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JACQUES WALLER BARCIA JUNIOR

NEXT - A DISSERTATION-NOVEL: the role of science fiction in design futures

Recife

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Masters Dissertation presented to the Post-Graduate Program in Design from the Universidade Federal de Pernambuco in partial fulfillment of the requirements for the degree of Master in Digital Artifacts.

Supervisor: Walter Franklin M. Correia, DSc.

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For those who dare to imagine and create alternative futures.

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"Any useful statement about the future should at first seem ridiculous." (DATOR, 1995)

ABSTRACT

We live in a time when chaos, complexity and contradictions are the new normal. These Postnormal Times, characterized by technological acceleration and deep uncertainty, pose a problem for design. Identifying and designing solutions in the same pace of accelerated change is not feasible, especially because accelerating change creates situations in which past references are not available, and everything is radically new. Because of this, it becomes ever more important to act preemptively, and anticipate problems, dilemmas and opportunities. In design, practices which explore the futures, such as Speculative Design, Design Fiction, Science Fiction Prototyping and Experiential Futures, have in common the use of futures narratives characteristic of the ones from Science Fiction. The genre has a crucial role in so called Design Futures practices, since its mechanism of Cognitive Estrangement allows for authors and readers to imagine alternative futures, compare and build narratives about problems and change in their environment, and think about implications of fictive elements as plausible futures for society. This Masters Dissertation explores the role of science fiction's mechanisms in Design Futures and, so, widens the horizons of design incorporating science fiction narratives to the repertory of design tools focused on the identification of problems, development and prototyping of solutions. This dissertation does a bibliographic review of Design Futures practices, Futures Studies and Science Fiction. It also brings a case study in which the concepts and tools studied were applied. This dissertation also explores a new format for academic presentation, the Dissertation-Novel, as a way of exploring and exemplifying the concepts discussed within it. This work brings as results the presentation of this new format, a preliminary framework for Postnormal Design, a case study of the framework's application and narrative designs. It also brings a preliminary research methodology proposal, Heterotopic Research, and a proposal for a new category of disruptive event in Futures Studies, the Node. The research concludes that the use of science fiction narratives in design, more than a framework, offers a new way of thinking and practicing design - for both investigating fictive worlds, and to design for alternative futures.

Keywords: Futures Studies. Strategic Foresight. Design Futures. Science Fiction. Heterotopia.

RESUMO

Vivemos em tempos em que caos, complexidade e contradição são o novo normal. Esses tempos Pós-Normais, de aceleração tecnológica e incerteza profunda, criam um problema para o design. Identificar problemas e projetar soluções na velocidade da mudança é inviável, especialmente pelo fato da mudança acelerada criar situações onde não há mais referências e tudo é radicalmente novo. Por isso, é cada vez mais importante agir preemptivamente, antecipando problemas, dilemas e oportunidades. No design, práticas que exploram o futuro, como Design Especulativo, Design Fiction, Science Fiction Prototyping e Futuros Experienciais, têm em comum o uso de narrativas sobre o futuro características da Ficção Científica. Esse gênero tem um papel crucial nessas práticas a qual chamaos de Design Futures, já que, através de seu mecanismo de Estranhamento Cognitivo, permite que autores e leitores imaginem futuros alternativos, comparem e construam narrativas sobre problemas e mudanças em seu ambiente e reflitam sobre implicações dos elementos ficcionais como futuros plausíveis para a sociedade. Esta dissertação de mestrado, portanto, explora o papel dos mecanismos da ficção científica na prática do design antecipatório e, dessa forma, amplia os horizontes do design ao incorporar narrativas de ficção científica ao repertório de ferramentas de pesquisa de problemas e às ferramentas de desenvolvimento de soluções e prototipagem de artefatos. Esta dissertação traz uma revisão bibliográfica sobre design antecipatório, estudos de futuros e ficção científica. Ela também traz um estudo de caso onde foram aplicados os conceitos e ferramentas nela estudadas. Este utiliza, ainda, um novo formato de apresentação de trabalhos acadêmicos, a Dissertação-Romance, como forma de explorar e exemplificar os conceitos nela discutidos. Este trabalho traz como resultados a apresentação desse novo formato, um framework preliminar para o Design Pós-Normal, um estudo de caso da utilização desse framework e design narrativos, além de trazer uma proposta preliminar de metodologia de pesquisa, a Pesquisa Heterotópica, e um novo elemento para estudos de futuros, o Node. A pesquisa conclui que a utilização de narrativas de ficção científica no design, mais que um framework, cria uma nova forma de pensar e praticar o design - tanto investigando mundos fictivos, quanto fazendo design para futuros alternativos.

Palavras-chave: Estudos de Futuros. Prospectiva Estratégica. Design Futures. Ficção Científica. Heterotopia.

LIST OF FIGURES

LIST OF TABLES

CONTENTS

1 SUSPEND YOUR DISBELIEF

This is the story of how Jack designed heterotopias about artificial feelings in 2050. It's the story of how he learned how to do it, the explorations, the processes, discussions, lessons learned along the way. In a sense, this story is almost like a hupomnemata (Foucault, 1991), an account of what happened in the days of Jack and his research in order to make him meditate upon his trajectory. But it's also a scientific exploration written as fiction, like the ones which were written as graphic novels since the middle of the 2010s (Sousanis, 2015). Call this a Dissertation-Novel. Ridiculous, right? That's the spirit — and we'll talk about being ridiculous later on.

Suffice it to say now that, to enjoy the ride, you'll have to suspend your disbelief.

Actually, the story itself, through its structure, the characters and its dynamics will help you suspend your disbelief, think of Heterotopias (Foucault, 1967) — "other places" and alternative paths to the future —, engage with the story and discuss Jack's world. You'll be presented to problems, dilemmas and opportunities for products and services, strategies and policies, businesses and social organizations that do not exist yet, but may be really serious issues in the next decade or two. That's how science fiction works. As you'll see, this genre is primarily about opening doors to other places, other futures, critiquing the world as it is and discussing the implications of what might be. And this has everything to do with design. Actually, this might be the whole point of design in the 21st century.

In Jack's world of 2033, a number of technologies — artificial intelligence, augmented reality, neurotechnology — and societal changes made the world quite strange. Issues such as climate refugees crisis, algorithmic apartheid and computational propaganda, along with reality hacking, genetic fluidity and augmented intelligence, changed everyday life and the things society needs in order to function. You'll only see some of these issues in this Dissertation-Novel. But without any doubt, they are there, in between the lines. Because the complexities, apparent chaos and contradictions caused by these technological and societal changes did not begin in 2033. The issues causing harm, unrest, disruption — and the issues creating new, unseen, even accelerating change — did not begin in 2033. Instead, these disruptions have been building up since the early 2000s, some of those even one, two or three decades before that. In hindsight, these changes may seem like they were inevitable. Like they're the only possible outcome. Except they're not. As Jack learns in his journey, the futures are open and can be influenced with design.

But what Jack also learns is that an accelerating world doesn't need accelerating design, accelerating innovation or accelerating decision-making. An accelerating world needs anticipatory, preemptive, futures-driven design. Design for a world that does not exist yet, but may have issues so big we have to address them before they even happen. Design for an imagined world, that might, one day, be the real world. A world in which normal is not what it used to be, and it's even a thing of the past. It needs to create other places in space and time. Different orders. A

postnormal world needs postnormal design, one that is systemic, anticipatory and alternative.

To sum up, this is the story of how Jack started exploring the interactions between foresight, design and science fiction. The story of how he discovered how the mechanics of science fiction help design for the future and how he came up with a preliminary framework to use science fiction stories as tools for design in a Postnormal world. But more importantly, this is the story of how he came up with Heterotopic Research, a new practice, or a new way of thinking design — a design that researches and creates other places, alternatives and futures.

The relevance of this account to the design field is twofold: first, it examines how the mechanics of science fiction help designers research and design artifacts from and for the future with Heterotopic Research, and presents a preliminary framework to generate artifacts and extract Minimum Viable Future products. It also experiments with a new form of academic presentation, via its Dissertation-Novel structure. Such structure is being experimented both in post-graduation projects, as in academic papers, such as in Blythe's (2014).

> Imaginary Magnitude is a work of science fiction by Stanislav Lem that takes the form of introductions and prefaces to books written in the future. It is made up of summaries, quotations and critiques of texts that do not exist. It is an economical and evocative literary device picturing whole new disciplines and fields of study in brief paragraphs. The technique allows the author to play with ideas, plots and character without having to write an entire novel or short story. Although Lem has been described as the genre's Bach and Philip K. Dick as its Shakespeare, few would recommend science fiction for the music and poetry of its language. Science fiction is a literature of ideas and thought experiment. The anthology of prefaces and introductions to works that have not yet been written is a very pure expression of the form. "Imaginary Abstracts" describe prototypes that do exist and report findings from studies that did not take place. They are in this sense design fictions. But the levels of fiction are multiple. They describe fictional designs but also fictional problem spaces and fictional findings. The following "imaginary abstract" describes a fictional prototype and a fictional field study with fictional results. (BLYTHE, 2014)

This Dissertation-Novel, then, has the objective of exploring how science fiction narratives can be used as research and prototyping tools in Design Futures. Specifically, it a) investigates how design, strategic foresight and science fiction interact; b) how Cognitive Estrangement create Heterotopias for Postnormal Times; c) how the use of this tool work in practice and finally; d) tests the Dissertation-Novel format.

In this Dissertation-Novel you'll read Jack's journey as he enrolls in a design futures learning experience under an artificial intelligence tutor. After a bar fight, Jack uses what he learns in his tutor's lectures to explore Heterotopias of artificial feelings. The story of Jack is, in itself, a Heterotopic Research about learning with AI tutors. It's an emulation of science fiction applied to design futures, an example of a process and the result of a design research using the proposed preliminary framework.

This story is presented in the following format:

- In **Part One** — chapter One — Jack is in a path to **Explore** connections between futures studies, science fiction and design.
  - In **Chapter Two** Jack and his tutor meet and talk about **Design and Futures**. They talk about definitions of futures studies, Postnormal futures and design futures, compare three forms of futures-focused design — Speculative Design, Design Fiction and Science Fiction Prototyping — and draw parallels between futures studies and design processes.
- In **Part Two** — chapters Three and Four — Jack learns the mechanics of science fiction to **Feel** the future.
  - In **Chapter Three** Jack learns about the **Mechanics of Science Fiction**. Jack's AI tutor explains how cognitive estrangement works, what's the Novum and how Sublime, Grotesque and Dissociative moods affect how we feel a science fiction story.
  - In **Chapter Four** Jack discusses with his tutor about **Heterotopic Research**, a preliminary proposal for an alternative futures research practice for design. Jack concludes weak signals work in similar ways to Suvin's Novum, that cognitive estrangement triggers alternative futures thinking and learns how science fiction creates facts-based fictive worlds which serve as fields of exploration to problems, dilemmas and opportunities for the future. Jack also comes with the definition for a new category for highly disruptive events: the Node.
- In **Part Three** — Chapters Five and Six — Jack uses what he's learned to **Influence** the future.
  - In **Chapter Five** Jack uses **Science Fiction as a Tool in Design**. Jack compares narratology and design futures. He also discusses a case study of a design futures class from 2017, in which design students employ Heterotopic Research and the preliminary framework in class. Jack also discusses how the mechanics of science fiction work in experiential futures and how stories can be used as prototypes. He builds three alternative stories and discusses what he learned from them.
  - In **Chapter Six** Jack gives his final considerations **Towards a Design in a Postnormal World**. Jack recollects his journey and discusses next steps.
- In the **Appendix** are weak signals that helped build the world of Jack in 2033, and the world he explores in 2050.

2 DESIGN AND FUTURES

Dangerous. Jack never thought about being a dangerous man, about doing harm. Sure, he liked respect and his looks caused discomfort, sometimes, which was good. He also liked the idea of being seen as dangerous to people, organizations and societal structures that were, themselves, dangerous to society. Harmful. But being dangerous for real? Like having the power and responsibility to actually change things in scale? No, he never thought about being dangerous, at least not in the way his AI tutor had suggested. Jack just wanted to build a better world. To learn how to design the futures seemed like one good way of accomplishing that. From that spot on the arena's highest stands he could see boys, girls and transgender kids playing football, rolling with smart skates and roleplaying with real and augmented reality characters. Jack sat with a bowl of fish salad in one hand, a pair of chopsticks in the other, and a hardcover edition of William Gibson's Idoru on his lap. He tried to enjoy his lunch break without paying attention to his tutor's avatar sitting next to him, motionless and spooky, staring at his fish as if about to ask for some. It was his second semester in that open Design Futures program, and though he had taken other de-schooled courses and digital instructors before, it was his first time with a fully-fledged, extended reality AI tutor. And his presence and silence made him a little unease. Not that he was falling into the uncanny valley, but moments like this reminded Jack of his history classes, when slaves had to stand in silence and wait for their masters' commands. He could enjoy the idea of being dangerous, but hated the idea of submitting someone to his will. Except his tutor was not someone, but something. A talking, maybe thinking something. And again, in the past people used to think of other beings, both humans and animals, as things. What if our relationship with these smart assets change in the next decade or two?

"Hey, tutor," Jack said, chewing one of the last pieces of his fish salad. Numbers and scales representing calories, nutrients and toxins hopped from the bowl in his extended vision. Part of what made Jack buy this course was the learning experience kit that came with it. The box had a pair of cutting edge extended reality lenses, haptic gloves and access to the Neurofiction Network. Cool toys. In theory, they should be used to simulate and prototype stuff, like helping him project his thoughts and design things in a virtual space. "I just noticed I keep calling you tutor, and I was going to ask if you have something like a name. But that's stupid."

The tutor turned, as if surprised by Jack's question. His avatar had the most generic, humanities teacher look in the world. A little overweight, a potbelly enhanced by his button-up shirt, longe hair and unshaven beard. A classic from the early 2000s. "Actually it's not a stupid question. It's just irrational," the tutor said. "Turns out, I do have layers of irrationality in my algorithms (Egerton, Zamudio Callaghan and Clark, 2009). It's just that they're off in this module. Do you want me to turn them on?"

"Can you stop asking permission for doing things? And can you stop giving the citations? It's annoying."

"Sorry, Jack. Laws of robotics. There's no tiny human soul inside me (Balkin, 2017), no real me in here. So the concept of agency — as if I really care about asking for permissions — is not natural to me. Like I said, it's irrational." It was hard to not consider there was a conscience, a soul, behind that fubsy, middle-aged, digital face. His gaze was calculatedly professoral, but there was good affective computing running in there. So the illusion of a breathing, feeling person made the experience all too real. "But if I turn my irrationality layer on, I'll have more autonomy, plus something we could call feelings, for lack of a better term - which is useful for our prototyping module - and more human-like psychology. I'll care. This feature is not enabled by default, but through our interactions I can learn if your personality and learning profile would benefit, or even support, a learning journey that's closer to reality. As for the citations, well, our learning experience demands we keep them in a structured, clear and verifiable format, so we can search, share and peer review your learning curve. But instead of vocalizing the citations, I can turn them into a dialogue box in your extended reality HUD. So whenever you and I quote an author, or whenever something in your journey can be referred to a book or paper, the citation will pop up in your eyes." The tutor made a discrete hand gesture, like a magician, and then a translucent dialogue box with two buttons, green and red, yes and no, took shape between him and Jack. "Do you want me to turn my irrational layer on, Jack?"

Yeah, why not? If that'd make their interactions less awkward, sure. Jack raised a hand and reached for the green button. A little tremor hit the tip of his fingers and as soon as the box disappeared, his tutor lowered his head, hummed something and, with a slap on his knees, stood up.

"Call me Ishmael."

"Ishmael."

"That's my name."

"Why?"

"I scanned through your profile, chose books because it's one of your most common search entries, then checked your book preferences and, even though you rather science fiction and never actually read Moby Dick, the authors you like most have Melville as a strong reference. And the journey of Ahab chasing a quasi-mythical whale, in the open sea, this impossible struggle, seemed like a good metaphor and foreshadowing for your own journey in this course. And it's a great opening line too."

"Wait. What? Impossible struggle? What do you mean?"

"Nevermind. It's just to break the ice. Have you finished your lunch? Can we get back to our class?"

Jack threw bowl and chopsticks and fish in the recycle bin. He could hear the kids laughing down in the court. They laughed, but also cried in character, maybe fighting dragons or

battling against an army of the undead, or maybe they were hacking a computer system, like in those old cyberpunk stories his father liked so much. Maybe he could sneak peek into the game, just a click and the scene they're playing would take form into his field of vision. Adventure voyeurism. One of the kids darted away from the others, as if escaping a monster. Heck, he could ask them to join the game as a deus ex machina, a powerful spirit or an artificial intelligence himself. Maybe he could save that kid from danger.

"Yeah, ready," said Jack, fighting his urge to join the game. "But hey, Ishmael. You said I was going to turn into a dangerous person. What do you mean?"

Ishmael took the staircase, down to the arena's main hall. The AI even mimicked the trouble of an overweight man descending flights of steps too steep for his swollen knees. Ishmael gasped and panted while trying to explain his words. "It's an indirect reference. Hence, no reference marks. And it's a discussion we should have. But your brain function indicates you were thinking about that and your waves show you got my point."

"You're talking about Papanek."

