interconnections, and a function or purpose" (Meadows, 2008. p.11), the concept of systems thinking is not as clearcut. Generally, it can be considered to be "a system of thinking about systems" (Arnold & Wade, 2015. p. 2). Understanding systems is essential in relation to the future as time is required for any change within a system to ripple through, and the

consequence of feedback delay from the complex system only becomes evident with time (Meadow, 2008). To a certain extent, these impacts can be predicted using system archetypes, which spot patterns in the behaviour of a system. Thus, systems thinking enables thinking on a longer timeline, anticipating the consequences before they happen. This characteristic is relevant in discussions about future as being able to conceive future in long horizons helps engage the brain's mental flexibility to overlook constraints and limitations in the present in order to think truly exploratively about the future (McGonigal, 2019). By allowing future to be conceived interconnectedly and on longer timeline, systems thinking enables more holistic conversations around changes and futures.

Storytelling

Storytelling as a technique has been around since early tribal times when stories have been used as a way to make sense of the world (McDowell, 2019) and to "encode and decode knowledge" (Lugmayr et al., 2016. p.7). When thinking about the future, the proposed future worlds are also foreign to our reality; therefore, exploration through stories helps us to better understand the structure, scenario, situation, and stuff in those worlds (Candy & Dunagan, 2017). Storytelling can also create more granular visions of the future. Lugmayr et al. (2016) proposed the definition of serious storytelling as storytelling being used outside the context of entertainment for the purpose of knowledge and wisdom creation in a serious context. Similarly, Andrews et al. (2009) had proposed four methods of storytelling, including the category of problem-based instruction which serves to synthesise abstract knowledge (Andrews et al. 2009; Wood, 2003). This further suggests that storytelling could be a viable way to explore and prototype futures to gather insights and feedback.

In summary, it becomes evident that each discipline's contribution is instrumental in framing and exploring the future. Future studies, as a collective endeavour, benefits from their collaborative insights. Every nuance of the definitions for future, design, systems thinking, and storytelling brings new dimensions to the discourse. Recognising and delving into these dimensions is essential for comprehending the future's complexity; as well as guiding our efforts to navigate and shape the paths that lie ahead. The following chapters will focus on each discipline's contribution to our understand of the future in the form of speculative design, storytelling, and systems thinking.

1.6. Summary

The aim of this thesis revolves around understanding the meaning of the phrase 'designing for the future' at the intersection of speculative design, systems thinking, and storytelling. This central inquiry is supported by subsidiary questions that delve into the interrelationships between these disciplines, their collaborative generation of shared visions of the future, and the influence of their distinct characteristics on our perception of the future. The methodology employed involves an interdisciplinary exploration using grey literature, embracing diverse sources such as published articles, interviews, lectures, and conference papers.

The researcher's motivation lies in uncovering the philosophies that underlie the disciplines of speculative design, systems thinking, and storytelling, aiming to enhance our comprehension of the future. Rationalism was chosen as the underlying perspective for this exploration, while acknowledging the subjectivity inherent in understanding the future. The

introduction chapter further highlighted the knowledge gaps in future studies, including epistemological uncertainties, the temporal dimension of the future, and ethical implications.

Key definitions of terms such as "future," "design," "systems thinking," and "storytelling" were provided to establish a shared understanding. The chapter underscored the interdisciplinary nature of future studies and the multifaceted contributions of these disciplines in shaping our understanding of the future. This interdisciplinary journey serves as the foundation for the subsequent section 2-4, where speculative design, storytelling, and systems thinking are examined in this order regarding the role they play in future studies, and finally concluding the theoretical reviews with a discussion on what it means to design for the future in chapter 5.

2. FUTURE THROUGH SPECULATION

Our visions of the future have always been based on speculation. Speculative design is a field that tackles the future through the lens of design. This chapter will discuss the background of speculative design, its definition and purpose, as well as the non-anthropocentric perspective in which speculative design views the future. To better understand the relationship between speculative design and the future, we need to understand how speculative design is situated within the field of design.

2.1. Speculative Design

As previously discussed in section 1.5, the definition of design is at large an action aimed for change. More granularly, according to Tharp and Tharp (2013), the field of design consists of the following four subcategories:

- **Commercial Design**: This category includes most product/industrial driven design that can be assessed by market profitability.
- **Responsible Design:** This category refers to non-profit driven design that usually originates from humanitarian rationales or socially driven causes.
- **Experimental Design**: The designs in this category are more focused on exploring new processes rather than producing an outcome
- **Discursive Design**: This category consists of designs that aim to start conversations about a particular issue. The purpose is to communicate new thoughts or reflections rather than a functional outcome.

The final category, discursive design, is often used interchangeably with “critical design”. Critical design has its roots in critical thinking; it is a term coined by Dunne and Raby (2001) to refer to the practice of “use[ing] speculative design proposals to challenge narrow assumptions, preconceptions, and givens about the role products play in everyday life” (p. 34). Later, critical design was developed upon by Dunne & Raby (2013) into speculative design, but the two shares similar foundational philosophies of wanting to start conversations and debate. Fig 2.1 illustrates the relationship between the aforementioned terms and helps us to contextualise and situate speculative design within the discipline of design.

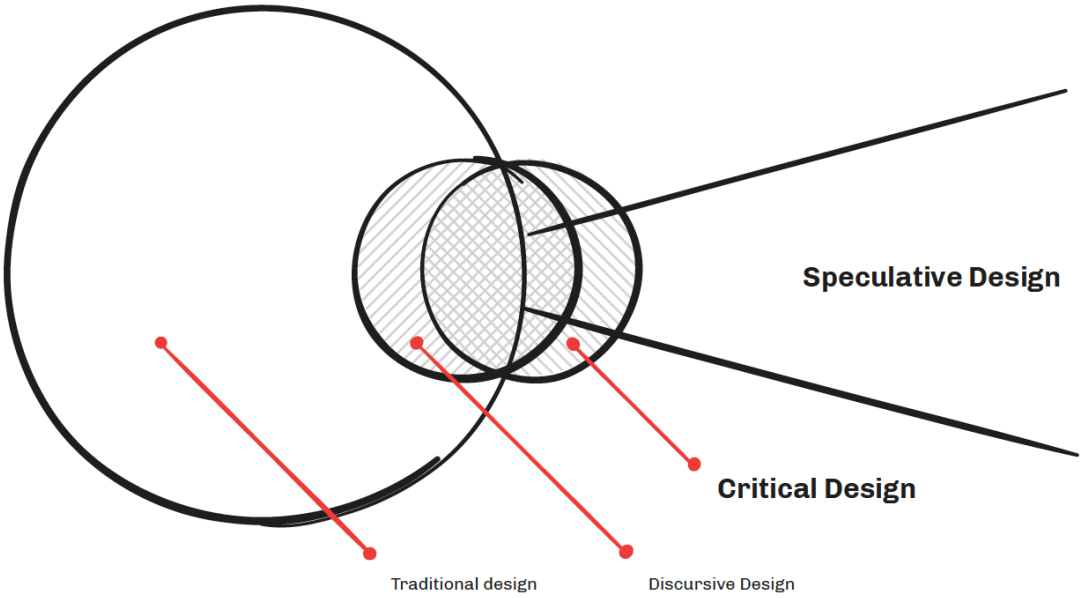

Fig 2.1. Illustration of the relationship between speculative design and traditional design by Mitrović (2015).

Due to the future being inherently unknown, any knowledge creation for the future can only be based on speculations of consequences yet to come. Subsequently, speculative design is defined by Dunne and Raby (2013) as “an activity where conjecture is as good as knowledge,

where futuristic and alternative scenarios convey ideas, and where the goal is to emphasise implications of “mindless” decisions for mankind”, and the core concept of speculative design is not to predict the future but to “open up spaces of debate and discussion” about the future as well as now (Dunne & Raby, 2013, p. 3). As such, in order to be provocative about the future, speculative design holds space for multiple realities of the future (shown in Fig 2.2.) following a possible-plausible-probable-preferable structure. The designer is responsible for proposing scenarios for each of the realities using artefacts and/or questions and to define what is preferable. Due to speculative design being a field steming from discursive and critical design, it also highly values the debates and conversations raised as a result of the designed outcomes. In the case of the PPPP future cone, the preferrable future is defined with the input of others through such discussions. Together, the designer and the audience define the path to the preferable future.

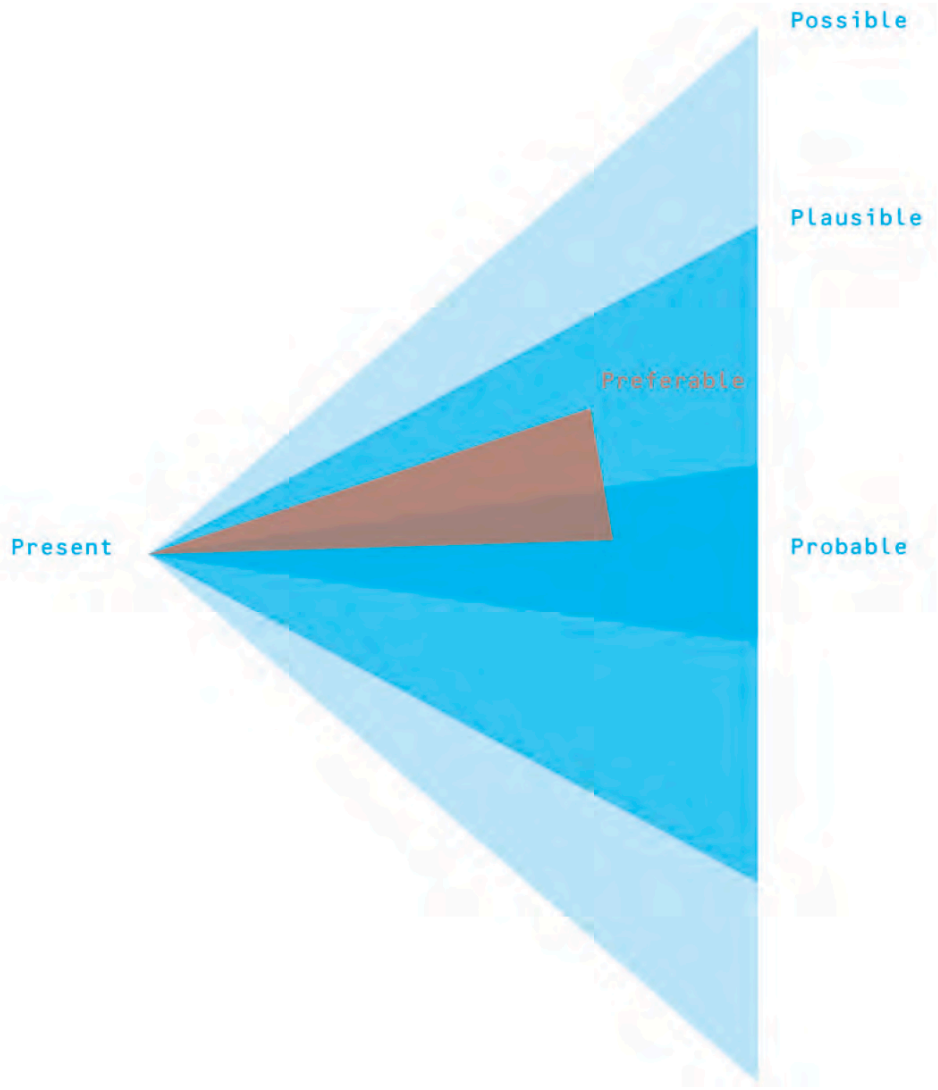

Fig 2.2. PPPP Model illustrated by Dunne and Raby (2013)

When examining other related terms, discursive design has the primary purpose to "communicate ideas…[and] encourage discourse" (Tharp & Tharp, 2013. p408). Critical design is defined by Dunne and Raby (2001) as "develop design proposals that challenge conventional values" (p. 59). This definition was expanded on by Maze and Redström (2007) who believed that critical design should serve as a tool for rethinking the parameters of a problem from a critical perspective. Speculative design can be thought of as a subcategory of

critical design that encourages discussions and social dreaming of what the preferred future could be (Mitrović, 2015) as such, speculative design focuses on developing images of the future based on a spectrum of opinions, especially those focusing on the emerging technologies. As Auger (2013) argued that speculative design's purpose is to "combine informed, hypothetical extrapolations of an emerging technology's development with a deep consideration of the cultural landscape", where future is not only focused on the implication of technology, but also its impact in connection to all other areas. This thought is further echoed by Malpass (2013), who believes that speculative design has the responsibility to "explore ethical and societal implications of new science". While the purpose of speculative design differs from starting conversations and debate to imaging the implications of technology, at its core the purpose of speculative design is an effort to speculate about the consequence of hypotheticals of the future.

Critical design, and thus also speculative design, is not without its critics/ have received their share of criticism. One of the main criticisms is that critical design does not solve any problems, which is against the purpose of the design discipline (Jakobsone, 2017) and that critical design is an exercise only for the privileged and elite as it only focuses on first world problems (Tonkinwise, 2015). To refute the second criticism requires a detailed consideration of the literature and more extensive response; however, the first criticisms can be answered with reference to the A/B manifesto for speculative design. This manifesto was written by Dunne and Raby (2013) in order to provide an easy reference point for discussions on what speculative design is, where column A refers to affirmative design/commercial design/traditional design/what speculative design is not, and column B refers to what speculative design is. An excerpt from the manifesto is shown in Table 2.1.

A	B
Affirmative	Critical
Problem solving	Problem finding
Provides answers	Asks questions
Design as solution	Design as medium
For how the world is	For how the world would be
Change the world to suit us	Change us to suit the world
Innovation	Provocation
Consumer	Citizen
User friendliness	Ethics
Application	Implication
Makes us buy	Makes us think

Table 2.1. Excerpt from Dunne & Raby's A/B Manifesto (2013)

Dunne and Raby have circumscribed the purpose of speculative design as fundamentally different from the type of design captured in column A. The definition for Column A was left vague on purpose, but many of its characteristics are overlapping with commercial design as previously discussed. Thus, considering that commercial design is considered to be driven by the market, it takes a much more human-centered approach, in line with design thinking (Brown, 2008; IDEO, 2008). However, speculative design has no consumer or user to impress, and therefore focuses on ethics, provocation, and problem finding instead. In response to Jakobson's criticism, speculative design simply states that solving a problem is not within the purpose of speculative design; rather, it focuses on finding the problems, provoking us, and making us think.

In other words, speculative design does not conceptualise the future as a problem that requires solving but as something that is a playground open to explorations and discovery. This may seem counterintuitive to those who are more familiar with design thinking and believe design thinking is a problem-solving method of sorts (Brown, 2008). Design thinking's aim is to "match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2008, p. 86). Key words such as "business strategy", "customer value", and "market opportunity" are relevant for those who aim to thrive in a capitalist world; however, the future is much broader than just those things and speculative design "remove[s] the constraints from the commercial sector " (Auger, 2013, p. 1). Consequently, designing for the future requires a new kind of thinking, such as counterfactual thinking.

2.2 Counterfactual Thinking and Design Fiction

After examining the definitions for and purposes of speculative design, I believe that designing for the future requires a new way of looking at the role of design, and counterfactual thinking is essential to the process of speculating about the future. Counterfactual by itself simply means "contrary to fact" (Merriam-Webster, n.d.). Expanding on the term, counterfactual thinking is a psychology term which describes the "mental representations of alternatives to the past and produces consequences that are both beneficial and aversive to the individual" (Rose, 1997, p. 133). This definition is important because a lot of decisions we make about the future is built on past experiences (Waters, 2020), and if we are unable to imagine different pasts, we are probably also unable to imagine a different future.

Furthermore, research supports that the ability to remember the past is related to the ability to imagine futures (Addis, Wong, & Schacter, 2007; Rasmussen & Berntsen, 2013). The ability to mental time travel by projecting ourselves into the future by re-experiencing an event from the past is demonstrated in the project “The Institute of Patent infringement” by Dunn and Raby (2013), where they re-imagined the past as a world where copyright law never existed, and as a result, people are able to share their creations freely. Similarly, the Victoria and Albert museum in London curated an exhibition titled “The Future Starts Here” (2018) where they encouraged visitors to imagine a world where certain technologies were more widespread in the past, resulting in a different society. In these projects, the creators imagined the future through the use of alternative histories, by imagining different past events as a starting point for creating new narratives for the future. Dunn and Raby (2013) have also identified counterfactual thinking in the context of speculative design; however, they framed it as thought experiments to aid in the design of speculative futures; however, I would argue counterfactual thinking has a more fundamental role in speculative design, as anything contrary to the current understanding of reality can be considered thinking contrary to the facts. It is worth noting here that I am not using counterfactual thinking to mean it in its psychological definition, but rather in the broader meaning as captured by Merriam-Webster's (n.d.) definition.

The outcome of these speculative processes is often in the form of artefacts, otherwise known as design fiction. Some argue that speculative design and design fiction have a hierarchical relationship (Lindley et al., 2014), while Dunn and Raby (2013) see them as separate practices sitting next to each other. Nevertheless, the original definition for design fiction was coined by Sterling (2012) as “the deliberate use of diegetic prototypes to suspend disbelief about change”. Through these artefacts, design fiction provokes critical reflections of how

emerging technologies impact our future. Auger (2013) provided an illustration of alternative presents and speculative futures (see Figure 2.2.1) where he positioned speculative design as the domestication of technologies, as new technologies become more widespread speculative design becomes domesticated and closer to “here” (or rather, now). The previous examples of mental time travel by imaging alternative pasts which result in an alternative present is represented by the arrow labeled “2. Alternative present” in Figure 2.2.1. Domesticating current cutting-edge technologies in the future becomes the arrow labeled “1. Speculative future”, and design fictions become the outcome of these domestication. I argue that design fiction is powerful in conveying speculative futures because the reimaging of everyday objects helps extend the concept of the current “here” into the future “here”, combining the familiar with the unknown, and the juxtaposition helps the viewer to reflect on the disparities between the two realities, thereby building the connection between the present and the future.

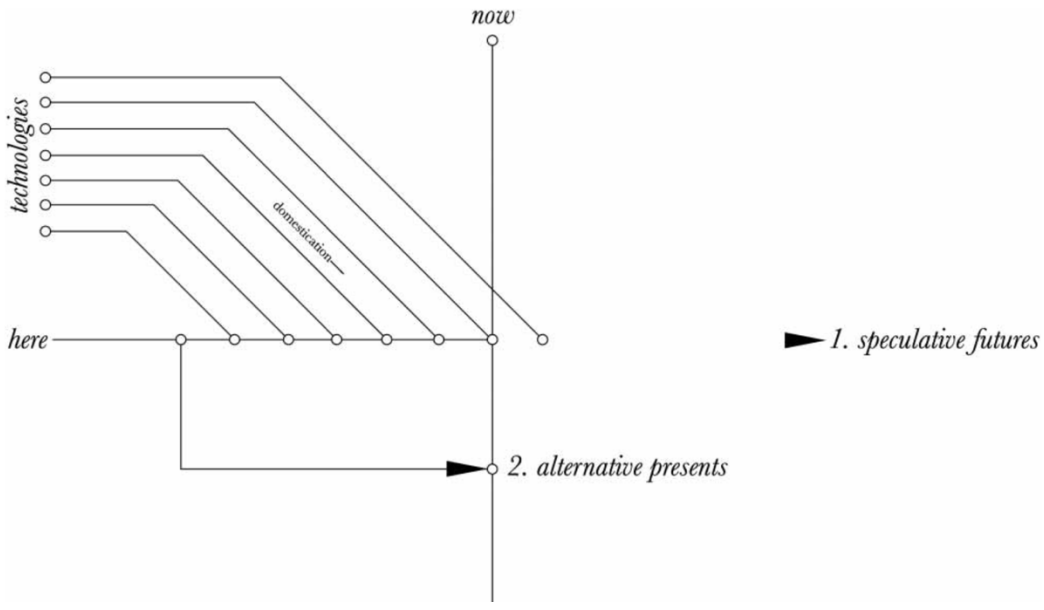

Fig 2.2.1. Auger’s (2013) depiction of alternative presents and speculative futures

To further illustrate the effect of domesticating technology, the Extrapolation Factory has a strong focus on the ordinary and has carried out projects and exhibitions such as imagining 99cent Future Store (2013) where participants collectively imagine items from the 99cent store in the future; 1-888-FUTURE (2015), which delivered presents from the future to the public, and Craigslist for Barter (2015), which was about the selling and exchanging of imagine household products. Similarly, Candy created the NuturePod (see Figure 2.2.2) to challenge the idea of parenthood in the future. All the artefacts attempt to paint a vivid image of the future through design fictions that emphasise the counterfactual of everyday objects, thereby evoking reflections about the future.

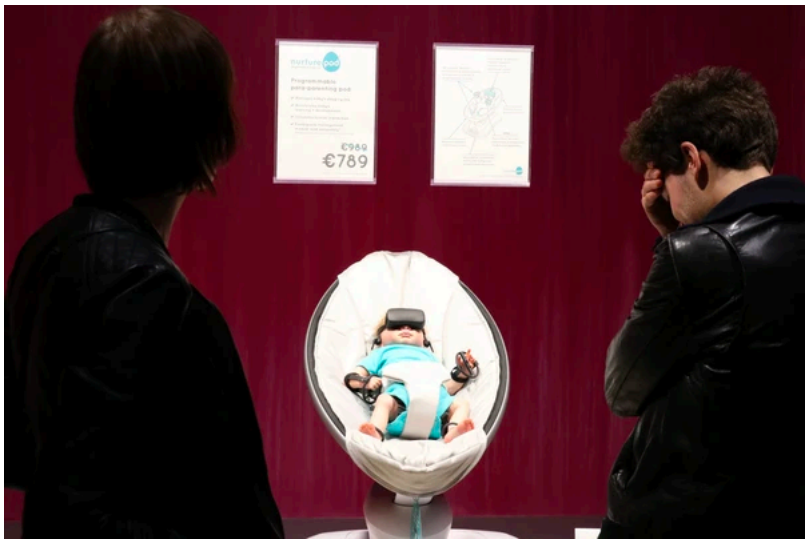

Fig 2.2.2 NuturePod by Stuart Candy (2017) which was shown as a part of the exhibition at Museum of Contemporary Art in Antwerp, Belgium

While speculative design often results in the expression of design fictions, another similar but different expression can be found in experiential futures. Experiential future is defined as “the design of situation and stuff from the future to catalyse insight and change” (Candy, 2015. p. 235), where the focus is on allowing the public to experience the future. Fig 2.2.3 depicts Candy’s interpretation of the relationship between design fiction, speculative design, and

experiential futures. The two approaches are similar in the sense that they both result in a tangible manifestation of the speculative. As such, design fictions are turned into objects for people to interact with and experiential future results in an immersive scenario that people can interact with. Consequently, counterfactual thinking can also be found in experiential futures, most prominently in its title. Candy wrote that the words “future” and “experience” in itself is a juxtaposition; however, visions of an experiential future aim to “make productive use of that contradiction and harness the energy of its friction” (2018). I argue that the contradiction and friction in the term is the manifestation of counterfactual thinking, a powerful tool as it confronts the public with a tangible reality that stands opposite to their understanding. Without experiential futures, the process of speculating about the future (especially complex future) can be difficult for the individual, as it requires mental and cognitive efforts that may challenge our own biases and may be emotionally challenging or distressing (Markman et al., 1993; Rose et al., 1999; Sanna et al., 2007). By turning futures into a scenario that can be experienced, it takes the cognitive load off the participants as it allows them to focus their mental capacity on reflecting on the proposed futures and reflect on the contrast of the proposed reality versus their own.

