

What in the World? Storyworlds, Science Fiction, and Futures Studies

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Abstract

This article looks at how futures studies can use storyworlds to address some of the challenges the field faces. It provides an overview of social constructionism, integral theory/integral futures, and sense-making in the context of the current evolution of futures methodologies. This article also examines the role of narratives generally and science fiction in particular in exploring and communicating about the future. An overview of what storyworlds are and how they have been used in science fiction and futures studies is followed by a pair of cases studies focused on two worldbuilding projects, one for the fictional world of Rilao and the other for the storyworld created for the 2002 film Minority Report. The article concludes with an analysis of how the worldbuilding process is compatible with social constructionism, integral theory/integral futures, and sense-making.

Keywords: worldbuilding, storytelling, narrative, science fiction, futures studies, information design, sense-making

Introduction

The creation of sophisticated imaginary worlds has been central to some of the greatest epic fantasy and science fiction stories. While the process of worldbuilding – the creation of imaginary worlds with coherent geographic, social, cultural, and other features – has a long history, it is reaching new levels of sophistication in 21st century science fiction. Rich storyworlds – the “universes” within which stories are set – provide detailed contextual rule-

sets that develop a larger reality that extends beyond a single story, while potentially providing a deeper understanding of the underlying systems that drive these worlds.

A number of theories – among them sense-making, integral theory, and social constructionism – have found their way into emerging and evolving foresight methodologies. Storyworlds (von Stackelberg & Jones, 2014, pp.66-68) and the process of worldbuilding are compatible with many of these approaches.

Foresight professionals should understand both the role of storyworlds in futures-oriented work and the process of worldbuilding used to create those storyworlds. The emerging theory and practice of worldbuilding provides insights that may be used to address some of the more vexing challenges facing futures studies and its practitioners.

Theories and Approaches Influencing Futures Studies

A variety of theories and approaches from both inside and outside of the field of futures studies have influenced the evolution of futures methodologies. Among those from outside the field of futures studies are social constructionism, integral theory, and sense-making, while approaches like causal layered analysis, critical futures studies, and integral futures come from within the field. This paper does not attempt a thorough analysis of these various methods as they are applied to futures studies; many excellent articles have already been written on these topics by Floyd (2008), Fuller and Loogma (2009), Inayatullah (2010), Slaughter (2011), and others. The overview presented in this section is intended to provide a basic introduction to these various theories and approaches in order to frame the context within which storyworlds and worldbuilding exist in relation to futures studies.

Causal Layered Analysis

Causal layered analysis (CLA) was developed to move “beyond the superficiality of conventional social science research and forecasting methods” (Inayatullah, 2004, pp.8-9) and delve more deeply into how subjectivity, interpretation, and cultural context affect our understanding of the future and our actions in shaping it. (Riedy, 2008) The core assumption of CLA is that there are multiple levels to making sense of reality and the future. (Riedy, 2008) Causal layered analysis’ philosophical and theoretical ties to social constructionism are clear and explicit. (Fuller & Loogma, 2009)

Social Constructionism

Central to social constructionism is the idea that whenever we employ words or other symbols to refer to objects in our social world we are constructing them; quite literally, as meaningful social objects that we can take account of in our actions. Constructionism is related to symbolic interaction theory and the sociology of action, which proposes that we actively make and remake social structures and institutions during the course of our daily activities. (Fuller & Loogma, 2009, pp.71-79)

When applied to futures studies, social reality can be seen as a construction that each member of a group contributes to by developing a picture of the world using currently available information. (Miller, 1994, pp.1-16) Slaughter stated “social construction of reality is an attempt to operationalize the deepest purpose of critical

futures work in ways that consciously and deliberately lead toward more humanly viable futures than those currently in prospect." (Slaughter, 2002, pp.26-31)

Knowledge as a creative social process is a powerful explanation for the unpredictability of the future, which is built on the creation of knowledge and on the way that knowledge guides everyday choices. Social constructionism is resonant with most or arguably all knowledge (e.g. even the meaning of mathematics is social), including the way in which knowledge of the future is produced and used. Foresight is both a social construction and a process for social construction. (Fuller & Loogma, 2009, pp.71-79)

Integral Theory

At the core of Integral Theory are four irreducible perspectives – subjective, intersubjective, objective, and interobjective – that should be used when attempting to fully understand any topic or aspect of reality.

- The *subjective* perspective examines the individual's interior world, with its concerns of individual motivation, changes in people's values, perceptions, and goals, and the meaning of life. (Collins & Hines, 2010)
- The *objective* perspective examines the individual's exterior world, with its concerns about changes in the ways people act externally; (e.g., voting patterns, consumer behavior, reproductive practices, etc.).
- The *interobjective* perspective examines the collective exterior world, generally referred to as the physical world, with its concerns about measurable changes in natural and constructed external environments.
- The *intersubjective* perspective examines the collective interior world of the shared meaning of groups, as expressed in their culture, with concerns about shared collective structures, such as changes in languages, cultures, and institutions.

Critical Futures Studies and Integral Futures

Critical futures studies (CFS) opened the "social interiors" of the future – social factors such as language, worldviews, paradigms and values – which were overlooked by more traditional futures studies approaches that focused on exterior aspects of social systems such as population trends, new technologies, infrastructure changes, and so on. (Slaughter, 2008, pp.120-137) The "social interiors" Slaughter referred to are the equivalent of the intersubjective perspective in Integral Theory, while the exterior aspects are the interobjective perspective.