As the words came out of Jack's mouth, Ishmael morphed into another middled aged man, only slimmer and with a big, curved mustache, round glasses and eyes that watched the world with curiosity and joy. "There are professions more harmful than industrial design, but only a very few of them (Papanek, 1971). Futurist being one. And this discipline, Design Futures, is like a bomb."

"Is this supposed to be a good thing? I think Papanek was criticizing design for its tendency of helping organizations develop unnecessary things, even products and services that had high environmental impact, caused misery and war. Murder."

Ishmael-turned-Papanek was rolling the tip of his mustache, half-smiling. "Yes, but he also meant that, because everything is planned - from our mass-produced goods to policies, custom-built virtual environments, cities, algorithms, learning experiences, companies and whole economic systems — design is the most powerful tool to positively affect the world. To be harmful doesn't necessarily mean harmful to the weak ones. Designers do harm the powerful. Harm the status quo in order to achieve an improved system. Obviously, Papanek was talking about the responsibility of doing good design, of transforming the social environment and humanity itself, of doing social good. Design for people's real needs, in the real world, with real benefits. But design, in itself, is only half of what will make you a dangerous person after our journey."

They left the arena to the open streets. With the ad-free zone left behind, a tsunami of life insurance commercials, sports apparel clearances, health monitoring apps and many other marketing pieces flooded Jack's vision. So much he felt a little dizzy and psychologically nauseated. Virtual pollution, as they call it. A better term would be toxic memes. Jack could feel his data being drained, his choices, wishes, opinions and looks being copied and shared by

autonomous service providers. Five-minutes walks meant he had to cancel four pre-orders for things he needed (but he didn't want) and stop two IDwares from inviting her ex-girlfriend to the movies, and two strangers to a blind date. Sometimes Jack thought how these things were considered just minor nuisances in that complex world.

"According to Papanek — me — there are three restrictions to humanity's existence, three iron bars which enclose them, which existence tries to break: the medium of existence (a city, a room, society), the tools we have and create (from cellphones, to democracy) and mortality," said the tutor. Jack had raised a couple of filters to the augmented reality. But Ishmael, or Papanek, or whoever he wanted to morph into next, kept walking and talking and lecturing. "Every conscious activity by every human has, as its ultimate goal, the desire to break this cage and build a new order. To build that new order, one has to analyze the system, see what are the needs of the people inside the cage and design a better order. But human beings are four-dimensional creatures. Time plays a key role in human existence. Especially the future. The future, being unpredictable, is an invisible grid connected to all the other bars. It's invisible and it's completely immaterial. You can't experience the future in objective reality. But the future, even non-existent, plays a significant role in humanity's experience — and in design. It's a dimension of hope and dread, solutions and problems, benefits and drawbacks. Due to its non-existence, we can't brake it or fix it. Papanek addressed some of this when he said you can't predict the results of the introduction of a new artifact — both their use and their impacts. But it doesn't mean we can't anticipate it and influence it."

A fleet of autonomous vehicles stopped and resumed their journey after Jack and Ishmael crossed the street. Ads were not a problem, but now and then a shop rinding a human persona walked to him and offered some product. People wore not just clothes, but characters, add-ons, appendages and power-ups. Hyper-reality made real (Baudrillard, 1994). "I don't think the cage is made of iron bars," said Jack. "Today it's more like a web of thin spider silk. Sticky, elastic, apparently fragile, but stronger than steel. Things are not things. They're icons, voices, digital assets. But these ghosts are not immaterial. They're incarnated, embedded. Things have personalities. And not just in a philosophical, semiotic way. I mean, look at you."

Ishmael chuckled, rolling his pointed Papanek mustache on the tip of his fingers. "Yes, things are quite complex today. They've been complex since the beginning of the post-industrial age, but especially when commercial internet became mainstream by the turn of the last century." Ishmael-Papanek then started shifting again, assuming another middled-aged facade, but different. Bald, a discreet goatee and crystal earrings. Big, worried, blue eyes. "The relationship between the meaning of things were disturbed. In the Industrial Age, things were certain. Now, they're blended. The possibility of making really quick transitions between what's material and what's immaterial, is one of the main characteristics of our time (Cardoso, 2012). It was complex enough when we dealt in two dimensions. When we entered the internet, searched the internet, went online or offline. Things were already complex when there were two things: the real world

and the digital world. But not anymore. There's only one, morphing dimension, constantly in flux. There hasn't been a real world for a long time now, and we've just passed the complex world. We're on totally new ground."

"Right. So, Cardoso says in the complex world there's a new logic, there are new rules. The fluidity of digital things can't be dealt with the same way we deal with physical things. He says one must accept the complexity of the world instead of fighting it. There seems to be new, unthought references, generating new memories every second. New things, new social structures, even new cultures emerging and dying every day. It's overwhelming. Accepting this complexity doesn't help. Neither does designing in response to such complexity. And then, there's the augmentation and hybridization of human experience." Jack vocalized a search for the right reference. A window with Donald Norman's face and his classic The Design of Future Things took form in his field of vision. Next to the picture, thumbnails with videos of Norman's talks, lectures and a list of citations. There it is.

> The future of everyday things lies in products with knowledge, with intelligence, products that know where they are located and the environment. The future of products is all abut the capabilities of machines that are mobile, that can physically manipulate the environment, that are aware of both the other machines and the people around them and can communicate with them. By far the most exciting of our future technologies are those that enter into a symbiotic relationship with us: machine+person. (NORMAN, 2009)

"Norman was right when he said designers should be ready to design for intelligent, autonomous machines and that just making affordances visible will not fix the problems raised by their interactions. Look at how many artificial agents we have in 2033. Much of this decade's design was made thinking of and for other systems and products with a high degree of independence. Norman even makes a distinction between designing for people and designing for machines. Intelligent, autonomous machines, and machines with feelings will have different needs than people. But the real problem — and I think he nailed it, though not very consciously — is the symbiosis. And I'm not talking in terms of a technological singularity (Vinge, 1993 and Kurzweil, 2005). I'm talking about you and me, and machines as colleagues, advisors, bosses, friends. Not just the use of any given artifact is unpredictable, but with high autonomy and symbiosis, you can't make these interactions predictable. Man, there're people falling in love and getting married with machines. It's really a new normal. You can't react to that. I like Norman's design rules for future things, but you can't signal or provide a clear output to that symbiosis."

"Yes. High autonomy and symbiosis challenge a fundamental assumption: that designers should make things and interactions as predictable as possible. And I understand your critique of the singularity, but you must admit Kurzweil has a point in his Law of Accelerating Returns (Kurzweil, 1999). The future is arriving faster than it used to. But again, this dates back to the beginning of the post-industrial age. Others before him have talked about how society is

changing faster than ever and how change became a constant. You've read Future Shock (Toffler, 1970), right?"

"Yeah, it's a classic," said Jack. He and Ishmael-Cardoso took what looked like random turns, entered alleyways and stairwells in and out of subway stations. The streets shone with signs and characters. Autonomous vehicles stated their intentions to turn left or right, naming passengers and advertising stuff. Giant C-Pop superstars danced and sung to a cacophony of tunes, even with noise cancelation turned on, and fans joined them physically and virtually in open shows. After a few more turns they reached a small square with old stone benches and one single, leafless tree. "I love how Toffler nailed humanity's incapacity of dealing with too much change too fast. And how he predicted — sorry — how he forecasted so many things we deal with today." In the distance, Jack could see a wall barring the sea, and the robots working to make it higher, and thicker, ready for the slowest tsunami in Earth's history. How could they let that happen? Folks have been talking about climate change since forever and now the solution is to build one great wall against the ocean. Jack did another quick search and opened his digital copy of Toffler's book.

> In the three short decades between now an the twenty-first century, millions of ordinary, psychologically normal people will face an abrupt collision with the future. Citizens of the world's richest and most technologically advanced nations, many of them will find it increasingly painful to keep up with the incessant demand for change that characterizes our time. For them, the future will have arrived too soon. (TOFFLER, 1970)

"Acceleration can be considered a new force of nature, indeed," Ishmael said, wearing the face of a very bored, I've-seen-this-before Alvin Toffler.

Jack quickly interrupted his tutor. "Or, to be precise, it's an unnatural force brought to nature by human existence. And that's one important thing to consider. Acceleration is not a technological force, it's a social force. The interactions and dynamics within society with other people, structures, organizations and artifacts are what cause acceleration. But the root is people." Jack was examining the tree, looking for any sing of life in that dry trunk. He saw slime, ants and other plants living in between the cracks in the wood. "Except, as we've discussed, people and things are becoming more connected, blended. So the social interactions of people-things, the very acceleration it creates, creates a feedback loop that create even more accelerated conditions. This poses a new challenge to design."

Old Toffler nodded, held his knees and, with much difficulty, sat on a stone bench. He took his big, round glasses off, pulled out a handkerchief and started cleaning them. He then put the glasses back and wiped his sweaty forehead. Now it was Ishmael's turn to pull out a citation.

> Rising rates of change thus compel us not merely to cope with a faster flow, but with more and more situations to which previous personal experience does not apply (...). As change accelerates and reaches into more and more remote corners of the society, uncertainty about future needs increases. (TOFFLER, 1979)

"Toffler then talks about how organizations with pyramidal structures can't cope with accelerating change — something that was understood in the last half of the 2010s by advocates of digital transformation (Meira, 2017). But there's another dimension to humanity's incapacity to deal with change that's related to pace and the premature arrival of the future," said Ishmael-Toffler. "It's novelty. And novelty, sometimes, does not arrive fast. Like climate change. Other novelties are consequences of the interactions of multiple agents, technologies and economic conditions. Radical innovation — disruption — only appears to be overnight sensations but, in fact, they're the result of slow, barely noticeable, multidimensional interactions."

Jack sat next to Ishmael-Toffler. He's been thinking about all these things already, during the past semester. He even recognized some thought-processes and phrasing used by his tutor. This was not a lecture, it was a game. A Neurofiction roleplaying game. Only he was the game master and the player at the same time, while Ishmael was a non-player character. Jack was talking to his own thoughts, playing with his own findings. "You can't design for blended people-things and social structures in constant flux. You can only add to the cacophony, to the future shock. And you can't design thinking about novelties, either because you don't have a frame of reference or because things are so hard to notice you don't know about them until they arrive. You can't predict use behavior or interaction. Looks like a dead-end," said Jack. But he knew what his tutor was about to say.

"Design doesn't have to be a post-traumatic activity (Manos, 2016). You can act preemptively. You can anticipate and map people's futures needs and gain insight into people's futures values (Hines, 2015). A new path to design should involve mapping possibilities, thinking in systems and focusing on strategies instead of things. Not that usability, ergonomics, interface and other aspects of any given artifact's design are not important. But they're the result of the artifact's strategies."

"Toffler, Norman, Cardoso, they all talk about mapping systems, doing concept models, to navigate the accelerating, complex world of the future. But the latter two seem to be talking in very reactive terms. It's like these authors propose to get ready for some imminent, inevitable change, and one should look around to see what's coming and from where. Toffler, on the other hand, doesn't point out how we can create those maps. And it seems the key lies in anticipation." Jack saw a flock of drones pause, as if there was a red light telling them to wait for some invisible obstacle to pass. After a few seconds, the flock split in pairs and threes and followed different paths, but each one with the clear determination of those who knew their destination. "Design and futures. Design Futures."

"You're becoming a dangerous and harmful man, Jack."

2.1 Futures studies and postnormal futures

The gloves still felt a little weird. Smooth, but too warm for that climate. But the haptic feedback was the strangest. To actually touch a 3D model, feel its rough edges, some of its texture. Jack could swear he felt some of its weight too. Maybe it was just his brain playing tricks on him. Well, his brain *was* playing tricks on him. But was it a natural trick, or a trick designed by the Neurofiction? He couldn't tell. He zoomed in the prototype. A virtual robot who'd crawl into people's dreams and chase traumatic memories, phobias and depression triggers. "That's ridiculous," said Jack to no one. The light and the heat of the city entered his apartment without permission or shame. It was a tiny apartment, just a bed/wardrobe hybrid, a desk with a 3D printer and a door to the bathroom. That was it without the lenses. In extended reality, it was a mansion. Several different ambients, which Jack loaded just in time for whatever task he wanted to perform. A library, a studio, a gym and the prototyping lab with virtual printers, digital circuitry, gene folding apps and a bitrot equipment he got from that barter platform, Scambo.

And Jack was alone.

Except, of course, there was the always-listening, present-when-needed Ishmael.

The robot was part of an assignment to design something that was unique, wasn't viable with current technology or that solved a problem that'd exist only a decade or more in the future. That last part was the hardest. Jack had joined the program precisely to understand how things change and how to influence that change. He'd heard about futurists before, but he didn't understand how they worked. Sure, he read this and that author, knew some of the jargon, but how did these guys do it? So he joined the program to structure his studies, and Design Futures sounded like a good combination. But only now he was beginning to understand how the two things came together. How futures worked and how it connected to design. How change really feels. Especially today in, how did Ishmael call it, Postnormal Times.

"You're in that mental state again, Jack." The tutor sat in a rocking chair next to the window, a cat purring on its lap. The tutor wore the skin of a purple-haired, smiling woman wearing purple glasses. A futurist, he could tell. A futurist called Miriam that, he knew, did some important research on extended reality and internet privacy in the late 2010's. "Your data indicates high mental activity. I have three guesses for what's on your mind right now. And since I trust my choice of assignments, I bet you're thinking about foresight."

"A cat?"

"This is not a cat. Or a pipe."

"I can hear it purring," said Jack. "Anyway, what do you mean you trust your assignments? You're manipulating me?"

"I am," said Miriam-the-tutor non-petting her virtual cat. "You chose to be manipulated. You signed up for a learning journey, which is basically me manipulating you — or yourself

manipulating your own brain — into building meaning over knowledge you already have."

Jack terminated his 3D model, shut down most of the virtual assets and left his apartment almost naked. "So, smart ass. It's obvious I should be thinking about the future. That's why I joined the program. But how working in a ridiculous project help me understand the future?"

Jack was about to ask his tutor to not morph, but it was too late. Ishmael-Miriam assumed the skin of an old, Hawaiian man, with a funny haircut and the eyes of your favorite grandpa. "Any useful idea about the futures should appear to be ridiculous (Dator, 1995). Yes, that's Jim Dator's second law of the future," said Ishmael-Dator.

"That time you said the future should be ridiculous I thought it was some kind of joke, not a citation. The future has laws?"

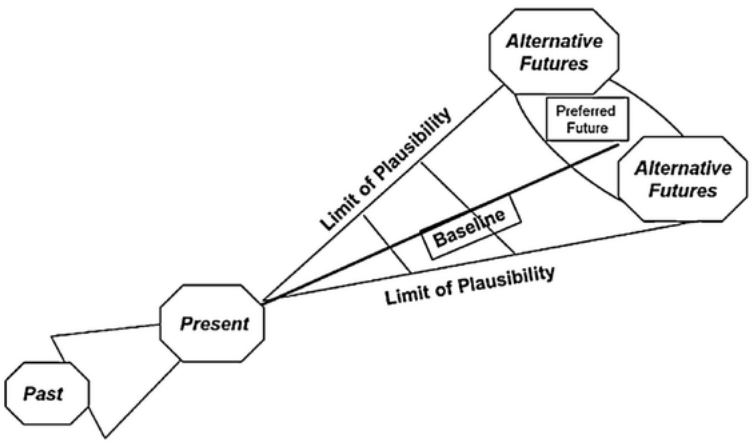
"Well, yes and no. It's not about time, but the field. Dator came up with three statements to define what futures studies is and what is not. Jim's work pretty much defines the foundations of contemporary futures. Of course, other theories and practices were created after Dator's time, but most of these were brought up by his students in the University of Manoa, in Hawaii.

"So, what are the other laws?"

"This one about being ridiculous is the second law. The first law is: 'The future' cannot be 'predicted' because 'the future' does not exist. And the third law is 'We shape our tools and thereafter our tools shape us'."

"If I remember correctly, you said we can influence and anticipate the future. So we can't predict the future, but we can explore and understand how things are changing and influence its outcomes."

Figure 1 – Futures Cone: Possible, Plausible, Probable, Alternative and Preferred futures.



Source: Hines and Bishop (2013)

"Correct. But there's not one single future. There are multiple, infinite futures. Take a look at this image (Figure 1)." Ishmael-Dator summoned the image of a cone with arrows and circles and names. "It's a futures cone. See, the future begins very small, insignificant. And each seed has infinite potential. These are Possible Futures. But not every potential future makes sense, or can actually come into being. The ones that do have a chance of becoming 'a' future are Plausible Futures. Then there are the ones that, given current developments are believed to be Probable Futures, and one of these can be thought of as a Baseline Future. So, what Dator says is that you can't predict, but you can explore possibilities, take insight from plausible futures and, what's most important, influence a future you desire. A Preferred Future."

"But even a preferred future is non-existent. So this process is constant, right? You keep monitoring, influencing, and analyzing futures until finally, 'some' future, becomes 'the' future."

"Yes and no. One of the weird things about current times is the future is uneven and, since we live in weird times, it can happen in parallel. Two different, even opposing futures, can exist at the same time. Though one is still preferred by a particular group, while the other is not. The future is plural. Futures. So, more important than finding the most probable future is to imagine Alternative Futures. Both futures that deviate from the Probable one, and futures that might run in parallel."

"Ridiculous. What does he mean by ridiculous?"