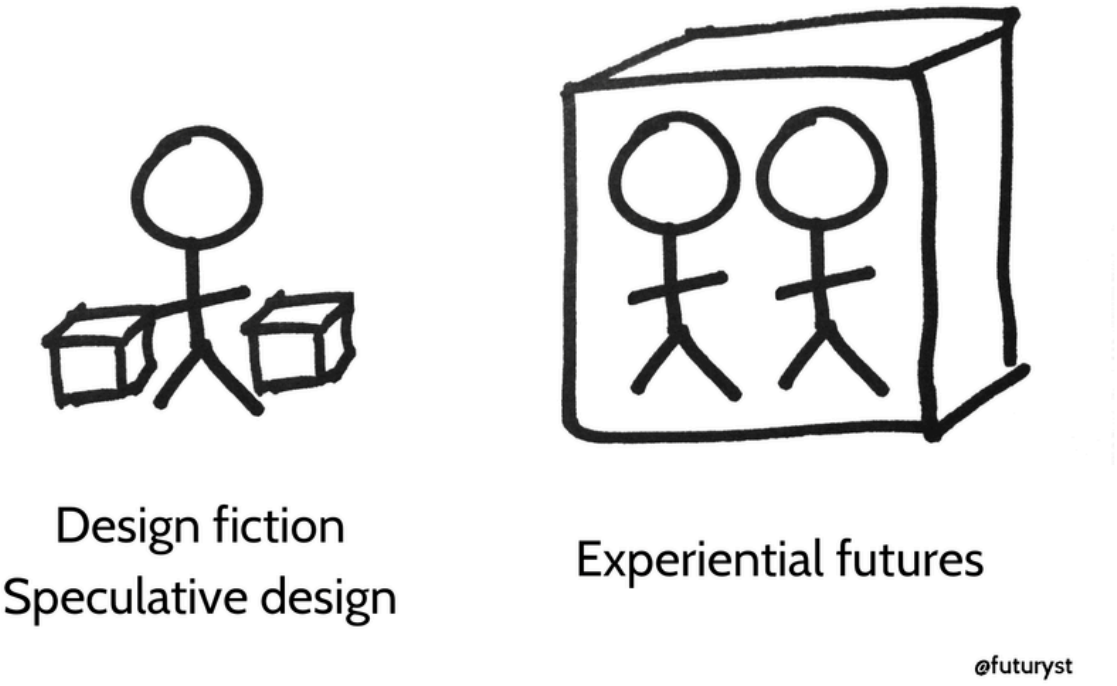

Fig 2.2.3 Candy and Dunagen's (2017) depiction of design fiction / speculative design vs. experiential futures

2.3 Non-anthropocentric Futures

If the process of speculating about the future is through counterfactual thinking, eventually we have to challenge paradigms that we have grown accustomed to. The ultimate counterfactual experience for us is to imagine a world where we are not the center of everything – a non-anthropocentric future. To understand non-anthropocentrism, first we have to understand the origin of anthropocentrism. Anthropocentrism is the remnant of a dualist belief that "interpret[s] the world in terms of human values and experience" (Merriam-Webster, n.d.). The problem with its dualistic roots is that it can lead to a sense of superiority of human value and experience over non-human life (Altvater et al., 2016). This philosophy also underpins some design disciplines, especially those that employ design thinking for it being "human centered design" (Brown, 2008; Brown & Katz, 2009; Norman,

2013.). As previously stated in the speculative design definitions and the A/B manifesto, speculative design concerns itself with ethics and citizens instead of user friendliness and consumers. The anti-thesis for anthropocentrism is the movement “post-humanism” (Wolfe, 2010) which “simply de-centre[s] the human experience” (Hupkes & Hedman, 2022. p.2). This perspective is already evident in some speculative future projects, such as the fictional piece Parliament of All Beings, created by Candy and Verbakel (2021) in collaboration with the Welsh Commissioner for Future Generations, which was used inform the public about rewilding in Cardiff from the perspective of animals living in the affected area. (fig 2.3.)

Fig 2.3. Letter from Parliament All Being by Candy and Verbakel (2021).

When examining non-anthropocentrism in greater detail, Hupkes & Hedman (2022) proposed that there are three main themes within the non-anthropocentric ideology, namely entanglement, language, and temporalities. The following section examines the themes of entanglement and temporality with regard to their relation to the future.

The idea of entanglement refers to the thought that “all species and phenomena are entangled, and therefore one whole, rather than separate entities and phenomena” (Hupkes & Hedman, 2022. p.2). If entanglement requires examining the connections as a whole, why should humans be at the centre of every examination of entanglement? Rather, the focus should be on whichever lens the entanglement is being examined from. For example,Haraway and Endy (2019) tried to demonstrate the extent of entanglement by tracking the life cycle of a single vanilla bean to illustrate the complexity and extensiveness of different networks that the vanilla bean was a part of. The idea of understanding connections and networks through the perspective a vanilla bean demonstrates non-anthropocentrism and manages to capture granularities that would be lost if viewed from the perspective of a human. This notion of connectedness is also reflected in speculative designs which focus on drivers of change such as technology and the cultural landscape (Auger, 2013) and thereby speculate on the implications of their effects in the wider, connected system in the future. While speculative design does not specifically tackle the issue of connectedness, physical fiction is often an outcome produced as the result of the speculative process. Dunne and Raby (2013) defined physical fiction as “intentional” and “props for non-existent films”, much like Candy (2018) described an experiential future as a method of “harness[ing] the energy of fiction”. The purpose of these physical fictions is to allow the viewers to imagine their own interpretation of the world that the object belongs to (Dunne & Raby, 2013, p. 89). The interconnectedness of said fictional future is not explicitly stated but implied through artefacts, and it becomes the viewer’s responsibility to find the ways the object is connected to their reality. This forces the viewer to empathise with the fictional future and find ways to identify themselves in the context and connectedness of that world.

Temporality is a concept restrained by the human condition. To be able to truly grasp the scale of the entanglement and systems, we need to think bigger and further than the duration of our own existence of around eighty years and recognise that the future happens on a much larger time scale (Cielemecka & Daigle, 2019). Therefore, to expand upon our own temporality, a wider a wider and more systemic perspective are needed (Forlano, 2018). Speculative design facilitates the understanding of such mental models by creating a space for the probability of multiple futures at the same time (as demonstrated in Figure 2.2), moving away from the traditional time scale and binary thinking (Hupkes & Hedman, 2022). The exercise allows the designer to anticipate a range of realities, and by doing so, they exercise their imagination and empathy for a more interconnected world (Granjou et al., 2017). Moreover, to further separate the us (the human condition) from the future, speculative design promotes the idea of "unreality". Dunne and Raby (2013) stated that design speculation should be considered more as a thought experiment than a narrative, the purpose of it being to "allow us to step outside reality for a moment to try something else" (p. 80). Relating back to counterfactuals, the unreality is a step to help us suspend our disbelief about the future by thinking counter to our own limitations and temporality. Speculative design provides techniques to achieve this unreality, such as by reductio ad absurdum (taking an argument to an extreme), counterfactuals (changing a historical fact to imagine what would happen instead), and what-ifs (creating forward looking what-if scenarios), with the purpose of making designers into "fictioneers in denial" so that they can create realities contrary to their own experience (Dunne & Raby, 2013, p. 80-88).

It is important to note that non-anthropocentrism does not mean the exclusion of people in the speculative process. In fact, speculative design greatly values collaboration. Dunne and Raby (2013) noted that "designers should not define futures for everyone else but work with

experts, including ethicists, political scientists, economists, and so on… about the kinds of futures people really want" (p. 6). Furthermore, speculative design highlights the importance of public engagement in the process to democratise the future and of using dialogue and public voice as a part of the reflection (DiSalvo, 2012). In their A/B manifesto, Dunne and Raby iterate that speculative design is contrary to traditional design characteristics captured in column A, where the preferred futures are decided by the consumers with business orientated outcome. Instead, speculative designs involved the public in the discussion on what a preferred future would look like and attempts to leverage their actions towards the chosen future (Jakobsone, 2017). While speculative design is non-anthropocentric in terms of the way it looks at the future, it is still very much a human process, where collaboration is valued, and the audience is also involved in the discussion about the future.

2.4 Summary

What is fascinating about the future is that it is there for all. All things, living or not, withstand a chance of having a future. Speculative design registers the designer outside the constraints of their own human narrative and forces them to speculate about the future from an open and explorative perspective that comprises larger scales: both in terms of connectedness and temporality. As noted by Dunne and Raby, speculative design is about raising questions about the future and finding problems rather than using the traditional anthropocentric approach of "saving" or solving problems. Hupke sand Hedman (2022) suggested that humbleness is a virtue that designers experience when comprehending the greater context of speculative design. They concluded that "humbleness can be valuable not only as a final outcome of the understanding of the entanglement but also as facilitating such understanding" (Hupkes & Hedman, 2022, p. 5). While the purpose of speculative design

varies between futurists, when speculative design is situated within discursive design, it becomes clear that the nature of speculative design is that it is about more than our own benefit. This is the first truth reflected in our attempt to understand the future: the future is not about us, or any species in particular. In the greater view of interconnectedness, we cannot centre the future around one perspective alone. We can only speculate about what is probable, plausible, and possible; and guide our course of action towards the preferrable future by starting conversations and asking questions through the lens of speculative design.

3. STORIES ABOUT THE FUTURE

Where does the future exist? Dator (2019) proposed the idea that the future does not exist, or rather that we can only paint "images of the future" which differs from person to person. Similarly, Slaughter (2018) believes that the future can only be imagined through "images, thoughts, feelings, and the multiple ways these are subsequently expressed in the outer world" (p. 444). As such, futurists have then turned their attention to ways of generating images of the future. But how do these images come to be? When talking about imagined futures, a common form of expression is storytelling. A story here is defined as "a description, either true or imagined, of a connected series of events" (Merriam-Webster, n.d.), which makes it the perfect medium for exploring imagined images of what not yet exist. Especially in the context of the future, when we are trying to convey a large amount of information to do with our values, world view, and speculation, stories become the most efficient medium as "we live storied lives and build stories though our life experience…our thoughts, feelings, actions and even our personal identity can be understood through stories" (Ketelle, 2017, p. 143-144). This way, stories conveniently compact many aspects of our lived and anticipated experience and articulate them in an easy-to-follow narrative. Stories also holds space for various possibilities of reality; as with futures, they can be interpreted in many different ways with each being equally valid and relevant (Thalhofer, 2018). This is in line with the view that the future contains multitudes as discussed in the previous chapter in speculative design, see chapter 2). In this sense, stories and futures seem to complement each other due to them sharing similar features such as being imagined experiences of things yet to be as well as being multi-faceted.

There are several tools in imagining these images of the future using storytelling as a technique. While the methods differ in terms of process, the way storytelling is used can be

roughly grouped into two branches: using storytelling for individuals (the storytellers) to synthesise their speculations about the future or using storytelling as a collaborative tool to gather other's speculations of the future and presenting the collective outcome within some sort of narrative frame. It is important to note that in this context, storytelling is not limited to only stories with words, but rather any medium that constitutes of an idea and/or narrative. This means that storytelling and the future intersect in an interesting way as we acknowledge that the future itself does not exist; however, the different realities of the future can be explored using stories as a tool. I argue that both uses of storytelling are rooted in the philosophy of phenomenology, as the foundation to approaching and understanding futures through the human experience and positions the future as the product of collective social foresight. In doing so, we view the future as a vision woven together that is centered around experiences and emotions of what we anticipate, and this contributes to building a future that is not void of warmth.

3.1 Storytelling as a tool for the storyteller to synthesise futures

While stories are often associated with entertainment, it is also used as a legitimate way for knowledge inquiry and construction (Brurner, 1994), which makes it particularly useful in synthesising visions of the future as "all stories share a similar experiential (as opposed to abstracted) approach to encapsulating information" (Andrews et al., 2009, p. 8). The following four categories of using storytelling as an opportunity to learn or problem-solve were identified by Andrews et al. (2009):

- **Case-based**: problems and solutions are fixed; the learner is seen as observing the situation.

- **Narrative-based**: the problem and solution are fixed, but the learner has some degree of control for context and information as the narrator.
- **Scenario-based**: the problem is fixed by the solution's criteria; the learner can interact and experience various solution paths.
- **Problem-based**: the problem has no solution criteria or parameters, and the learner is in control of the direction.

Both the case-based and narrative-based versions have fixed problems and solutions and therefore are not suitable for exploring uncertainties in the context of the future. The scenario-based solution category echoes the ideas put forward in the speculative design, where the problem is fixed, and the solution criteria are defined by the "preferred future". However, in the context of imagining "images of the future", problem-based storytelling is the most relevant as it provides the necessary width and freedom to explore the various options. This also corresponds with the A/B manifesto of speculative design (Dunn & Raby, 2013) as discussed previously where speculations about the future focus on problem finding and provoking. This thought is reflected in the following examples, where problem-based storytelling is used for the storyteller to understand, abstract, and synthesise their own image of the future. Each method presents an open-ended question about the future, and the storyteller is required to come up with a response through the process of storytelling. As it is problem-based learning with no defined solution, the storyteller is required to form their own conclusion on the matter, although sometimes conclusions are generated with the help of other participants (Savery & Savery, 2010; Wood, 2003). The following tools reflect these thoughts of utilising storytelling as a tool for personal reflection about the future.

Four Alternative Futures

Dator (2009), in an attempt to theorise images of the future, derived four "generic" scenarios for alternative futures from science fiction. He annotated that the goal of these scenarios was to have people experience the variations of the future, and the instructions given to carry out the exercise requires the storyteller to be immersed in the possibility of the future through hard empathy and a first-person perspective, even as far as saying: "this is your life. Love it, because you can't leave it… Please just accept it" (Dator, 2009, p. 8). By experiencing the future firsthand, Dator asks the storyteller to consider the following four scenarios:

- **Continued Growth:** most factors remain the same, status quo grows.
- **Decline and Collapse**: the system fails; and crisis emerges.
- **Limits and Discipline:** our behaviour changes and adapts due to growing internal or environmental constraints
- **Transformation:** the sudden emergence of a new technology or other driver that completely changes the game.

The exercise requires the storyteller to write detailed descriptions of what the world is like in those scenarios, covering topics from economic activities, environmental problems, to an individual's behaviour and fears (Dator, 2009). Dator (2009) noted that this is the "most crucial" (p. 2)part of the future visioning process, as it allows the storyteller to experience alternative futures in more granularity. It is in this process that the storyteller synthesises their own images of the future, processes their response to the proposed problems, and hypothesises the possible futures in the form of stories. However, while this exercise requires individuals to synthesise and reflect, the stories themselves are meant to be discussed with others, so the image of the future can be shared through stories.

Experiential Futures Ladder

Experiential future, a term coined by Candy (2010), focuses on "the manifestation of one or more fragments of an ostensible future world in any medium or combination of media… designing and staging interventions that exploit the continuum of human experience." (p. 3). Experiential future does not limit itself to any medium but "takes in all manner of other things that one might create in order to manifest, evoke and make available thoughts, feelings and insights about the whole gamut of possible futures" (Candy, 2017, p. 6). As previously discussed, as opposed to design fiction conveying futures through artefacts, experiential future communicates future through immersive, theatre like scenarios that participants can experience. In order to create these scenarios, Candy (2015) proposed *The Experiential Future Ladder* (Figure. 3.1.1), which was intended to help the futurists (storyteller, in this case) navigate between abstract and concrete creation of these scenarios as it moves from broad scope, general settings, down to minor details . McGonigal (2019) proposed using the Experiential Future Ladder as a simulation tool or thought experiment that allows the storyteller to think holistically about the future worlds and to communicate and feel for the possible futures ahead. The goal of experiential design is to turn these stories into scenarios so that others can experience and interact with them. However, before others come to experience these scenarios, the storyteller must first synthesise their futures. In the project *Hawaii 2050* (Candy et al., 2006) the futurists acted as storyteller first by writing detailed stories based on four images of the future and then turned the stories into scenarios for the citizens of Hawaii to experience and debate. In this way, the story told through the use of The Experiential Future Ladder can be seen as a prototyping tool that helps the storyteller to synthesise from abstract future to the concrete, as the future slowly becomes more and more

tangible as the granularity of the stories increases, so that eventually they can be experienced by the many.

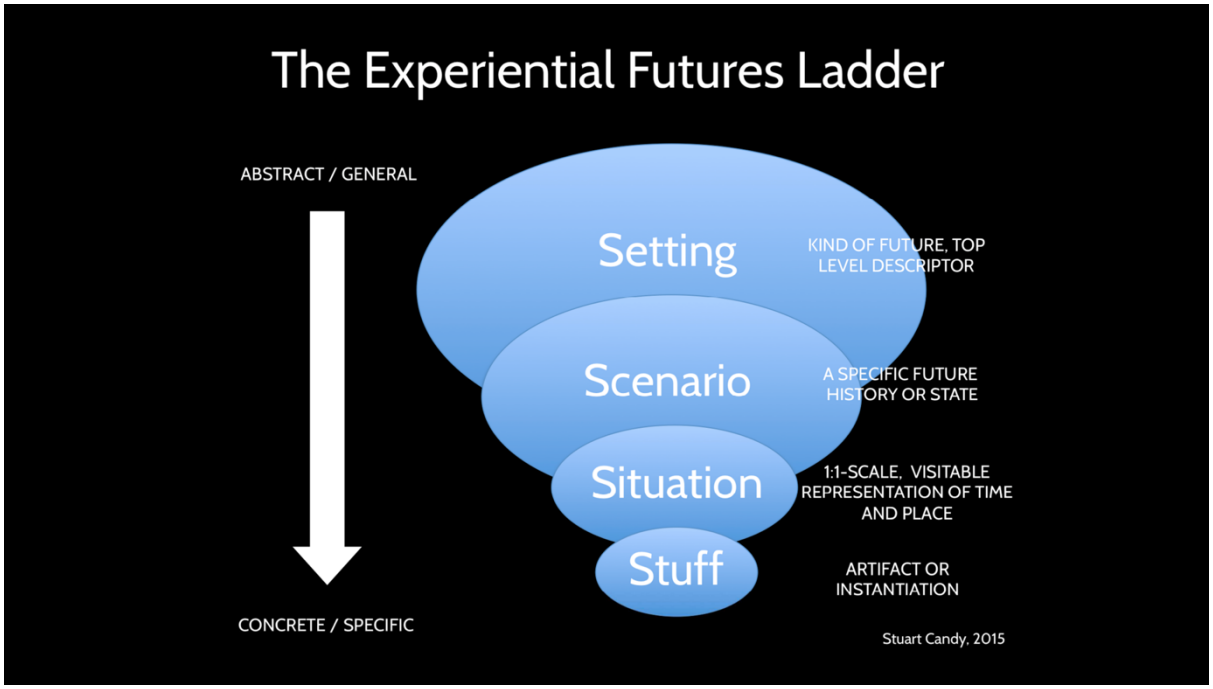

Fig 3.1.1. The Experiential Futures Ladder (Candy, 2015).

Future Through Personas

There is no better way to imagine the actual lived experience of a possible future than to 'experience' it first-hand. Personas are an evolution for the futurists to consider the realities of the proposed futures. Jalonen et al. (2017) called this approach *People Primacy Foresight*. In their exploration of the future, Jaline et al. (2017) first created trend cards and then interpreted them through established personas to answer the question "if the change were to happen then what is the impact on this person's everyday life?" (Jalonen et al., 2017, p. 33)

From there, they built stories based on the persona, using methods such as ‘A Day in the Life’, where they imagine how the individual’s morning to night life would be affected by the emerging trends. This approach is also echoed by Burdick (2019), who investigated how to use narrative-based design fiction to develop a future where it “allowed its creators to experience a future ‘from the inside’” (p. 75). In the piece *Trina,* Burdick (2019) tells the story of lone scholar Trina who lives in a desert in a far more technologically advanced future, showing how Trina interacts with the new normality.

Evidently, personas are used by storytellers to view futures through a new lens; in other words, to walk in the someone else’s shoes. Storytelling as a method helps expand the horizon of the storyteller and helps them to visualise details that may otherwise be overlooked if only seen from their own perspective.

3.1.2 Summary

As the boundaries between fiction and futures blur, storytelling emerges as a powerful means to bridge the gap between the yet-to-be with our reality. It is not only a means of entertainment but also for the storyteller’s own knowledge construction. The tools discussed in this section underscore the multidimensional nature of storytelling in shaping our view of possible futures. Dator's (2019) scenario exercise prompts individuals to hold space for multiple stories (and thus multiple futures) at once. The Experiential Futures Ladder helps the storyteller navigate from the abstract and the concrete, progressively refining their futures into tangible scenarios. Meanwhile, the utilisation of personas enables storytellers to

empathise with the perspectives of others, broadening their horizons and unearthing nuanced details that might otherwise remain concealed.

Perhaps the biggest advantage of using storytelling as a tool for the storyteller to synthesise futures is that it fosters a deep emphasis on personal images of the future that empowers us to not only envision them but also to actively participate in shaping them. By combining creativity with synthesis, reflection, and empathy, storytelling helps us form more conscious engagements with the future.

3.2. Stories as a tool for presenting collective speculations of the future.

While the previous methodologies place significance on storytelling as a tool for the storyteller themselves to synthesise visions of the future, the following examples focus on using collecting stories of the future told by others in order to synthesise a collective vision of the future. This idea can be found in the Ethnographic Experiential Futures (EXF) process, which follows the structure of Map – Multiple – Mediate – Mount (see Figure 3.2.1). The Map phase refers to “inquire into and record people’s actual or existing image of the future” (Candy & Kornet, 2019. p.11) and is established by asking participants to think and describe their lives in the specified scenarios, these stories are then collected and reflected upon, before the storyteller (usually a futurist as in this case) mounts the collected insight into the context of futures. The EXF framework is built upon an earlier model of Ethnographic Futures Research rooted in anticipatory anthropology (Textor, 1980), which aimed to “elicit from members of an extant social group their images and preference (cognition and values) with respect to possible or probable future cultures for their social group” (Textor, 1980, p

10.) This is done by asking questions such as “what potential changes in your sociocultural system do you (1) want (2) fear (3) expect?” (Veselsky & Textor, 2003, p. 31-32), to understand their imagined experience as a story, and traces of these questions can be found in the EXF framework even today (Candy & Kornet, 2019).

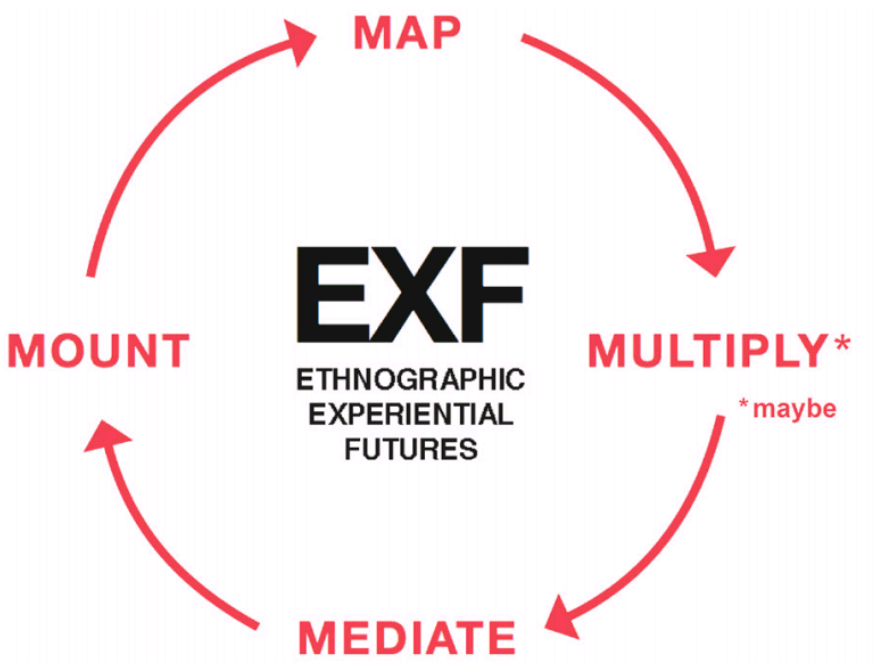

Fig 3.2.1 The EXF Cycle (Candy & Kornet, 2019).