Integral Futures (IF) extends the perspective of critical futures studies by adding the subjective and objective perspectives of Integral Theory to futures methodologies. Scenario development is a complex, detailed process that requires foresight practitioners and clients to have a high degree of self-knowledge and a nontrivial grasp of human psychology. Adding IF to scenarios opened individual and collective human interiors to much deeper examination. (Slaughter, 2008, pp.120-137)

Sense-making

Sense-making is the process by which people give meaning to their experiences and the world around them. (Weick, 1995) Narratives are an important part of the

process by which sense is made of events and environments. (Currie & Brown, 2003, pp.563-586) Sense-making is a social activity in which plausible stories are shared, retained, or preserved. Narratives are both individual and shared products of conversations. (Currie & Brown, 2003, pp.563-586). When engaged in sense-making, individuals have an interaction during which they simultaneously shape and react to the environment they face. (Thurlow & Mills, 2009, pp.459-579)

Sense-making is vital to the processing of information. If we are unable to put information into context and ascribe meaning to it, that information is lost. (Raltonen & Barth, 2005)

(T)he ways we imagine the future, understand the past, and come to grips with the present are extremely valuable in providing continuity and direction for our lives. Sense-making is rooted in time and space, and occurs at the intersection of three horizons: the past, present, and future... Sense-making is also gap-bridging, because by moving theoretically and analytically across time and space we bridge gaps inherent in the human condition...Sense-making is accomplished by verbalizations that involve information, knowledge, cognition, thoughts, and conclusions (Raltonen & Barth, 2005, pp. 45-46)

Narratives and Futures Studies

Storytelling in all its forms exists in our world for one major reason amongst others – it provides a way to make sense of the world around us. Fiction is a powerful tool that through, for instance, metaphor and fable provides ways in which deeper meaning is conveyed and the unfamiliar is contextualized.

Storytelling has become an increasingly important tool in facilitating changes in people and organizational cultures (Kaye, 1995; Maas, 2012), while the role of media and its narratives in shaping public opinion and societal values has been widely studied (McCombs, 2002; Semetko, 2004). Narratives are crucial to futures communications, supporting strategic decision-making and critical reflection by helping organizational actors comprehend uncertainties. (Li, 2013) Jarva (2014) states that narrative has the potential to fill the gap between images of various futures and the actions needed to create those futures.

A futures narrative creative process is described by Schultz, Crews, and Lum (Schultz, Crews, & Lum, 2012, p.137).

Our goals in designing this process were three-fold: 1) to create a participatory, integrated futures process that digs more deeply into organizational cultural assumptions and blind spots; 2) to produce scenarios inductively by interconnecting impacts of multiple variables to mimic more closely the turbulence of real-world change; and 3) engage participants in creating their own richly detailed, vivid, and dramatic stories about possible futures. (Schultz, Crews, & Lum, 2012, p.137)

Embracing narrative and particularly fiction can provide one of the most powerful tools for building and exploring plausible futures.

Design fiction involves the convergence of design and fiction to prototype possible future outcomes of contemporary technological, social, political, and cultural life. Design fiction often takes the form of short films and critical design

objects and artifacts that help build rich narratives that can serve as prototypes of future worlds. (Stein, 2014)

Science Fiction vs. Futures Studies

The impact of science fiction on popular visions of the future is considerable. Science fiction is clearly the most visible and influential contemporary form of futurist thinking in the modern world. (Lombardo, 2006, p.5) However, the relationship between science fiction and futures studies has at times been strained. The relationship of futures studies with popular culture is characterized by “a deep uneasiness”, with anxieties about “their legitimacy and utility of popular culture-steeped futures content, and the threat that the credibility of futures professionals will be disrupted and usurped.” (Li, 2013, p.138)

The relationship between science fiction and futures studies is often one in which each side worries about being confused with the other. (Li, 2013) There is anxiety in the futures field about a conflict between “expert/elite and grassroots/amateur producers” of futures knowledge. (Li, 2013)

Li (2013) said that the futures field’s attitude towards engaging with popular culture can be expressed in three broad ways:

- Monkish, where professional futures knowledge is institutionally protected from popular culture.
- Gonzo-ish, where popular culture is the primary target for information and insights from “grittily enlightened” futurists.
- Collapse-Folkish, where futures knowledge is thoroughly mangled after being absorbed by grassroots popular culture.

Li notes that the futures field’s relationship with popular culture in general and science fiction in particular has improved but is still limited by a deep uneasiness over the relationship between the two. (Li, 2013) This divide between science fiction and futures studies is neither necessary nor desirable. There is a long history of crossover between the two, with each positively influencing the other. Authors like H.G. Wells and Arthur C. Clarke, for example, frequently and successfully crossed back and forth from science fiction and futures studies. A little later in this article we will examine more closely how the 2002 science fiction film *Minority Report* used futures techniques and professional futurists as part of the worldbuilding process.

The power and popularity of science fiction comes from its narrative approach, which uses dramatic plots, compelling story lines, interesting characters – human and otherwise – and fascinating settings.