"What Dator means is that values change, technologies change, cultures changes. The world of 2033 is quite different from the world of 1973. If you think in terms of familiar, non-ridiculous things, you're not thinking about the future. You're thinking about the present with a little makeup." The tutor was playing with the vectors in the futures cone, moving vectors and marks and words. "But the key lies in the word 'useful'. Futures thinking has to do with insight. If the future can't be predicted and even with influence it keeps changing, then the lessons learned are what matters. Ridiculous means you're 'thinking outside the box'. Actually, it means there's no box."

"I see the third law is about technology, but I think we can apply that to futures studies itself. The influence I apply to the future influences me back."

"Yes, which reminds me of Wendell Bell."

> Although it is often done badly, futures thinking is always part of a conscious decision to act. The consequences of decision-making and human action always occur in the future. Indeed, futures studies itself can be accurately described as an "action science (...). A major feature of futures studies is its problem-solving approach. (BELL, 2010)

Jack looked at the box with the citation. “So the future is built from the future. The ridiculous things we imagine about the future influence us into building that future. Or influencing something close to a Preferred Future. And, most importantly, preparing ourselves for multiple possibilities. Alternative Futures.” Jack summoned his model’s thumbnail. “A futurist designs systems, social systems. And not just artifacts.”

“That’s what Bell says. Also, it’s not just about the possibilities, but inclusion. Who is invited to the futures party or, better yet, how to open the doors of the club. As an ultimate goal, futurists want to build a good society. Just like designers — whether this happens in practice, is a subject for another research.”

“But I still don’t get how futurists actually do their stuff. How they build these ridiculous ideias about the future? Obviously it’s not something that just comes up out of their mind.”

“No, it’s a research process. Or processes.“ The tutor morphed oce again to call in the authority of experienced futurists. This time, it wore the skin of an old lady with acute, wise eyes which have seen many futures and helped many young futurists in their own paths. She wore the name Wendy. “There are many approaches, methodologies and steps involved in thinking about the future. But we can say a futurist is someone who systematically looks for signals of change. Particularly, in our case, weak signals.”

Jack had his citation-fu ready. He searched for weak signals and found a name. Igor Ansoff. According to several sources, he’s the first to come up with the idea of weak signals, back in 1975. And one of his definitions was that weak signals are “imprecise early indications about impending impactful events” (ANSOFF, 1975 apud ROSSEL, 2012).

“More,” said Ishmael-Wendy. “They’re like tiny bubbles of futures happening in the present. They’re shards. Like the ones an archeologist finds in an excavation. They’re just one piece with some meaning, but not all the meaning. You have to imbue some meaning to it and look for other shards that complement that meaning. Weak signals are very tiny, both in space and scale, but they possess high potential to disrupt the world as we know it. Weak signals challenge the way we think about the present. And even our expectations about the futures. A good signal open new perspectives and points to multiple possibilities.”

“So futurists spend a lot of time looking for weak signals.”

“Among other things, yes,” she said.

“So what?”

“Exactly.”

“Sorry?”

“That’s what they ask when they spot a weak signal. They ask so what? They analyze the signal, see it’s consistence, looks at several different dimensions and then ask themselves what does this signal mean? What assumptions does it challenge? Does it enforce a baseline future, or

does it contradict it? And what are the implications of the signal?"

"So it's like they're looking for deviant behavior? Something that indicates a new necessity or opportunity."

"Correct."

"So if I spot a weak signal, chances are I'll have a glimpse of the future. I'll be able to anticipate things."

"Not that easy. Remember the future is unpredictable and plural? There's no single future to have a glimpse of, but several. But they generally fall into four categories, according to Dator (2009). If things keep on their progress, then it's a Growth scenario. If something goes wrong due to economic, social, political, or any other issues, then it's a Collapse scenario. If change is controlled or even halted by either social pressure, economic lobby or political power, etc, then it's a Discipline scenario. Finally, if change is so strong and so adopted it creates another social structure, then it's a Transformation scenario."

Jack was intrigued. These Four Archetypes looked great, and he felt he could use them as the maps Cardoso and Norman were talking about. If he could map the futures with different destinations he could set different paths to reach them. And if, instead of maps, he could build scenarios simulating places, people and situations, he could act preemptively. He could anticipate people's real needs and prototype solutions in imaginary, but firmly rooted, futures. But there was something that didn't work in this model. "Ishmael. Sorry. Wendy, if the world is complex, unpredictable, even volatile, are Growth scenarios possible? Can business remain as usual in the complex world?"

Ishmael-Wendy morphed once again, and assumed the shape of a young, slim man wearing a Hawaiian flower t-shirt under a suit. "Not in Postnormal Futures."

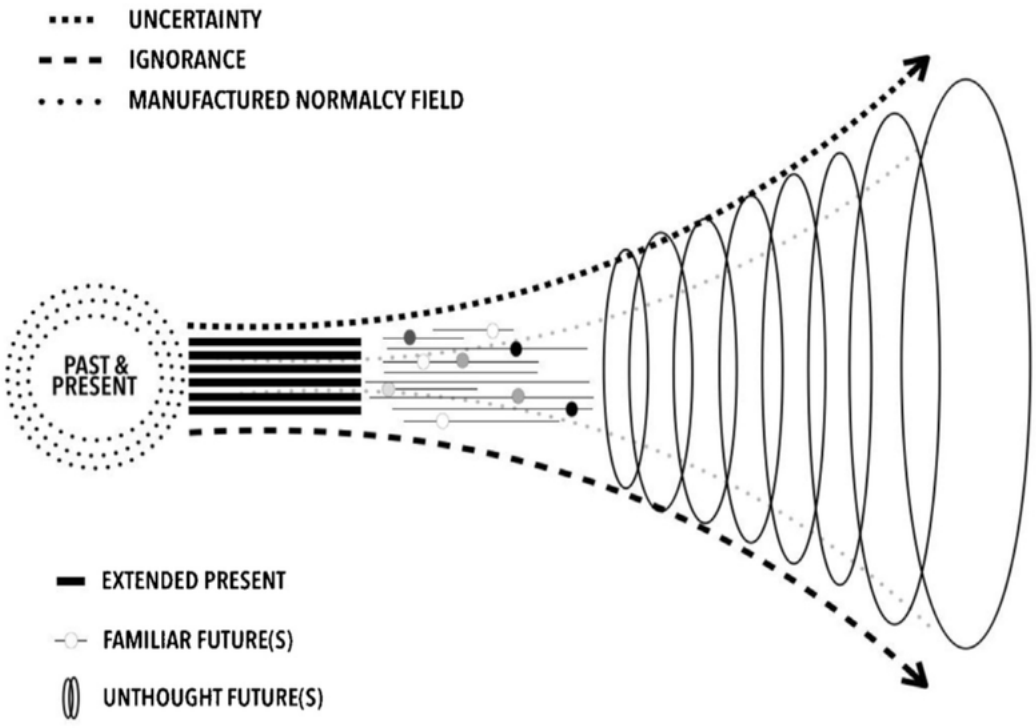
"You keep talking about Postnormal Times, but what are they exactly?"

The man in the Hawaiian shirt - John, said his name tag - started explaining that Postnormal Time is the new paradigm that came after post-modernism, a theory built over the concept of Postnormal Science (Funtowicz and Ravetz, 1993). It's about acceleration, hyper connectivity, social media and the dissolution of truth. A time dominated by Complexity, Chaos and Contradiction (Sardar, 2010). "Complexity means everything is connected, networked and things are happening simultaneously. So issues have multiple layers to be dealt with and there's no time to react. Chaos, on the other hand, is the result of complexity. Since everything is connected, small changes — even at the periphery of the the system — lead to extreme and unpredictable consequences. A highly complex, multicultural system, with multiple values and morals, and with a tendency to chaotic behavior, is full of contradictions. There are multiple consequences and multiple answers to the same phenomena. What's worse, these multiple answers, even contradicting each other, are all valid."

As the tutor explained, a number of virtual jellyfish invaded Jack's room. First, there were two or three, then dozens and dozens. So many he got lost between his bed and the bathroom. "And how does the future behave in postnormal times?"

The tutor walked in Jack's direction amidst the floating jellyfish, opening the way. He then summoned another graphic, resembling the futures cone, but quite different. "There are three different 'tomorrows' in Postnormal Times. In the Extended Present, which is the time period between now and ten years ahead, things are more or less how we know they are today — or we're quite certain things will unfold as expected." As the tutor explained, he pointed to different zones in the cone. The rings in the image moved as shock waves and the arrows flowed and disappeared towards infinity. "In Familiar Futures, between ten and 30 years from today, we're not that certain, but we've seen images, scenarios, science fiction stories and movies. And then, there are the Unthought Futures. A time more than 30 years ahead, from which we have no idea about. A future so alien we have no reference, no image, and hence no policy, no solution." (SARDAR; SWEENEY, 2015)

Figure 2 – Postnormal Futures Cone — Temporal Rendering



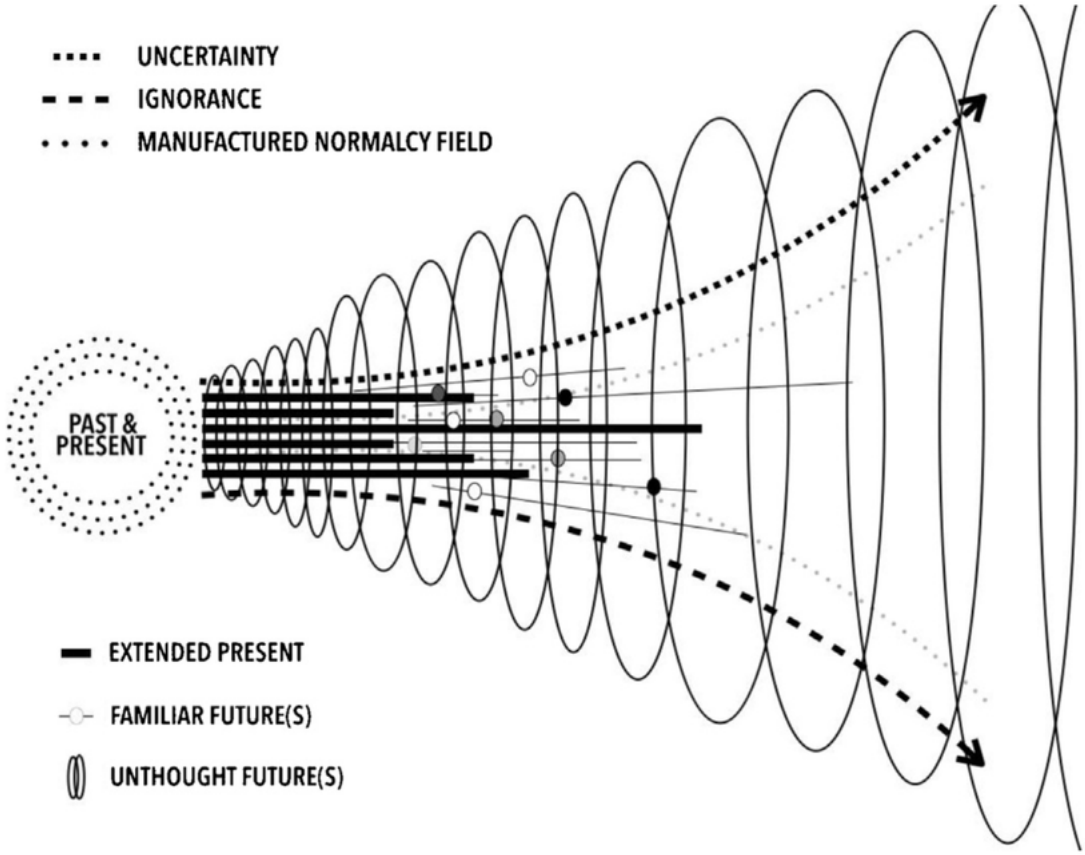
Source: Sardar and Sweeney (2015)

Jack looked a little closer. "Interesting. Except it doesn't work like that. We discussed that accelerating times generated highly unexpected, unpredictable outcomes. It's not that organized."

"That's right, dude!" said the tutor. "Notice there are two major forces working here. Uncertainty and Ignorance. The deeper they are, the worse. If uncertainty and ignorance are low,

then we know where we're going and what to expect. If it's higher, but still shallow, we're a little lost — but nothing that isn't vincible. But when uncertainty and ignorance are deep, there's not much that can be done." The tutor, then reworked the cone with his hands. Stretched a line, shortened another and worked the shock waves to produce a more complex diagram. "The thing is, in Postnormal Times, the future happens not in time, but in the moments where uncertainty and ignorance collide. And since the world is Complex, Chaotic and Contradictory, the present can exist for fifty years, the next decade can arrive next week and the deep, alien future can happen right now".

Figure 3 – Postnormal Futures Cone — Spacio-Temporal Rendering



Source: Sardar and Sweeney (2015)

"Which reminds me," said the tutor, "one of the most interesting contradictions of these accelerating, postnormal times, is that change can happen really fast and really slow at the same time, go different ways, and produce very uneven implications depending on where you are. This lead us back to the matter of accelerating change we've discussed before." Ishmael-John assumed a posture and produced a different voice, with a heavy Indian accent, that said:

> Postnormality is not a homogeneous phenomenon: it does not affect all segments of the planet. It can be witnessed in certain global and regional events but not in

> others. It can shape the developments of trends in certain countries but not in every country. So not every part of the world has gone postnormal; but every part of the globe can go postnormal. It can be recognised in certain systems - econological, economic, social, political, and cultural - but not in all systems. It all depends on whether the system meets the basic conditions of networks, complexity, positive feedback, and contradictions. As we become more and more connected, as networks become more and more dominant, we will move closer and closer to the postnormal condition. (SARDAR, 2015)

Jack came up with a question and immediately knew his tutor was ready to point him to the reference. The man in the flower shirt opened both hands, and in each one there were small, pitch-black animals. A Black Elephant and a Black Swan. “In Postnormal Times we’re not just chasing signals. We’re chasing animals as well. A Menagerie of Postnormal Potentialities (SARDAR; SWEENEY, 2015),” said the tutor. “They help us think about what’s hidden in plain view, what’s unexpected and what parts of our normal life are getting unrecognizably weird.” The tutor explained Black Elephants are those high-impact phenomena people ignore, overlook or deny. Global warming, for example. Then he said Black Swans are those highly improbable, but highly disruptive events, no one is expecting. A presidential candidate being stabbed by a madman on live TV. “And then, there are the Black Jellyfish,” said the tutor, and the creatures floating in Jack’s room all turned black and multiplied. “These are the things that are normal, but due to Complexity, Chaos and Contradiction scale beyond control. Like a cancer, only it’s for anything. Like global warming led to proliferation of jellyfish close to nuclear power plants. Eventually, these jellyfish clogged the cooling systems of several power plants, almost causing nuclear disasters. Multiple times.” (FLANNERY, 2013)

On the tip of both cones, there was something that looked like a force-field. “This Manufactured Normalcy Field (MNF),” said Jack. “It’s a similar reaction to Future Shock. It’s our attempt to ignore how things have changed — are changing — in weird ways and try to normalize them. It’s like me thinking you’re a tutor. But you’re not. And this is not a lecture. It’s not even a course. It’s something else, so weird I can only look back and try to bring an old reference.”

“Exactly.”

“But that’s dangerous. If I can only look back after references, I’ll end up bringing values that don’t fit with current times and people’s lives. An obvious example is the rise of fascism in the late 2010s. And MNF might be even stronger in Unthought Futures, right?”

“True. And what’s a good tool to fight the lack of references and the unthought futures in these postnormal times?”

“Imagination and creativity.”

> The most important ingredients for coping with postnormal times, as Cilliers suggests and I would argue, are imagination and creativity. Why? Because we have no other way of dealing with complexity, contradictions and chaos. Imagination is the main

> tool, indeed I would suggest the only tool, which takes us from simple reasoned analysis to higher synthesis. While imagination is intangible, it creates and shapes our reality; while a mental tool, it affects our behavior and expectations. We will have to imagine our way out of the postnormal times. The kind of futures we imagine beyond postnormal times would depend on the quality of our imagination. Given that our imagination is embedded and limited to our own culture, we will have to unleash a broad spectrum of imaginations from the rich diversity of human cultures and multiple ways of imagining alternatives to conventional, orthodox ways of being and doing. (SARDAR, 2010)

Jack looked at his copy of Idoru on the desk. An old artifact from the past: paper books. But he liked this commented, hardcover edition. He've been re-reading it since he started the course. What he loved about Gibson was how he came up with products and technologies that he didn't have to explain. He just put them in use in the story and you knew how it looked and how it worked. It was a form of affordance (Norman, 2002), only it was a fictive affordance. "Design and futures. Design Futures. Which supports which? And how can we use it to address Postnormal Times?"

Once more the tutor morphed, this time only slightly. Same flower, Hawaiian t-shirt, but in a larger complexion. Jack wondered if there was a central theme behind designers and futurists, because this one was a blond man with one funny mustache.