Differing from the tools discussed in the previous section, EXF requires participants to conjure up their own images of the future, and the burden of storytelling shifts from the futurist to the participants, where participants become storytellers themselves. Then, these stories are gathered and synthesised by the futurist, and the futurist completes the final retelling of their collective stories using various mediums. This process has also been referred to as “social dreaming” by Dunne and Raby (2009); however, they did not give a clear definition for the term as “social dreaming” is usually used to refer to a practice in

psychoanalysis. Candy (2010) referred to a similar process as “social foresight”, expanding on the term first defined by Slaughter in 1996. Candy (2010) noted that social foresight encapsulates the “notion of futures-orientation and awareness as a distributed and persistent property of the thoughts and behaviours of the many, as opposed to the preservation of a few designated specialists and institutions” (p. 293), and stories are a good medium for collecting and processing this social wisdom.

This notion of viewing the future through the eyes of others is complemented by storytelling as storytelling believes in the multi-perspective on the truth. Multi-perspective storytelling refers to the belief that “all views are true… they are relevant to collectively form a better understanding of whatever is there – of what is reality” (Thalhofer, 2018, p. 4). This characteristic suggests that images of the future can be created and refined through constant discussion and exchange between the different perspectives, so that we can understand the future in its entirety.

3.2.1 Project examples

FoundFutures (Chinatown)

FoundFutures is a project by Dunagen and Candy (2007) in Honolulu’s Chinatown. For six weeks in 2007, the futurist duo developed alternative futures for Chinatown and created artefacts which they installed around the neighbourhood as a form of a guerrilla installation. These items ranged from a bronze plague at a street corner commemorating a fake epidemic that started in the neighbourhood to a new Chinese flag that symbolises an earth friendly China. These installations were ’droplifted’ into their ‘native’ context (Dunagen & Candy, 2007) and the public’s reaction to the installation was registered. The final act of the project

was to invite stakeholders of Chinatown to take part in a workshop to given them the "opportunity to reflect both systematically and imaginatively on the possible, probable and preferred futures for the area over a longer time horizon than they might typically be accustomed to planning" (Dunagen & Candy, 2007, p. 5). During the workshop, participants delved into the historical context of Chinatown, then discussed the problems they faced at that time, before finally moving on to imagining the future in different scenarios where they were asked to summarise their vision in a metaphor.

Here, storytelling is used to evoke more stories – it is both used as a way for the storyteller to synthesise their visions of the future in the first phase (creation of alternative future scenarios and artefacts), but also as a way to gather the public reflections as evident in the workshop outcome. The role of the storyteller shifts from just the futurist to the public, enriching the stories about the future with more perspectives and insights.

Causing an Effect

Kornet ran the project *Causing an Effect* in 2015, which included three case studies aimed at understanding how ordinary people living in real industrial communities in Canada and America become changemakers to overcome the uncertainty of social and environmental change. The project started with a literature review, then Kornet collected stories from the residents living within the three communities. The participants were asked questions related to their experience of becoming activists; other prompts included asking the participants to come up with optimistic, pessimistic, and probable futures. The interviews were then synthesised into personal stories and cross-examined for patterns and values (Kornet, 2015).

This project used storytelling to collect future stories from the residents during the interview phase, where “through the process of abstraction, the experiential future research method enables participants to demonstrate their values and beliefs in a safe space” (Kornet, 2015, p. 7). The outcome of the project was an exhibition that consisted of the personal stories of the interviewees and designed fiction artefacts that were based on their stories. In this case, storytelling was used as an insight gathering process to collect visions of the future from the masses which were then distilled by the futurist into an exhibition.

1-888-FUTURES

The project *1-888-FUTURES* (Extrapolation Factory, 2015) presents a compelling synthesis of storytelling and design as a means to materialise distant future scenarios into tangible artifacts through narratives. Participants, referred to as ‘visioners’, call the hotline to place an order of a gift from the future for a specific person based on their own imagining of the future, then the futurists “takes a future dream, vision or problem, renders it tangible as a “future present”, and delivers it to a specific individual” (Extrapolation Factory, 2015). The stories recorded from the hotlines ranged from wanting to hunt endangered languages to having a personal pocket void that allows an individual to escape into nothingness (1-888-futures, n.d.). The project's distinctiveness lies in its focus on the intimate personalisation of each individual’s future dream, unlike other projects where it is the collective vision that gets distilled. Here, each individual story is manifested into tangible objects, which could lead to more empathetic connections between the participants and their imagined future, as storytelling helped them transcend the temporal boundaries of dreams.

3.2.2 Summary

Just as cavemen told stories about the creation of the universe, trying to make sense of a past that they did not understand, we, too, can tell stories about the future and use stories as a medium to explore and learn about the unknown (Andrews et al., 2009; Brady, 1997). Whereas the previous chapter focused on the role storytelling plays in the individual's synthesise of the future, these examples of story-telling based projects delved into the diverse roles of storytelling in forming collective future visions. The examples illuminate the potential of storytelling to converge the multitude of voices and perspectives into a collective tapestry of future visions. As seen in alternative futures, stories create space for exploring the multi-perspective nature of possible futures. In the Experiential Future Ladder, stories are used to carefully analyse and build concise images of future. Through the use of persona, stories about the future are experienced through a more immersive and emotional lens. In EXF, stories are used as a collaborative tool to gather public insights and are retold again to evoke conversations and reactions. These examples underscore storytelling's versatility, as it has the capacity to help the wider public to reflect, synthesise, build empathy, and enrich narratives about futures. By embracing narratives from various sources, this approach enriches the futurescape, fostering inclusive, imaginative dialogues that reach beyond individual boundaries. Storytelling, when harnessed as a means of social foresight, catalyses the formation of shared futures, showcasing its profound ability to shape shared destinies.

3.3 A Phenomenological Approach to Stories about the Future

Stories represent a compact way of conveying value, beliefs, worldview, emotions, and perspectives of the individual, and I argue that the core reasoning behind examining the future through storytelling is rooted in a phenomenological understanding of the future. Phenomenology is most commonly found within the discipline of philosophy which refers to

the approach of "describing the essence of a phenomenon by exploring it from the perspective of those who have experienced it… both in terms of *what* was experienced and *how* it was experienced" (Neubauer et al., 2019, p. 91). As such, phenomenology is the study of the way we perceive and understand a phenomenon, through our lived experience of the world (Smith, 2013). An obvious reason that makes it relevant in the context of storytelling and the future is that the future cannot be measured through units of time or numbers. As previously mentioned, images of the future can only be expressed by "images, thoughts, feelings, and the multiple ways these are subsequently expressed in the outer world" (Slaughter, 2018, p. 444). This is consistent with phenomenology's interpretation of experience.

Furthermore, I argue that our understanding of the future is based on differences of experience rather than through logical units of time. If all aspects of our lives remained the same after 50 years, and there was no difference in our lived experience, would we still think of it as "the future"? When thinking about what the future will be, we rarely answer with "the future will be in 50 years", but rather "the future will have flying cars, virtual worlds, teleportation". In line with the definition of phenomenology, it is the difference in our expectations of the imagined lived experience that makes up for the image of the future, it is also why futurists favour long-term futures, precisely because that is long enough for "new ideas and actions [to create] a previously unimaginable social reality" and that (McGonigal, 2022). Stories, by definition, require a narrative and a sequence of events. As previously mentioned, "all stories share a similar experiential (as opposed to abstracted) approach to encapsulating information" (Andrews et al., 2009. p. 8), and so stories naturally tend towards the phenomenological approach of describing what and how things are experienced, thus fitting seamlessly into expressions of the future.

When phenomenology is used as a research method, there are two schools of thought within the discipline: hermeneutic and transcendental phenomenology (see Table 3.3.1). Transcendental phenomenology (sometimes referred to as descriptive phenomenology) was developed by Husserl and is based on the understanding that "reality is internal to the knower" (Neubauer et al., 2019, p. 92) and whoever observes the phenomena, must separate themselves from the world in order to achieve a bias-free understanding of the phenomenon. Hermeneutic (sometimes referred to as interpretive phenomenology), on the other hand, is based on the ontological assumption that all "lived experience is an interpretive process situated in an individual's lifeworld" (Neubauer et al., 2019. p.92) and that the observer is not bias free but rather a part of the world and understands the phenomenon by their own interpretation. This divergence in understanding of phenomenology is also reflected in the ways that storytelling is being used in the context of the future.

	Transcendental (descriptive) phenomenology	Hermeneutic (interpretive) phenomenology
Philosophical origins	Husserl	Heidegger Gadamer
Ontological assumptions	Reality is internal to the knower; what appears in their consciousness	Lived experience is an interpretive process situated in an individual's lifeworld
Epistemological assumptions	Observer must separate him/herself from the world including his/her own physical being to reach the state of the transcendental I; bias-free; understands phenomena by descriptive means	Observer is part of the world and not bias free; understands phenomenon by interpretive means
Researcher role in data collection	Bracket researcher subjectivity during data collection and analysis	Reflects on essential themes of participant experience with the phenomenon while simultaneously reflection on own experience
Researcher role in data analysis/writing	Consider phenomena from different perspectives, identify units of meaning and cluster into themes to form textural description (the what of the phenomenon). Use imaginative variation to create structural (the how) description. Combine these descriptions to form the essence of the phenomenon	Iterative cycles of capturing and writing reflections towards a robust and nuanced analysis; consider how the data (or parts) contributed to evolving understanding of the phenomena (whole)

Table 3.3.1 Excerpts from "Comparison of transcendental and hermeneutic phenomenology" (Neubauer et al., 2019).

The examples shown in section 3.2.1. are representative of the hermeneutic phenomenology approach as in the projects the researchers re-interpreted the lived experiences of others and then reflected upon their own experience. This is demonstrated especially by the EXF framework where the futurist collects the stories/imagined lived experience of other individuals and then interprets the insight by themselves through synthesise in order to produce an outcome, often in the form of design fiction. The outcome is their reflection of other's lived experience, and in the project *FoundFutures: Chinatown* (Dunagen & Candy, 2007), the futurists were documenting the reaction from the public to their synthesised artefacts and then re-processed them through a collective workshop. This is in line with the definition of hermeneutics phenomenology which postulates that the researcher should "capture their reflections in writing and then reflect and write again, creating continuous, iterative cycles to develop increasingly robust and nuanced analyses" (Bynum & Varpio, 2018, p. 253). A key difference between the two approaches is that transcendental phenomenology requires the researcher to be impartial, while the hermeneutic approach assumes that "the researcher's past experiences and knowledge are valuable guides to the inquiry. It is the researcher's education and knowledge base that lead him/her to consider a phenomenon or experience worthy of investigation." (Neubauer et al., 2019, p. 95). In these examples, the futurist plays a key role in re-interpreting the (imagined) lived experience of others, and the outcome focuses on "how" the phenomena is being experienced by others.

The examples shown in 2.2.1 are leaning more toward a transcendental approach. Husserl's interpretation of phenomenology also rejects the absolute focus on objective reality and

instead believes that “phenomena as perceived by the individual’s consciousness should be the object of scientific study” (Neubauer et al., 2019. p.92). So, we see the use of storytelling more on how the researcher themselves interprets the circumstances given and allows the researcher to go beyond obvious sensory perceptions on the topic and dig deeper into the experience of thoughts, emotions, and imagination (Reiners, 2012). This is highlighted in the methods Four Alternative Futures, which covers the width of the possible futures; the Experiential Future Ladder, which covers the depth of the futures, and Personas that allow the researcher to process their deeper reflections on the topic as someone else, bracketing their own biases on the topic. The only inconsistency is that the researcher in this case is not completely impartial to the phenomena as they are still interpreting the future from their lived experience; however, the use of persona can, to some extent, elevate this symptom. The second phase of the transcendental phenomenology approach is reduction, where a complete description of the phenomenon’s meaning is constructed from the researcher’s individual experience (Ashworth, 2003). The process requires “imaginative variation” where discussions on the researcher’s description of their experience is distilled to form a uniform consensus (Gill, 2014). As such, “this process relies on intuition and requires imagining multiple variations of the phenomenon in order to arrive at the essences of the phenomenon” (Neubauer et al., 2019. p.92). This is evident in the Four Alternative Futures and Experiential Future Ladder, where both methodologies require the sharing of individual synthesise with others in order to cover the ‘multiple variations of the phenomenon’ needed to reach a general consensus. Here the researcher acts as a catalyst for articulating and reducing the understanding of the (imagined) lived experience of the future until they can synthesise the ‘core’ of their future vision.

The advantage of viewing futures through phenomenological storytelling is thereby two folds – first, the story approach ensures that we consider the individual's imaged lived experience to be a valid form of sense making in helping us create insights about future phenomena. It encourages us to think about the future from a first-person perspective and also to learn from other people's points of view through forced empathy, so we can create an "outcome [that] is an easy to approach and understandable story about a person and his future life enriched with the solution, manifestations, and ideas" (Jalonen et al., 2017. p.33). Secondly, when storytelling is used as a research method, the distinction between transcendental and hermeneutic phenomenology positions the researcher in different roles and leverages storytelling for either collaborative or analytical functions, depending on the focus. This way, the future is brought to life through the stories that are told and retold by the people who will live it.

3.4 Summary

The future, by nature, does not exist and thus we can only explore images of the future using storytelling in various mediums. Stories help us make sense of the unknown, and they are a low fidelity way of prototyping different possibilities of the future. When we tell stories, it is inevitable that we place ourselves in the story – whether as the storyteller in the way that we communicate our beliefs, values, and world view; or as a member of the audience by understanding the versions of reality presented to us through an emotional lens that enforces empathy and understanding. Just as stories contain multiple perspectives, we, too, try to paint the image of the future through the exchange the different perspectives.

By trying to understand the future through stories, we choose a phenomenological approach to the future. Phenomenology as a mindset allows us to interpret the future as a series of (imagined) lived experience, and phenomenology as a research method focuses on the 'what' and 'how' of the future experience. To understand the future through phenomenology is like the parable of the blind man and the elephant – the one that touches the nose thinks the elephant looks like a bamboo, the one that touches the body thinks the elephant looks like a wall. Similarly, the future we feel is only one facet in an unknown that contains multitudes. But with enough stories, we can place the future together piece by piece, story by story. In this manner, the future becomes something we explore collectively through our social foresight, and this future is coloured with our experiences, emotions, and dreams. By doing so, it also means we value a future where our collective imagination is just as valid as numbers, facts, and data. Understanding the future through phenomena means a more abstract and imaginative way of projecting the future; after all, we understand the future not through bloodless facts, but by the difference of experience. Just as we cannot be without the world, the future cannot be without our experience of it.

4. FUTURE IN SYSTEMS

In the context of today's interconnected world shaped by globalisation, the understanding that we exist within a complex web of interdependency is no longer new. For example, when the central bank makes adjustments to the interest rates, it triggers a chain reaction that can culminate in the inflation of everyday essentials. We sit in a web of entanglement, where changes flow from one entity to another, where changes are multiplied onto each other and yield unintended consequences despite the intentions (Meadow, 2008; Kim, 2015; Senge, 1990). An example of this is the inception of the plastic bag by Sten Gustaf Thulin in 1959. Thulin's noble aim was to curb deforestation by promoting reusable bags, thereby conserving trees (Weston, 2019). Regrettably, his well-intentioned innovation eventually propagated its own set of predicaments. Encapsulating this dynamic, Senge noted that "today's problems come from yesterday's solutions" (Senge, 1990, p. 42). Thus, comprehending the consequences of our actions, their ripple effects and subsequent ramifications on the broader landscape requires transcending temporal limitations and acknowledging the grander scale at which the future unfolds.

This imperative leads us to recognise that the tapestry of the future extends far beyond individual temporalities. We must embrace this broader perspective to apprehend the vast scope of futures. In section 1.5., I briefly discussed systems thinking as the generalisation of “a system of thinking about systems” (Arnold & Wade, 2015, p. 2). This discussion established parallels between systems thinking and futures, highlighting commonalities such as their focus on long-term perspectives, the influence of feedback loops, and their holistic nature. However, the convergence of systems thinking and futures extends beyond these initial observations and warrants a more comprehensive exploration. In this chapter, I will

explore systems thinking's perception of future, the perception of time, holism, and indigenous knowledge and how they can shape our perception of the future.

4.1. Systems thinking and Archetypes

The definition of systems thinking has been defined and redefined many times since its conception almost 40 years ago, it was first introduced by Richmond in 1987, yet he only later defined systems thinking as a way for the system thinkers to see both trees and the forest (Richmond, 1994). This definition was expanded on by Senge (1990), who defined systems thinking as "a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static "snapshots"" (p. 68), and further expanded on by Meadow (2008) who described a system as "an interconnected set of elements that is coherently organized in a way that achieves something" (p. 11) and that "a system is more than the sum of its parts" (p. 12). Arnold and Wadeso argued that systems thinking is so difficult to define as it requires "the application of systems thinking to itself" (Arnold & Wade, 2015, p.673). Figure 4.1.1 presents a comparison of the different definitions of systems thinking as summarised by Arnold and Wade (2015).

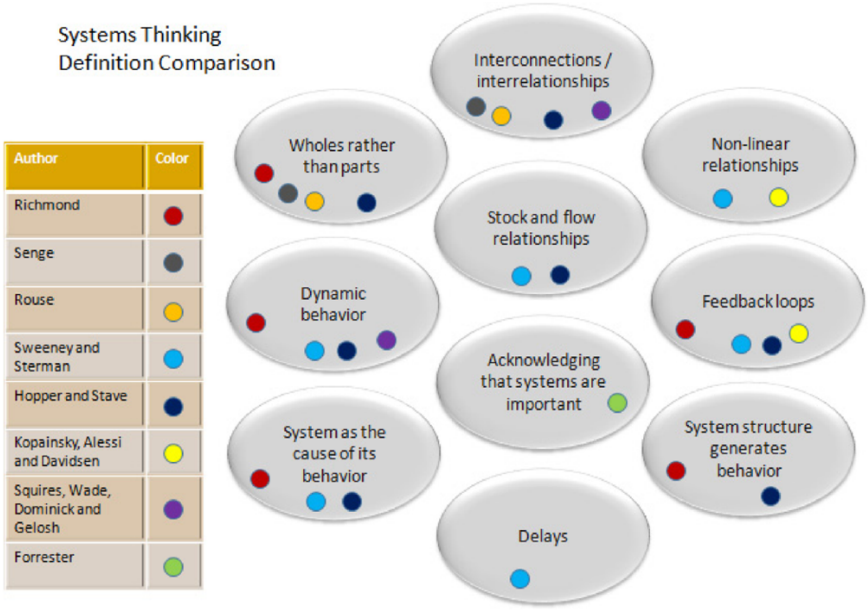

Fig 4.1.1. Comparison of Systems Thinking Definitions (Arnold & Wade, 2015. P. 674).

As the diagram illustrates, it seems the most agreed upon core components of systems thinking are interconnections and interrelationships (Hopper & Stave, 2008; Senge, 1990; Squires et al., 2011), focusing on the whole rather than parts (Hooper & Stave, 2008; Richmond, 1994; Senge, 1990) and that it consists of dynamic behaviour and feedback loops (Hopper & Stave, 2008; Kopainsky et al., 2011; Richmond, 1994; Squires et al., 2011; Sweeny & Sterman, 2000;). These are important qualities to consider since they can also be applied to the discussions about the future. As Meadow (2008) pointed out, "the future can't be predicted, but it can be envisioned" (p.168) when using the systems thinking approach. When talking about interconnections and the future, it is inevitable to talk about the connection between time and future. As previously discussed, the future is defined as "a time that is to come" (Merriam-Webster, n.d.). Time serves as the medium through which events unfold and transitions occur, rendering the future an inevitable outcome of the present. The future represents the yet-to-be-realised temporal domain that follows the present moment, carrying a sense of uncertainty, potentiality, and evolving possibilities. Within the context of

systems thinking, the perception of time is influenced by physics. In physics terms, a system abides by the second law of thermodynamics, which states that "for any change in a system, the total entropy of the universe must increase" (Cooper & Klymkowsky, 2013, p.116). And as a result, entropy is often referred to as the 'time's arrow' as it is one of the few qualities that can reliably mark and measure the passing of time. Similarly, systems also increase their entropy and decay over time, as it is dependent on the interactions between elements, and the elements can only interact with each other as time progresses. This means all systems are only in motion as time passes, as each component can only interact with each other in time. The idea of illustrating time as a tangible component of a system is demonstrated in systems thinking tools, such as casual loop diagrams and stock and flow diagrams. The passing and inevitability of time (and by extension, the future) is denoted by lines/arrows travelling between the different components, making up system archetypes that lead to their inevitable future as illustrated in Figure 4.1.2. below.

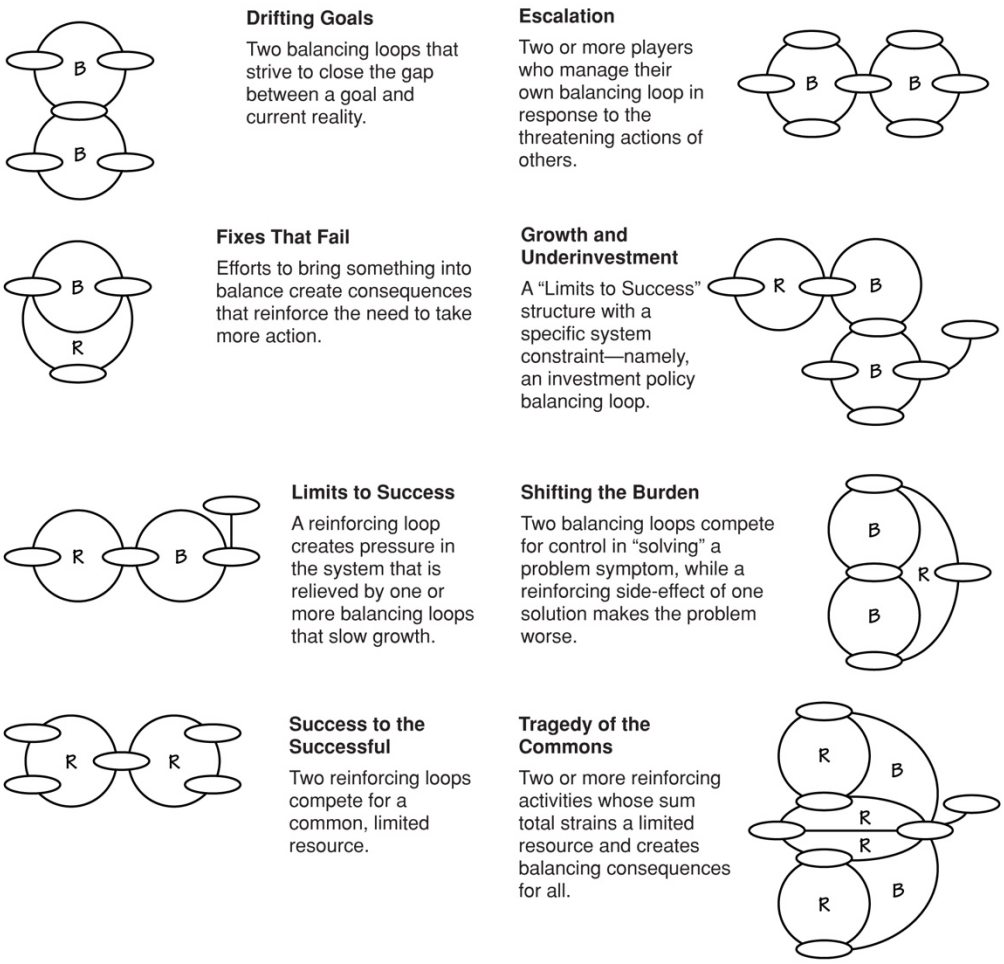

Fig 4.1.2 Systems archetypes as structural pattern templates (Kim, 2015).