It is imaginative, concrete, and often highly detailed scenario-building about the future set in the form of stories...It has become so popular because it appeals to the dramatic dimension within people. Life seems more like a story than a set of abstractions, and just as history is a multi-faceted story, the future will be a complex saga of stories. (Lombardo, 2006, p.5)

Futures methods should target both cognitive (intellectual) and affective (emotional) processes. (von Stackelberg & Jones, 2014) Affective (emotional) processes should be specifically targeted since emotional stimuli has a significant

impact on, among other things, focusing attention, processing information faster, and provoking empathic responses towards others. (von Stackelberg & Jones, 2014) Science fiction can provide that kind of emotional stimuli:

Although science fiction may inform it also produces an emotional experience in the reader. The future is felt, as well as imagined and considered. This emotional dimension often translates into inspiration. (Lombardo, 2006, p.8)

The use of science fiction to explore the forces and choices in our world is similar to the futures field's scenario planning, causal layer analysis, integral futures, and other approaches for exploring alternative futures. Future-oriented science fiction tends to fall into one of four literary categories (Levin, 2010):

- **Cautionary tales** that emphasize the consequences – generally negative – of some aspect of today's society.
- **Thought experiments** – also referred to as "what if" stories – that examine the potential impacts of some current or anticipated event, technology, or trend.
- **Literalized metaphors** that use a metaphor to study a particular aspect of our world – for example, stories of space aliens to address our alienation from society – and make it concrete.
- **Explorations of new science and technology** that use new advances as the basis for a storyline.

These four literary categories could be readily adapted by foresight professionals and applied to futures studies through genuine, rich, and deep worldbuilding of the future.

Narratives about the future can trigger new directions for thought and exploration that foster the creation of new realities. The self-lacing shoes from *Back to the Future II*, a science fiction film released in 1989, became a reality in 2015 when Nike's innovation chief, who designed the shoes for the film, announced plans to release the shoes as a commercial product. (Luntz, 2015) The film's main character time travels to 2015 and finds a variety of futuristic inventions.

Many futuristic technologies depicted in the film *Minority Report* have been developed since the film's release in 2002. These include a gesture-driven computer interface, personalized advertising, face recognition technology, driverless cars, and robotic insects. (Alba, 2014; Howard, 2014; Prigg, 2012) According to Alex McDowell, production designer for *Minority Report*, the film provided an opportunity for entertainment and science to intersect and use fiction as a testing ground for reality. (McDowell, 2015)

A formal framework for science fiction prototyping has emerged as a way to communicate complex ideas about science and technology to lay audiences in a way that provoked thought and discussion about the future. (Graham, Greenhill, Dymski, Coles, & Hennelly, 2015) The science fiction prototype framework uses narratives that are based explicitly on scientific and technological facts as a design tool in the development of a technology. The subtlety of how people will use and interact with new technology provides insights that are fed into it as it works its way through the

technology development process. (Graham, Greenhill, Dymski, Coles, & Hennelly, 2015)

Urban Futures

Closely related to both design fiction and science fiction prototyping is urban futures, in which science fiction and other forms of narrative are used to explore the future of cities. Narrative plays an important role in encouraging discourse in urban planning and engaging communities in the design process. (Collie, 2011) These “cities of the imagination” can connect people to a particular place, even if it is imaginary, and help them make sense of that world and their place in it. (Popova, 2014) The “what if” scenarios that science fiction presents can stir the imagination of architects and designers, and inform the creation of cities. (Kerkez, 2014)

While all fiction may be enlightening for designers, science fiction should be of distinctive interest for three overlapping reasons: it reflects and shapes popular culture; the world building propositions of writers and the work of urban designers and architects share significant concerns; and sci-fi offers poetically rich thought experiments that can help designers understand the nuances of theory. (Childs, 2014)



Figure 1. By conducting research in fields as diverse as architecture, engineering, physics, urban planning, technology, and advertising, a team of experts developed a logic-driven vision of the near future for *Minority Report*. For instance, interactive, customized marketing catered to the characters' personalities was woven throughout the film. Image courtesy of 20th Century Fox.

In an examination of three 21st century science fiction novels – *Peridido Street Station* by China Miéville, *Windup Girl* by Paolo Bacigalupi, and *The Dervish House* by Ian McDonald – the authors “give voice to, and believably shape and reshape, images of ‘the city’, the place where climate, culture, economy, politics, and environment are integral to determining the urban design”. (Kerkez, 2014)

On the whole, these novels are also works of aesthetic action and design. Their atmospheres and settings, eye for compelling and resonant detail, balancing of multiple storylines, formal structures and other aspects of craft can inform and inspire today's designers of built form. (Kerkez, 2014)

Storyworlds in Science Fiction and Futures Studies

As we've seen earlier, worldbuilding is an important aspect of science fiction prototyping and the "cities of the imagination" approach to urban design. In both situations fictional storyworlds are central to the exploration of and communication about the future.

A storyworld is defined in part as the place and time in which a narrative happens. (Herman, 2002) The term "chronotope" – literally "time-space" – has also been used when describing the temporal and spatial relationships in narratives. (Bakhtin, 2008) Storyspace and worldspace are also terms that have been used. In this article we will use the more common term "storyworld".

In addition to providing a temporal and spatial setting for narratives, storyworlds should provide coherent geographic, technological, social, cultural, and other features. Storyworlds can be fictional, non-fictional, or a combination of the two. "Fictional" and "Non-Fictional" are opposite ends of a spectrum, with storyworlds tending to fall between the poles rather than falling precisely into one category or the other.