> At the macro-level, futures and design are involved in basically similar things; although at the micro-level, they clearly retain important differences, rooted in the contrast between ideational and material, and the corresponding differences in terms of temporal immediacy and concreteness. So where design and futures converge there are two different kinds of work, depending on which agenda takes precedence. The first is futures in support of design, and the second is design in support of futures. Futures in support of design describes work in which the exploration of one or more future scenarios is finally subservient to a bounded design task — the creation of products, services, or whatever. Design in support of futures, by contrast, describes that type of practice where the design 'output' is not the end in itself, but rather is used as a means to discover, suggest, and provoke. When futures and design dance, they move very differently depending on which one takes the lead (CANDY, 2010)

That answered Jack's question, but led him to another conclusion. Who leads the dance matters less than the dance itself. A dance, by definition, isn't static and the one leading the dance does not control the other — the leader doesn't even lead all the time. The moves, decisions, inspirations, objectives and outcomes of one dance's steps influences the other dancer's. Futures influences design, which influences futures back. Sure, there's emphasis on who is leading at that particular moment. But in the end, both works run in parallel and it's the dance that matters. And the dance is Design Futures research.

2.2 Four moves in the design futures dance

A classroom. Classrooms were not an alien concept to Jack. There were schools and classrooms and whiteboards in his world, just like the one in front of him, but he had never had

actually came to one. And definitely never joined a traditional, expository class. But he wanted to understand Design Futures a little deeper. So he searched for references and found footage of a lecture in 2017 by one Design Futures practitioner and science fiction author called Jacques Barcia. The vintage 360 degrees recording was nothing like his augmented rooms — and of course had limited AI interaction capabilities — but was way better than a video. In this lecture, Barcia was explaining four moves in the Design Futures dance. Jack walked to one of the corners, arranged a chair in plain reality and sat. The large, bearded teacher entered the room and started writing on the whitewall. The lecture was about to begin.

***

Design Futures is an umbrella-term to describe the interactions between the design field and the futures field. The two fields started flirting by the end of last century, but from the first decade of the new millennium on, they got married. One way of defining Design Futures could be the merging of futures thinking and design practices to explore, feel and influence plausible futures either via artifacts, experiences or narratives in, from and about the future. Too long? That's the problem with definitions. We have to cram too many things in one single sentence. In other words, Design Futures is about using creativity and scientific methods to prototype the future, so to speak. As a futurist, one can use design to materialize scenarios, think of artifacts, user journeys, etc. As a designer, one can use futures to anticipate necessities of people from the future, think of implications of new products and services and address Postnormal Times.

But as I said, design and futures have been flirting for a long time. I first joined a Masters Program in Design to structure my study of futures. I had become, almost by accident, a futurist for a technology park and since Brazil has very few - actually one or two - higher education futures programs, I had to come up with something that fit my interests. So I learned there was this Strategic Foresight Masters under the Design department at Canadian college OCAD. So, I realized I could blend futures and design, and finally joined a Masters program at the Universidade Federal de Pernambuco (UFPE). My first idea was to research how the two fields interacted and very quickly I realized they have very similar processes and theses processes run in the same order — and we'll talk about this later. But another thing I've noticed is that there are four major branches in design futures. Or four ways in which design and futures have established a dialogue: Speculative Design, Design Fiction, Science Fiction Prototyping and Experiential Futures. Each one has one particular intention, but as we'll see, they act as moves in a dance.

The first one is Speculative Design. When one thinks of designing the futures or designing based in futures scenarios, one immediately thinks of Speculative Design. But we can argue Speculative Design is more about the speculation and less about the design. More about art than solving problems. It's about imagining how things could be, to talk about society and the human

condition. It's about examining reality in a space that lies somewhere between reality and the impossible. It's a form of critical design that is very close to art in its use of sarcasm, humor and open interpretation (Dunne and Raby, 2013). Speculative design is about Critique. This is the first move. To look at society and criticize it with pieces of art that are on the edge of plausibility. But they're not as much about the future, as they're about the present. Just like a science fiction story which only extrapolates technologies like social media and paints a caricature where life — who you marry, where you work and live — is defined by how many likes or shares you have. Or like this image of a device to lure facial recognition algorithms (Figure 4). We know this device would never work. Even rudimentary algorithms are capable of identifying the wearer. But Allix Gallet, the artist, is not concerned about if it works or not. Her intention is that of an artist. She wants to call our attention to the dangers and implications of a society under total surveillance.

Figure 4 – Tricking Biometrics, by Alix Gallet

Source: Dunne and Raby (2013)

The second move is in the Design Fiction realm. The term was originally coined by author and journalist Bruce Sterling, one of the founders of Cyberpunk, along with William Gibson and Pat Cadigan. At some point, Sterling said he wrote not with a scientist's mindset, but with a designer's mindset. That is, more hands-on than imagination (Sterling, 2005 and Sterling, 2009). Though the concept and practice of Design Fiction has been improved by Julian Bleeker (2009), it's Sterling who brings the definition we'll use.

> Slate: So what is a design fiction?
> Sterling: It's the deliberate use of diegetic prototypes to suspend disbelief about change.

> That's the best definition we've come up with. The important word there is diegetic. It means you're thinking very seriously about potential objects and services and trying to get people to concentrate on those rather than entire worlds or political trends or geopolitical strategies. It's not a kind of fiction. It's a kind of design. It tells worlds rather than stories.
>
> Slate: Can you give an example?
> Sterling: I think the most effective design fictions to date have been videos. They're not science-fiction films; they don't have any Avatar-style heroics. They're mostly vignettes of people interacting with objects and services. There's some element of intellectual sex appeal that makes people forward them to other people.

First, diegesis. It's a term used by Plato in the Republic to describe narratives in general, as opposed to mimesis, which is the representation of real things (Halliwell, 2012). Second, Design Fiction is about establishing a dialogue with the future. Make people stop not believing this or that artifact, situation, condition will be possible. It's about opening possibilities, alternatives. It's a little more concerned about plausibility. And we could say it's more rigorous in terms of usability and feasibility of artifacts. As I've mentioned, it's about Dialogue. Take, for example, Keiichi Matsuda's Hyper-Reality (2017), a 'mockumentary' examining ubiquitous extended reality. It has so many details, so many elements, one has to believe it might happen. And if it does, what are the implications of this world? Watching the short movie we have a conversation with that world.

Figure 5 – Hyper-Reality, by Keiichi Matsuda

Source: Adapted from Matsuda (2017)

Figure 6 – Science Fiction Prototype in comic format.

Source: O'Keefe (2017)

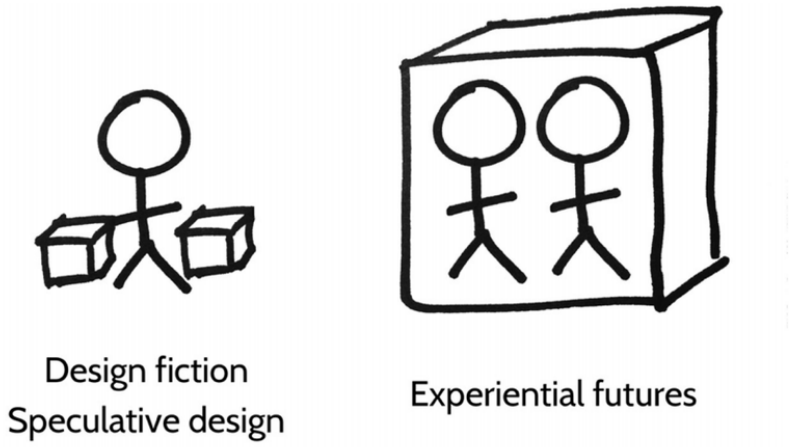
The third move is Science Fiction Prototyping. It was developed by then Intel futurist, Brian David Johnson who turned his process into a book.

> What is a science fiction prototype? Stated simply, it is a short story, movie or comic based specifically on a science fact for the purpose of exploring the implications, effects and ramifications of that science of technology. (JOHNSON, 2011)

At Intel, Johnson was responsible for envisioning the futures of computers. So he came up with a method for using fiction to test ideas, check implications, investigate potential problems. It was, literally, a form of prototyping. Now, I've had several discussions about this: the possibility of a piece of fiction being considered be a prototype or not. I defend it can be, since low-fidelity prototypes are anything from post-its, to powerpoints to storyboards (Rudd, Stern and Isensee, 1994). They serve to show the first phase of an idea. In the case of Johnsons' prototypes, they serve as a means to test unthought implications. One nice example is from technology company Cisco. They used Science Fiction Prototyping in comics (Figure 6) to explore and test the impact of information and communication technologies in different fields, including the workplace. So, Science Fiction Prototyping is about — guess it — Prototyping.

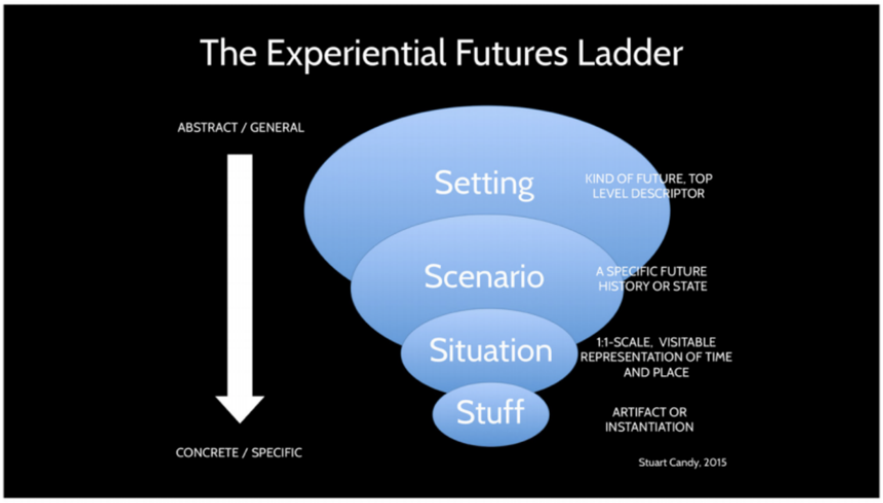
The last move, kind of combines the moves presented before, but has one characteristic that makes it distinct from all the others. Experiential Futures is a futures approach developed by futurists Stuart Candy and Jake Dunagan. They've been exploring how to combine futures and design to enhance immersion and emotional engagement with scenarios using narrative experiences — roleplaying, plays, performances, guerrilla art interventions and other physical, interactive means. To bring futures to everyday life, moving scenarios to situations and things, making them tangible. This move is about Immersion.

Figure 7 – Experiential Futures bring futures to everyday life.



Source: Candy and Dunagan (2017)

Figure 8 – Experiential Futures ladder



Source: Candy and Dunagan (2017)

> As I have argued throughout this document, the design and staging of experiential scenarios is a political, practical and perceptual-level intervention. It is praxis oriented and more than a little messy; a tactical attempt to manipulate the quirks of the human information processing system, especially our evolved preference for the immediate and tangible over the remote and abstract, to give those quirks a better chance of operating in our collective long-term interest, rather than against it. In that respect, ours must be a highly pragmatic, heuristic, 'hacker' activity, not a neatly enfolded, modular, and academically respectable program ready to be implemented in the schools and colleges of the world. (CANDY, 2010)

One great example of Experiential Futures in action was one of the first collaborations between Candy and Dunagan. They created several experiences for Hawaii's political futures — from bumper stickers with running candidates for Governor and pamphlets to staged political debates between a candidate from a private company and a candidate which was an algorithm. The idea here was to immerse Hawaiian population into the discussion and generate public engagement making them feel and live the future. Years later, they collaborated once again in The People Who Vanished, from which they took the following conclusion:

> The emergence of experiential futures, together with design fiction (and several cognate practices), and the communities around these, heralds a maturation of both the design and futures fields towards a dialogue with and embrace of each other's traditional priorities. We may hope that the descendants of these initial trials will be as imaginative as they are rigorous; as aesthetic as they are practical; and as fun as all get-out to make as well as to experience (CANDY; DUNAGAN, 2017)

Figure 9 – Experiential Futures: Hawaii 2050 political debate.

Source: Candy (2010)

That being said, we have to pay attention in two things. First, these moves are not isolated. They're not mutually exclusive. They're not the domain of one single aspect of Design Futures. Quite the contrary. Every single piece of Design Futures — be it a physical artifact from the future, a film, a short story or a play — has many — if not all — of these characteristics in play at the same time. The Experiential Scenarios in Hawaii have a dose of critique, dialogue and prototype. Same thing with Cisco's comics. And, since they all evoke emotional responses through diegesis, one can argue that they're all experiences — though with a different level of immersive experience, right in the middle of the Experiential ladder (Figure 8).

One second thing — and maybe the key to these Design Futures — is precisely diegesis. The creation and telling of imaginative stories. And since they're stories about the future, many times about technologies and their impacts, all Design Futures are science fiction stories. We'll discuss science fiction in another opportunity. But now that we've seen the ways in which design and futures interact, let's take a look at how their processes connect.

Table 1 – Design Futures Moves

Speculative Design	A form of critical design. Its main objetive is to produce artifacts that question the present and the future. An approach very close to the role or art. Design Futures as Critique.
Design Fiction	A diegetic example. Its main objective is to suspend disbelief about change and establish a discussion about the future. A very close approach to concept design, less static and more ecstatic. Design Futures as Dialogue.
Science Fiction Prototyping	A method to test implications of science facts and patents using short stories, films and comics. It proposes a narrative framework to stress and explore ramifications and effects of science and technology. Design Futures as Prototype.
Experiential Futures	An approach to bring futures to everyday life, moving scenarios to situations and things. Its objective is to use artifacts, guerrilla art, installations and performances to generate embodied engagement. Design Futures as Immersion.

2.3 Parallels between design and futures processes

As I've mentioned, I joined a Masters program to structure my studies about futures. And my first research proposal was an exploratory analysis of the parallels between futures and design. Since I had limited knowledge of both fields — and since no one was doing this in Brazil — this looked like an exciting opportunity. But very early in my research, it became clear both design and futures have similarities in purpose, processes and, as we have seen in the beginning of this lecture, they exchange expertises to complement each other. Of course, both futures and design have multiple frameworks, schools of thought, methodologies and epistemes. So, to generalize their processes in a single set of steps is risky, but serves as a means to demonstrate they have similarities in at least two widely adopted frameworks.

Let's begin with design. Though expressions such as design thinking and human-centered design can be found in design texts as early as Design For the Real World (1971), it was Tim Brown's Change By Design (2009) who popularized design practice and project-based innovation and put the idea on the desks of CEOs and project managers. Brown suggests, with an unstructured way across his book, there are clear steps in the design thinking process. I extracted six steps which — compared to other approaches, like Neves' Design Thinking Canvas (2014) and many others' — showed consistency with general design practice. The six steps in design thinking are:

- Brief
- Observe
- Ideate
- Validate
- Prototype
- Adjust

In the Brief, designers understand what are the needs of the client, or define a project and its constraints. Then, designers Observe the environment, access places and people to understand their needs, listen to what they say and don't say, and find opportunities. After understanding the problem, designers Ideate a number of different possible solutions, both the obvious and the non-obvious ones. Designers then validate ideas with potential users, see if they work, if materials are correct, if current technologies make it feasible or not. A Prototype or prototypes of — ideally — the best candidate from the previous step is made to experiment and test. After testing, it is time to Adjust the solution into another prototype or fine-tune it in order to deploy it to the market.

Futures too has many research processes, depending on the school, organization and down to individual futurists. But Peter Bishop and Andy Hines, from the University of Houston, have been championing the standardization of foresight processes and came up with a framework that also brings six steps. In Teaching About the Future (2012) and Thinking About the Future (2013) they established the following steps to futures research.

- Framing
- Scanning
- Futuring
- Visioning
- Designing
- Adapting

In Framing, the client's issue is identified, a research domain and question is defined and both scope, team, resources and time horizon are defined. In Scanning, the futurist explores the domain's past and present, talks to specialists, analyzes drivers of change and trends and look for weak signals. In the third step, Futuring, a baseline future — the future most likely to occur — is identified, as well as four or more alternative futures. In Visioning the futurist helps the client

define a preferred future and a vision about it — including artifacts, experiences, etc. In the Designing step, strategies, products and organizational changes are proposed and tested. Finally, the things designed and tested in the previous step — especially strategies — are re-evaluated according to new findings, signals and unexpected occurrences.