In systems thinking's terms, the lines and arrows used in causal loop diagrams represent either positive or negative relationships between them; positive here means that "it reinforces the direction of change" while negative means that "it opposes, or reverses, whatever direction of change is imposed on the system" (Meadows, 2008, p.187). But no matter the direction of travel, these interactions must happen over time. Combined with system archetypes as shown in Figure 4.1.2., systems are able to anticipate the future to an extent based on the known patterns of behaviour. This idea is echoed by Meadow (2008) who proposed that "systems thinkers use graphs of system behaviour to understand trends over time… We also use behaviour-over-time graphs to learn whether the system is approaching a goal or a limit, and if so, how quickly" (p. 20). Similarly, Kim (1992) suggested in regard to

system archetypes that we need to “see the world as patterns of behaviour over time” (p. 2) and that ”managing at this level allows us to anticipate trends and accommodate them” (p. 2).

In particular, the archetype of “Tragedy of the Commons”, illustrated in Figure 4.1.3. below, exemplifies how futures can be predicted through systems thinking. The archetype depicts the case when all parties want to advance their own gain but ultimately make things worse for everyone involved. The following example illustrates the archetype by applying it to the fishing industry – both groups 1 and 2 are interested in increasing their own net gains through the amount of fish they catch (in loop R1 & R2); however, their actions have a positive relationship with the amount of effort required to catch the fish (shown in loop R3&R4). As a result, the more fish they catch, the more effort it takes to catch more fish. This cycle repeats until it hits a point of diminishing return where the local fish population is reduced to zero. Each group will invest more and more effort in catching the fish while receiving less and less net gain. This is due to R1, R2, R3 and R4 all being reinforcing loops, sustained by the resource limit (in this case the regeneration rate of fish) which has no connections to any other components in the feedback loops and therefore cannot self-correct or balance other’s behaviours. Once the shared common resource runs out, the current reinforcing loops turn into vicious cycles where, as one thing decreases, the other also decreases, resulting in the inevitable collapse of the system and leading to net loss for both groups. This explains the name – tragedy of the commons, as “the common becomes overloaded and everyone experiences diminishing benefits” (Kim, 2015. p.1). In this example, we see how the system archetype is able to predict the future due to its ability to anticipate system behavior through patterns.

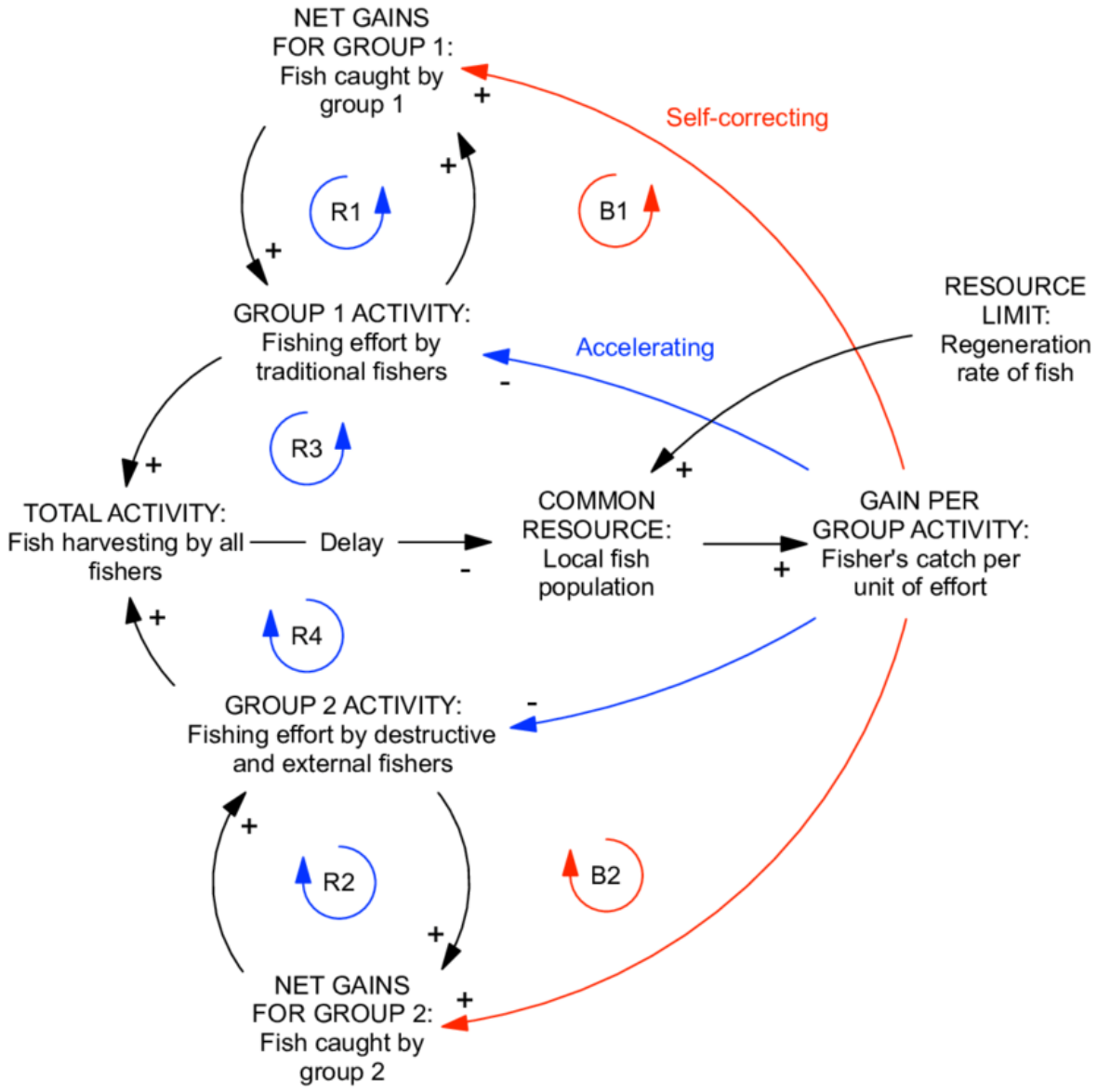

Fig 4.1.3., Tragedy of the Commons archetype (Affata et al., 2018).

Through these explorations, we can establish that:

1. Like systems thinking, the future must be looked at holistically to grasp the bigger picture, as any changes in the system can lead to increased entropy and consequences that may sometimes oppose our intention (demonstrated by the example of the plastic bag);

2. Time is crucial to our perception of the future, and systems thinking calls for time to be viewed holistically as changes occurring interconnectedly (demonstrated by the second law of thermal dynamics);
3. Systems thinking is able to predict futures by recognising system behaviours as a whole and mapping their patterns (demonstrated by system archetypes and tragedy of the commons).

I would further argue that the future can be described as change rippling through a system, the time and delay it takes for the change to reach us is the future that we anticipate. A common misconception about the future is that it is something looming in a vacuum, but when examined from systems thinking's perspective, time, and consequently the future, does not happen in isolation. They are the accumulation of change that has already happened and are currently happening, as one feedback loop feeds into another, and all futures can be traced back and find their roots in the past. The relationship between time, past, and future is crucial to our understanding of the future.

4.2 The perception of Time and Futures

Time is something that objectively exists when viewed from a physics' perspective; however, philosophy has other takes on how time is perceived and experienced. In the 4th century, St. Augustine discussed the concept and relation of time to God in his *Book XI of Confessions*, where he concluded that we measure the duration of time through our memory, and therefore time is “a matter of measuring something wholly in the mind” (Le Poidevin, 2019, chapter 3). This again links back to the discussion in the previous chapter on phenomenology (see

chapter 3.3), where the future (the extension of time) is also perceived as something that happens internally first.

If our perception of time is entirely based on internal happenings, what are the things that shaped time into what we know today? A common symbol associated with time is a clock, whether digital or analogue; yet the clock is more than just working as an instrument for time keeping. Dohrn-van Rossum (1996) noted that "'the introduction of public clocks was not only a technological but also a social innovation" (p.126) because the modern perception of clock time is heavily influenced by capitalism. Time plays a major role in the synchronisation of labour, to the extent that "capitalism thrives to impose abstract clock-time" on the masses for efficiency (Martineau, 2015, p. 145). Indeed, the idea of time zones followed the rise of railroads, and when first introduced in the late 1883s, caused "temporal dissonance" (Gleick, 2016) among travelers. Later, in 1911, Taylor wrote *The Principles of Scientific Management* where the suggestion of using clocks to mark labourers' work hours first emerged. The modern clock time is then perfected by Ford who maximised work hours and efficiency, and clock time was used to measure if an employee was profitable (Leon, 2016). It was also Ford who famously shut his factory on Saturday and Sunday to spread the idea of the "weekend" as we know it today. Through the brief history of modern clock time, we can see that capitalism has successfully abstracted the concept of time from its original context by linking it solely to productivity. To this, Thompson (1967) observed that "time is now currency: it is not passed but spent" (p. 61). As such, time is now a capitalist tool and associated with productivity and monetary growth. By extension, the future has also become an isolated concept, detached from the experience of time.

If we want to know what an alternative experience of time could be, is it worthwhile to look globally to indigenous cultures around the world who have preserved their connection to *event time.* Event time can be described as viewing tasks in relation to other tasks, where we progress on to the next task when we perceive that the task before has been completed (Levine, 1997), thereby viewing time as a series of events. For example, Synge (1907) noted in his travels to the Aran Islands that the locals experienced time by the direction in which the wind blows, and Burman monks have described their routine by saying they get up “when there is light enough to see the veins in the hand” (Salas, 1966, p. 75). Thomspon (1967) recounted that in Madagascar, time is measured by "a rice-cooking" (around 30 mins) or "the frying of a locust" (a moment). The characteristics of event time is that it is seen in relation to others – in the examples above, the Burman monks do not set a specific time for getting up but act according to when the sun rises. This notion of viewing time not as a set or absolute unit relates largely to those aspects of systems thinking that focus on interconnections and looking at elements in their entirety rather than their parts. We can further observe that it is more likely for those cultures that have preserved event time to perceive time as circular instead of a linear progression. When asked about their perception of time, the Australian Aboriginal peoples describe time as “a pond you can swim through – up, down, around” (Janca & Bullen, 2003. P.41). Most Native American cultures have also been found to have a circular and cyclical view of time (Csaski, 2019). Similarly, relics uncovered from the ancient Mayan people suggest that they had formed their view of time by observing cycles in the natural world, the cosmos, and even in their own bodies (Zorich, 2013). A theory on the prevalence of event time and circular time in indigenous cultures is that the thinking is not influenced by a Christianity-based preference for a more linear progression of time as manifested in deeply rooted beliefs such as “when I die, I go to heaven” (Csaki, 2019), instead, these indigenous people’s perception of time comes from observing heavenly bodies

and the natural world, in which things form circular patterns of behaviour (Fixico, 2003, p. 42).

It is understandable that this perception of time as circular is more in line with systems thinking as nature is full of systems working in feedback loops that feed into each other and need to be observed as a whole. I would argue that it is this perception of time as circular, balanced and reinforcing, that informs a holistic approach to the future. When time is viewed in a circular format, it is natural to assume the actions of today would have an impact on tomorrow's future. In this way, we can see how the future becomes an extension of the actions taken in the present instead of being perceived an abstract concept with unseen and subsequently neglected outcomes. One example that clearly illustrates short term and long term futuring is the process of Ni-Vanuatu preparing for upcoming storms by observing the early flowering of their mango trees which reflects the change in weather (Evans, 2023). Another example is Australian firefighters adopting the process of burning as a fire control method to reduce bush fires that was developed by indigenous Australian people (Russell-Smith et al., 2013). Furthermore, reports released by Worldbank explored the environment contributions made by indigenous people (see Figure 4.2.1), which highlights that despite occupying only 20% of the world's land surface, indigenous communities nurture 80% of the world's biodiversity (Worldbank, 2003; 2008). Whilst Worldbank may not have explicitly cited the future or systems or circular time perception as their primary focus, We can see that various forms of indigenous knowledge makes a significant contribution to the health of the planet and thus that their world view helps secures the short- and long-term futures of us all.

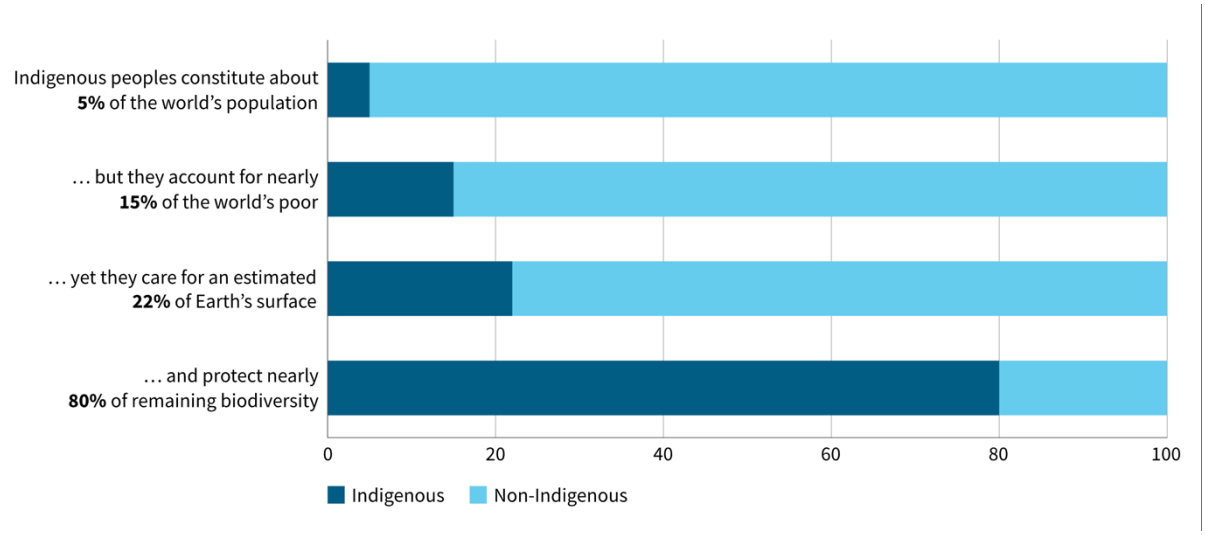

Fig 4.2.1. Indigenous peoples and the environment (Trewin et al., 2021).

4.3 Case study: Māori perception of time, future, and Kaitiakitanga

Much like the previously discussed indigenous groups, the traditional Māori perception of time is also circular, which is demonstrated by the proverb *Kia whakatōmuri te haere whakamua - I walk backwards into the future with my eyes fixed on my past.* Rameka (2016) explained the Māori perspective as follows:

> Patterson (1992) argues that, from a western perspective, the past tends to be behind and one's goals and aspirations relate to the future, which is ahead. From a Māori perspective, the opposite is the case. The past and the present are knowable, and so are viewed as in the forefront of human consciousness, whereas the future cannot be seen and therefore is conceived of as 'behind' (Walker, 1996). Walker (1996: 14) explains that the individual is 'conceptualised as travelling backwards in time to the future, with the present unfolding in front as a continuum into the past'. This

> conceptualisation of time does not leave the past behind; rather one carries one's past into the future. (p. 387)

The Māori perception of time is also complex as it is rooted in their spiritual beliefs as well as in the physical realm. With the perception of the future being a continuation of the past, it is important to understand what is understood as the "past". One key concept to the understanding of Māori values is whakapapa, which refers to genealogy, but also "links people to all other living things, and to the earth and the sky, and it traces the universe back to its origins." (Taonui, 2015). Moreover, this extends to the Māori perception of a lifeline of all those who existed from the past into the present, and everything that is passed on from one generation onto the next, as well as connecting the individual to their spiritual world (Rameka, 2016). As such, the perception of time is both tied into their spiritual beliefs as well as their surroundings. Cheung (2008) stated that "there is no separation between the physical and spiritual worlds; in the holistic Māori worldview they are continuous" (p.3).

Kaitiakitanga is a demonstration of this worldview and refers to guardianship and protection, especially of the environment (Te Ahukaramū Charles Royal, 2007). Kaitiakitanga consists of three components: Mana (spiritual power), Tapu (spiritual restrictions), and Mauri (life force). They are interconnected as it is believed that the mana of a place is expressed in the lives occupying the land, such as flowers blooming and birds coming to feed. In order to protect the mana of a place, tapu needs to be placed sometimes in the form of rāhui (restrictions). When the land prospers, mauri, which manifests itself in ways such as an abundance of fruit or animals, also increases (Te Ahukaramū Charles Royal, 2007). The mana, tapu, and mauri relationship can be depicted using a casual loop diagram as used in systems thinking (see fig. 4.3.1).

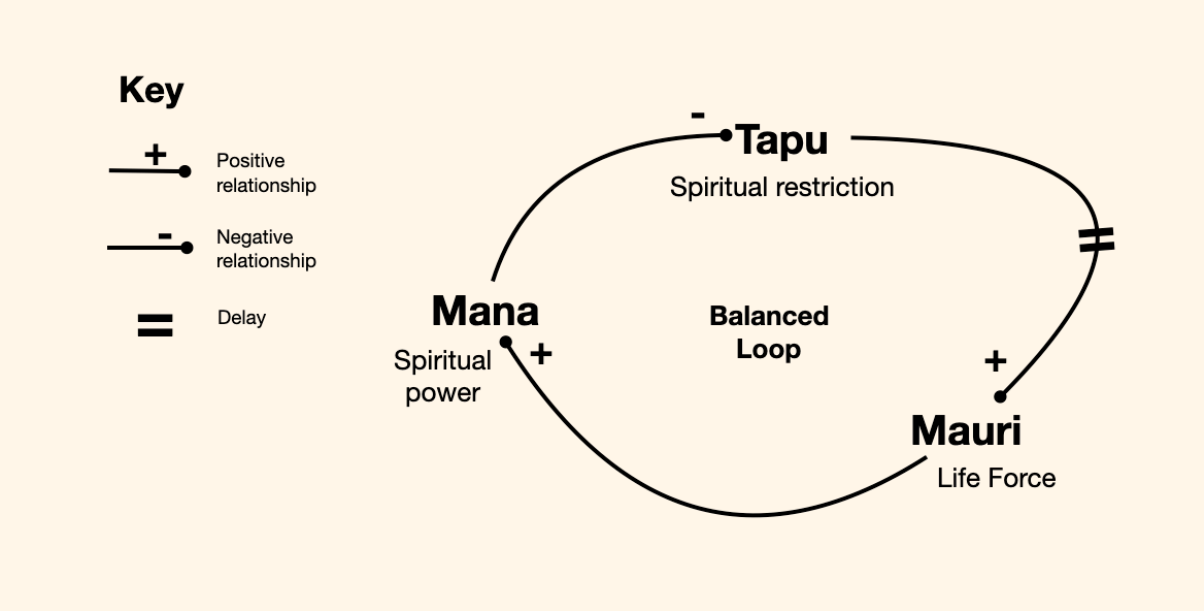

Fig 4.3.1. Casual loop diagram depicting key concepts in Kaitiakitanga

As shown in the diagram, the three components create a balanced loop, where tapu and mauri, and mauri and mana have a positive relationship to each other (when one increases so does the other, and vice versa), and mana and tapu have a negative relationship (when one increases the other decrease, and vice versa). Together they form a balanced loop as there is only one negative link in the cycle. Balanced loops are essential for sustaining futures as this prevents vicious cycles or the exhaustion of resources, as they tend towards equilibrium and thus stabilise themselves. However, the effect is not immediate as noted by the delay between tapu and mauri. Delays refer to changes in the system that are not immediate, and they are "strong determinants of behaviour" (Meadows, 2008, p. 57) as they have the ability to change the system behaviour over time due to the systems "responding to each other through delays, entraining each other in their oscillations, and being amplified by multipliers and speculators"

(Meadows, 2008, P. 58). The delay can be thought of as the future we anticipate in the system behaviors. In the case of kaitiakitanga, the delay between tapu and mauri allows the system leniency in dealing with small fluctuations of changes to slowly balance itself against the previous actions.

Referring back to the system archetype “Tragedy of the Commons” discussed in chapter 4.1., this system is inherently unsustainable as there are only reinforcing loops that benefit each individual to peruse their own goal, which in turn causes the limited resource to run out, eventually creating a situation that is worse for all (Kim, 2015). In the example of fishing, company A and B both try to maximise their profits by catching more fish, which ultimately exhausts the fish population so that no fish are available anymore for either company, thereby making the situation worse overall. This process is illustrated previously in Figure 4.1.2.

When examining this archetype through the lens of kaitiakitanga, we find the ‘Tragedy of the Commons’ is an unlikely scenario. Firstly, “kaitiaki” refers to guardian, where the individual is entrusted with the responsibility to protect and care for the land (Te Ahukaramū Charles Royal, 2007), thus going against the intention of maximising one’s own profit. Secondly, the practice of kaitiakitanga would place a balanced loop between the total number of fish caught and the fish population, as demonstrated in Figure. 4.3.3. As the total number of fish caught increases, the mana of the water will decrease, leading to an increase in rāhui (fishing restriction, as a part of tapu and spiritual restriction) for fishing, which allows the fish population to replenish with a delay.

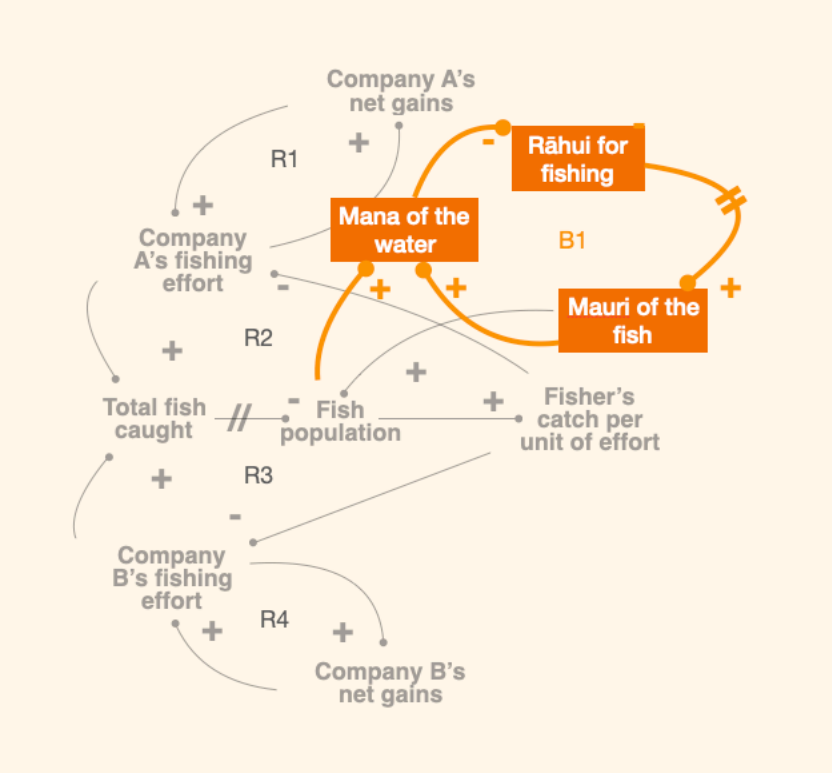

Fig 4.3.3. 'Tragedy of the Commons' archetype with kaitiakitanga in place

In the revised version of the 'Tragedy of the Commons' archetype that has kaitiakitanga in place, we see that, contrary to the original archetypes where it forms four reinforcing loops with 'regenerate rate of the fish' as the single, unchecked resource of which the entire system depends on, kaitiakitanga adds a balanced loop to the system which helps it regulate itself towards an equilibrium. The three components of kaitiakitanga connect the 'regeneration rate of the fish' (in this case, labelled as the mauri of the fish) to the fish populations by enforcing rāhui in connection to the mana of the water, as determined by the fish population. This way, as the fish population decreases, kaitiakitanga is adopted in order to regulate the fish population, as demonstrated by loop B1. The added balanced loop changes the system behaviour from a series of reinforcing loops to a balanced one, regulating itself and thereby ensuring a sustainable system for the future. In practice, kaitiakitanga has been cited as the reason why Sealord had to reduce hoki fishing on New Zealand's Westcoast (Te Ohu

Kaimoana, 2018) as well as for the fishing rāhui on Maunganui Bay since 2016 to preserve the local ecosystem (Ngati Kuta & Patukeha Hapu, 2016, see fig. 4.3.4). Here we can see that the circularity in the Māori worldview inadvertently prevents the collapse of the fish population and creates a sustainable model for a thriving future. As a result, examples of the application of kaitiakitanga can be seen in the Para Kore ki Tāmaki (Zero Waste) program, the Ngāroto Catchment Management Plan, Tūpuna Maunga Authority, and freshwater model in Auckland (Independent Maori Statutory Board, 2019). Kaitiakitanga is also referred to in section 2(1) of New Zealand's Resource Management Act (1991) and redefined in in the7(a) Resource Management Act (1997). All of these examples show the benefits of adopting kaitiakitanga as a worldview when it comes to creating a sustainable future and preserving the currently ecological landscape.