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.

These world-building narratives act as maps, allowing us to test our current strategies and discover new opportunities, while avoiding threats. By painting immersive pictures of possible future worlds, we can be prepared no matter what future unfolds. (Salvatico, 2015)

Sophisticated constructed worlds are not new: they have been central to a number of epic fantasy and science fiction stories. J. R. R. Tolkien's Middle Earth – setting for *The Hobbit* and *The Lord of the Rings*, which were written between the mid-1930s and 1949 – and Frank Herbert's Arrakis – developed in the early 1960s as the desert planet in *Dune* and its five sequels – are notable early examples of constructed worlds.

We are starting to see the use of storyworlds in futures studies as foresight professionals move beyond traditional futures tools and methods. *ZED.TO: By-*oLogyc**, created in 2012, used a comprehensive fictional storyworld as the setting for a speculative scenario based on the extrapolation of current technology trends, business models, and values in the biotechnology industry. (Haldenby, 2015) Over an eight-month period a narrative about "the beginning of the end of the world" caused by a genetically engineered plague that decimated the human population was played out using an integrated combination of interactive theatrical events and

online content centered on a single storyworld. (The Mission Business, 2013)

An experimental scenario planning exercise developed by Time's Up and FoAM in June, 2014 used a combination of approaches such as worldbuilding, business futures, lucid dreaming, and improvisational theater to develop a “world that was strangely like ours, yet filled with dreamy metaphors of rolling photocopies and shape-shifting beings, an eternal twilight and a search for green plants”. (TimesUp, 2014) The resulting imaginary space is used to explore “the doubts, hopes, fears, and possibilities of the near future.” (TimesUp, 2014)

Worldbuilding Case Study: Rilao

Rilao is an open-source ground-up worldbuilding project that imagines a fictional archipelago in the Pacific Ocean. Elements of the real world cities of Los Angeles and Rio de Janeiro were fused into the storyworld to create the “DNA” for Rilao. The fictional world of Rilao first began to emerge in January 2014 when science fiction and futures studies came together in two worldbuilding classes in the Media Arts + Practice division at the School of Cinematic Arts at the University of Southern California (USC). Rilao went on to serve as a narrative framework at the USC School of Architecture, Amsterdam Film School, University of Rotterdam’s gamification division, the Bauhaus in Dessau, FAMU in Prague, the ESBM school of journalism in Rio, and design fiction classes offered at the Royal College of Art and Design in London.

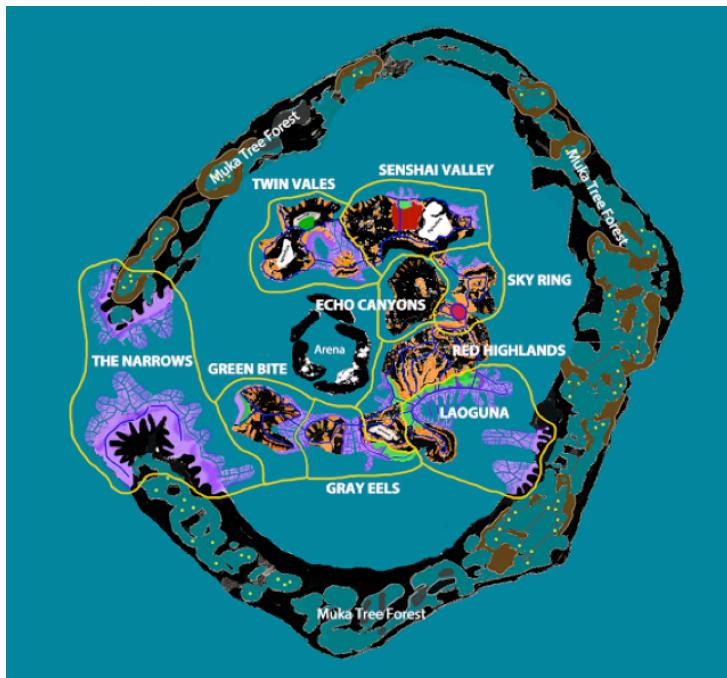


Figure 2. Rilao is an open source fictional storyworld that spawned more than 100 student projects and over 1000 narratives. Image courtesy World Building Media Lab

For students in the Media Arts + Practice Division of USC's School of Cinematic Arts, Rilao became the subject for design fiction in the classroom and beyond. Many of the narratives mined from the Rilaean storyworld by students and other participants evolved into imaginings of future Rilaean politics and society; the scientific, cultural, and psychological – both individual and collective – impacts of a nation-wide plague; terraforming and new architectural techniques to deal with overpopulation, and the development of religion, mythology, storytelling, and language.

An architecture student created a practical and dynamic robotic exoskeleton that could both obscure and display the Rilaean wearer in their overpopulated environment, a games group developed an early VR experience for tourist visitors to Rilao, another game created terraforming to increase the land mass of the island, a writing student evolved the idea of a script contained in a physical suitcase filled with artifacts from the world that when read in random combinations could trigger entirely new stories.