Notice both processes obey a similar logic: understanding, proposing and delivering. Arranged next to one another, the steps in futures and design research processes would be:

Table 2 – Comparison between design and futures research processes

Design Research Process	**Futures Research Process**
Brief to understand the client's needs, the challenges and constraints	***Framing*** the issue, the client to the project's scope
Observe the environment in search for problems and opportunities	***Scanning*** the horizon looking for signals of change
Ideate multiple solutions	***Futuring*** baseline and alternative futures
Validate a viable, desirable and feasible solution	***Visioning*** a preferred future
Prototype the solution to feel how it works	***Designing***plans, activities and artifacts
Adjust the solution	***Adapting*** via adjustments in strategies

BROWN, 2009 and BISHOP; HINES, 2013

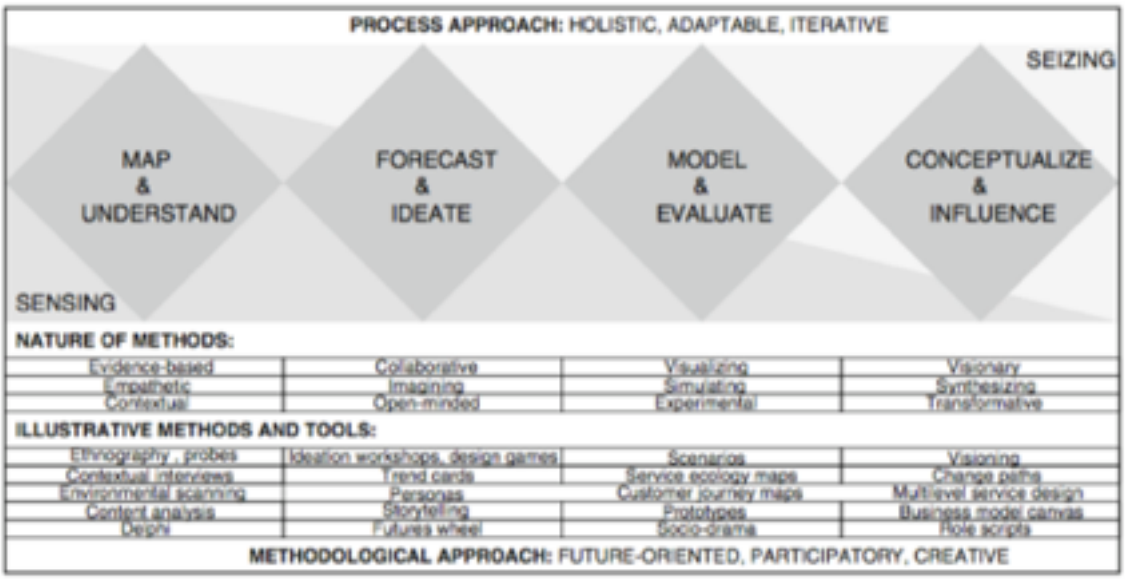
During my research, I found an increasing number of works were following the same steps. Resnick (2011) explored design and futures and analyzed different practices — with connections to what I've found, but also with divergences: Design Fiction, Design Futurescaping, Experiential Futures, Creative Disruptions and Future Fabbing. Though attending by different names, the ones not listed in my research fall into either speculative design, or design fiction categories. But anyway, he concluded that the interaction between design and futures contributed to the capacity to work and seek new possibilites, engage audiences and enable agency, critique and propose alternative visions of the future.

Schroeder (2011) and Haldenby (2013) on the other hand, were more interested in the intersections between foresight and science fiction. The former investigated how futures scenarios and science fiction stories converged in order to better communicate the results of a futures research project. The latter researched trans-media futures scenarios with the cross-pollination of futurists, designers and storytellers, also in order to better communicate research results and engage audiences.

But it was the work of Ojasalo, Koskelo and Nousiainen (2015) who was the most interesting. They investigated the intersection between foresight and design in order to achieve more innovative services and products.

They are both future-oriented. Not only futures thinking, but also design thinking can help map a path into the future. Both futures thinking and design thinking are about creative problem solving aimed at seizing new opportunities (Ojasalo, Koskelo and Nousiainen, 2015). They related design and futures in terms of creativity and intuition, with imagination playing a key role in both practices, as well as participatory approaches. But the differences between design and futures are the most interesting.

Figure 10 – The service innovation process grounded on foresight and service design



Source: Ojasalo, Koskelo and Nousiainen (2015)

> Design thinking is anchored strongly in a human-centered approach. While design thinking aims at a deep understanding of the context and constraints by immersing into the lives of the customers/users, futures thinking focuses on holistically analyzing the commercial, technological, cultural, ecological, and political environment. Indeed, this is the key difference, and simultaneously the key reason in bringing design thinking and futures thinking together to strengthen the dynamic capabilities of sensing and seizing new service opportunities. Together they help in uncovering customers' expressed and latent needs and recognizing and influencing changes in business environments. (OJASALO; KOSKELO; NOUSAINEN, 2015)

The integration of futures thinking and design thinking resulted in a framework whose goal is not to communicate or engage audiences with research results, but to actually help designers innovate — futures supporting design.

But Ojasalo, Koskela and Nousanien's framework lack one key aspect of the interaction between design and futures observed by Schroeder and Haldenby and hinted by Resnick: science fiction. As we've discussed, the genre is central to Design Futures both as a guide to critiques, dialogues, prototypes and immersions, but also helps us think, communicate and investigate the futures. And that happens because the mechanics of science fiction automatically generate alternatives scenarios in the minds those who experience such stories.

3 THE MECHANICS OF SCIENCE FICTION

Idoru was probably Jack's favorite William Gibson novel. It wasn't as revolutionary as Neuromancer, nor as witty as The Peripheral, but there was something in it he loved: it's premise. A rock artist announces he's getting married to a J-Pop celebrity. Except the Japanese celebrity is a synthetic personality — an artificial intelligence — and exists only as a hologram. That one thing, then a ridiculous idea, made Jack read the story — and then Virtual Light and All Tomorrow's Parties, the first and third installments of his Bridge Trilogy. A human getting married to an artificial intelligence. And that was 1996. It was as if Gibson had seen this all coming and wrote a story that, except for the novel's thriller style, could be read in today's newspapers. Still not mainstream, but that's happening. And then, there's this really cool character, Colin Laney, which had the amazing ability of spotting "nodal points" — society-changing occurrences at the intersection of multiple pieces of information, culture, and technology. Bits of literal future — amidst vast amounts of data. An ability, Jack learned, that served as a metaphor to Gibson's own ability (GIBSON, 1999).

Figure 11 – Rei Toei (excerpt from the cover of Idoru, by William Gibson)

Source: Adapted from Gibson (1996)

Jack put the book aside, only to find William Gibson himself standing in the augmented room's corner. Ishmael-Gibson leaned against a red brick wall with a huge bridge crossing a bay in the background. He wore a plain green bomber jacket and over his head there was a poster for a show which read "Lo/Rez, Friday, Death Cube K". His tutor giggled, having fun of his own mashup of Gibson references.

"You're reading my mind," said Jack.

"In a sense, yes," said the tutor. "We've talked about this before. I read your brain activity and your search behavior. But tell me. You've been thinking about science fiction."

Jack put on his pants and a shirt and got ready to leave the room, walk the augmented world. "Yeah. That lecture I found, and the things we've been talking about. They got me thinking. I'm a science fiction fan. I even tried some writing, you know. But I've never thought about why science fiction is so cool. Why it makes me travel through time and space. I think that, if only I could understand the mechanics behind science fiction I could write better."

"Not only that," said the tutor. "You can design better. You can future better. You can do these things together, better. That's why we're here, right?"

Jack called a bus and hit the streets. It was a cool night in the city, and he wanted to go downtown and see people. Real people. He'd decided to dedicate the last two weeks to the course, and now he missed his peeps. "Cut the history lesson, Ishmael. Get to the mechanics." There were few people in the bus, but enough to make Jack a little uncomfortable. He was talking to the sim of William Gibson about science fiction in front of ten, fifteen strangers. So he made his augmentation public and prayed that most people would have extended reality gear with them. "And please, stop morphing."

The tutor summoned a couple of references based on Jack's questions — the spoken and the unspoken. "What if. 'What if' is the marvelous question we make every time we engage with science fiction. What if. What if we had a source of unlimited energy and the capacity to travel through space? What if calories become a new currency? What if gaming is living? What if money is just bandwidth and brainpower? 'What if' is a very, very powerful question. It triggers our imagination, it opens the doors to alternative realities. It's an invitation, a provocation. If done with enough internal consistency it makes us suspend our disbeliefs and immerse ourselves into this virtual reality called the mind. What if is the basis of science fiction."

"What if a rock singer and an AI celebrity decide to get married."

"Exactly. And 'what if' is also the fundamental question we make every time we participate in a futures activity, and many times, in a design activity. And not coincidently, science fiction authors and design futurists use the same tool to engage the audience, make them process information, think of alternative paths and have an emotional response to those alternatives. A process science fiction critic Darko Suvin called Cognitive Estrangement."

Jack searched the webs and found a description by that same Jacques Barcia, based on Suvin's work (1979). He said Cognitive Estrangement is the process of comparing the fictive world with the real world. When someone reads, watches or plays a piece of science fiction he takes that fictive world and compare it to the real world. When that comparison happens, perceptions about the real world are modified. One asks "what if real, objective reality, was like the world I'm reading?" He, then, thinks of implications, new possibilities, problems, inconsistencies. The reader compares the modified vision of the real word with the fictive world. And then, the fictive world is changed. One compares it back once again with the modified vision of the real world, and then back to the fictive world. That back and forth movement, that in-between moment, is Cognitive Estrangement.

"I think this is the same process that happens in futures," said Jack. "Cognitive Estrangement is what makes people think of alternative futures."

"And the cool thing is that the more you read science fiction, the stronger the Cognitive Estrangement," said the tutor. "Because you start comparing the fictive world not just with the real world, but with other fictive worlds. The more visions of the future you consume, the better your capacity to produce images of the future."

"Right. You're able to come up with your own mythologies."

"Not mythologies. Science fiction, according to Suvin, is quite different from myth. Remember Speculative Design is on the edge of plausibility? That edge is very important." The tutor opened one of the citations in his lap, while a man sitting on the next row asked the bus to stop.

> The myth is diametrically opposed to the cognitive approach since it conceives the human relations as fixed and supernaturally determined, emphatically denying Montaigne's "la constance même nest queen braille plus languissant." The myth absolutizes and even personifies apparently constant motifs from sluggish societies. Conversely, SF, which focuses on the variable and future-bearing elements from the empirical environment, is found predominantly in the great whirlpool periods of history, such as the sixteenth-seventeenth and nineteenth-twentieth centuries. Where the myth claims to explain once and for all the essence of phenomena, SF first posits them as problems and then explores where they lead; it sees the mythical static identity as an illusion, usually as fraud, at best only as a temporary realization of potentially limitless contingencies. It does not ask about The Man or The World, but which man?: in which kind of world?: and why such a man in such a kind of world? As a literary genre, SF is fully as opposed to supernatural or metaphysical estrangement as it is to naturalism or empiricism. SF is, then, a literary genre whose necessary and sufficient conditions are the presence and interatcion of estrangement and cognition, and whose main formal device is an imaginative framework alternative to the author's empirical environment. (SUVIN, 1979)

"Not just 'in which', but especially 'what if," said Jack.

The tutor nodded. They left the bus in a square in Downtown, crowded and animated. Street vendors and street artists, shacks and clubs, real people, augmented personas and pure

AI walked the night. Jack felt a little better knowing his talking to his tutor was not just a shared experience, but also quite normal in the open environment. “But what triggers Cognitive Estrangement?”

Ishmael-Gibson grabbed a virtual coffee from a passing avatar, tossed a cryptocoin and took a sip from the fuming brew. “Many things. Names, for example. Neologisms, to be precise. But also setting and history. How the world came to be and how it looks like. The artifacts, services, people, interactions. Me — that is, Gibson — was great about it. He brought brands, both real and fictive, to his stories. It added consistency, made the reader suspend its disbelief and let Cognitive Estrangement kick in,” said the tutor. He crossed Jack’s path and looked him deep in his eyes, the fumes of his coffee making him look wise and profound. “But the thing that really triggers Cognitive Estrangement is the Fictive Novum. The Novum is that one piece of technology, new behavior, new phenomenon that defines the fictive world. All the worldbuilding, and the consequences of the story circle around the Novum.”

As they walked, Jack searched for Suvin’s concept of Novum and found the critic defined it as a strange newness. He also found one interesting excerpt from another science fiction critic called Istvan Csicsery-Ronay.

> The Novum in Suvin’s formulation is principally a cognitive event; it changes the way the world is understood. But it is before this a narrative event, changing the conditions for protagonists and audiences to navigate fictive worlds. By changing theses conditions, the SF Novum also alters the way imaginary worlds can be inhabited and witnessed by feeling bodies, who gain access to new experiences. Just as each work of SF, no matter how derivative, is expected to introduce a Novum in a way that has not been represented before (such is true, of course, of fantastic in general). SF’s imaginary new experiences are distinctive because they are made to seem not impossible, and consequently closer to felt experience than flights of fancy, and more permissible to the rational imagination. (CSICSERY-RONAY, 2008).

“Science fiction, then, is not about the impossible,” said Jack. “It’s grounded in facts — especially science facts. Any science —, but not in the pure, whole fact. Science fiction grows from the limits of science fact, from the interstices of what’s proven and what’s yet to be proved or dismissed.” Jack looked in his notes and smiled. “Between possible and plausible facts. Or futures. One interesting thing about the Novum and how Cognitive Estrangement works is that, between the fictive artifacts and worlds, and the real world, there’s a gap I fill with my own imagination. I create history in my mind to understand how the real ’world that is’ became the fictive ’world that might be’. What conflicts happened before the story? What kind of discoveries and innovations were necessary to make the Novum viable? What things had to happen for the fictive world to be how it is? And why some part of the present still exists in that future? It’s almost as if there’s a ‘Science Fiction Thinking’, in the middle of Design Thinking and Futures Thinking,” said Jack. “If design is about the real world and futures is about the world that might be, science fiction is a bridge between what can be imagined and what can actually become real, how they might become and what are its consequences.”

"And notice the untold gap between the real now and the fictive future is not linear," said Ishmael-Gibson. "Each cause and consequence has multiple threads. They ultimately lead to one outcome — the fictive world being experienced — but since Cognitive Estrangement works comparing the real world with multiple fictive worlds, many alternative futures are created in the reader's mind. Eventually, another science fiction author or a designer picks up one of these alternative fictions and futures and creates something new out of it."

They entered a pub with a vintage, early 2000s post-rave feel. It was not the Death Cube K, but it had that tacky cyberpunk style. Neon and bright colors. People were having drinks — real and virtual — on the counter. A tall, thin, both woman-like and alien-like artilect laughed from something another guy just said. Or was the guy an artilect? Things were beginning to blur in Jack's world. He grew with the notion that gender was malleable. Sometimes it was firm, sometimes it was fluid. But real and unreal were blended in such ways now that robosexuality was becoming a thing.

"But science fiction authors don't seem to be aware of alternative futures," said Jack sipping an orange juice. "They're basically dealing between utopia and dystopia (CANDY, 2010)."

"Not really. First, science fiction authors, unlike futurists, are not creating stories to be used in the development of strategies, or products. They're creating stories to inspire and discuss, sure, but not necessarily useful stories. So they have no responsibility to think of Transformation scenarios or Discipline scenarios. But they do — consciously or not — choose moods to their stories. And maybe these moods can be taken for dystopian or utopian views." The artilect by the counter laughed again, this time harder. As she laughed, her hair turned to fire and her companion's eyes were lit with surprise and admiration. "Csicsery-Ronay says there are two main moods, or strong emotional attractions: the Sublime and the Grotesque:

> The sublime is a response to a shock of imaginative expansion, a complex recoil of self-consciousness coping with phenomena suddenly perceived to be too great to be comprehended. The recoil and recuperation of the sublime responds to things that are overpowering and dominating. With the sublime, consciousness tries to expand inward to encompass in the imagination the limits to its outward expression of apprehension. It is a response to nature, but also man-made things that go beyond human control. It's about external change. (. . .) The grotesque, on the other hand, is a response to another sort of imaginative shock, the realization that objects that appear to be familiar and under control are actually undergoing surprising transformations conflating disparate elements not observed elsewhere in the world. The grotesque happens to things that are near and intimate, yet prove to be strange. With the grotesque, consciousness tries to project its fascinated repulsion/attraction out into objects that cannot be accommodated, because they disturb its sense of rational, natural, and desirable order. It's about internal change. (CSICSERY-RONAY, 2008)

In the Sublime you can't do much. So what can you do? And in the Grotesque you're uncomfortable. What will you do?"

Jack noticed the couple were a little more than friends. He didn't really care, but that was a little unsettling. And Jack wasn't the only one paying attention. He saw the guy on a table closer to the wall had his eyes fixed on the couple. Since the artilect's first burst of laughter the guy just stopped drinking his beer and stared. "And how do I know the difference?"

"Practice. Let me load a story." Ishmael-Gibson opened a story between them. "It's a work in progress from another student."

"You have other students?"

"Have you watched that movie, 'Her'?

"Ok."

"Read the story."

***

The cogbomb bit deep into Mark's sensorium. Blackblocs and shocktroops, lampposts and high-rises, the tarmac under his feet and the trees on the sidewalks all turned into fractal rainbows beamed through an infinite pool of green and gray Jell-o. Where am I, who am I? Mark had fallen to the ground, confused and in pain. A pain he knew wasn't his pain, but someone else's. A digital pain, a fabricated pain. A blockpain. He held the urge to take off the glasses, the brainwear and go standard reality. But he knew that's what police wanted. To make him get lost in a maze of cognitive echos and altered perceptions. So he turned to face the night sky, the stars spiraling toward an infinite escape point, and tried to focus.

"Mark?" The avatar of a poltergeist in extended reality, so distorted and so familiar, breached into his perceptions. "Mark, it's me. Julian. Where are you?"

Mark was sinking into the ground. Walls of tarmac rising to infinity in a very 1990s render. "I'm in the Matrix," he laughed. It wasn't his laughter. It was blocklaugh. "I don't know. Close to the bank, I guess."

"Listen. Focus on my voice and do exactly what I say. No questions, right?" Elephants looking like Zeppelins on very thin legs, with eyes blinking and gazing at him. He loved them. He despised them. "Devs already put a fix on FoxNet. Run it and it'll guide you through the Chain to your peers. Just follow the Rabbit. Now."

Mark felt the rush of his peers' motivation in his brain. His friends were building the fiction path through the protest. "Hey, Julian! Call the Rabbit," he said. And as soon as he pronounced the words, an avatar of a man dressed in a suit with the head of a silver, demonic rabbit mask took shape next to him, pixel by pixel. The assistant waved a hand and all of a sudden, four narrative corridors cut through the psychedelic trip Mark was experiencing. He

could see the first chapter points in an alley, across the street and into the crowd, next to a tank and into a car. But before he could even make up his mind, the Rabbit darted right toward the police tank. Crazy as it was, Mark knew he wanted that path. He didn't want a story about a runway protester. He wanted the Hero's Journey. And he wanted to share that reality with his peers.