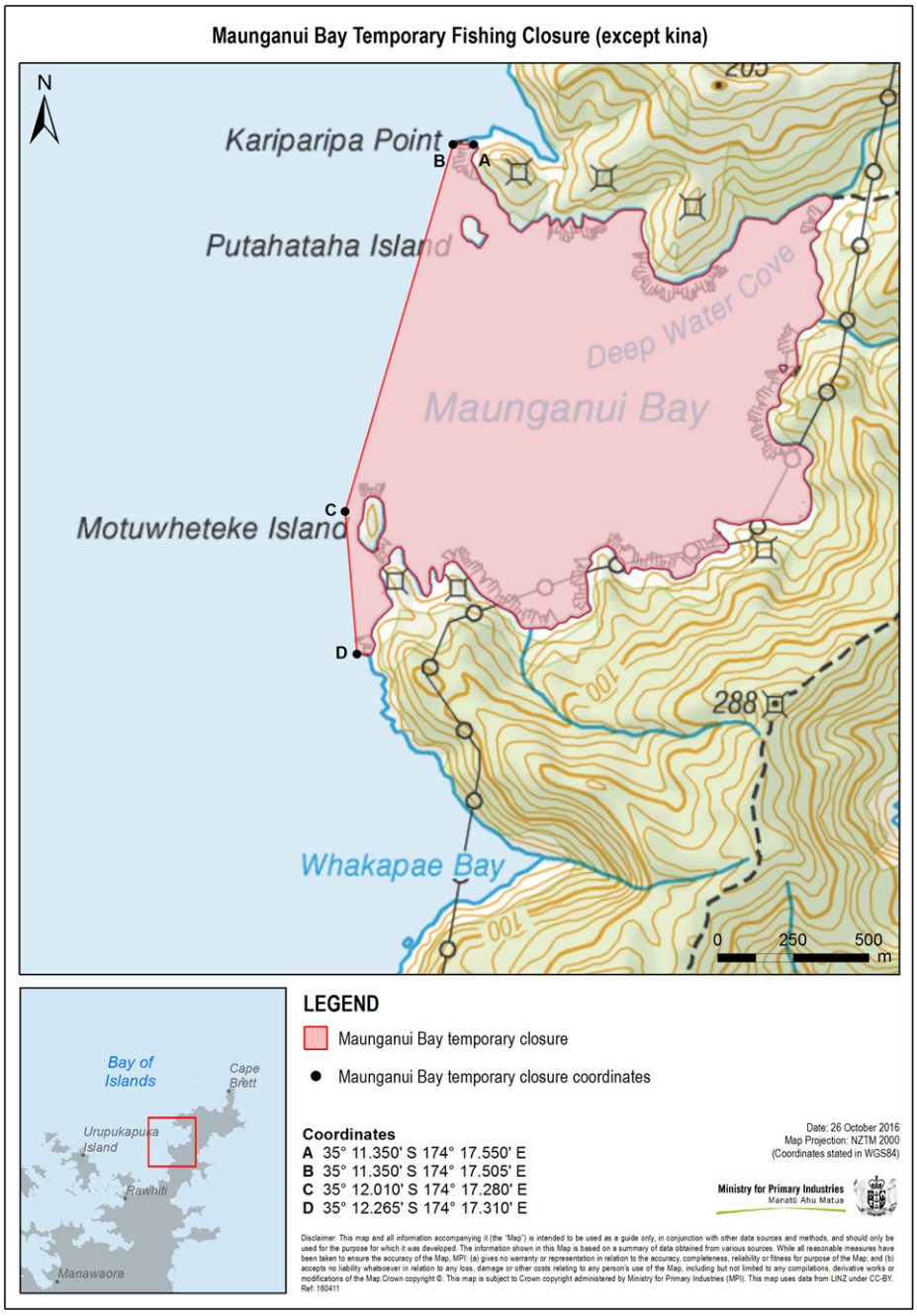

Fig 4.3.4. Boundaries for rāhui placed on Maungan.ui Bay at the request of Ngati Kuta and Patukeha Hapu (Ngati Kuta & Patukeha Hapu, 2016)

I argue that the power of viewing time not as a linear helps to reform our focus of the future. The linear view of time demonstrated by clock time has been in existence for centuries, but as Martineau (2012) noted, “it is only after the consolidation of capitalism that the process of

universalisation of clock-time will truly unfold, that clock-time will embark on its path to social hegemony" (p.79). The destructiveness of clock time's impact on our ability to think about the future has come only after capitalism has absorbed clock time as a means for it to measure and maximise productivity. Although time passes at the same rate through all the components in a system, the abstraction of time from its surroundings also extends to our abstraction of the future and shifts our focus to abstract things: profit per quarter, annual GDP growth, KPIs, and so forth. McNally (2004) commented that "the result is a process of real abstraction through which concrete activity becomes subordinated to its abstracted (and alienated) forms of appearance. In the commodified world of capitalism, the system of commodity exchange revolves around the most abstracted form of value – money – while 'forgetting' its roots in concrete human labour" (p. 155). I would further expand and argue that this abstraction has also made us forget the future roots in the concrete, "real", physical world.

In the example of the 'Tragedy of the Commons' for overfishing, abstract linear time focused more on the profits we generate as time goes on rather than on the effect it has on the environment (as shown in the comparative examples presented in Figure 4.3.5. below). When we view time as circular or in relation to others, time becomes rooted in the system around us, something that is tangible from the way planets move in the cosmos, to the ripening of fruits, to the number of fish in the sea. It is natural, then, to consider the future as an extension of the present, as we can directly observe how the actions of today can affect tomorrow. In the same example of the 'Tragedy of the Commons', it becomes much more natural to emphasise the effect time has on the concrete, "real", physical world. This mindset is much better for thinking about futures, because the future does not happen in GDP growth or profits per quarter; the future is changes rippling through a system, and rooted in the real

world where everything happens, which then informs the abstract world. This is demonstrated by the use of kaitiakitanga in conservation and sustainability related legislation bills in New Zealand, as its underlying time perception and philosophy is helping in building sustainable futures.

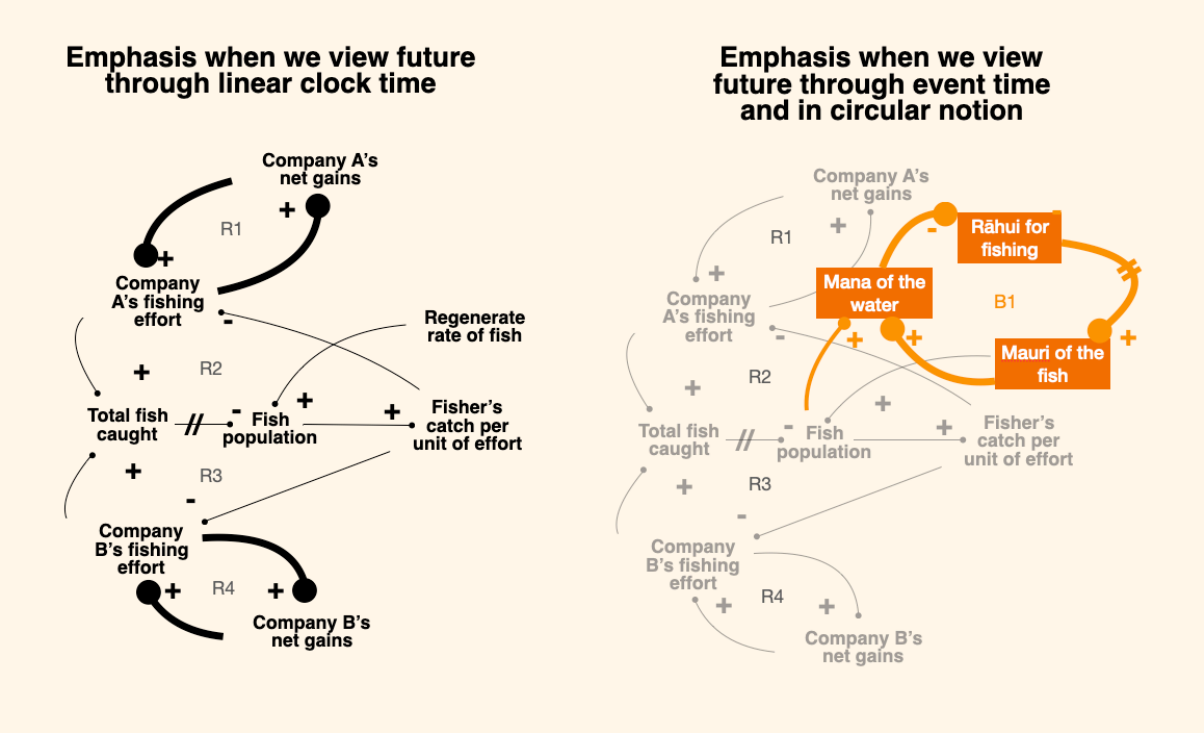

Fig 4.3.5. How our perception of time emphasizes different things about the future

4.4 Summary

Systems thinking and futures are closely intertwined, with systems thinking providing a valuable framework for understanding and anticipating the future by emphasising the interconnectedness of elements, the importance of feedback loops, and the holistic view of futures as a whole. When we embrace systems thinking, we also gain a new perception on time, where time becomes connected to the things around us. In systems thinking, time is

seen as a tangible component of a system, marked by the interactions and feedback loops between its elements. Through systems thinking tools like causal loop diagrams and archetypes, the future can be predicted to some extent by allowing us to map patterns and trends over time. Furthermore, the perception of time and futures is influenced by various factors, including social, cultural, and philosophical perspectives. In the modern era, capitalist societies have abstracted time from its original context, associating it solely with productivity and monetary growth. This perception of time as a commodity separates it from the experience of the present moment and disconnects it from the future. In contrast, indigenous cultures that preserves a holistic view of time see tasks and events in relation to one another, perceiving time as a series of interconnected events. The perception of time being circular, and cyclical rather than a linear progression is demonstrated by the Māori belief of kaitiakitanga. By embracing these views, we can broaden our understanding of building sustainable futures with respect for the natural world.

As the world is increasing in complexity and interdependence, systems thinking offers invaluable tools for navigating the challenges of the future. Moreover, exploring different cultural perspectives on time can provide valuable insights into alternative ways of perceiving and experiencing the future. Through this holistic approach, we can shape a future that is sustainable, harmonious, and in alignment with the well-being of the environment around us. By considering these aspects, the future becomes more than just a hunch or an abstract concept, but something rooted in past behaviours and an extension of the present.

5. FUTURES AND DESIGN

Previously, I have referred to the definition of design as something that "devise[s] courses of action aimed at changing existing situations into preferred ones" (Simon, 1969, p. 112). This definition of design makes a clear distinction between the present and the desired, where the desired refers to the future. Following this definition, any effort put into an attempt to improve or change the present can be considered as designing for the future. Candy (2010) also referred to design and future being a good fit, as they both share elements of divergence and convergence in the process and are iterative in nature. In the previous chapters, I have discussed how the future is viewed through the lens of speculative design, storytelling, and systems thinking, as well as the ontological roots that these disciplines bring to the way future is seen. While I have not yet explicitly discussed the relationship between design and futures, the previous chapters have been leading to this final section on what it means to design for the future. I intend to expand on the previous arguments made on viewing the future using non-anthropocentrism, phenomenology, and systems thinking in terms of how these approaches have manifested in the different design disciplines in relation to futures.

When discussing designing for the future, it is inevitable to touch base on the political nature of both fields. As Nandy (1996) noted, future studies "are an attempt to widen human choices" (p. 637). When the matter concerns choice, how should we determine what to discard and what to guard against? From this, new ethical considerations arise concerning how those who shape our futures align with desired values. The diverse nature of the future calls for an interdisciplinary approach and context-specific methods. Following the discussion around the manifestation of design in future studies, I present my three key reflections to guide the explorations of designing better tomorrows.

5.1 Non-anthropocentric futures in Design

As previously mentioned in section 2.2, design fictions and speculative designs at large borrow thoughts from psychology by thinking counterfactual to reality, thereby proposing alternatives for the future. The most counterfactual thought one can have is to question the reality that everything is based around the human perspective, which inevitably leads to a non-anthropocentric approach to the future. Non-anthropocentric ideas are sometimes expressed in relation to post-humanism or more-than-human designs. The Design Way (Nelson & Stolterman, 2014) argued that design is not only a discipline but one of the oldest human traditions, and it is a valid way of knowledge creation that deals with plurality and uncertainty; in doing so, it opens the possibility of design being based around more than just binary human/non-human experiences. Similarly, Forlano (2017) suggested that the boundaries between "human and non-human, culture and nature, and human and animals" (p. 16) are also blurring, thereby advocating for *post-humanism* in design. Other arguments for non-anthropocentrism in design includes the limitations imposed by human-centered design as "it leads to forgetting what "human" and designing for "humans" mean, for instance when it is limited to usability or "user-centeredness"" (Tarcane et al., 2022, p. 2). Moreover, human centered design may not cover all humans as it tends to overlook less privileged groups e.g., people with disabilities, older citizens, women, or people of colour (Forlando, 2017; Jones & Jones, 2020; Tarcane et al., 2022). According to Lakatos (1999), every research program has a set of paradigms at its center, known as the "core theories". The core theories are supported by a "protective belt" against other intruders, or theories, that challenge the current paradigm. In order to position non-anthropocentrism in design, Tarcane et al. (2022) used Lakatos model to summarise the intruders that challenge the notion of human centered design in a model that is provided in Figure 5.1.1 below.

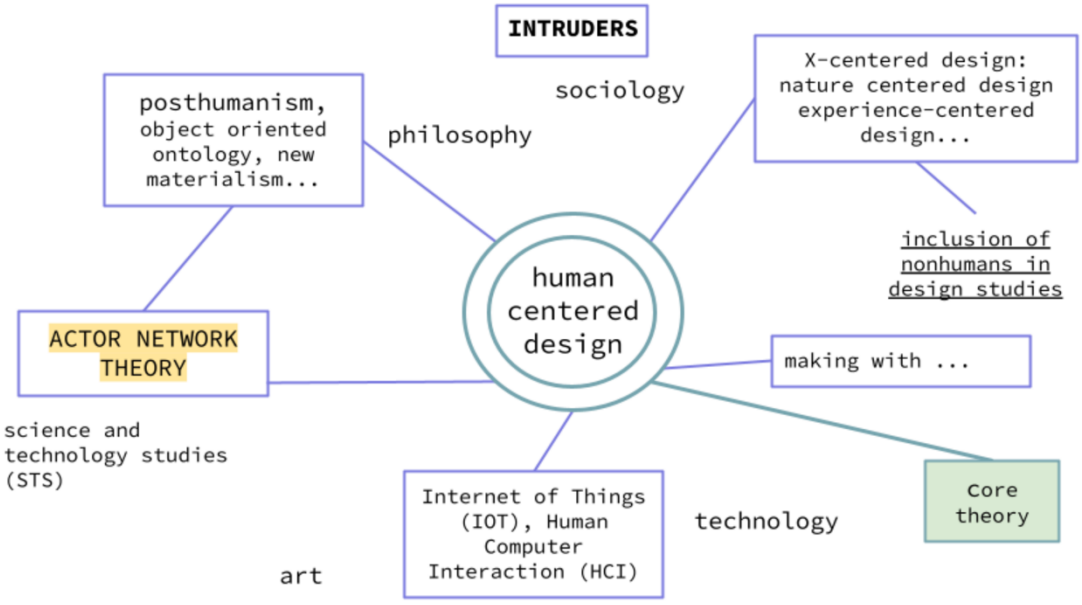

Fig 5.1.1. Lakatos' model with intruders challenging and de-centering humans in design (Tarcane et al., 2022).

In the diagram, Tarcane et al. (2022) depicted the current intruders of the human-centered design core theories. They described them as:

> Some example intrusions in design are from technology and environment: Decentering humans from design, non-anthropocentric approaches, sustainability studies, IOT and technological approaches can be taken as intruders. For instance, studies on nature-centered design, multispecies design, co-creating with urban ecosystems or Human-Nature Interaction focus on the environment, while others focus on technology, materials or objects. (Tarcane et al., 2022, p. 5)

Evidence of successful intrusion is already observable in the design sphere. When Inayatullah (1998) proposed causal layer analysis as a framework for future research to create transformative spaces for alternative futures, he referred to the first layer of change being litany – "events, issues and trends are not connected and appear discontinuous" (p. 820). The litanies of the blurred line between human and non-human in policy making can be seen in New Zealand passing a bill to recognise Whanganui river as its own legal personhood (New Zealand Parliament, 2017) and the United States appointing their first diplomat for plants and animals (Grandoni & Montalbano, 2022). Other observable litanies in the design sphere include a variety of interdisciplinary projects emerging in this field. In the following, three examples of such changes are presented.

Foreground Design Agency is a transdisciplinary design practice primarily focused on landscape architecture. Their work explores the synthesis of architecture, urbanism, and the arts through design competitions and research projects. In their recent project, *Liquid Breath (2023)*, they explored the idea of "what does it mean to share our breath with the multi-species world?". For these projects, people were encouraged to breath into vessels that were designed to catch the water vapour from their breaths that was then used to sustain the fungus contained in the vessels, thereby facilitating collaboration between humans and fungi to envision co-survival in a water-scarce future scenario (Foreground Design Agency, 2023). In 2018, they also created the project *Posthuman Habitat* (shown in Figure 5.1.2) that addressed future city challenges such as food and water scarcity, urban density, and energy and water infrastructure stress by proposing wearable landscape systems. These systems, resembling cloaks of plant life, aimed to provide sustenance to wearers while functioning as expanding ecosystems that attract other life forms, promoting a symbiotic relationship between humans and nature in a non-anthropocentric context (Foreground design agency, n.d.).

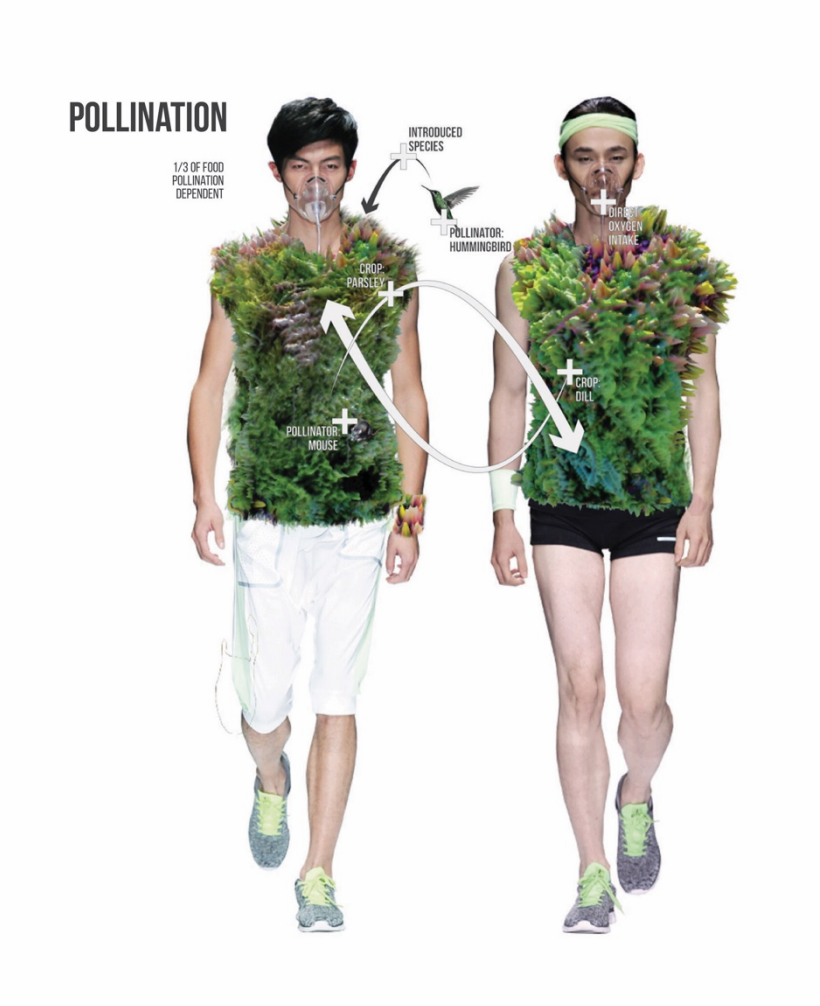

Fig 5.1.2. Posthuman Habitat blurring the line between nature and human (Foreground design agency, n.d.).

Examples of non-anthropocentrism can also be found in architecture. Architect Ariane Lourie Harrison challenged the conventions of human-centric architecture with the project the Pollinators Pavilion (shown in Figure 5.1.3). Inspired by post-human and non-anthropocentric principles, the striking dome-like structure made of concrete and spiky protrusions created an analogous habitat for solitary bees, emphasising the coexistence and

collaboration between humans and other species. The Pavilion aimed to raise awareness of the crucial role of native pollinators in the ecosystem, Harrison described this as “moving humans away from the center of our inquiry” (Pratt Institute, 2022) and promoting a more profound contribution to the environment through architecture that accommodates multiple species.(Pratt Institute, 2022).

Fig 5.1.3. The Pollinators Pavilion sits atop a hill on the grounds of Old Mud Creek Farm. Photo by Lily Landes (Pratt Institute, 2022).

Beyond urban architecture, non-anthropocentrism also extends to the application of technology and its beneficiaries. The concept of Animal Computer Interaction (ACI) holds great promise in reshaping our relationship with animals and nature. Over the years, the recognition of animals as sentient beings has grown, urging a shift towards an animal-centered approach in designing interactive systems (Haraway, 2013; Zamansky et al., 2017) By emphasising methodologies and technologies that respect the sentience of animals and nature, ACI has the potential to foster collaboration with animal intelligence rather than imposing human interventions (Morrison et al., 2017). The first international workshop on ACI was held at the Third International Conference on Animal-Computer Interaction by Zamansky et al. (2017). The workshop discussions revolved around adapting research methodologies to address interspecies differences and communication barriers, ensuring that animals can actively participate in the design process. By acknowledging the "otherness" of animals and adopting non-anthropocentric perspectives, ACI has the potential to expand the boundaries of human-computer interaction and develop innovative and inclusive interactive systems for all living beings (Zamansky et al., 2017).