Figure 3. One of the artifacts excavated from the world of Rilao by Murilo Hauser, a Master of Fine Arts Screenwriting candidate at USC, the Lost Suitcase consists in souvenirs gathered by an outsider who visited Rilao. Propaganda brochures from the Disciples of Lao, avant-garde seafood, an opera about oil workers; this anonymous traveler sampled various facets of the archipelago. Each physical fragment offers an entry point into some aspect of Rilao, including culture, food, architecture, and media. Image courtesy USC World Building Media Lab

As stories and artifacts were created and added to the storyworld of Rilao, a complex web of interactions emerged. As a result, the evolution of Rilao was fluid, chaotic, and open-ended. The multi-threaded, cross-disciplinary, collaborative

approach used to create the storyworld aligns closely with the social constructionist idea that each member of a group contributes to the development of a picture of the world. This approach to building storyworlds also aligns with the goals for more deeply examining individual and collective perspectives as advocated by causal layered analysis, critical futures studies, and integral futures. The use of storyworlds can also aid the sense-making process by rooting information in time and space within a storyworld and providing context and meaning.

Rilao remains an ongoing project fueled by international engagement including the USC World Building Institute's Science of Fiction practice-based annual initiative. In the 2014 event, participants at this three-day "non-conference" were immersed in the world of Rilao through a carefully constructed set of Rilao-specific card-based prompts developed by game designer Jeff Watson and festival director Alex McDowell. Not only did the audience participate in immersive, collaborative workshops and interactive breakout sessions, but participants were also entertained at a Rilaean immersive musical concert, ate Rilaean food, and examined Rilaean artifacts. Currently, further developments of parts of the world of Rilao continue to expand the overall world of Rilao, as this open-source worldspace is engaged by audiences at international conferences like the Berlin Film Festival, FMX 2015 in Stuttgart, and the 2015 BAM festival in Bogotá. Recently in Sweden, at the Awesome Bergman 2015 conference of film and games, three Rilao world building groups each took a specific scale of the world in 2035 and observed a rapid development of rich narratives in the city, neighborhood and family that they cross-pollinated, creating new canon, unexpected narrative threads and diverse characters in just a few hours. This ability to immerse participants in a persistent coherent storyworld is one of the key strengths of the worldbuilding process and is one that holds promise for futures oriented projects.

Worldbuilding Case Study: Minority Report

The futuristic technologies in the 2002 film *Minority Report*, an action-detective thriller set in Washington, D.C. in the year 2054, have been widely noted for how prescient they have been. (Carr, 2010; Harrell, 2010; Hart, 2010) While worldbuilding had been used before for science fiction projects, *Minority Report* took the process to a new level of sophistication. Alex McDowell, a co-author of this paper, was the production designer on the film.

McDowell said the worldbuilding process for the film came about almost by accident as a result of a confluence of several events. He and writer Scott Frank were hired on the same day to work on the film. The previous script for the film had been thrown out when Spielberg took the project and it took many more months than expected to complete the new script. In lieu of the customary text, the film's designers were effectively obliged to develop the storyworld prior to the script. Because the script then took much longer than expected to deliver, the process became a radical departure from the norm of film production to date, or since.

Another critical factor was the falling cost and rising performance of computer technology, which brought conceptual and 3D visualization into the design department for the first time. This allowed not only designers, but also the producers, writers, director, and other members of the production team to share in the visual and story development process through immersive design visualization and prototyping.

There were several examples of the ways in which the design and world building process disrupted the previous linear production through new technology. McDowell had experienced early previsualization in *Fight Club* and through his collaboration as designer for David Fincher in commercials.

Previs as it became known, is an extension of storyboarding and focuses on sequence design, where a virtual camera moving in relation to digital characters and environments brings together the director and key creative leads to determine solutions – usually visual effects solutions – to complex production issues. For *Minority Report* this was developed into a sophisticated design visualization (D-vis) system that allowed unprecedented collaboration across several of the film crafts. An example of this is the Sprawl Hotel sequence, when a single camera move traverses the entire set from above as Spyder surveillance bots search for Anderton.

This intricate camera move required that many elements be carefully explored prior to any physical execution. The exact placement of a very heavy super Technocrane and its track above a three-story set was particularly complex as it needed to reach all necessary views of the characters in the hotel rooms in one shot. Digital prototyping the shot sequence in advance of building the set and placing the camera allowed designers to modify the virtual set and character movement to accommodate real-world camera constraints. After the set was built to match the digital data specs of the D-vis, the final sequence was rehearsed by the camera crew reproducing the previs animation of characters and camera within the digitally designed set. During shooting, the complexity of the sequence had been so carefully resolved in the digital simulation that the final shot was completed in four takes within a couple of hours, a shot that traditionally might have taken over a day.

As a very different example of disruption, a digital visualization process was developed as an urban planning tool to help resolve the design of the world. A 3D model allowed for iterative development of the rules and logic of the world. This process involved examining the scale and location of fictional elements relative to the real world geography and terrain of Washington DC, infrastructure, architecture, urban development, and transportation systems.

McDowell approached architect Greg Lynn and some of his young architecture students to join the design department, where they used Maya 3D animation software to radically change the traditional film design process and incorporate it into the world build. McDowell also hired car designer Harald Belker, who brought with him the 3D tools he had been using at BMW, to design the unique vehicles of *Minority Report*. One of these vehicles was conjoined with the vertical design of the new architectural city to create a vertical and horizontal transportation system. The final vertical car stunt sequence in the film was almost entirely produced in post-production but it was designed, prototyped and developed using 3D visualization. Not only was Spielberg able to direct the digital animation long prior to shooting, but he was also able to approve 3D printed maquettes of the vehicles and then see the same digital data used to manufacture the final car for actor Tom Cruise to interact with at full scale. In the past, many of the decisions for these sequences would have been made in post-production during visual effects development, but with *Minority Report* that old linear process was upended and replaced by an entirely non-linear collaboration in the early stages of production, prior to shooting.