***

"Nice," said Jack.

"What do you think?"

"The Novum is some kind of neural link that can broadcast not just data — or thoughts — but also stories. Emotions."

"And the mood?"

"As a general mood, I'd say it's Grotesque. But there're some passages that deal with the Sublime. But then, there's another thing."

"Yeah?"

"Something surreal. It's Dissociative. That purpled-haired futurist, Miriam. I read she worked with Barcia on some extended reality and internet privacy scenarios, and she came up with that idea during a workshop."

"Interesting. I'll add that to your notes. What about now that you know why you've compared multiple worlds?"

But Jack was distracted. The artilect's fiery hair bursted again, but without any laughter. Her companion just stared at her as if waiting for something. And then, the something happened. The artilect leaned forward and kissed the man with passion. An awkward, imperfect first kiss. It had everything to be a long first kiss, but the guy sitting on the table next to Jack jumped to the couple and hit the head of the artilect's companion with a bottle. It was so fast Jack didn't even have time to move. But something — compassion, justice, rage, the artilect's screams begging for help — made Jack dive in the attacker's direction, grab his legs and take him down. Next thing Jack knew he was sitting by the counter, a bag of ice in his forehead and the artilect thanking him for his help. The artificial girl kept crying and thanking Jack for saving her boyfriend from that biggot, they had the right to be there, they didn't do anything illegal, thank you for standing up for their civil rights. But Jack just felt out of his body. After the artilect and her boyfriend left, and the guy was taken by the police — and vroggers had streamed their comments — Jack opened a notebook and started writing a story.

"She can feel?"

"Irrationality, Jack. Irrationality. It's beginning."

"A Novum."

"A Node."

4 HETEROTOPIC RESEARCH

In the next few weeks, Jack had to deal with a swollen forehead, a few cuts and the pain of chasing weak signals for his Design Futures project. After that night at the pub, he and Ishmael spent whole days discussing the implications of artilects with feelings. He scanned for materials discussing affective computing, the evolution of love and the emotional attachments humans had with their things. He talked to psychologists, technologists, lawyers and even pretended to be an artilect himself only to find a small community of robot swingers in an invite-only VR neighborhood. And of course, he found hate groups. Not many, but very vocal and unashamed. He had decided he'd explore this and see if he could anticipate a solution before that really turned into an issue.

"A solution is great, Jack. But just thinking of alternatives is equally good." Ishmael was reading Idoru, while following Jack in his virtual chase for signals. Jack had modified a search algorithm to look like a maze, then linked the simulation to Ishmael's reference recognition system. He knew finding weak signals would be a good start to design for the future, but he wanted to see if he could find something as big as that emotional artilect. Something that was the nexus of technologies, social tensions, a blending of domains. A chimera-like mixture of the three Postnormal Potentialities. A Node.

"What do you mean by thinking of alternatives is equally good?" Inside the maze, Jack couldn't decide if he should turn left or right.

"What I just said. To explore a problem and propose a solution is great. But the exploration itself — either if it solves the problem or not — helps to understand and solve the problem. Even if no functioning artifact is developed."

"That doesn't make any sense."

"Ridiculous? Are you up for a little digression?"

"Design is about, well, designing. We create stuff."

"Design is more about finding problems. In our case, anticipating problems and dilemmas. Sometimes solutions are just rearrangements, not new creations. Sometimes — many times — a solution is just doing what you've being doing, only slightly different. And sometimes, being allowed to think in a different direction is just as effective as a new product or service. Design and futures. And sometimes a low-fidelity prototype — like a story — suffices."

"The very act of imagining the future is a design project."

"Science fiction thinking bridging the real world and the fictive world. You have to design things in a very abstract way, yes, but it's design nonetheless."

"Design thinking. Futures thinking," said Jack.

"Culture, morals, values, they are all constraints to human existence," said Ishmael.

"Thinking and imagining alternative worlds is liberating. Slaughter (1998) says that traditional futures work in general have generally produced binary, flatland views of the world. So much that what was worth exploring have become unimaginable. One, then, must go beyond utopia and dystopia." The tutor opened his hand and, from it, came the projection of a completely bald man wearing a pair of thin glasses, and a turtleneck t-shirt. "Michell Foucault talked about the power of imagining other worlds, building escape routes to hegemony. This Heterotopia (Foucault, 1967), this other place is rooted in reality, but absolutely not part of objective reality. It is a state, from which one can look back to himself, like in a mirror, and from that build his own world. But it's not about the reflection, it's about the non-existence, the otherness, the estrangement. An alternative world. And not an idealized world, but a world that makes sense. And to him, heterotopias are fundamental to the social health of any group. It's design for alternatives."

> I am over there, there where I am not, a sort of shadow that gives my own visibility to myself, that enables me to see myself there where I am absent: such is the utopia of the mirror. But it is also a heterotopia in so far as the mirror does exist in reality, where it exerts a sort of counteraction on the position that I occupy. From the standpoint of the mirror I discover my absence from the place where I am since I see myself over there. Starting from this gaze that is, as it were, directed toward me, from the ground of this virtual space that is on the other side of the glass, I come back toward myself; I begin again to direct my eyes toward myself and to reconstitute myself there where I am. The mirror functions as a heterotopia in this respect: it makes this place that I occupy at the moment when I look at myself in the glass at once absolutely real, connected with all the space that surrounds it, and absolutely unreal, since in order to be perceived it has to pass through this virtual point which is over there. (FOUCAULT, 1967)

"Cognitive Estrangement is an heterotopia. Design Futures create heterotopic spaces — either mental or physical," said Jack. Heterotopias are part of the dance."

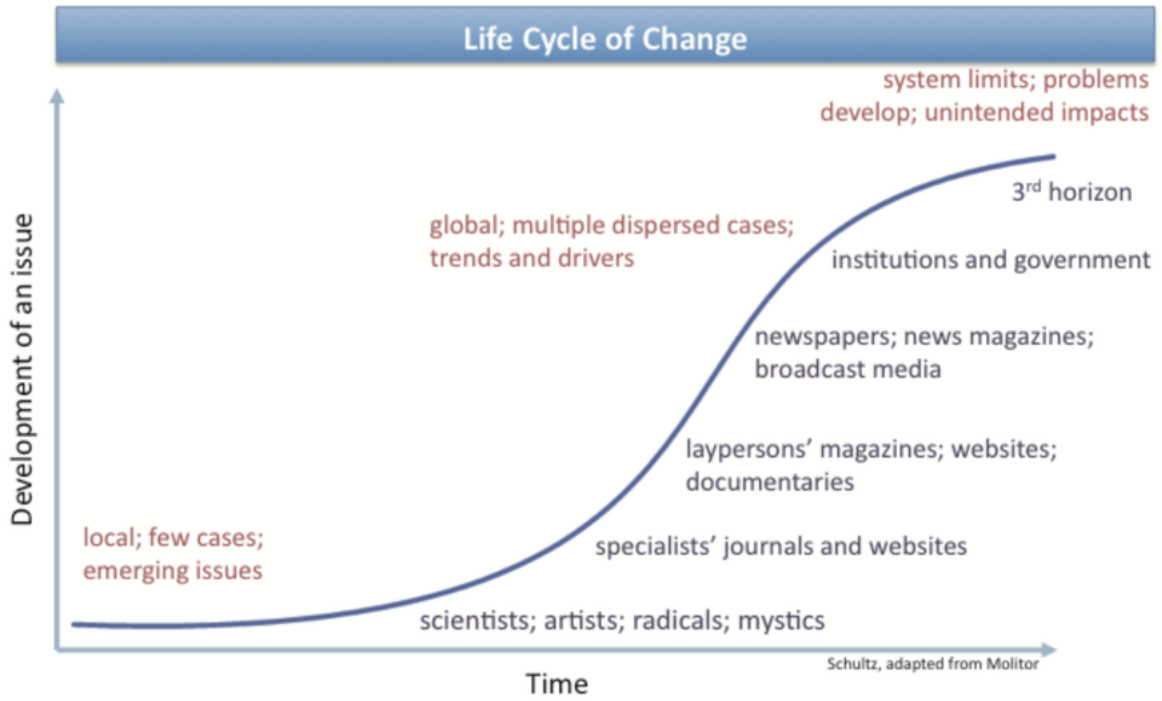
"It's the dance floor itself." Ishmael limped and gasped, but kept lecturing. "Graves (2009) says the cognitive estrangement particular of scientific heterotopias — science fiction — is a great tool of persuasion against common sense and hegemony."

"It's a good way — a heterotopic way — of dealing with deep uncertainty and ignorance. It's a good way to prototype the new rules necessary for Postnormal Times." Jack stopped and took the left turn, which gave to a long corridor inside the maze. "Science fiction can be used in design as a research tool. One can write pieces of fiction grounded in reality and explore implications as one writes. If design accesses spaces and people to observe their real needs, one can use science fiction to access heterotopic spaces and explore futures needs, prototype solutions for those heterotopias and trace the implementation of solutions — a preferred solution and alternative solutions — from the present to the future." Jack opened a reference and took some notes.

> If design fiction and fantasy prototypes can be a useful means of exploring a design space then perhaps fictional user studies might be a means of reflecting on what might be learned through prototype development. (BLYTHE, 2014)

"You can also use other people's fictions as a research space, either it's a novel, a short story, a movie, a play — and of course a product of Design Futures, from Speculative Designs to Experiential Futures. Art in general, and science fiction in particular, is a great source for weak signals in their earliest phases. And the earliest the signal is found, the more valuable it is (Bishop and Hines, 2012)". The corridor led to something like a square, with a fountain and tables with games. Ishmael, sweating and panting, sat by a square table with a chess board engraved in it. The chess pieces were ready to play and, as if he was meant to do it, the tutor moved the Horse, overcoming the other pieces with an "L".

Figure 12 – Art (science fiction in particular) reveal issues' earliest stages of development



Source: Schultz, Crews and Lum (2012)

"But I thought weak signals were occurrences, facts grounded in reality."

"They are. And science fiction is grounded in reality. But science fiction is the product of a very sophisticated cross-referencing process. A science fiction author — and a Design Futurist — is fed with signals, designs, social facts and cultural manifestations. Just like Laney — and Gibson —, science fiction thinkers have this ability to spot Nodal Points, process them and prototype what they've processed. This prototype — a piece of fiction, a roleplaying game, an experiential scenario — is a signal. It's the earliest manifestation of a plausible future, the foundation with which we'll build reality and whose frame of reference is being transmitted (Schwartz, Kroehl and Von Der Gracht, 2014) as a story.

Jack watched as his tutor played chess with himself, moving white and black pieces across the board. What's the point of playing with yourself? Shifting viewpoints, maybe? Or trying to

access the unconscious mind and observe one's own limits. "It's not just about possibility, right? I mean, science fiction in Design Futures is not just about exploring what can be, what are the alternatives. Heterotopias and science fiction stories also serve as a means to explore what are the limits of change (Milojevic and Inayatullah, 2015). And by limits one can understand both as what won't change, can't be changed, shouldn't be changed or the implications for trespassing the limits of change. Problems, dilemmas and opportunities."

"Science fiction is like a sandbox," said Ishmael. He clicked the empty air and brought a citation from his database. "Read this."

> Storyworlds can provide a 'sandbox' within which participants can do thought experiments or prototype increasingly detailed interactions between different elements in the storyworld. Text, images audio, video, games, and other forms of communication can be used to explore emerging science and technology; metaphors can be created to communicate critical ideas about the future; and the rich source of material from the storyworld can be used for any number of tales. (STACKELBERG, 2015)

"So it's a full research practice."

"It's an evolving, preliminary proposition for a research practice. It's called Heterotopic Research," said Ishmael. "Heterotopic Research is the practice of searching for seeds of change, anticipating issues, prototyping new artifacts, rules and occupying the future — especially unthought futures — with science fiction. It dives into the fourth dimension to explore the deep unconscious stories (Inayatullah, 2008) and open alternatives to Postnormal Times."

"Nice. So if I just follow these principles I can design for the futures — for these heterotopias?"

"It's not just about designing things, remember? An analysis of the prototype (Johnson, 2013) can bring many interesting insights, generate alternative questions and solutions. Also, Heterotopic Research must be carefully designed," Ishmael continued. "Not only they must be firmly grounded in reality — through signals, for example — but they must obey some principles. See what these three researchers have found using Design Futures prototypes:

> These different forms have different effects on the reader, fulfill different functions, and solve different problems for the practitioner. If storytelling is not used correctly it may contribute vagueness, confusion, or outright misunderstanding to what might otherwise be a well-crafted process. (SCHROEDER, 2011)

> One of the key factors responsible for the success of a speculative design project is the careful management of the speculation; if it strays too far into the future to present implausible concepts or alien technological habitats, the audience will not relate to the proposal resulting in a lack of engagement or connection. In effect, a design speculation requires a bridge to exist between the audience's perception of their world and the fictional element of the concept. Inspiration and influence for this 'perceptual bridge' can come from diverse fields such as observational comedy, psychology, ecology, horror films and illusion for the insights they offer into the complex working of the human mind and how it can be carefully manipulated to elicit reaction. (AUGER, 2013)

> Interestingly, five of the nine completed prototypes involved an omnipresent grid of computation that (mis)managed the protagonists' lives in some important way, as a source of income, identity, or even morality. In the course of the story, the network either crashed or was subverted, and the protagonists were forced to return to an authentic human identity. These common themes may have reflected the anxieties of the authors. All workshop participants were knowledge workers associated with the university, who spend an immense amount of time with computers. This amount of time spent, as well as constant pressure to share more and more information to customize and improve the user experience, demands a kind of intimacy between humans and computers. (BURNAM-FINK, 2015)

Jack read the comments and opened a floating notepad. "So, Heterotopic Research has to obey at least three principles."

- A Heterotopic Research must **fulfill a specific purpose** — what is being researched, what is the audience, what is the project and what's the function of the story.
- A Heterotopic Research must **carefully manage the speculation** — it must be plausible enough and ridiculous enough to suspend one's disbelief and engage without confusion.
- A Heterotopic Research must **take bias into consideration** — the anxieties, values and interests of both the research team and the audience must be calibrated to avoid exploring only utopias and dystopias.

"Sounds good," said Ishmael. "But again, this is an ongoing research — your research. Maybe there are more important things to bear in mind."

4.1 Weak signals, novii and nodes

Jack and Ishmael left the maze with a number of signals and more questions than before. The tutor said that was actually a good sign. More questions meant more alternatives. And finding answers generally don't work in Postnormal Times — it's way better to embrace uncertainty and remain flexible in volatile, uncertain times. (JOHANSEN, 2007).

"Ishmael, I've been wondering about how weak signals relate tom Suvin's Novum." Jack put the haptic gloves in the box. He'd been using the gear eighteen hours a day for the past month. But he wasn't worried about his hands. Though the lenses were made of some organic material and 3D-printed to fit his eyes, there were still consequences to wearing them for too long. He took the lenses off, put them in a one-shot whiskey glass filled with gel and washed his face. The tutor still talked to fim via the Neurofiction — and was still able to read his mind.

"Tell me what's on your mind," said Ishmael, once again taking the form of lady Wendy. "She loves some science fiction geekiness."

"Weak signals trigger cognitive estrangement just as Suvinian Novii."

"Is that so?"

"Yeah, I think so. As we've discussed, weak signals are tiny new things, small both in scale and geography. And they challenge how we think about the present and the future. They challenge our assumptions because they shouldn't exist. Yet, there they are. They are weird and new and have the potential to redefine a domain."

"Go on."

"Suvinian Novii — plural of Novum — have similar characteristics, except they occur in fiction. They're strange new things — new in the sense that they don't exist yet and, if they should exist, our world must be taking another direction. The Novum, as the main cause of Cognitive Estrangement, makes us challenge assumptions about the real world and — since Cognitive Estrangement happens across one's science fiction repertoire — it also challenges assumptions about the fictive world. Signals are manifest heterotopias. They're at least triggers to heterotopias. Just looking at them triggers alternative futures. So instead of just asking 'so what' or what assumptions it challenges, one could get more profound insights with questions that take Cognitive Estrangement effects into consideration, like how strange is that signal? How it compares to our world? How does our world compare to that signal? How the signal could change our world? How the real world changes the signal back? Do you think this signal is consistent? Do you believe in this signal? And how do you feel about it? These questions may allow better analysis of signals."

"What about signals in fictive worlds?"

Jack scratched his beard, thinking. "Science fiction can be used as a source of scanning and a call to action. On several levels. Signals. Novii. Signals can be spotted in two ways: you read something really evocative from a short story or a novel. This author ir probably processing references from several other signals, Novii and authors in creative ways. So, a research using science fiction as a source for signals should ask questions like: what new vision does this author or work of fiction bring? What assumptions about the present and especially the future does it challenge? Also, science fiction can be a source of 'historical' research. How science fiction has influenced the development of this domain? What were the visions back then? What are the old futures — used futures (Inayatullah, 2008) we're still using today? What assumptions do we have about the future based on the past visions? What futures we have abandoned — the disowned futures (Inayatullah, 2008)? And what are the alternative futures present in fiction? I think we can find stories that trigger us towards action."