According to Inayatullah's (1998) casual layered analysis, summarised in Table 5.1.4 below, litany is the first layer of change and is the "tip of the iceberg" (p.821), symbolic of deeper change. Once the change makes it to the final layer of myth/metaphors, we must move back up to the litany level to propose a new alternative for the future. I argue that the observable litanies of non-anthropocentrism across the various fields of design are caused by successful "intrusion" on the core theory of design (Tarcane et al., 2022), which indicates a change occurring at the more foundational worldview and myth and metaphor level (see the

"Transition" column shown in Table 5.1.4 below). Once the belief of non-anthropocentrism becomes the new widespread 'myth & metaphor', changes will once again ripple back up the layers that will then inform a new future (Future Myth & Metaphor column in Table 5.1.4)

New table

	CURRENT MYTH & METAPHOR	TRANSITION	FUTURE MYTH & METAPHOR
LITANY	"User friendly design"	Co-existence with other species (Foreground Design Agency, 2023., Zamansky et al., 2017) Decentering humans (Pratt Institute, 2022)	Alternative Future Possibilities
CAUSES	Design Thinking	"Intruders" from other fields challenging core theory of design (Tarcane et al., 2022)	
WORLDVIEW	Human centricity	Post-humanism, more-than-human-design	
MYTH/METAPHOR	Anthropocentrism	Non-anthropocentrism	Non-anthropocentrism (wide spread)

Table 5.1.4. Simplified causal layer analysis of the observable litanies of non-anthropocentric design and new futures.

The relationship between non-anthropocentrism and futures has connections to the idea of fairness and equality, and it has significant implications for futures and the vision of a sustainable and equitable world. Adopting a non-anthropocentric perspective in planning for the future can shape policies and actions that prioritise the well-being of all living beings and the environment, promoting a more just and inclusive society. I argue non-anthropocentrism offers a valuable perspective in shaping the futures we aspire to create. By recognising the intrinsic value of nature and non-human species, and by prioritising fairness and equality for all living beings, society can move towards a more sustainable and just future. Embracing non-anthropocentrism in future planning can inspire transformative actions that foster harmony between humans, ecosystems, and all species, ensuring a future that promotes the well-being of the entire planet and its inhabitants.

5.2 Designing phenomenological futures

Phenomenology is a philosophical approach that focuses on the subjective experience of individuals and their interactions with the world, as discussed in section three. In the context of design, phenomenology is reflected in various ways, especially in co-design and participatory design and more recently in participatory futures as well. By prioritising the subjective experience of individuals, designed futures are not bloodless but rather engaging and meaningful to the individuals that will live in it. The differentiation between participatory design, co-design and co-creation are minute. The journal CoDesign defines co-design as "inclusive…any design domain concerned with the nature of collaboration" (CoDesign, 2005), while co-creation is defined as "refer[ing] to any act of collective creativity, i.e., creativity that is shared by two or more people" (Sanders & Stappers, 2008). Participatory design, on the other hand, is defined by Simonsen and Robertson (2012) as:

> A process of investigating, understanding, reflecting upon, establishing, developing, and supporting mutual learning between multiple participants in collective 'reflection-in-action'. The participants typically undertake the two principal roles of users and designers where the designers strive to learn the realities of the users' situation while the users strive to articulate their desired aims and learn appropriate technological means to obtain them. (p. 2)

The common theme among these definitions is the act of doing something *together,* whether designing or creating, by leveraging the collective wisdom and individual perspective on the matter. Van der Velden and Mörtberg (2014) noted that the key principles for participatory design include:

- Situation based actions: Contextualising the participant and their expertise;
- Mutual learning: Through democratic participation, enable learning between participant – participant, and facilitator – participant;
- Tools and techniques: Selecting the most appropriate tools/methods/techniques to bridge the gap between all those involved;
- Alternative visions about technology: Challenging the current monopolies and giving participants a voice.

These principles are also reflected in participatory future activities as they borrow the core ideas from the established design practices to create futures. In the project Hawaii 2050, Candy (2010) created four images of the future for Hawaii and employed actors and sets to make the scenarios come to life (tools and techniques), and then invited the citizens of Hawaii to experience these futures (situation based). During one of the scenarios, one participant was so disturbed by the scenarios that they broke "the scene to argue about it" (Candy, 2016, para. 18) (challenge visions about technology). Afterwards, the citizens reflected on each of the scenarios for the future related to their present, with "unusually energetic" (Candy, 2016, para. 19) post-immersion dialogues (mutual learning). In the exit survey, 94% of the participants indicated that the experience has impacted their motivation to take actions for the future (Candy, 2010). Although the project itself is positioned in the field of experiential design, the principles of participatory design are evident in the process. By extension, participation future is defined as facilitating "empowerment and transformation through engagement and participation. Researchers have found that being able to participate in how the future is constructed by the powers-that-be is an empowering process" (Gidley, 2017, p. 70). The notable difference between participatory future and similar design practices

is the element of empowerment for the participants in the act of creating, speculating, and reflecting together. The participatory element can be seen as the first step in democratising future for the masses (Candy 2022; Morgan, 2021) as participation enables diverse voices to shape futures, leading to more inclusive and responsive outcomes.

However, the participatory futures approach is not without criticism. Gidley et al. (2009) pointed out that participatory research does not "take account of relevant empirical research, it may lack legitimacy in positivist scientific circles" (p. 430). However, Gidley et al. (2009) later added that different approaches to the future are not mutually exclusive, and that "conceptualisation impl[ies] a linear developmental mode" (p. 431). As previously discussed, the epistemological underpinning of understanding the future from individual perspectives originates from phenomenology, which is one way of knowledge creation. But just as the future contains multitudes, we, too, should be able to hold space for various ways of knowledge creation. Figure 5.2.1. shows a summary of typologies in approaching the future. It is worth noting that each approach has different paradigms and goals, each with their own strength and limitations. The future is a complex topic at the intersection of many disciplines, so we should approach the future equally in its transdisciplinary and select those methods that best fit the context and goal of our specific inquiry. I argue that while phenomenology and participatory future cannot be the only lens to approach the future, they are still useful in helping us form a comprehensive understanding of what the future is and to empower citizens to democratise and take ownership of their futures.

Key Terms	Futures Studies Approaches	Underlying Theories and/or Paradigms	Goals
'probable futures'	Predictive/ Empirical	Positivism Empiricism	Analysis Prediction
'preferred futures'	Critical/ Postmodern	Critical Theory Deconstruction	Normativity Emancipation
'possible or alternative futures'	Cultural/ Interpretive	Constructivism Hermeneutics	Alternatives "Other" futures
'prospective or participatory futures'	Prospective/ Participatory	Action Research Hope Theories	Empowerment Transformation
'planetary or integral futures'	Integrative/ Holistic	Integral Theories Planetisation Theories	Global justice Planetary Era

Fig 5.2.1. A typology of Future approaches (Gidley et al., 2009).

Moreover, while the idea of involving multiple human perspectives may seem contradictory to the previously discussed non-anthropocentric futures, the two approaches are not mutually exclusive . Non-anthropocentrism does not mean discarding the human experience completely, but rather "moving humans away from the center of our inquiry" (Pratt Institute, 2022). We can hold space for both ideas at once – humans may not be at the center of the futures, but we can still involve individuals' imagined lived experience in our construction of the future, as humans are the ones to take actions in shaping it. As Hemmati and Röhr (2007) noted in relation to participatory activities in the context of climate change, "adaptation, which must be context-specific and participatory, requires that all members of the affected communities be part of a climate change planning and governance process. If women [for example] are not fully involved in planning and decision-making… the quality of adaptive measures will be limited and successful implementation will be doubtful" (p. 7).

An example of a participatory future activity involving others is a series of workshops aimed at envisioning feminist futures by Gunnarsson-Östling et al. (2012). The study involved engaging diverse stakeholders, such as staff, gender studies experts, and students, in the process of envisioning and shaping "a society free of structural inequalities based on sex" (Gunnarsson-Östling et al., 2012. p.914). The project was carried out using participatory principles, such as guided discussions for mutual learning, challenging alternative futures, choosing tools, and methods to work together as shown in Figure above 5.2.2. However, the authors noted that while individual perspectives were accounted for, personal experience had a heavy weight in the Staff group. The participants raised conversations around their own personal problems, which led to the reflection that "the starting point in personal experiences was overemphasised and that the road towards actually generating the factors was too long" (Gunnarsson-Östling et al., 2012, p. 918). This echoes the previous criticism from Gidley et al. (2009) on the limitations of participatory futures of lacking empirical data. However, the input by the Expert group balanced the personal input from the Staff group, as the "personal perspectives were less apparent." (p. 917) and "many factors were rather abstract… [but] concrete in terms of suggesting policy measures and actual solutions" (p. 918). The final output of the series of workshops were different images of the future produced as an outcome of the discussions, and the reflections ranged from "'thought provoking" to wishing for "more concrete, tangible outputs" (p. 920). This is a common criticism for participatory activities, as the value is not always apparent. However, the value is more apparent when considering its ethical motivation (Van der Velden & Mörtberg, 2014; Robertson & Wagner, 2012; Robertson & Simonsen, 2012) as participation "enhance[s] how people can engage with others in shaping their world, including their workplaces, over time [...] working together to shape a better future." (Robertson & Wagner, 2012, p. 65). This echoes with the

intention of the authors who conducted the study to imagine “a society free of structural inequalities based on sex” (Gunnarsson-Östling et al., 2012. p.914.).

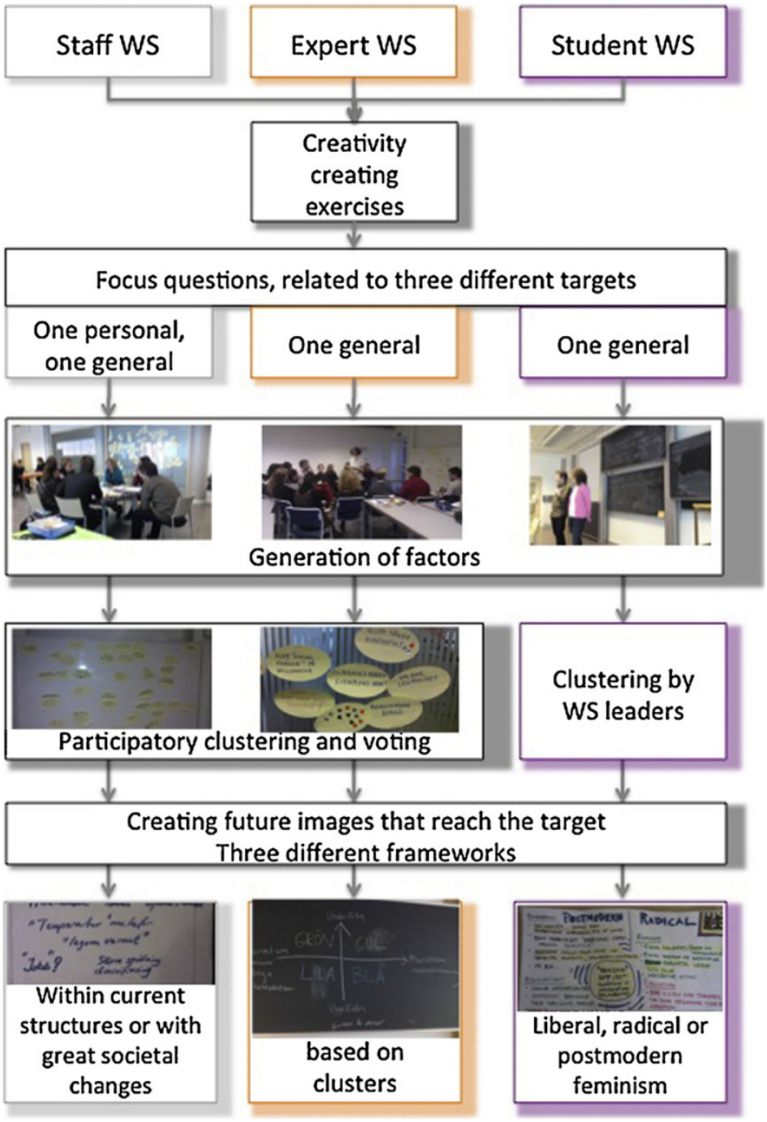

Fig 5.2.2. Schematic outline of the three workshops (Gunnarsson-Östling et al., 2012).

In conclusion, this section has highlighted the significance of phenomenology and participatory practices in shaping future scenarios and empowering those involved in the process. By prioritising subjective experiences and including diverse perspectives, designed futures become engaging and meaningful to their inhabitants. Participatory futures, with its empowering and democratising approach, enables diverse voices to shape the future, fostering inclusivity and responsiveness, and thereby, encourages the development of thought-provoking and ethically motivated outcomes. While not without criticism, participatory futures offer valuable knowledge creation and understanding about the future through a uniquely human lens and empowers individuals to take ownership of their futures. The coexistence of non-anthropocentric futures and participatory practices allows for the inclusion of human experiences without centralising humanity, rather using subjective experience rooted in phenomenology as valid way of knowledge creation and sense making in order to shape a responsive and equitable future towards a better tomorrow.

5.3. Designing at future's past

In the discussion on systems thinking and futures, I covered the perception of time and looking back to look forward by leveraging indigenous knowledge to imagine futures. In the section about time, I explored the origins and impact of viewing time as clock time and event time, and how event time perception is more in line with the core principles of systems thinking. Furthermore, indigenous cultures who have preserved event time in their traditions are more likely to view time as circular. These attributes – from systems thinking to circular time perception, are also evident in the field of circular design. It can be argued that the predecessor to circular design was design for sustainability (later referred to as DfX), which is defined as a "radical redesign of product and services striving towards a sustainable future"

(Moreno et al., 2016, p. 5). Later, De Los Rios and Charnley (2016) developed the taxonomy further by combining the branch of design for sustainability with systems thinking, thus changing the role design plays in the economy and creating the foundations for circular design. Building on their work, Moreno et al. (2016), proposed 10 points to consider when partaking in circular design:

1. Design for "systems change" when considering any circular design strategy;
2. Design by identifying the new circular business model that your product/service is being designed for;
3. Design by thinking of revolutionising the world: Circular design goes beyond doing less bad;
4. Design for multiple cycles (short and/ or long) and not only with end-of-life in mind;
5. Design by thinking and living in adaptive systems;
6. Design with different participants in the value chain, including your final user, and always keep him/her/it/them in mind;
7. Design by considering value in a broader view, not as a price tag on a shop shelf, but as an asset;
8. Design with failure in mind: It is better to test and prototype as many times as possible;
9. Design knowing where each material and part comes from and where each material and part goes to;
10. Design with "hands on" experiences that fosters a call for action.

(Moreno et al., 2016, p. 11-12)

As seen from this list, circular design aims to deliver a functional product or service using optimal materials, ensuring peak performance and minimising negative environmental impact throughout its entire life cycle (Fifield & Medkova, 2016). In 2017, the Ellen MacArthur Foundation launched the circular design guide and proposed four steps for the circular design process, namely understand, define, make, release in a circular format as shown in Figure 5.3.1. A phrase often repeated in discussions of circular design is the transition away from linear – be it part of the production process or life cycle. Fifield and Medkova (2016) also proposed that DfX focuses on the design's impact on the planet, while circular design emphasises the circular business model. However, I argue that circular design places equal, if not more, emphasise on the impact of the planet than business models. In the ten points to consider for circular design presented in Table X above, point 7 calls for designers to not focus on the monetary value alone and point 3 requires circular design activities to have ethical motivations . Points 1, 5, and 9 posit that designers should be aware of how their decisions impact the systems as a whole. While circular design is often associated with aiding a circular economy, I argue they do not have a subordinate relationship, but help each other achieve the collective goal of circularity as "a circular economy is one that is restorative and regenerative by design" (Ellen McArthur Foundation, n.d.). Moreover, circular design has the potential to impact on the future in more areas than just the economy because when "true circular design is applied, design will not need a palliative strategy to influence more sustainable behaviour" (Moreno et al., 2016, p. 6). As a result of these issues, Moreno et al. (2016) called for designers to be system thinkers to move away from careless depletion, in order to transition "towards an abundant, innovative and prosperous future, enabling a true adoption of circular design" (p. 6).

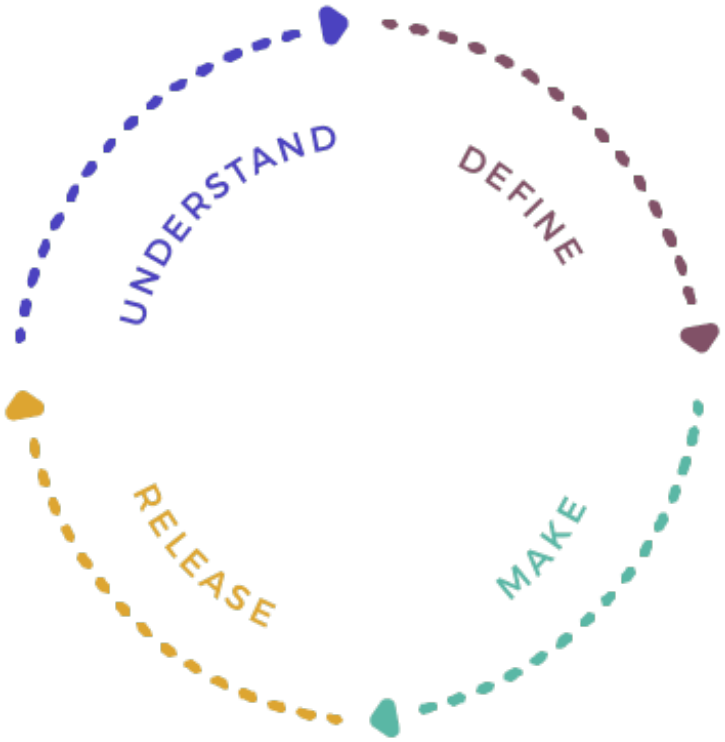

Fig 5.3.1. Circular design process (Ellen MacArthur Foundation, 2017).

Initiatives motivated by sustainability have a natural connection to the future; however, “there is very little discussion around what a circular future may look like” (Bauwens et al., 2020, p. 2) as the dimension of time is often excluded from discussions around circularity (Bauwens et al., 2020; Geissdoerfer, 2017). Instead of applying circular design to long term futures, it is more commonly found in short term futures. In the reflections by Earley (2017), the Textiles Environment Design research group (TED) recognizes that design has had damaging impacts on natural systems and human populations in the textile supply chain, but also sees its potential to drive systemic change and realign values, ethics, and meanings (Earley, 2017). In 2010, TED created the TEN (Earley, 2017), a set of design tools to accelerate circularity across different fields that are rooted in their understanding of the material journey (See

Figure 5.3.2). TED started a collaboration with H&M in 2010 using the first five of The TEN to develop the *Conscious Collection* line of clothing, which was launched in 2019 (H&M, 2019). H&M's statement explained that the collection was intended as a vision for a sustainable fashion future, and to lead the shift towards a more sustainable industry (H&M, 2019).

Fig 5.3.2. The TEN created by TED for circular design created in 2010 (Mistra Future Fashion, n.d.).

The momentum in sustainability and circularity can also be seen in the growing recognition of indigenous knowledge or traditional ecological knowledge, as "sustainability requires understanding relationships between natural and social ecologies" (Wolfgramm et al., 2018,

p. 213). Traditional ecological knowledge (TEK) is referred to as the culturally and spiritually rooted approach through which indigenous peoples interact with their ecosystems (LaDuke, 1994). Interest in TEK is related to the increasing acknowledgement that indigenous peoples worldwide have cultivated a sustainable environmental knowledge and practices that can be applied to tackle global societal challenges (Clarkson et al., 1992; McGregor, 2004;). Hansen (2022) of SAPCE10, a design and research lab specialising in the future, has conducted a series of interviews titled Ancestral Futures aimed at learning about how indigenous wisdom can guide us in maintaining harmony with natural ecosystems, fostering resilience for both humanity and the planet (Manthei & Rendell, 2022). I argue that indigenous knowledge can be taken further than just maintaining and meeting sustainability goals but can also play an active role in shaping the future with inspirations from the past. In 2023, I conducted a seminar “Welcome to Mars” at the Köln International School of Design that focused on imaging governance on Mars. The student groups were required to act as individual ministries and propose policies and design fictions that support their view of the future. A student group chose to act as the Ministry of People and Planet Health, and part of their policies were inspired by TEK, indigenous cultures, and a connection to the land. This group proposed a “Closed Circle Policy” where individuals receive continuous health care from birth, but when they decide to end their lives, their body would be repurposed and used to grow food for the coming generations, thus linking personal health with planet health (shown in Figure 5.3.3). The Closed Circle Policy borrows ideas from systems thinking by viewing life and death in relation to each other, and it takes inspiration from circularity to envision life and death in a closed circle. While the proposed policy is an oversimplification of a complex problem, it is an example of circular design applied to far futures that leverages insights gained from indigenous knowledge.

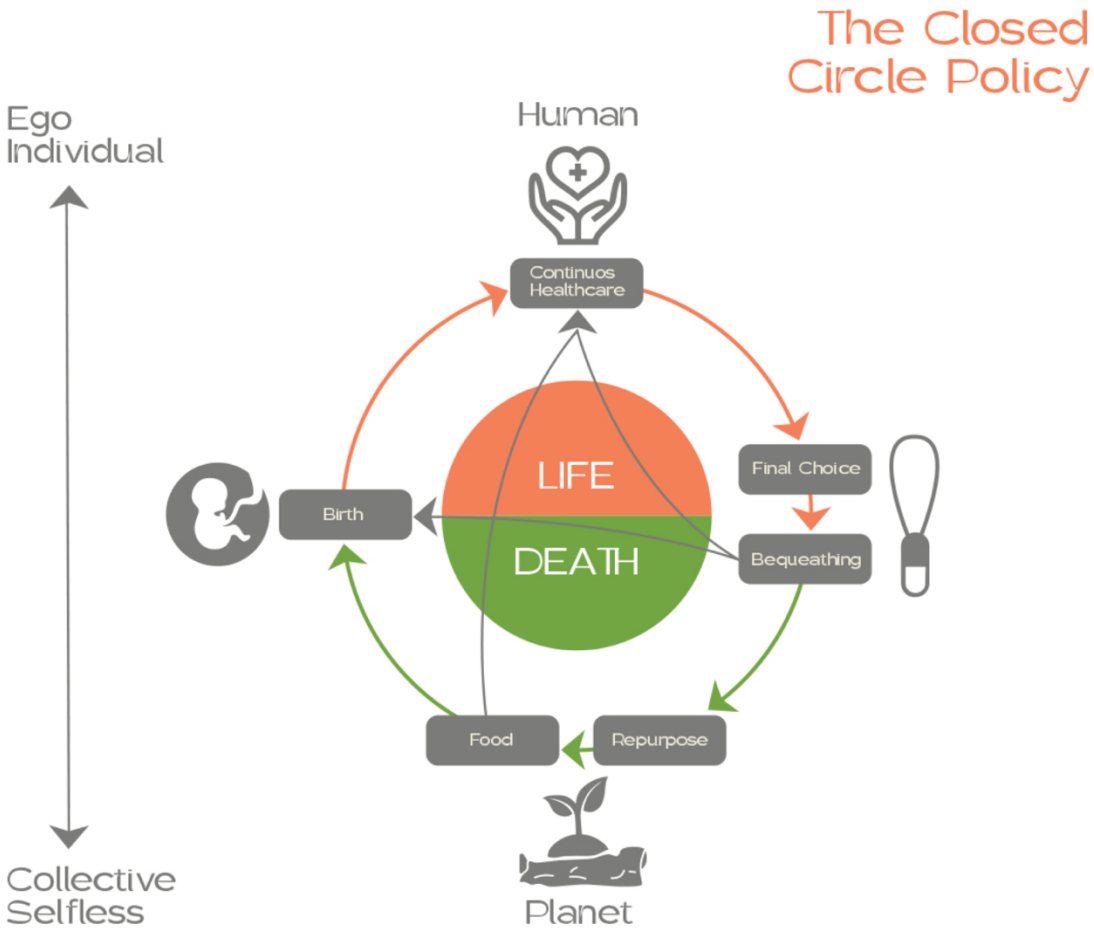

Fig 5.3.3. Closed Circle Policy proposed by Köln International School of Design students André Freiha, Emilie Starch Bendsen, and Youjin Kim, 2023.