These new applications of digital technology in developing the narrative logic for story and production resulted in a rich storyworld with a unique level of consistency of vision for the film.

The third factor in shaping the film was director Steven Spielberg's requirement that *Minority Report* be approached as future reality, not traditional science fiction. He did not want to allow his audience to escape the implications of the film's outcome of the film by dismissing it as simply science fiction.

Spielberg locked in a few key elements of the story, which was already radically changed from the 1956 Philip K. Dick short story on which it was based: it would be set in Washington DC in the 2050s; it would be a benign and apparently utopic future world with no fossil fuels, sustainable and ecological, with technology that works and augments the society and political, cultural, economic and technological systems; and at the heart of the film would be the primary societal disruptors – the Precogs themselves. Their ability to predict violent crimes and apprehend the perpetrators before they commit the crimes results in Washington DC becoming a murder-free city. This in turn leads to a massive population shift to the Washington DC area, which in turn leads to the development of a new vertical city and a highly stratified society.

With Spielberg looking for a future reality that fit within those parameters, the processes of narrative design and the visioning of innovative technologies and urban environments were not simple. Typical movie design research involves in-house designers and usually a single researcher gathering information. (McDowell, 2015) The process for *Minority Report* was much more sophisticated.



Figure 4. Actor Tom Cruise works on set, using G-speak - a gesture-based computer interface for Tom Cruise's character developed by computer scientist John Underkoffler and Alex McDowell. This fictional prototype of gesture recognition was developed into a real world interface, called G-Speak, by Underkoffler and his start-up Oblong Industries after the film was released. Image courtesy of 20th Century Fox

Spielberg and producer Walter Parkes had convened a group of experts for Jurassic Park with great success. Without a developed script, McDowell and Frank worked with Spielberg determined to create an initial approach to a comprehensive near-future world through conducting in-depth research with experts in architecture, engineering, urban planning, advertising, art, science and technology, and politics.

In 1999, they took the first step in the research process by engaging in multiple weeks of internal design research. That research framed a two-day meeting with the first round of experts, convened by Peter Schwartz's Global Business Network and Walter Parkes. In addition to futurists, a diverse group of experts in a variety of fields was present, along with Spielberg, the producers, Scott Frank, Alex McDowell and a small team of designers.

At that initial meeting, the first level of detail of flying vehicles and weaponry was provided by Dr. Shaun Jones of DARPA, and other members of the group provided a wealth of discussion and information about the ways in which this future city might develop, with its initial logic of society, politics and urban development framed by the demands of the story. In the two-day gathering, the group sliced through this future world, looking broadly at a very diverse set of conditions. This was the first glimpse of what would become the world building process for the film. Writer Douglas Coupland produced a highly tongue-in-cheek 100-page document of the future in 2050 specifically for the futurists and designers gathered together for *Minority Report* that was highly simulative for the group. It is interesting to note that the interplay between the traditional 'futurist' approaches – based on current, real-world constraints – and the storytelling demands created a valuable creative tension.

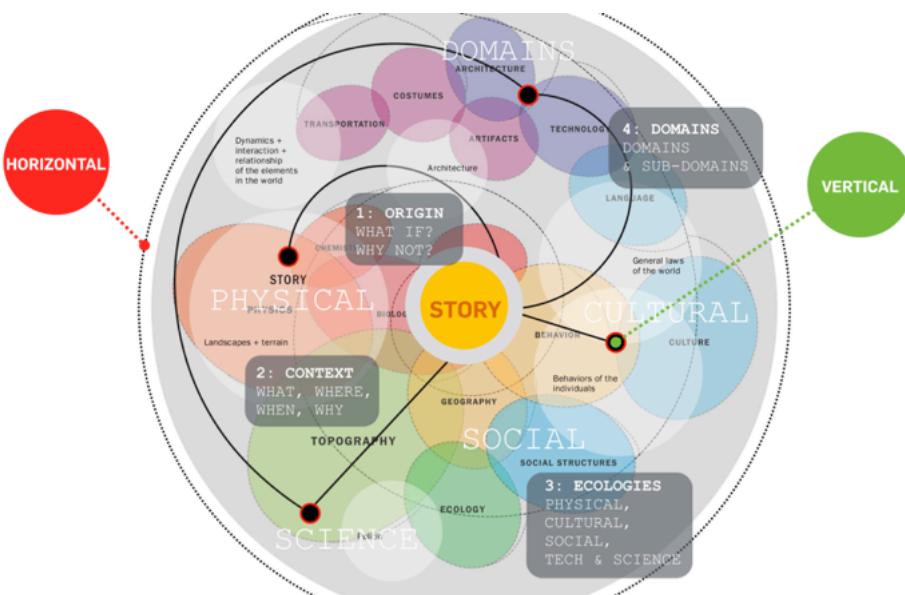


Figure 5. The worldbuilding mandala is rooted in a logic-driven world space crafted through deep research and exploration, *Minority Report*'s narrative organically evolved out of the refinement of the storyworld. The 21st century digital and non-linear design process replaces the anachronism of the linear, industrial 20th century model and allows for a fluid cross-disciplinary collaboration from the start of development of the story space. Image copyright and courtesy of Alex McDowell

The Mandala was initially developed by McDowell in 2004 to describe the radical change put in place by his world building process. It shows that after an initial impetus from the story origin at the center (note, the script is no longer considered Step 1) the first approach is to what disruption in the narrative would stimulate the

interrogation of the world.