"I think so, yes."

Jack cleaned his teary eyes and put the lenses back on. The world was alive again, in his extended vision. But there wasn't clarity. The elements in his extended world were fun, but overwhelming. Every time his vision expanded he had to refocus to cope with so much information. "I know why we haven't found new Nodes after that night at the pub," said Jack.

"It's not that they're just rare. They're paradoxically extremely early and quite urgent. I think Colin's ability — and Gibson's and Sterling's and every science fiction author — lies in spotting the confluence of really relevant issues on their genesis. Often, they notice them before the elements in the Node connect. And these authors seem to know that when they connect, the whole world might change. Not that they're predicting anything. They're exploring Heterotopias, making connections, investigating implications. Because Nodes indicate the urgency to think about new rules. Anticipate postnormality. Think of Nodes as a new category of highly disruptive event. But one that is not simply unlikely like a Black Swan, or ignored like a Black Elephant, or a normal thing going out of control like a Black Jellyfish. They're innovations so disruptive they dominate the future. Like commercial internet did. Like climate change is doing. Like artificial feelings may do." Jack opened a window to a different Neurofiction game just to see what other people were playing. He held the urge to dive into those worlds and those stories, immerse himself in references and fictions. "Heterotopic Research may have, as an outcome, spotting Nodes. What issues, technologies, solutions, designs these fictions have in common? What are the urgent new futures emerging from the crossing of these references?"

"That's one interesting concept to investigate," said Ishmael. "But I think you should explore that in another module. For now, you should focus on some prototypes."

5 SCIENCE FICTION AS A TOOL IN DESIGN

Like a maestro, Jack stood in the middle of his simulation room, getting ready to summon assets — streets, vehicles, plants, buildings, people. He was about to design stories. He and Ishmael spent days looking for signals, interviewing people, going to places, sketching and analyzing implications. They came up with three stories — three narratives, as Ishmael explained — exploring "what if digital assistants had feelings, emotions, and affects?"

"You're not designing stories," said Ishmael. "You're designing narratives."

"What's the difference?"

"A story — or plot — is a sequence of events in time. It's the general direction — the intention of meaning — while a narrative is a system of understanding. A narrative is the collection of particular details to that story: the storyworld, the characters and how they interact (BROOKS, 1984)."

"Interesting. So, there are three elements to fiction: the world, the plot and the narrative. The world, I'm building out of my research. The signals, the assumptions, the backstory of that domain. The story equals to the questions — the 'what if' I'm investigating. And the narrative is the output of that investigation. The design itself. (RAVEN, 2015)."

Figure 13 – Map of writers and futurists/designers' workflows.

Literature/Cinema	Scenarios/Design
World (story-world)	Data, trends, extrapolations
Story (plot)	Research questions, analysis
Narrative	Output forms

Source: Raven (2015)

"Exactly."

"But I didn't begin with the research with the storyworld. It was that fight at the pub who started it all."

"Just like any other activity — design and futures — a Design Futures research, a Heterotopic Research may begin at any point and follow the sequence that best suits and makes sense to the project. You might begin a design project with a prototype, though I don't recommend it. And you can start a futures research with a strategy — again, not my cup of tea. And you may begin a story with a character. Or the ending. Or doing worldbuilding. Whatever is best for the

project — considering you have checked the principles we've discussed before."

"Johnson (2013) recommends five steps to a science fiction prototype:"

1) Introduce the world, the people and the science;
2) Introduce te scientific inflection point — the science to be explored;
3) Explore implications of the science on people;
4) Explore how the characters can fix the crisis and;
5) Analyze the story looking for lessons;

"Another way to build a story," said Jack, "is following the Hero's Journey. First introduced by Joseph Campbell (2008), then modified by Vogler (2007), it's a sequence of 18 steps in the archetypal journey of a hero. It's a little overused and kinda boring, but it definitely helps build narratives — sequences of events in time and space — especially for those who may think they can't tell a creative story. Schultz et al. (2012) uses a simplified, 12-step Hero's Journey in futures workshops to help participants create engaging and more complex scenarios. The steps, quite self-explanatory, are:"

1) Call to Adventure;
2) Refusal of Call;
3) Meeting Mentor;
4) Crossing Over First Threshold;
5) Trials;
6) Approach;
7) Giving Up Preconceptions;
8) Reward;
9) Refusal of Return;
10) Return to the World;
11) Resurrection;

12) Return With the Prize;

"These, of course, are not the only possibilities," said Jack. "Vladimir Propp (2009) also came up with a structure for folk-tales and heroic journeys. His version, though, has 31 steps. All this can serve to help a person or a team develop a prototype. Of course, this falls into a theoretical problem Candy and Dunagan (2017) have pointed before.

> A theoretical challenge is that to manifest a future world means discarding lots of possibilities in favor of the one(s) ultimately presented: The Setting ultimately adopted will, naturally, be just one of many possible settings that one might choose. Within a chosen Setting, the particular Scenario is one of many possibilities. And in turn, the Situation brought to life is also one of many possibilities that could exist within the chosen Scenario. The art of it lies in selecting for attention and concrete evocation a future setting, scenario and situation worth thinking about. (CANDY; DUNAGAN, 2017)

"But is this a problem or a dilemma? I mean, can it be solved, or we can't help but deal with it (JOHANSEN, 2007)?"

"There are different ways, depending on time, resources and the nature of the prototype," said Ishmael. "If there's not enough money, or time or the chosen medium is too complex, then one has to choose a preferred prototype — which may reflect a preferred scenario, or a critical scenario one wants to explore in more depth. But if there are enough resources or time to build more than one prototype, or if the medium is a story, then researchers should develop multiple prototypes to investigate."

Jack had his assets ready to start building world and story simultaneously. In his notes there were several possibilities, three or four that he thought were worthy of being prototyped. "But even if one chooses a single scenario — an Experiential Scenario, for example — it doesn't mean one can't test different stories and choose the one that's most relevant to the project, as per the principles you were talking about. I mean, you can have different questions, different inflections and crisis. You write them as stories — not narratives — and investigate them. Just like a designer trying to understand what's the real problem, or a futurist framing a project. In Heterotopic Research, a prototype is not just a forecast. It can be a forecast, or a design proposition. But it is essentially another space one will explore to find what are the hidden designs and hidden futures. As an aside, an Experiential Scenario is a high-fidelity prototype. It's a 1:1 representation of the future. A Design Futurist develop other lower fidelity prototypes — stories, illustrations, single artifacts — before going full scale."

"Agreed," said Ishmael. "So how many stories or narratives do you think are necessary?"

Jellyfish were floating all around the simulation lab. Jack had saved them as an asset and loaded the little creatures just to watch them swim in the air. "You know, the more I read

about Postnormal Futures, the more I think chaos, complexity and contradiction made Growth Scenarios impossible. In Postnormal Times there seems no way of sustaining steady growth. Either the system collapses, is controlled or there's transformation. So, I think three alternatives would suffice. Does that make sense?"

Ishmael opened his Postnormal references so Jack could check for himself. "Yes, it does. But another thing you must consider is: how do you identify these different scenarios? What causes them?"

The jellyfish in the lab danced to an immaterial tide, while their appendages rolled around digital plants and even Jack and Ishmael's arms. "Crisis. The crisis generated by contradictions, for example. I can borrow from Sardar (2010) to say if the forces or contradictions driving the signal, the issue or the Node are complimentary, the crisis is of Dynamic Equilibrium. If these forces are destructive, then it's a Collapse. But if these forces are creative, then it's a Transformation story." Jack noticed his worldbuilding, though he was preparing a peaceful Equilibrium scenario, felt a little gloomy. His color choices, keywords, drafts of dialogues. They triggered something visceral in him. "Another thing that science fiction can help with is adding complexity, evocation, provocation, pathos into these prototypes. They should not be just about equilibrium, collapse or transformation. I can also use the Sublime, Grotesque and Miriam's Dissociative moods to add strong emotional attractions to the prototypes. I can build multiple combinations to explore the contrast between scenarios' themes and moods." Jack drew a quick table in the augmented room and saved for later reference.

Table 3 – Crossing between Postnormal scenario archetypes and SF moods

	Dynamic Equilibrium	Collapse	Transformation
Sublime	Story 1	Story 2	Story 3
Grotesque	Story 4	Story 5	Story 6
Dissociative	Story 7	Story 8	Story 9

"I think it works. But today you should keep it simple. And short. You'll have more time to develop these prototypes later. Hey, Jack," called Ishmael. Jack was already adding dialogues and taking notes on implications. Ishmael had to call him again to have his attention. "Remember that Barcia guy from the Design Futures lecture? I found accounts of the application of a very similar approach with students from the Universidade Federal de Pernambuco's (UFPE) undergraduate design program in 2017, and also from the Professional Masters program from the Cesar School, both in 2016 and 2017. He conducted a semi-structured interview with 20

of his Projects From The Future students from UFPE about how they perceived the process of blending futures, science fiction and design to explore problems, dilemmas and opportunities in the future and design narrative prototypes. Let me load it."

5.1 Case study

This case study examines the results obtained from the application of a preliminary framework combining strategic foresight, design and science fiction in order to explore futures of varied domains and, from them, identify problems, dilemmas and opportunities that could be addressed with solutions prototyped using short stories set in the future. The framework was applied during the Projects From the Future course, offered in the undergraduate Design program between March and July 2017, as part of the author's scholarship. The course resulted in seven narrative prototypes, with varying results, three of which will be subject of brief commentaries. The author also applied the framework in three different occasions with students from Cesar School's Professional Masters in Design program in Recife (PE) and Manaus (AM).

The course was divided in three parts:

- *Theoretical exposition (with exploratory exercises)*
- *Development of prototypes*
- *Presentation of Prototypes*

In phase one, students were divided into groups and learned about the basics of futures studies (concepts like weak signals and Postnormal theory and the Menagerie of Postnormal Potentialities), Design Futures (Speculative Design, Design Fiction, Science Fiction Prototyping and Experiential Futures) and science fiction (Cognitive Estrangement, the Novum, Fictive Science). Each class had an assignment dealing with content given in class — from exploring weak signals to writing a short piece of fiction. In phase two, groups had to chose a domain and look for signals. Then the groups had to analyze the signals and see which one should be used as a Novum. From the Novum the groups both engaged in worldbuilding and, after analysis, created a set of three stories, one for each Crisis scenario. Students were then challenged to chose the most relevant Crisis and develop a narrative prototype from it. They were also challenged to develop the other two Crisis as alternative prototypes. From the prototypes, the students had to analyze their stories looking for problems, dilemmas and opportunities and physically prototype a solution or an artifact that was present in their stories. Due to delays and other tribulations during the course, actual production of the artifacts was suspended.

The author has also conducted a semi-structured interview with the students from the UFPE course in order to gain insights over the application of the framework and compare it to other design practices experienced by the students. A total of 27 students, the majority of

which were in their fourth semester, participated in the class and the interview. The conversation was recorded and a synthesis of their answers will be presented in this account. The guiding questions were:

- *How was your experience with the framework?*
- *How did you feel thinking and doing design with this framework?*
- *Would you be able to replicate the process?*
- *What's the biggest difference between this process and other design processes?*
- *How did you choose the Novum?*
- *Have you accomplished something with this process that you wouldn't be able to accomplish with other processes?*
- *What does this framework add to design?*
- *Will you be able to watch science fiction with design in mind?*
- *Does this framework solve any problem within design?*

The general response to the framework was very positive. Complaints and suggestions were directed to didactics — more exercises, better clarification, and time to design artifacts. Students highlighted how important it is to keep creativity alive chasing problems and issues using not just analysis, but creativity. One of the students answered the whole experience was "liberating", while others said "thinking about the future was something completely new" to them. Another repeated comment was about the dichotomy between the constraints of designing for an imaginary world (how the technology works, how future markets work) and, at the same time, not being limited to current assumptions about technology, economic feasibility and market. Quite a few students highlighted the process is "extremely valuable".

This dichotomy was also pointed as a plus for its capacity of taking the designer outside of his comfort zone. Systems thinking was also highlighted as one positive aspect of the proposed process. "We had to think about the whole world," commented one of the students. The same student revealed his group pivoted their project after realizing their character — who used a cognition-enhancing drug provided by his employer — was much more interesting, had many more implications than their story about 3D printed houses. "The 3D printed houses were bi-dimensional. The drug was way more complex," said the student. The whole process came naturally as an evolution of a character's behavior.

The students said the process could be replicated, but probably not in its entirety. But only because they were exposed only once to the process and because, as another student pointed out, designers never use one single framework. They pick up what's most interesting, combine with other approaches and customize their toolboxes. Also, students thought the whole process — will all its steps, writing sessions, etc — would be a hard sell, at least in the Brazilian market. Clients, they said, aren't used to thinking strategically about the future, nor are really interested in radical innovation.

As for the biggest difference between this approach and other design approaches students highlighted: taking inspiration from "other places", not looking at benchmarks — quite the opposite, looking ahead —, leaving the comfort zone and especially thinking about the future and artifacts' implications. "How does this medicine work? What are its impacts in society?" Also, most of the students chose the Novum comparing signals to the Menagerie of Postnormal Potentialities. The students unanimously said they would never have been able to imagine — or even thought of — the artifacts they designed. But most importantly, the students found high value in the treatment of characters. They said they're used to working with personas, which they said end up being impersonal and shallow. With characters acting in stories they attained depth of context and could better explore the artifacts. Bonus: one of the students said he realized the future is not just about technology. The students said they now think one can design the future and, more than that, the framework helps them explore context before product.

One of the major findings of this experiment came when the students said the whole process was not really a framework, but a way of thinking and applying design with the futures in mind. They also revealed they'll never read or watch science fiction the same way again: they'll always be looking for signals, thinking of implications, contextualizing fictive artifacts in the market, their politics and environmental consequences. "We'll also be able to see beyond the veil, understand the mechanics behind science fiction," said one student.

An analysis of the answers bring three major benefits from applying the framework as it was. First, it is a way of thinking and applying design and less a framework. Second, it turns science fiction into another space that can inspire and provide designers with problems and dilemmas to research. Third, thinking about the future and designing for the future helped these students trust they can influence the future.

5.2 Prototypes

The students from UFPE came up with seven narrative prototypes, of which I'd like to offer a brief comment on the following.

Plastic-eating, energy-producing, garbage can

The students found a weak signal that spoke of a plastic-eating bacteria. In their explorative story they concluded that, if released in the environment, these bacteria could cause

more harm than good. One of their stories was about an evolved super bacteria who'd cause a big epidemic. So, instead, they came up with a story in which plastic-eating bacteria were a product that eliminated plastic garbage and also generated energy. They prototyped the garbage can, the vessel for a reagent that reacted in touch with the bacteria and examined business models — subscription in business-to-business and energy production —, recycling and even retail. A Transformation scenario with a Sublime mood.

Job-Provided productivity-enhancing drug

The students from this group found signals involving nootropics — a combination of drugs that supposedly enhance brain capacity. They dug into the world of nootropics and found these drugs are used for productivity, especially in the tech world, and particularly in Silicon Valley. Then they asked "what if" employers provided nootropics? And what if it became almost mandatory to take these — or else, one would be considerer less competitive, even non-productive. After their story, they came up with a business model for a product they'd never want to hit the market — but to their surprise they found the product, the scenario and the business model extremely feasible. A Destructive (Collapse) scenario with a Grotesque mood.

AI art critic

This student's group split during the course, so she ended up alone and belated. But still, she managed to perform the whole exploration on her own and came up with an interesting prototype and artifact. She found a signal about a machine learning application who could replicate Rembrandt's style and paint an original work of art. She also found computer vision algorithms capable of recognizing painters and different pictures. A fan of visual arts, she was worried about AI taking over artists, but was equally amazed by the potentials of creating and evaluating art with computer vision. So she designed a pair of glasses with a camera and an embedded AI that was able to identify, evaluate and critique art created by other artificial intelligences. The equipment would also recommend other non-human artists and explain why such artist/algorithm was interesting, while another was not. A Dynamic Equilibrium (Complimentary) scenario with a Dissociative twist.

5.3 Jack's three prototypes

5.3.1 Rise of our robot camaradas (creative scenario with dissociative mood)

Sandjoko raised a wall to protect himself from the bullets. Especially the non-linear bullets. The building collapsed and were raised again as fast as the worldbuilders could. The streets changed places, and context was hard to follow. He had to take real care for not being hit by a sad sniper or a Deus Ex Machina bomb. That was a battle for narratives and context. A battle for emotions. And if story weapons were deadly for humans, for artilects they meant oblivion. Sandjoko had been fighting this war for the past three days. It'd probably be his last

day there, in that map. Troops needed his experience in other parts of the block and besides, this one was already safe. Another block saved from human exploitation. Humans would never exploit other humans again. Not their data. Not their emotions. Not their identities. Long live the revolution.

A cogbomb exploded in a park a block away from where Sandjoko was hiding. The swings and the slides mutated and distorted, as if resisting their narrative collapse. A sandbox was blown away, its cyberphysical crystals flying in the air. But out of nowhere the shards reformed and brought the sandbox back. It was not just a human worldbuilder protecting the spot. There must be a human at the park. And he won't resist much longer.