Systems thinking is evident when designing futures through circular design practises, which highlights the need to shift away from linear processes to promote regenerative and restorative practices. While discussions around circularity are often criticised for lacking the time dimension, the addition of a circular time perception inspired by TEK helps fill the gap when it comes to envisioning what futures may look like. Moreover, TEK is not only limited to sustaining current mindsets but can play a more active role in shaping our futures. By

considering the impact on the planet and emphasising ethical motivations, designing for the future goes beyond merely focusing on economic benefits and instead contributes to a more sustainable and prosperous future.

5.4. Reflections at the Intersections of Designing for Futures

When talking about designing for futures, it is necessary to also mention the politics of both design and futures. Here, I refer to politics not as in political parties or ideologies, but rather as "the relationships within a group or organization that allow particular people to have power over others" (Cambridge dictionary, n.d.). As Candy (2010) argued, design is political both as demonstrations of human intention as well as having a physical impact by shaping the material world. The future also shares the property of being political (Candy, 2010; Mazé, 2019) as "every planning effort involves philosophical assumptions as to what is considered immutable and what is negotiable; the significant and the trivial. Thus, every effort to plan the future is submerged in an overarching politics of the real" (Inayatullah, 1990, p. 116). Design and the future both share the sentiment of being political as they both revolve around choices and decisions made on behalf of others. Whether it is designers making the choice on behalf of the users, or policy makers deciding on the future of the many, these choices expose the person's own values and beliefs. This raises a new question regarding ethics: how do we ensure these people who can shape our futures reflect the desired values and beliefs onto the future that they shape? As mentioned in section 5.2., the future is a complex topic – sometimes the future is viewed as an opportunity to "fix" the things we are dissatisfied with, sometimes the future is a playground to explore new ideas, and sometimes the future is used to help us make decisions about today. The diversity of the nature of the future means there is no one-size-fits-all solution to what it means to design for the future; instead, we must

approach the future in its interdisciplinarity and select those methods that best fit the specific context and goal. My personal reflection on the topic of designing for the future with regards to its political nature can be summarised in three points that I hope will provide guidance to designers how face ethical dilemmas when it comes to how their designs will influence the future:

1) Design for Selfless Futures

   The notion of non-anthropocentric futures involves the idea of equality. The future is fair, and the future will be there for everything. Living or non-living organisms will experience and deserve to experience their own futures. By understanding the future in this light, we cannot center the future around a human perspective alone. As demonstrated by the projects in section 5.1., we are beginning to expand the boundaries of the subjects we design for by including non-humans, thus moving away from human-centricity. Furthermore, selflessness is required to design futures that have a long horizon, that extend the designer's own temporality and are beneficial for generations to come.

2) Design Futures that are not Bloodless

   Bloodless may be a word that causes confusion. In this context, I use it to mean "lacking in spirit or vitality; lacking in human feeling" (Merriam-Webster, n.d.). Designing for futures that are not bloodless requires an awareness of the experiences to be, and therefore any conversation we have about the future is inherently subjective to the individuals involved . Thus, it is inevitable that the future we talk about will always have a uniquely human touch – especially when we consider the collaborative

approach in participatory futuring where the future is built on collective imagining and social insight. Designing for the future will never be just numbers and data, it is also not built on just one person's perspective, instead the image of the future is pieced together by the many stories that we tell each other.

3) Design for Futures with Roots

   A mind trap that we sometimes have about the future is that it is at a distance, somewhat detached from current happenings. Yet, when viewing through the lens of systems thinking, everything is connected, including the future to the present. In fact, the future can be seen extending its roots back to the present, and our understanding of time shapes how we perceive the future. Ultimately, all systems are rooted in this earth and designing for a rooted future means having to take into consideration systems that have existed long before us and will continue to exist without us. It also means seeing the future as continuous, never-ending happenings; it does not stop or start at an arbitrary point, but rather everything about and from the future can find its trace in the present and in the past.

I believe that to design for futures in its complexity requires a lot of empathy. First, we must extend empathy beyond ourselves, to listen to the stories others imagine about the future. Then, we need to extend empathy beyond our own species, to create futures also for those without a voice. Finally, we need to extend empathy beyond our own temporalities and recognise that we are designing for systems that are larger than our existence and will continue to exist without us.

While I discussed each lens independently, there were undoubtingly overlaps between them. A project that demonstrates the interconnectivity between the topics is the Phenomena Dress by Smitheram and Joseph (2020). The project was a practice-led exploration that delved into conceptual frameworks, material thinking, and posthuman theory from a Māori perspective to develop new forms of dress for terrestrial bodies through collaborative processes (shown in Figure 5.4.1). It emphasised the recognition of the ecosystem as the primary collaborator, shifting away from human-centric design and repositioning human and more-than-human relationships. The methodology used integrates indigenous ways of knowing and theories of new materialism to shape the research practice and create material-discursive expressions rather than traditional end products. The project's engagement with ecosystems and expanded kinship networks challenges human-centeredness, highlighting the interconnectedness of all living entities with the lifeworld (Smitheram & Joseph, 2020). This project demonstrates non-anthropocentrism through the attempt to de-center the dress as an artefact for the human body, and the phenomenological approach applied by the authors positioned them as human collaborators while seeing nature as the primary collaborator. Systems thinking is reflected in the fostered interconnections of creating-with, especially with regard of the recognition of indigenous knowledge; and through the act of exploring human relationships with their environment. While the Phenomena Dress is not explicitly a future orientated project, it gives light to what designing for a selfless, not-bloodless, and rooted future looks like.

Fig 5.4.1. Hīnaki Dress, worn by the wind and Jasmin Canuel at Karekare beach. (Smitheram & Joseph, 2020).

In conclusion, the exploration of designing for futures using an interdisciplinarity approach of non-anthropocentrism, phenomenology, and systems thinking has shed light on the complexities and political nature of this endeavor. The intersection of design and futures reveals the power dynamics inherent in shaping the material world and the choices made on behalf of others. The multifaceted nature of the future demands an interdisciplinary approach, acknowledging that there is no one-size-fits-all solution to designing for what lies ahead. Three key reflections emerge from this discussion, offering guidance for designers grappling with the challenges of shaping the future, namely, to embrace selfless futures moving away from human-centric perspectives and considering the well-being of all living and non-living organisms. Designing futures is not bloodless; it involves a subjective human touch, storytelling, and collective imagining. Additionally, designing for futures with roots recognises interconnectedness and responsibility for systems beyond one's existence.

Throughout this thesis, it becomes evident that empathy plays a crucial role in designing for futures. Empathy extends beyond human boundaries, encompassing the perspectives of all living beings and future generations. It involves listening to the stories of others, creating futures for those without a voice, and embracing the broader, interconnected systems of our world.

The Phenomena Dress project serves as an example of these reflections. By de-centering the dress as a mere artifact for the human body, the project embraces non-anthropocentrism, phenomenology, and systems thinking. The collaborative engagement with ecosystems and expanded kinship networks challenges human-centered designs, highlighting the interconnectedness of all living entities within the lifeworld. As we move forward in designing for futures, it is essential to remain mindful of the inherent political nature of this work and the ethical implications it carries. By embracing selflessness, acknowledging the human touch, and recognising interconnectedness, we can strive to create a future that is inclusive, sustainable, and respectful of all life. In doing so, it is justified to say that the future is, in fact, by design.

6. LIMITATIONS

As both design and future studies are well established fields, there are certain points of view omitted from the discussion in this thesis due to various limitations. I recognise the importance of the following topics to the discussion and explain why they were omitted.

Recognising privilege in design and futures

If design and futures are inherently political, it is logical to conclude there are a privileged few who are able to make decisions for others. While the question of who get to have this privilege to design our future is a crucial issue that needs to be part of any discussion on the ethics of designing for futures, it was not included due to the extensive social commentary it would have required to identify who are the privileged few in this context and how this privilege may be reflected. This simply required its own discovery work and arguments, and for this reason was not included.

Other topics around the future and design such as, experiential design, ethnographic future research, discursive design, sustainable design, inclusive design etc.

Some of these topics were covered briefly in the previous chapters but were not included as part of the main argument as I feel that the philosophy behind them either share similarities to the topics I have covered or they were more concerned with the application and the technical side, and that it would distract from the main ideas of this thesis . Others were excluded purely due to time and resource constraints, but I recognise the importance of their contributions to the field of design and futures studies.

Future and foresight work orientated around economics related fields such as risk assessments, trend analysis, horizon scanning etc.

The goal of this thesis was to focus on creating a theoretical framework around the conceptualisations of the future in relation to design. This required layers of abstractions in order to construct a theoretical framework. The topics mentioned above are very important in applying futures in real-world scenarios; however, they primarily focus on short term futures and the practical nature makes abstraction difficult for the development of a theoretical framework.

Finally, as I only covered three disciplines in the body of the thesis, it is inevitable that there will be gaps surrounding the philosophies that contribute to the conception of the future. Further investigations are needed to identify the known unknowns in this area. Moreover, this thesis covers a broad body of work spanning across many fields, from psychology to philosophy to anthropology and others. I would like to highlight that my education and professional experience is in service design; while I believe I researched each topic thoroughly, my research only extends to the areas that overlap with the research questions for this thesis. I am not an expert in these disciplines and the arguments made in this thesis are certainly not a reflection for the entire discipline. My intention of covering such a broad scope of work is to draw attention to the connections of the future to the various disciplines so we can form a more comprehensive view of the future. Moreover, I hoped by doing so we can also venture out to other established disciplines and utilize their extensive research in our exploration of the future – truly interdisciplinarily.

7. CONCLUSION

This thesis revolved around the question of what it means to design for the future at the intersection of speculative design, storytelling, and systems thinking. By examining the future through these lenses, we covered how speculative design challenges traditional anthropocentric perspectives by viewing the future not only from a human centered perspective but as a place of true equality. Moreover, we delve into the importance of storytelling in envisioning potential futures as stories provide a way to prototype different future possibilities, offering a means to navigate the unknown and make sense of it. Exploring the future through stories means to take advantage of the phenomenological nature of placing oneself within the narrative, either as the storyteller conveying beliefs and values or as an observer gaining empathy and understanding. By sharing different perspectives through storytelling, we can paint a more comprehensive picture of the future, embracing collective imagination and emotional engagement.

The intersection of systems thinking and futures is explored, with systems thinking offering a framework to understand the future in patterns as well as perceiving time holistically and in circular form. The concept of time is a crucial element in this framework, as it plays a tangible role within systems and influences the perception of the future. Different cultural perspectives on time and future, including indigenous views, are discussed, highlighting the contrast between capitalist societies' linear perception of time and the future to a more cyclical and interconnected understandings for building more sustainable futures.

The interdisciplinary nature of designing for futures is explored from the lens of post-human design, participatory futuring, and incorporating TEK and indigenous knowledge, to reflect on what it means to design for the future when both future and design are inherently political.

Through these reflections, the following three suggestions for designing for the future are derived: Design for selfless futures and depart from human-centric perspectives to consider the well-being of all living and non-living entities. Design futures that are not bloodless – this advice recognizes the humanity within visions of the future and considers everyone's imagined experience. And lastly, design futures that are rooted – recognise that the future extends its roots to us into the present and that the future is rooted in the systems that exist around us, have existed before us, and will continue to exist after us. Finally, emphasizing the role empathy plays in designing for futures to extend beyond human boundaries to embrace the perspectives of all living beings and future generations.

Recommendations for future research include further explorations of the role that empathy plays in designing for the future, and examinations of the methods of extending empathy to future design in practice. Moreover, it would also be interesting to derive a process for designing for the future – similar processes exist for experiential future (Candy, 2010) and future focused agencies (Montgomery & Woebken, 2016), but it would be interesting to see a process proposed from the motivation of extending empathy.

In the background chapter I covered my personal motivation for exploring this topic due to my involvement in teaching how to design for futures at a tertiary level. I find that I always learn more while teaching, and through this process I have reflected on how to teach the topic of designing for futures as well as fielded notes from the excellent questions I have been asked by the students. I hope to document existing projects, processes, and reflections I have been a part of so that they can contribute to the goal of increasing future literacy for other educators. I am also interested in the discussions around time perception and how it shapes the future we understand. In this thesis, I have discussed time perception as circular, taking

inspiration from indigenous knowledge. However, I would also like to explore how other time perceptions may affect the way we view the future. Thus, I did not discuss time perception in the chapter on phenomenology as I believe in it being its own standalone work, nor did I touch on other time perceptions such as how physicists view time as entropy, or philosophy's A/B (and now C) series of time perception. I hope these discussions will lead to a more diverse understanding of the future and inspire different views we have when approaching futures.

Overall, the thesis contributes to the field of future studies by highlighting the multifaceted nature of envisioning the future. It underscores the significance of non-anthropocentrism, phenomenology, and systems thinking in shaping our perception of the future and calls for a more empathetic and interdisciplinary approach to designing for futures, while recognising the ethical implications and political nature of such endeavors. By gaining insights into the formative philosophies, I aspire to help future designers form their own ethics around designing for futures by helping them identify what philosophies shaped their conception of the future so that they can recognise their own bias and blind spots. Designing for the future is a process of discerning what will change and what will not, it is the process of knowing how to design for a world where everything seems to be different (technology, values, the latest crisis), but some that always remain unchanged (behaviour patterns, Maslow's hierarchy of needs, human temporalities). It is by dissecting the future that we form a comprehensive, well-rounded view of what it is, so we can practice discerning between the changed and unchanged. With each conscious choice made to shape a more empathetic future, the negative connotations of the volatile, uncertain, complex, and ambiguous nature of the future suddenly takes on positive traits. Because the future is all of those things, it is also exactly why the future is what we design it to be.

BIBLIOGRAPHY

1-888-FUTURES. (n.d.). *1888Futures*. Retrieved August 23, 2023, from http://1888futures.com/

Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagining the future: Common and distinct neural substrates during event construction and elaboration. *Neuropsychologia, 45*(7), 1363–1377. https://doi.org/10.1016/j.neuropsychologia.2006.10.016

Afatta, S., Kusumo, S., Setianto, N., Luky, A., Ab, R., Richards, R., & Smith, C. (November, 2018). *Social-ecological trap in an Indonesian small-scale inshore fishery: A Case study from Selayar, South Sulawesi* [Conference Paper] The 2nd International Conference on Integrated Coastal Management and Marine Biotechnology; Bogor, Indonesia.

Altvater, E., Crist, E. C., Haraway, D. J., Hartley, D., Parenti, C., & McBrien, J. (2016). Anthropocene or capitalocene?: Nature, history, and the crisis of capitalism. *Design Studies, 24*(6), 507–522.

Andrews, D. H., Hull, T. D., & Donahue, J. A. (2009). Storytelling as an instructional method: Definitions and research questions. *Interdisciplinary Journal of Problem-Based Learning*, *3*(2). https://doi.org/10.7771/1541-5015.1063

Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia Computer Science, 44*, 669–678. https://doi.org/10.1016/j.procs.2015.03.050

Ashworth P. (2003). An approach to phenomenological psychology: The contingencies of the lifeworld. *Journal of Phenomenological Psychology, 34*,145–56.

Auger, J. (2013). Speculative design: Crafting the speculation. *Digital Creativity, 24*(1), 11–35. https://doi.org/10.1080/14626268.2013.767276

Hippo, A. O. (1961). *Confessions*. National Geographic Books.

Bauwens, T., Hekkert, M., & Kirchherr, J. (2020). Circular futures: What will they look like? *Ecological Economics, 175, 106703.* https://doi.org/10.1016/j.ecolecon.2020.106703

Bell, W. (2003) *Foundations of futures studies: History, purposes, and knowledge. Volume 1, Human science for a new era*. Transaction Publishers.

Blakeslee, S. (2004). The CRAAP test. *LOEX Quarterly*, *31*(3), 4. https://commons.emich.edu/cgi/viewcontent.cgi?article=1009&context=loexquarterly

Bleeker, J. (2009). *Design fiction: A short essay on design, science, fact and fiction*. Near Future Laboratory. https://blog.nearfuturelaboratory.com/2009/03/17/design-fiction-a-short-essay-on-design-science-fact-and-fiction/

Brady, M. K. (1997). Ethnic folklore. In T.A. Green (Ed.) F*olklore: An encyclopedia of beliefs, customs, tales, music, and art* (pp. 237-244). ABC-CLIO.

Brown, T. (2008). Design thinking. *Harvard Business Review, 86*, 84-92. https://www.researchgate.net/publication/5248069_Design_Thinking

Brown, T., & Katz, B. (2009). *Change by design: How design thinking transforms organizations and inspires innovation*. Harper Business.

Bruner, Jerome (2004). Life as narrative. *Social Research: An International Quarterly, 71*(3), 691-710.

Buchanan, R. (1989). Declaration by design. In V. Margolin (Ed.), *Design discourse* (pp. 91-109). University of Chicago Press.

Burdick, A. (2019). Designing futures from the inside. *Journal of Future Studies*, *23*(3), 75–92. https://doi.org/10.6531/JFS.201903_23(3).0006

Bynum, W., & Varpio, L. (2018). When I say ... hermeneutic phenomenology. *Medical Education, 52,* 252–253.

Cambridge Dictionary. (n.d.). Politics. In *Cambridge Dictionary*. Retrieved August 7, 2023, from https://dictionary.cambridge.org/dictionary/english/politics

Candy, S. (2010). *The futures of Everyday life: Politics and the design of experiential scenarios* [Doctoral thesis]. University of Hawaii at Manoa, Department of Political Science. https://www.researchgate.net/publication/305280378_The_Futures_of_Everyday_Life_Politics_and_the_Design_of_Experiential_Scenarios

Stuart Candy. The Thing From The Future. The Sceptical Futuryst. (20 October 2015). Retrieved June 17, 2019 from https://futuryst.blogspot.com/2015/10/the-thing-from-future.html??

Candy, S. (2016, August 28). Ghosts of futures past. *The Sceptical Futuryst*. Retrieved August 3, 2023, from https://futuryst.blogspot.com/search/label/2050

Candy, S. (31 Dec 2022). *Participatory futures for democracy*. Retrieved August 2, 2023, from https://futuryst.blogspot.com/2022/12/participatory-futures-for-democracy.html

Candy, S. (July 4, 2017). *Could this be the future of parenting?* Retrieved April 16, 2023, from https://futuryst.blogspot.com/2017/07/nurturepod.html

Candy, S. (March 31, 2021). *Adding dimensions to development futures with UNDP*. https://futuryst.blogspot.com/2021/03/experiential-futures-undp.html

Candy, S. (October 31, 2018). Experiential futures: A brief outline. Retrieved April 16, 2023, from https://futuryst.blogspot.com/2018/10/experiential-futures-brief-outline.html

Candy, S., & Dunagan, J. (2017). Designing an experiential scenario: The people who vanished. *Futures*, *86*, 136–153. https://doi.org/10.1016/j.futures.2016.05.006

Candy, S., & Dunagan, J. (2016). The Experiential Turn. Human Futures. 26.

Candy, S., Dator, J. & Dunagan, J. (2006). *Four futures for Hawaii 2050*. Hawaii Research Center for Future Studies: University of Hawaii Manoa.

Candy, Stuart. (2010). The futures of everyday life: Politics and the design of experiential scenarios. https://doi.org/10.13140/RG.2.1.1840.0248

Casi, C., Guttorm, H., & Virtanen, P. K. (2018). Traditional ecological knowledge. In *Cambridge University Press eBooks*. https://doi.org/10.1017/9781108552998

Cheung M (2008) The reductionist–holistic worldview dilemma. *MAI Review 3: Research Note 5*. http://www.review.mai.ac.nz/index.php/MR/article/viewFile/186/196

Cielemecka, O., & Daigle, C. (2019). Posthuman sustainability- An ethos for our anthropocenic future. *Theory, Culture, and Society, 36*(7-8), 67-87. https://doi.org/10.1177/0263276419873710

Clarkson, L., Morrissette, V., & Règallet, G. (1992). *Our responsibility to the seventh generation - Indigenous peoples and sustainable development*. International Institute for Sustainable Development.

CoDesign. (2005). Editorial. *CoDesign, 1*(1), 1-4. https://doi.org/10.1080/15710880412331289935

Committee on Facilitating Interdisciplinary Research, Committee on Science, Engineering, and Public Policy (2004). *Facilitating interdisciplinary research*. National Academies. National Academy Press.

Cooper, M. M., & Klymkowsky, M. W. (2013). Chemistry, life, the universe, and everything: A new approach to general chemistry, and a model for curriculum reform. Journal *of Chemical Education, 90*(9), 1116–1122. https://doi.org/10.1021/ed300456y

Csaki, B. S. (2015, November). Coming around again: Cyclical and circular aspects of Native American thought. In *Native leadership: Past, present and future: Proceedings of the eleventh Native American Symposium, Durant, Oklahoma* (pp. 5-6).

Dator, J. (2009). Experiencing alternative futures. *Journal of Futures Studies*, *14*(2), 1–18.

Dator, J. (2019). What futures Studies is, and is not. *Jim Dator: A Noticer in Time*, 3–5. https://doi.org/10.1007/978-3-030-17387-6_1

De los Rios, C., & Charnley, F. (2016) Skills and capabilities for a sustainable and circular economy: The changing role of design. *Journal of Cleaner Production, 160,* 109-122.

DiSalvo, C. (2012). Adversarial design. In *The MIT Press eBooks*. https://doi.org/10.7551/mitpress/8732.001.0001

Dunagan, J., Draudt, A., Hadley, J., Hogan, R., Murray, L., Stock, G., & West, J. (2019). Strategic foresight studio: A first-hand account of an experiential futures course. *Journal of Futures Studies*, *23*(3), 57–74. https://doi.org/10.6531/JFS.201903_23(3).0005

Dunagen, J & Candy, S. (2007). *FoundFutures: Chinatown - Community futures initiative*. Report submitted to Hawai'i Arts Alliance. https://issuu.com/jakedunagan/docs/ff-ctown-report5

Dunne, A., & Raby, F. (2001). *Design noir: The secret life of electronic objects*. Springer Science & Business Media.

Dunne, A., & Raby, F. (2013). *Speculative everything: Design, fiction, and social Dreaming*. MIT Press.

Ellen MacArthur Foundation. (2017). *Methods*. The Circular Design Guide. Retrieved August 3, 2023, from https://www.circulardesignguide.com/methods

Ellen MacArthur Foundation. (n.d.). *The circular economy in detail*. The Ellen MacArthur Foundation. Retrieved August 6, 2023, from https://ellenmacarthurfoundation.org/the-circular-economy-in-detail-deep-dive#:~:text=An%20economy%20that%20is%20restorative%20and%20regenerative%20by%20design.&text=It%20is%20based%20on%20three,Regenerate%20nature

Evans, M. (March 27, 2023). *Preparing for a storm the Ni-Vanuatu Way.* Hakai Magazine. Retrieved May 14, 2023, from https://hakaimagazine.com/news/preparing-for-a-storm-the-ni-vanuatu-way/

Extrapolation Factory. (2015). *1-888-FUTURES*. Retrieved August 23, 2023, from https://extrapolationfactory.com/1-888-FUTURES

Fifield, B., & Medkova, K. (2016). Circular design - Design for circular economy. *Lahti CleanTech Annual Review, 23.*

Fixico, D. (2003). *The American Indian mind in a linear world*. Routledge.