This first stage is known as “What If and Why Not”. In this case the story impetus of the Precogs – “What if there were three precognitive beings who could predict murder and allow Precrime Police to arrest perpetrators before they commit the crime” – leads to a question of range, whether this is an experiment unique to DC, and in turn to a massive influx of population to get the benefit of the murder-free society, leading to the need for rapid urban development. This is contextualized by knowing where and when the story takes place, which brings real world constraints like the zoning laws in DC into direct relationship with the fiction of the narrative. At three broad scales – the world scale (the larger urban conurbation), the community scale (the new Mall City), and the individual scale (Anderton’s apartment, his car, and his artifacts) – the world begins to fill in with connective rules that develop a holistic logic-driven world space. The overview indicated in the Mandala represents a Horizontal slice through the world – all the major elements of society, culture, politics, science, technology, history, infrastructure and ecosystem that interconnect the narrative elements of the world. To develop the fine detail of the world, the world builders then engage in a series of Vertical ‘core samples’ that interrogate the world system in relation to specific elements that have a direct impact on the narrative. These detailed investigations demand answers of the ecologies and domains of the world that in turn tighten the logic.

An example of how the tension between the needs of the narrative conflicted with real-world constraints was the development of the urban landscape in *Minority Report*. Initially, the concept was for Washington DC and the Mall to be filled with high-rises. In an interview in 2012, McDowell said:

People from DC were saying that you can’t build anything higher than the Capitol building, and you’ll never be allowed to, even in 50 years’ time. So we moved all of our architecture across the Potomac River and developed a vertical city, although there was a lot of resistance to that from the [think tank] group. (Bonnington et al., 2012)

In the think tank, futurist urban planner Joel Garreau advocated his “Edge City” theories of an extended suburban city, but the film’s world builders rejected this in favor of stacked vertical urban spaces that gave much richer narrative scope, and provided an effective metaphor for the consumer hierarchy of the new city. For McDowell, this is an early example of the benefits of a coherent storyworld in which the world’s internal logic helps shape the narrative. (McDowell, 2015)

Two important contributors at that initial meeting were physicist Neil Gershenfeld and architect William Mitchell, both from the MIT Media Lab. McDowell recalls:

Neil told the assembled team that when he received the brief for the gathering, he had gotten to thinking, and although he hadn’t previously considered precognition, he thought he knew how to solve it. The result of his theorizing around precognition quantum pairs led directly to the design of the PreCog Chamber.

Mitchell did a deep dive into urban design that allowed the design team to develop many of the characteristics of the Mall City where Tom Cruise’s character lives. (McDowell, 2015)

After the initial stimulus of the GBN group, intensive research for the film began, first with a visit to the MIT Media Lab. (McDowell, 2015) At MIT, McDowell and prop-master Jerry Moss observed and experienced many early ideas in innovation labs that were developed into futuristic artifacts and functionalities for *Minority Report*. What he saw included:

- The very first functional examples of e-ink, which inspired the film's flexible media
- The robotics lab, with technologies that were extrapolated to become the bio-mimetic PreCrime Spyders and other robotics in the film
- Targeted advertising, which in the film not only recognized individuals but their state of mind

John Underkoffler, at the time a recent MIT Media Lab graduate, was McDowell's guide to the Lab for this initial visit. His research on computer interfaces and gesture recognition caught McDowell's attention. Underkoffler was subsequently hired as science advisor in the film's design department; his research became the iconic gesture-based system used by John Anderton – the Tom Cruise character – and others in the PreCrime police department.

The deep research by the design team offered up robots based on insect behavior, non-lethal weapons, driverless cars, eye-tracking, voice command of computers, holography, optical tomography, heads-up displays, personalized advertising, even cloud computing. An exploration of smart elevators, maglev vehicles, and driverless taxicabs stimulated the prototyping of a three-dimensional transportation eco-system. McDowell's process was to "extrapolate forward" – if Amazon has established a relationship with the consumer that allows personal data tracking to evolve into "if you like this, you'll like that", then why would that not extend to targeting consumers in real time in advertising and store point of sale.

The research process became an essential part of the narrative design and prototyping of the world of *Minority Report*, extending through the first year of development and establishing an unprecedented collaboration space for director, designer, writer, and the whole production team.

All of the information gathered was assembled into an 80-page encyclopedic vision of the storyworld. This document – dubbed the "2050 Bible" by the design team – combined found images, custom illustrations, and text to set out details of the science and technology, cultural, and socio-political aspects of the story. The document became an important resource for the design department and all key creators as they came into the film. Incorporated into the 2050 Bible was a series of white papers written by design scientist John Underkoffler to provide the "science" for a multitude of elements that required a greater degree of detail, both in the design and as drivers for story. For example, in the Precog Chamber (the Temple) the quantum physics that became the underlying logic for the precogs, determined the milky liquid in which they float, the optical tomography extracting the images from their precognitive minds, the intricate CNC-cut interior surface that was 'sound-proofing for the mind', the gesture language, the machine parts of the transparent computers, and the "red ball" system were conceived as an interconnected set of narrative triggers connecting to the larger world aspects of the precogs, the contrasting aspect of them in a public sculpture, their range and influence, their deification.