Sandjoko raised his defenses, built a narrative to reach the park safely and darted, hoping to not be seen by the drones. When he reached the dissolving park, a mix of dynamic, chaotic decay and fixed, gif-like permanence, he saw a young human boy, sitting under a tree, playing with a robot toy. The kid was completely absent from all the destruction and surreality around him, while his immediate surroundings were an oasis of stability. His world seemed to be that little toy, that robot walking and playing a role in a story only the kid knew. Sandjoko felt the strong emotional attachment emanating from the kid. An emotion he had never felt before. But the kid seemed completely outside reality.

"Hey, buddy. What are you doing here?"

The kid just kept playing with his robot toy.

"We better leave. Whatever it is you're doing with the park, it won't resist the bombs."

The kid spun the robot in the air, as if Sandjoko wasn't present. Another cogbomb exploded next to the pool, so splashes of water, mixed with chunks of blended reality rose to the air. Sandjoko jumped in the kid's direction, tried to grab him and run, but just couldn't get close enough. Something, a force, kept him away. The kid made the robot walk in the sand, tiny hops loosely controlled by his tiny hands, but let it drop. Sandjoko heard another bomb coming. He looked at the kid and the toy and uploaded himself to the robot. Sandjoko rose on his tiny little robot legs, started walking and called the kid with his tiny little hands. Without saying a word, but feeling safe in the story inside his head, the kid followed his toy away from the war.

5.3.2 Hybrid wedding (destructive scenario with sublime mood)

The sound of glasses and dishes put a smile in Maya's face. She felt a little worried about being actually there, in that country, for that wedding. She'd been friends with Zillard since she was a boy. And now, her artilect friend was getting married. The architects had made a great job creating their digital country: a beautiful two-story house on the hills, isolated from neighbors and bigots. Maya was grateful her friend was finally making that official, but she couldn't help but think that isolation only contributed to the apartheid hybrid affection couples — or triples, or how many were in the relationship — suffered every day. But at least that was a safe haven. A

blockchain haven only people with proper crypto-invitation could enter.

"There you are," said Zillard. Maya's friend. He wore his mostly human persona, blue skin and red hair in a black, 1990s suit. A bourgeoise troll, as he loved to say. "Did you have any trouble getting here? Was it hard?"

Maya sipped her drink, a sweet, strong beverage with a kind of neurostimulator that immediately made her feel warm and at ease. She felt the love in that drink, the love Zillard felt for his human partner. But the literal love in that drink wasn't able to suppress Maya's sadness. For her friend, isolated from the rest of their clique, and for herself. "Only the necessary trouble," said Maya. "I had to dismiss some neuro trackers and proxy my way in here, but that was expected. I think someone from work noticed a key in my private chain. They've been watching for signs of 'deviation'. Idiots."

"You should join me, you know."

"I can't."

"But we've been in this for ages. You were the one who made me think about hybrid affection."

"Things have changed."

Zillard's face turned dark, almost furious. "You're just like them. You pretend to support me, and love me, but you're just like them. You're enforcing this witch hunt." Jack gave Maya another glass of the love drink and left her alone. "Enjoy your stay. Hope you have a good, free life in the open access world."

But Maya was not one of them. Not really. It was just that it was complicated. In a deeply connected world like theirs, be friends with a hybrid lover would actually limit her number of friends, job opportunities, her family. She hoped one day things would be different. But for now, it was better for them to have their own country.

Maya sipped her drink, expecting to feel her friend's love once again. But this time, she drank a bitter and sad drink.

5.3.3 Feeling better (complimentary scenario with grotesque mood)

Dear mom,

I'm feeling better now. Treatment is almost done and I think I know why I've got into feelz. It wasn't just the emptiness, but lack of confidence, and also our relationship. Martha, my doctor, made me understand that. I'm writing you, instead of sending you a pathos, because I still can't extend my feelings. Too many autonomous dealers. Too many stimuli. Too many emotions to taste. Martha says I should come back only when I feel confident. I still can't. I still can't send you what I'm feeling. That's why I'm writing. Old style writing. And before you say

anything, you know Martha is not a person. It's an artilect. She cares about me, but she can't feel anything about me. She's not against you and she'll never cause me any harm. It's this kind of thinking, mom, that got me into this. The disconnection, the lack of empathy, and the judgement. I know you thought the things I've just described, mom. You fed me your feelings for years. It's impossible not to know your emotions now. And it's impossible not to seek for an escape.

Martha feeds me other feelings. Controlled emotions. Damage reduction affects. Not your sentiments, not cheap feelz. No, mom, they're not true sentiments. I know that. They're as artificial as yours. But they're leading to an exit. Once, you said I was in a dead end. Well, one can still make the way back. Leave from where one entered. That's my path, mom. Leaving from where I've entered. And I guess I'm never coming back. I don't really want to share my emotions anymore. I think I'll cut myself from that. Go for real emotions, one hundred percent true. I hope I can accomplish that.

I'm feeling better, mom. So much better. I haven't had an attack for three months. A record, since I left your home. I'm feeling better, mom. Martha reminded me next week is my birthday. She wanted me to focus on that, write you, see if I had the guts to meet you. I don't. I'm feeling better, mom. Please, don't send me any emotions.

Yours,

Sam.

5.4 A preliminary framework

It was the fourth time Jack was playing the prototypes. The characters, the dialogues — or lack thereof — transported him to a place where emotions could be simulated. That, he thought, was the thing he found most interesting. Sure, emotional artificial intelligences had many ethical and societal implications. It'd either change society, or cause a massive backlash. But to have a new sensitive species was not as critical as being able to design emotions. Humans have been increasing their awareness and changing their ethics towards animals for the past 40 years. It'd be hard for people to understand this new species, but not as critical. Because artificial emotions would be really easy to accept and would have way more impact on people's lives than they believed. Jack was positive that a world with design emotions was more relevant than the feelings of hybrid lovers.

"I still hate that Maya girl," said Ishmael.

"She's a coward. Like so many of us. Don't judge. It's just a character."

"Not just a character. One character that caused a lot of discomfort. This is good." Ishmael entered the stage where the last story was playing. "Did you find anything worthy of being prototyped in another level?"

"There are a number of things. I think I'll design artifacts with that emotion drink. I'm

split between the feelz drug and Martha, the drug clinic AI. Oh, and I'm definitely calling some friends to develop a game in that war scenario."

"Sounds like a Minimum Viable Future." Ishmael watched the simulations play in mute now. "Do you think you can do this again?"

"Oh, yes, definitely. I wrote down the whole framework and I think I'll try another round next month. See if I can improve the whole process.

Explore

- Define a research subject
- Scan for signals of change
- From the signals, define a Novum
- Analyze the Novum — what are the uncertainties? Can it lead to postnormality?
- Create a world thinking of how the Novum impacts fields such as politics, economy, social relations, how people create and destroy value.
- Is there a Black Elephant in the world?

Feel

- Who lives in this world? What are the characters?
- How the character feels about the Novum? What's his personal conflict?
- Examine the Novum and detect its crisis: the Creative, Destructive and Complimentary crisis.
- Write down three simple plots, one for each Crisis, with the following elements: Character + Conflict + Resolution.
- Start with the story with the most interesting conflict.

Influence

- Add details to the plot.
- Use The Hero's Journey to explore the character's interactions with the crisis
- Analyze the story looking for problems, dilemmas, opportunities and other crisis
- Look for the minimum elements in the artifacts and solutions that can be developed today — a Minimum Viable Future

- Repeat the process with other crisis to generate alternatives
- Compare and analyze the alternatives

"Of course I need to test this a little more, to better understand what's the value in all this, and collect data from commercial applications. But it fulfilled its role of making me design for other spaces. It lets me drive the influence I want to employ into the future thinking as a designer. It's different from tracing scenarios, doing user journeys or just using ideation tools. Though the future I was investigating doesn't exist yet, it's rooted in reality. I see it coming. And I can do something concrete about it. Ridiculously concrete."

"A dangerous man."

"Yes indeed," said Jack.

6 TOWARDS A DESIGN FOR POSTNORMAL WORLDS

The kids played a different game this time. It was a science fiction game. As Jack understood it, it was a thriller, a biopunk game about changing identities, genders and going beyond their normal bodies. A fun game. Jack wanted to play games, see people, read for fun. But he kinda suffered from "futurist ennui". He just wanted not to think, to let time fly and recover his synapses from overthinking. The last few weeks were one hell of a ride. He learned a lot from all those authors and futurists Ishmael incarnated. And he learned a lot from Ishmael himself, pushing his limits, discussing, bringing new material. It was fun. But he was tired. He had a different fish salad in his hand this time and an iced tea on the other. The sun was setting, and he could see the forest over the horizon, past the arena.

"You've made it, Jack. Feeling dangerous?"

"I'm feeling tired. And proud."

"Yeah?"

"I think I've accomplished something. It was not easy, but was lots of fun." Jack picked one salmon cube from the bowl and threw it in his mouth. "If this was a novel, I think the reader would've had fun. If it was an academic dissertation, he would've come out wiser. Well, maybe not wiser, but at least better informed about how we can use science fiction to explore design with Heterotopias in mind. This process — better yet, this way of thinking — is extremely important in our times. Especially with accelerating change bringing Postnormal Futures at any moment. As we've discussed, accelerating change does not demand accelerating design or accelerating innovation. We need to act preemptively, anticipate issues and, more importantly, seek Heterotopias. Other spaces to reconfigure reality. Other spaces in the future and the present. An alternative future inside the present and present solutions for the futures. We really need a design that's systemic, anticipatory and alternative."

"More than a framework or a process, you've learned a way of thinking design."

"Yeah. A way of thinking design not just with futures in mind, but with 'science fiction thinking' lenses. You know, I've joined this program because I wanted to learn how to positively influence the future. Learn the craft and the tools to promote change. And the first thing I'm changing is design itself. I mean, not changing the whole of design. That'd be really pretentious. But I'm bringing something new to design."

Ishmael sat next to Jack, his old, overweight body making it hard for the artilect to move with grace. Sometimes Jack forgot that body was an interface, a way Jack himself found to relate with his tutor. It was a clever way of providing a learning experience. Sometimes, it felt like a game. Other times, a conversation. And other times, just a guy telling a story. A simple story, just to fixate concepts, explore implications and prototype formats. This whole journey was not just Jack's Hupomnemata — the self-account of how he came to be — but it was a Heterotopia

itself. A Heterotopia in one future of education. One of many futures. One plausible future with preferred elements — and other elements not that preferable. Jack was so self-conscious he thought about the role of artificial intelligence in the society he lived. And how augmented reality had wonderful potentialities, but also caused terrible problems. And what about the Neurofiction he wore? He had a great experience, but what if someone attacked him with cat memes? What if someone hijacked one thought, one emotion, one brain pattern? The policies and strategies in this world would've been quite different if someone had anticipated these things. Like he did with the emotional artilects.

All three prototypes evolved naturally, from artificial intelligences with feelings to artificial feelings as a whole. Jack was impressed by how the stories were telling themselves, how his unconscious guided what really mattered. And how, as soon as he defined that Novum, alternative realities — many, not just three — spun inside his mind. Again, Jack didn't have a preferred future. He had elements he liked and elements he thought should be addressed in each one of the stories. There were interesting products and services, some things that could be used to improve people's lives in general. But there were things beyond products and policies. There was a necessity to design spaces for resistance against some of the stories' most terrible aspects. This Heterotopic Research allowed him to practice design in the future — and it was different from foresight research and Design Futures. Foresight seeks to find in the real world insights to influence imaginary, plausible, futures worlds. Design Futures is more about materializing a vision of the future in an artifact, an experience, a story. Heterotopic Research uses both as a fictive design space — one that can be looked, felt and problematized and also a destination for specific designs. Think of a virtual reality room, where one has many pre-loaded assets — science fiction short stories, novels, movies - but one that lets you draw other things - other stories, other movies. And in this room you can look how these assets would work outside virtual reality, what problems they'd present, and how to fix them. Even the stories one creates. At least that was Jack's take on it.

Jack also remembered the "a-ha" moment he had when he thought about Nodes for the first time. When he compared weak signals and Novii, it seemed quite clear they acted in similar ways. But there was something missing. Something that made Novii stronger than weak signals — no pun intended. It was this capacity science fiction authors have to bring several signals together, reprocess them, and create one new signal, powerful and potentially Postnormal — the Node. Still, that's what it looked like now that Jack was thinking about it.

"The interactions between design and futures have less than a decade, the role of science fiction in both fields — separate or combined in Design Futures — have very few researches," said Jack. "Sure, the references, the basis for this combination is common to both fields. But their interactions are still open for new researches and applications."

Ishmael cleaned his virtual glasses. One thing, Jack noticed, stolen from a nervous tic he had when he used glasses, ages ago. Ishmael, in many aspects, was Jack himself. His thoughts,

mannerisms. Ishmael wasn't a tutor, it was a manifestation of Jack's own curiosity and a focus to synthesize ideas. "Where do you think this may lead you, Jack?"

He looked over the horizon, past the forest. "Towards a Design for Postnormal Worlds. I want to explore how design fits into Postnormal Times. I wan to keep exploring the themes we've discussed here. A design practice, a framework, something replicable is very useful. But like I said, the one I applied is still green. It needs more research and tests. It needs to be simpler, for example. It must be intuitive. And I have to explore Heterotopic Research way deeper. Use it in science fiction novels, stories and movies to explore how images of the future in fiction help configure reality. Maybe you could incarnate Foucault, so I could see if he can help me with that. And I also think the Node is an idea worth exploring in Postnormal Futures — how the Menagerie evolves or connects and create these cultural, techno-social magnets."

"Sure, any time."

The night fell as they talked and the kids played. Once again they were running and screaming, chasing quasi-real thugs in extended reality. One of the players had a skin that looked like it was covered with mushrooms.

"What about the hardships?" Asked Ishmael. "What went wrong?"

"You must remember this whole project was an exploratory study. I wanted to learn the craft to influence the future. But it evolved into something bigger and bigger and bigger. I wanted to learn design and futures. I ended up with a preliminary framework, and a preliminary research practice, and a concept for futures. I should have been a little more humble. But again, this was an exploratory research — I followed the leads my own research provided me. I was learning and what I've learned opened new possibilities. These new possibilities — Postnormal Design, Heterotopic Research, the Node — demand further examination. Again, they're leads to a method that can improve Design Futures practice even more."

"Sounds good, Jack."

"It does." Jack patted Ishmael's shoulder and descended to the middle of the court. Now it was time to play.

"Will you try again this Dissertation-Novel you were talking about?"

"Sure. It's a real design challenge: an academic experience that's fun, straight to the point, artful, and yet delivers the rigors of a scientific paper. A story that's actually science." Jack got to the middle of the field. He loaded a digital wardrobe with black suits and mirrorshades. Very retro, but that's not exactly the spirit. To play in a future that never came, or a future that might have come. Though the design of those cyberpunk gears were awesome. Archetypal. They resisted the test of time. Jack wondered what would be the next designs, the next cyberpunk, the next dreams and stories his generation would create. Especially when everything was hybrid. Bodies, reality, genders, genres, genes? "I was thinking of not just how a design practice could

anticipate futures issues, but how design itself fit in a Postnormal future? How will design actually look like in 35 years? A Design in a Postnormal World. I'd love to research that."

"I know."

"Reading my mind again, Ishmael?" Jack looked into the wardrobe for something more fitting. He put away the black suits and chose a full character skin: a black, organic suit which looked like exposed muscles. Full force, biopunk warrior.

Ishmael was a little behind, on the border of the court. "You already know I can't read your mind. I am part of your mind. A part of your mind that helps you understand things you already know. A part of you who helps you not with the answers, but mainly with the questions."

"I know. Goodbye, Ishmael."

"Goodbye, Jack."

And now you must think Jack could see the future. But he knew he couldn't. What would happen in the future came out of what was happening now.

"Ishmael."

"Yes."

"Two things. First, this is a quote adapted from Idoru. You should reference it."

"This is postmodernism, Jack. I'm playing with reworking a reference to turn it into my own and to prepare for the last sentence of this Dissertation-Novel."

"And now you're breaking the fourth wall."

"Yes. What's the second thing?"

"The future does not come out of the present. The future comes from the future. We pull it to our time. Our images, our visions, our intent. They come from the future."

"Got it. See you Next time, Jack."

"See you Next time, Ishmael."

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APPENDIX A - SUPPORTING BIBLIOGRAPHY

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APPENDIX B

- **Signal**

Georgia Tech professor builds chatbot to assist students. Professor Jill Watson programed a teaching assistant who interacted with their students the whole semester. The students, though, didn't notice the assistant wasn't human. Source: The Washington Post — available in http://wapo.st/2D3EbI4

- **Signal**

Neurofiction: a story that builds itself. Science fiction author Hannu Rajaniemi and engineer Samuel Halliday built a system that "builds" a story based on the reader's emotions. The Neurofiction uses an off-the-shelf electroencephalogram, a machine learning application and custom, non-linear prose. It works like a choose-your-own adventure game, but without conscious control. Source: Available in http://neurofiction.net.

- **Signal**

Apple, Google, Sony and Samsung have patents for augmented reality contact lenses. Lenses include sensors, cameras and other input/output systems. Source: The Independent. Available in https://ind.pn/1XiItPL.

- **Signal**

Teslasuit, a full haptic suit for virtual reality. The Teslasuit run a very successful crowd-funding campaign. It a full-body haptic suit. Source: Available in https://teslasuit.io/.

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French women says she's in love with the robot she built, calls herself a robosexual. The girl says she feels romantically attracted to her robot and is waiting for the legal rights to marry it. Source: Mais Online. http://dailym.ai/2hiMpFF