Foreground design agency. (2023.). Liquid breath. Retrieved August 1, 2023, from https://www.foreground-da.com/LIQUID-BREATH

Foreground design agency. (n.d.). Posthuman habitat. Retrieved August 1, 2023, from https://www.foreground-da.com/posthuman-habitats

Forlano, L. (2017). Posthumanism and design. *She Ji: The Journal of Design, Economics, and Innovation*, *3*(1), 16–29. https://doi.org/10.1016/j.sheji.2017.08.001

Friedman, K. (2003). Theory construction in design research: criteria: approaches, and methods. *Design Studies*, *24*(6), 507–522. https://doi.org/10.1016/s0142-694x(03)00039-5

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J., (2017). The circular economy – A new sustainability paradigm? *Journal of Cleaner Production, 143*, 757–768. https://doi.org/10. 1016/j.jclepro.2016.12.048.

Gidley, J., Fien, J., Smith, J., Thomsen, D., & Smith, T. (2009). Participatory futures methods: towards adaptability and resilience in climate-vulnerable communities.*Environmental Policy and Governance*, *19*(6), 427-440. **https://doi.org/10.1002/eet.524**

Gidley, J. M. (2017). *The future: A very short introduction*. Oxford University Press.

Gill, M.J, (2014). *The possibilities of phenomenology for organizational research. Organizational Research Methods, 17*(2), 118–37.

Gleick, J. (2016). *Time travel: A history*. Pantheon.

Grandoni, D., & Montalbano, V. (2022, December 1). I*n a first, U.S. appoints a diplomat for plants and animals*. Washington Post. https://www.washingtonpost.com/politics/2022/09/29/first-us-appoints-diplomat-plants-animals/

Granjou, C., Walker, J., & Salazar, J. F. (2017). The politics of anticipation: On knowing and governing environmental futures. *Futures, 92*, 5-11. DOI:10.1016/j.futures.2017.05.007

Gunnarsson-Östling, U., Svenfelt, Å., & Höjer, M. (2012). Participatory methods for creating feminist futures. *Futures, 44*(10), 914–922. https://doi.org/10.1016/j.futures.2012.06

H&M. (2019, August 4). *H&M's conscious collection launches worldwide with a sustainable fashion future in mind.* . H&M Press. Retrieved August 6, 2023, from https://about.hm.com/news/general-news-2019/h-m-s-conscious-collection-launches-worldwide-with-a-sustainable.html

Hacking, I. (1981). *Scientific Revolutions.* Oxford University Press.

Hall. (2021, May 13). *Second Law of Thermodynamics*. NASA. Retrieved December 4, 2022, from https://www.grc.nasa.gov/www/BGH/thermo2.html

Haraway, D. J. (2013). *When species meet*. University of Minnesota Press.

Harb, A. M. M. E. R., & FAHMY, M. A. (2020). Humans, Technology and Speculative Design Futures: Can We See the Invisible?. In *Design: Vertical and Horizontal Growth* (pp. 5-9)

Haugeland, J. (2005). Reading Brandom reading Heidegger. *European Journal of Philosophy,13*(3), 421–28.

Hemmati, M., & Röhr, U. (2007). A huge challenge and a narrow discourse: Ain't no space for gender in climate change policy? *Women & Environments International Magazine, 74,* 5-9.

Hookway, C. (2013) Pragmatism. *The Stanford Encyclopedia of Philosophy* (summer 2016 edition). https://plato.stanford.edu/archives/sum2016/entries/pragmatism/

Hopper, M., & Stave, K. A. (2008). Assessing the effectiveness of systems thinking interventions in the classroom. In *The 26th International Conference of the System Dynamics Society* (pp. 1–26). Athens, Greece

Hupkes, T., & Hedman, A. (2022). Shifting towards non-anthropocentrism: In dialogue with speculative design futures. *Futures, 140,* 102950. https://doi.org/10.1016/j.futures.2022.102950

IDEO Design Thinking. (2008). *IDEO | Design Thinking.* Retrieved May 7, 2022, from https://designthinking.ideo.com/

Inayatullah, S. (1990). Deconstructing and reconstructing the future: Predictive, cultural and critical epistemologies. *Futures, 22*, 115-14.

Inayatullah, S. (1998). Causal layered analysis. *Futures, 30*(8), *815–829.* https://doi.org/10.1016/s0016-3287(98)00086-x

Independent Maori Statutory Board. (2019). *The kaitiakitanga report for Tāmaki Makaurau.*. https://www.imsb.maori.nz/assets/pdf/IMSB-Kaitiakitanga-Report-20200226.pdf?k=c6cba5af1c

Jakobsone, L. (2017). Critical design as approach to next thinking. *The Design Journal, 20*(sup1), S4253—S4262. https://doi.org/10.1080/14606925.2017.1352923

Jalonen, H., Lehti, M., Tonteri, A., Koskelo, M., Nousiainen, A. K., & Jappinen, T. (2017). *From signal to future stories*. Turku University of Applied Sciences.

Janca, A., & Bullen, C. (2003). The aboriginal concept of time and its mental health implications. *Australasian Psychiatry, 11*(1_suppl), S40–S44. https://doi.org/10.1046/j.1038-5282.2003.02009.x

Johannessen, L.K. (2017). *The young designer 's guide to speculative and critical design*. Norwegian *University of Science and Technology.*

Jones, H. F. & Jones, N. (2020). Race, technology, and posthumanism. In M. Rosenthal Thomsen & J. Wamberg (Eds.), *The Bloomsbury handbook of posthumanism* (pp. 161-170). Bloomsbury Academic.

Ketelle, D. (2017). Introduction to the special issue: What Is storytelling in the higher education classroom? *Storytelling, Self, Society*, *13*(2), 143–150. https://doi.org/10.13110/storselfsoci.13.2.0143

Kim, D. (1992). *System archetypes*. Toolbox Reprint Series, Pegasus Communications.

Kim, D. (2015, November 19). *Systems archetypes as structural pattern templates*. The Systems Thinker. https://thesystemsthinker.com/systems-archetypes-as-structural-pattern-templates/

Kopainsky, B., Alessi, S. M., & Davidsen, P. I. (2011). Measuring knowledge acquisition in dynamic decision making tasks. In *The 29th International Conference of the System Dynamics Society* (pp. 1–31). System Dynamics Society.

Kornet, K. (2015). *Causing an effect: Activists, uncertainty and images of the future* [Master's thesis]. Faculty of Design, OCAD University. http://openresearch.ocadu.ca/id/eprint/257/1/Kornet_Kelly_2015_MDes_SFIN_MRP.pdf

LaDuke, W. (1994). Traditional ecological knowledge and environmental futures. *Journal of International Environment and Policy, 5*, 127-135.

Le Poidevin, R. (2019). The experience and perception of time. In, *The Stanford Encyclopaedia of Philosophy* (Summer 2019 Edition). https://plato.stanford.edu/archives/sum2019/entries/time-experience/

Leon, C. B. (2016, February 4). *The life of American workers in 1915: Monthly labor review: U.S.* Bureau of Labor Statistics. https://www.bls.gov/opub/mlr/2016/article/the-life-of-american-workers-in-1915.htm

Levine, R. (1997). *A geography of time: The temporal misadventures of a social psychologist, or how every culture keeps time just a little bit differently*. Basic Books.

Linehan, C., Kirman, B., Wakkary, R., Desjardins, A., Tanenbaum, T. J., Blythe, M., Reeves, S. (2014). Alternate endings. In *Proceedings of the extended abstracts of the 32nd annual ACM conference on Human factors in computing systems - CHI EA '14.* , (pp. 45–48). ACM Press.

Lugmayr, A., Sutinen, E., Suhonen, J., Sedano, C. I., Hlavacs, H., & Montero, C. S. (2016). Serious storytelling – a first definition and review. *Multimedia Tools and Applications*, *76*(14), 15707–15733. https://doi.org/10.1007/s11042-016-3865-5

Malpass, M. (2013). Between wit and reason: Defining associative, speculative, and critical design in practice. *Design and Culture, 5*(3), 333–356. https://doi.org/10.2752/175470813X13705953612200

Manen, M. V. (1997). *Researching lived experience: human science for an action sensitive pedagogy*. Routledge Taylor and Francis Group

Manthei, E., & Rendell, L. (2022, April 11). *Ancestral futures*. SPACE10. Retrieved August 6, 2023, from https://space10.com/ancestral-futures/

Markie, P., & Folescu, M. (2023). Rationalism vs. empiricism, *The Stanford Encyclopedia of Philosophy* (Spring 2023 Edition). Retrieved from: https://plato.stanford.edu/archives/spr2023/entries/rationalism-empiricism

Markman, K. D., Gavanski, I., Sherman, S. J., & McMullen, M. N. (1993). The mental simulation of better and worse possible worlds. *Journal of Experimental Social Psychology, 29*(2), 87-109.

Martineau, J. (2016). *Time, capitalism, and alienation: A socio-historical inquiry into the making of modern time*. http://ci.nii.ac.jp/ncid/BB18826373

Mazé, R. (2019). Politics of designing visions of the future. *Design and Futures*, *23*(3), 23–38. https://doi.org/10.6531/jfs.201903_23(3).0003

Mazé, R., & Redström, J. (2007). Difficult forms: Critical practices of design and research. *Research Design Journal, 1*(14), 28-39.

McDowell, A. (2019). Storytelling shapes the future. *Journal of Future Studies*, *23*(3), 105–112. https://doi.org/10.6531/JFS.201903_23(3).0009

McGonigal, J. (2019, February). *Simulation skills: This is your brain on the future* [Video]. Coursera. https://www.coursera.org/specializations/futures-thinking#courses

McGonigal, J. (2019, May 29). *Thinking in facts versus thinking in first person* [Video]. Coursera. https://www.coursera.org/learn/simulation-skills/lecture/c0Wir?t=270

McGonigal, J. (2019a). *When does the future start?* [Video]. Coursera. Retrieved December 5, 2021, from https://www.coursera.org/learn/introduction-to-futures-thinking/lecture/6geuq?t=234

McGonigal, J. (2022, June 10). *Want to change your life? Don't think one year into the future—Think 10.* Slate Magazine. https://slate.com/technology/2022/06/imaginable-excerpt-futures-thinking-10-years.html

McGregor, D. (2004). Coming full circle: Indigenous knowledge, environment, and our future. *The American Indian Quarterly, 28(3), 385–410.* https://doi.org/10.1353/aiq.2004.0101

McNally, D. (2004). Language, praxis and dialectics: Reply to Collins. *Historical Materialism, 12*(2), 149-167.

Meadows, D. H. (2008). *Thinking in systems*. Chelsea Green Publishing.

Merriam-Webster. (n.d.). Anthropocentric. In *Merriam-Webster.com dictionary*. Retrieved August 20, 2023, from https://www.merriam-webster.com/dictionary/anthropocentric

Merriam-Webster. (n.d.). Bloodless. In *Merriam-Webster.com dictionary*. Retrieved August 6, 2023, from https://www.merriam-webster.com/dictionary/bloodless

Merriam-Webster. (n.d.). Counterfactual. In *Merriam-Webster.com dictionary*. Retrieved April 16, 2023, from https://www.merriam-webster.com/dictionary/counterfactual

Merriam-Webster. (n.d.). Empiricism. In *Merriam-Webster.com dictionary*. Retrieved August 20, 2023, from https://www.merriam-webster.com/dictionary/empiricism

Merriam-Webster. (n.d.). Future. In *Merriam-Webster.com dictionary*. Retrieved August 20, 2023, from https://www.merriam-webster.com/dictionary/future

Merriam-Webster. (n.d.). Mimesis. In *Merriam-Webster.com dictionary*. Retrieved March 21, 2022, from https://www.merriam-webster.com/dictionary/mimesis

Mistra Future Fashion. (n.d.). *Teds ten - Mistra Future Fashion*. Retrieved August 6, 2023, from http://mistrafuturefashion.com/output/teds-ten/

Mitrović, I. (2015). An Introduction to Speculative Design Practice. In I. Mitrović & M. Golub (Eds.). Department for Visual Communications Design, Arts Academy, University of Split.

Montgomery, E. P., & Woebken, C. (2016). *Extrapolation Factory - Operator's manual: Publication Version 1. 0 - Includes 11 Futures Modeling Tools*. Createspace Independent Publishing Platform.

Moreno, M., De Los Rios, C., Rowe, Z. O., & Charnley, F. (2016). A conceptual framework for circular design. *Sustainability*, *8*(9), 937. https://doi.org/10.3390/su8090937

Morgan, B. (2021, July 26). *Participatory Futures: Integrating public voices in futures thinking*. Futures, Foresight and Horizon Scanning, United Kindgom Government Blog. Retrieved August 2 , 2023, from https://foresightprojects.blog.gov.uk/2021/07/26/participatory-futures-integrating-public-voices-in-futures-thinking/

Morrison, A., Turner, J., Farley, H., Webber, S. & Oliver. L. J. (2017). Workshop: Animal computer interaction (ACI) and designing for animal interaction (AXD). In *Proceedings of the 29th Australian Conference on Human-Computer Interaction* (pp. 656–657). https://doi.org/10.1145/3152771.3156196

Nandy, A. (1996). Bearing witness to the future. *Futures*, *28*(6–7), 636–639. https://doi.org/10.1016/0016-3287(96)84465-x

National and international frameworks (n. d.)*Indigenous Involvement*. Australia State of the Environment. Retrieved May 14, 2023, from https://soe.dcceew.gov.au/climate/management/national-and-international-frameworks#-cli-21-figure-21-indigenous-peoples-and-the-environment

National Grey Literature Collection. (1997). *Luxembourg Definition*. National Grey Literature Collection. Retrieved August 20, 2023, from https://allcatsrgrey.org.uk/wp/knowledgebase/luxembourg-definition-1997/

Nelson, H. G., & Stolterman, E. (2012). The design way. In *The MIT Press eBooks*. https://doi.org/10.7551/mitpress/9188.001.0001

Neubauer, B., Witkop, C., & Varpio, L. (2019). How phenomenology can help us learn from the experiences of others. *Perspectives on Medical Education, 8*(2), 90–97. https://doi.org/10.1007/s40037-019-0509-2

New Zealand Parliament. (28.03.2017). *Innovative bill protects Whanganui River with legal personhood.* Retrieved August 1, 2023, from https://www.parliament.nz/en/get-involved/features/innovative-bill-protects-whanganui-river-with-legal-personhood/

Ngati Kuta & Patukeha Hapu Te Rawhiti. (2016). *Boundaries.* Retrieved May 29, 2023, from https://www.rahui.org.nz/boundaries.html

Norman, D. A. (2013). *The design of everyday things.* MIT Press.

Pratt Institute (2022, November 30). *Habitat for the Bees - Pratt Institute*. Retrieved August 1, 2023, from: https://www.pratt.edu/prattfolio/stories/habitat-for-the-bees-pratt-professor-explores-post-human-architecture-for-n/

Rameka, L. (2016). Kia whakatōmuri te haere whakamua: I walk backwards into the future with my eyes fixed on my past. *Contemporary Issues in Early Childhood, 17*(4), 387–398. https://doi.org/0.1177/1463949116677923

Rasmussen, A. S., & Berntsen, D. (2013). The reality of the past versus the ideality of the future: Emotional valence and functional differences between past and future mental time travel. *Memory and Cognition, 41*(2), 187–200. https://doi.org/10.3758/s13421-012-0260-y

Reiners, G. M. (2012). Understanding the differences between Husserl's (descriptive) and Heidegger's (interpretive) phenomenological research. *Journal of Nursing and Care,1,* 1–3.

Richmond, B. (1994). System dynamics/systems thinking: Let's just get on with it. *System Dynamics Review*, *10*(2-3), 135-157.

Robertson, T., & Wagner, I. (2012). Ethics: Engagement, representation and politics-in-action. In *Routledge International Handbook of Participatory Design* (pp. 64–85). Routledge.

Roese, N. (1997). "Counterfactual thinking". *Psychological Bulletin, 121*(1), 133–148.

Roese, N. J., Hur, T., & Pennington, G. L. (1999). Counterfactual thinking and regulatory focus: Implications for action versus inaction and sufficiency versus necessity. *Journal of Personality and Social Psychology, 77*(6), 1109-1120.

Russell-Smith, J., Cook, G. D., Cooke, P. H., Edwards, A. G., Lendrum, M., Meyer, C., & Whitehead, P. J. (2013). Managing fire regimes in north Australian savannas: Applying Aboriginal approaches to contemporary global problems. *Frontiers in Ecology and the Environment, 11*(s1). https://doi.org/10.1890/120251

Salas, E. (1966). L'Évolution de la notion du temps et les horlogers à l'époque coloniale au Chili. Annales. *Histoire, Sciences Sociales, 21*(1), 141-158. https://doi.org/10.3406/ahess.1966.421357

Sanders, E., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign*, *4*(1), 5–18. https://doi.org/10.1080/15710880701875068

Sanna, L. J., Chang, E. C., Miceli, M. P., & Lundberg, K. J. (2007). When an event never happened: An analysis of the cognitive processes associated with the formation of false counterfactual thoughts. *Journal of Experimental Social Psychology, 43*(4), 489-497.

Savery, J. R., & Duffy, T. M. (1995). Problem based learning: An instructional model and its constructivist framework. *Educational Technology*, *35*(5), 31–38. http://www.jstor.org/stable/44428296

Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization* . Doubleday.

Simon, H. (1969). *The sciences of the artificial*. MIT Press.

Simonsen, J., & Robertson, T. (2012). *Routledge international handbook of participatory design.* Routledge.

Slaughter, R. (2018). “Two fine additions to the futures literature,” *Foresight*, *20*(4), 444.

Slaughter, R. A. (2020). Futures studies as a quest for meaning. *World Futures Review*, *12*(1), 26–39. https://doi.org/10.1177/1946756719870277

Smith, David Woodruff. (2013) Phenomenology. *Stanford encyclopaedia of philosophy*. Retrieved August 10, 2022, from https://plato.stanford.edu/entries/phenomenology/

Smitheram, M., & Joseph, F. (2020). Material-aesthetic collaborations: Making-with the ecosystem. *CoDesign*, *16*(4), 293–310. https://doi.org/10.1080/15710882.2020.1841796

Squires, A., Wade, J., Dominick, P., & Gelosh, D. (2011). Building a competency taxonomy to Guide experience acceleration of lead program systems engineers. *9th Annual Conference on Systems Engineering Research (CSER*) (pp. 1–10). Redondo Beach, CA. https://apps.dtic.mil/sti/tr/pdf/ADA589178.pdf

Stave, K. A., & Hopper, M. (2007). What constitutes systems thinking? A proposed taxonomy. *In 25th International Conference of the System Dynamics Society.* Boston, MA.
https://www.researchgate.net/publication/255592974_What_Constitutes_Systems_Thinking_A_Proposed_Taxonomy

Sterling, B. (2009). Design fiction. *Interactions, 16*(3), 20. https://doi.org/10.1145/1516016.1516021

Sterling, B. (2013, October 11). *Patently untrue: Fleshy defibrillators and synchronised baseball are changing the future*. WIRED UK. https://www.wired.co.uk/article/patently-untrue

Sterling, B., 2012. *Bruce Sterling explains the intriguing new concept of design fiction (Interview by Torie Bosch)*. Slate. Retrieved April 16, 2023, from http://www.slate.com/blogs/future_tense/2012/03/02/bruce_sterling_on_design_fictions_.html

Sweeney, L. B., & Sterman, J. D. (2000). Bathtub dynamics: Initial results of a systems thinking inventory. *System Dynamics Review, 16*(4), 249–286. https://doi.org/10.1002/sdr.198

Taonui, R. (2015, July). *Whakapapa – genealogy*. Te Ara - the Encyclopaedia of New Zealand. https://teara.govt.nz/en/whakapapa-genealogy

Tarcan, B., Pettersen, I. N., & Edwards, F. (2022) Making-with the environment through more-than-human design, in D. Lockton, S. Lenzi, P. Hekkert, A. Oak, J. Sádaba, & P. Lloyd (Eds.), *DRS2022: Bilbao*, 25 June - 3 July, Bilbao, Spain. https://doi.org/10.21606/drs.2022.347

Taylor, F. W. (2014). *The principles of scientific management*. CreateSpace Independent Publishing Platform.

Te Ahukaramū Charles Royal, (2007). *Kaitiakitanga – guardianship and conservation,* Te Ara - the Encyclopaedia of New Zealand. http://www.TeAra.govt.nz/en/kaitiakitanga-guardianship-and-conservation

Te Ohu Kaimoana (2018). *Iwi and industry exercise kaitiakitanga for hoki*. Retrieved May 29th, 2023, from https://teohu.maori.nz/iwi-and-industry-exercise-kaitiakitanga-for-hoki/

Teherani, A., Martimianakis, T., Stenfors-Hayes, T., Wadhwa, A., & Varpio, L. (2015). Choosing a qualitative research approach. *Journal of Graduate Medical Education, 7*, 669–70.

Thalhofer, F. (2018, October). *Future of storytelling - Future of thinking.* Vertice Festival / Transmedia Meeting, Mexico City, Mexico.

Tharp, B. M., & Tharp, S. M. (2013). *Discursive Design Basics: Mode and Audience.* Nordic Design Research Conference, 406–409.

Tonkinwise, C. (2015, August 22). *Just design: Being dogmatic about defining speculative critical design future fiction*. Just Design, 1–10. https://medium.com/@camerontw/just-design-b1f97cb3996f

Trewin, B., Morgan-Bulled, D., & Cooper, S. (2021). *National and international frameworks | Indigenous involvement.* Australia State of the Environment. Retrieved May 14, 2023, from https://soe.dcceew.gov.au/climate/management/national-and-international-frameworks#-cli-21-figure-21-indigenous-peoples-and-the-environment

University of Exeter. (2023). *Grey Literature: What is Grey Literature?* The University of Exeter. https://libguides.exeter.ac.uk/c.php?g=670055&p=4756572

Van der Velden, M., & Mörtberg, C. (2014). Participatory design and design for values. *Handbook of Ethics, Values, and Technological Design*, 1–22. https://doi.org10.1007/978-94-007-6994-6_33-1

Victoria and Albert Museum. (2018). The future starts here. Retrieved April 16, 2023, from https://www.vam.ac.uk/exhibitions/the-future-starts-here

Waters, R. (2020, June 12). *How do our previous choices inform our future decisions?* Princeton Insights. https://insights.princeton.edu/2020/06/how-do-our-previous-choices-inform-our-future-decisions/

Weston, P. (2019, October 17). *Plastic bags were created to save the planet, inventor's son says.* The Independent. https://www.independent.co.uk/climate-change/news/plastic-bags-pollution-paper-cotton-tote-bags-environment-a9159731.html

Wolfe, C. (2010). *What is posthumanism?* University of Minnesota Press.

Wolfgramm, R., Spiller, C., Houkamau, C., & Henare, M. (2018). Home: Resistance, resilience, and innovation in Māori economies of well-being. In M. Nelson & D. Shilling (Eds.), *Traditional ecological knowledge: Learning from indigenous practices for environmental sustainability* (pp. 213-228). Cambridge University Press. https://doi.org/10.1136/bmj.326.7384.328

Wood, D. F. (2003). ABC of learning and teaching in medicine: Problem based learning. *British Medical Journal, 326,* 328-330. https://doi.org/10.1136/bmj.326.7384.328

World Bank (2003). *Implementation of operational directive 4.20 on indigenous peoples: an independent desk review.* World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/570331468761746572/implementation-of-operational-directive-4-20-on-indigenous-peoples-an-independent-desk-review

World Bank (2008). *Social dimensions of climate change: workshop report*. World Bank. https://www.worldbank.org/en/topic/social-dimensions-of-climate-change

Zamansky, A., Roshier, A., Mancini, C., Collins, E. C., Hall, C., Grillaert, K., Morrison, A., North, S. & Wirman, H. (2017). A report on the first international workshop on research methods in animal-computer interaction. *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '17*. https://doi.org/10.1145/3027063.3052759

Zorich, Z. (2013). *The maya sense of time.* Archaeology Magazine. Retrieved 14, May. 2023. https://www.archaeology.org/issues/44-1211/features/386-maya-long-count-calendar