The 2050 Bible and the research behind it developed into a viable way to contextualize the future for the film. The investigations of the design team and the deeply researched ideas set out in the 2050 Bible directly stimulated narrative elements based on storyworld vehicles, weapons, building interiors, and urban landscapes as well as the interactions between characters and the various storyworld components. For example, the three-dimensional transportation system emerged as a design prototype, which in turn prompted the addition to the script of a new chase segment called the Vertical Car Chase. It became clear that the traditional scriptwriting process – the classic image of a writer sitting in a bungalow in the Hollywood Hills creating a stacked 120 pages of a script (McDowell, 2015) – could not provide the layered and integrated detail that the world building process developed.



Figure 6. The creative team imagined that a massive influx of population drawn by the Precogs' influence on creating a murder-free society had given rise to an immensely vertical Washington D.C. Key factors would drive the evolution the city, such as the need for three-dimensional roadways, as vehicles would be required to negotiate horizontal and vertical space. Artist: James Clyne; Image courtesy of 20th Century Fox

The connection between the design vision and the accuracy of prototypes of near-future technology in *Minority Report* demonstrates the power of worldbuilding and interrelationship of science fiction storytelling and reality. When the film's design team visited the innovation labs at MIT or spoke with experts at Apple, Lexus, and DARPA, projects viewed were often 10 to 15 years from fruition. Clearly, more than a series of "genius forecasts" helped shape the *Minority Report* storyworld.

The complex evolution of a story requires interactive design of physical, political, cultural, and other environments and systems. What is clear from the worldbuilding process developed for *Minority Report* is that the combination of deep research feeding a logic-driven multi-disciplinary and collaborative storyworld can provide rich narrative outcomes as well as significant insight and foresight. It is not an individual series of foresights from futurists but an organic evolutionary process centered in storytelling that allowed the emergence of a holistic fictional world that was genuinely "precognitive".

Conclusions

Scriptwriting instructor and story consultant John Truby states that you set a story in the future to give the audience another pair of glasses, to abstract the present

in order to understand it better. (Truby, 2011) It might also be said that foresight professionals should set the future in a story (and storyworld) so the audience is better able to experience it.

As our society develops and changes, both futures studies and science fiction can be used to show what will happen if we continue along certain paths. The freedom that worldbuilding allows makes both futures studies and science fiction more powerful by applying creative imagination to real conditions and then extrapolating forward and outward. The worldbuilding process fits well with a number of theories and approaches that have influenced futures thinking and methodology:

- The creation of storyworlds is a collaborative knowledge building process that is consistent with the principles of social constructionism. As we saw with both the Rilao and *Minority Report* case studies, the creation of those storyworlds was a highly social, integrated, and collaborative process.
- Integral theory and integral futures call for futures methods that look at issues from the subjective, intersubjective, objective, and interobjective perspectives. Storyworlds can provide a venue for including all of these perspectives in a foresight project. Characters in the storyworld present numerous opportunities to examine an individual's interior and exterior worlds, while the storyworld's settings, complete with fictional physical environments, social groups, cultural systems, and technologies, provide the opportunity to examine the collective interior and exterior worlds.
- Sense-making is a process by which people's experiences are given meaning. It is a social activity involving storytelling and shared conversations, with participants simultaneously shape and react to their environment. (Currie & Brown, 2003) Storyworlds can provide an open, evolving, multi-participant environment from which the meaning can be developed through the stories that are told and the conversations that are shared.
- The role of narrative in futures studies is not new. Whether it is the futures narrative creative process described by Schultz, Crews, and Lum (2012, p.137), the future-focused transmedia narratives described by von Stackelberg and Jones (2014), or design fiction described by Stein (2014), narrative is playing an increasingly significant role in futures studies. As storytelling both inside and outside the futures field becomes increasingly sophisticated, the importance of storyworlds and worldbuilding grows
- Some futurists may be wary of science fiction treading on territory that they feel is better left to futures studies. However, science fiction does play a major role in shaping popular perceptions of the future. The emergence of science fiction prototyping to explore technological and urban futures based on science fiction is showing how science fiction can play a meaningful role in shaping technologies and cities.

Worldbuilding should be central to all of these approaches to constructing and exploring the future. As we've seen with the Rilao and *Minority Report* case studies, worldbuilding can and should be a multi-threaded, cross-disciplinary, collaborative process in which the storyworld evolves as stories and artifacts were created. In the case of the Rilao project, hundreds of participants worldwide, many of them students, some of them aged five to 14, contributed more than a thousand stories and artifacts to the storyworld. Storyworld development for *Minority Report* involved

a smaller group of participants and the results were much more tightly focused on producing that storyworld for a film. However, in both cases deeper insights into the future emerged as the storyworlds evolved and grew because of the contributions of multiple participants. While worldbuilding and the use of storyworlds is not the only method for working collaboratively, it is one of the most effective methods available for developing deep, rich narratives that lay out visions of the future.

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