

# FictionXR Framework: Merging Design and Science Fiction for XR-Integrated Future Architectural Spaces in a Changing World

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**Abstract.** Innovative solutions are critical in an era marked by global challenges such as climate change, pandemics, and urbanization. The FictionXR Framework integrates Extended Reality (XR) with Design Fiction and Science Fiction (Sci-Fi) prototyping to create and think about future spaces with XR tech implementation. This novel integration facilitates discussions about the fusion of the virtual and physical domains and offers an immersive platform for architects to experience and design for future challenges. Through a preliminary study involving newly graduated architects, the efficacy of the framework was tested, shedding light on its potential to catalyze creativity and facilitate collaborative design endeavors. The feedback gathered underscores the promise of the FictionXR Framework, with participants generating speculative narratives and visions while gaining a deeper appreciation for the interplay of XR within architectural contexts. This research explores innovative approaches to architectural practice by combining Design Fiction and Sci-Fi prototyping. It aims to develop strategies that can effectively respond to emerging challenges while embracing imaginative possibilities.

**Keywords:** Extended Reality, Future Architecture, Design Fiction, Science Fiction, Speculative Narratives

## 1 Introduction

The intersection of technology, fiction, and design has offered a dynamic framework for envisioning our built environment. Today's challenges, from global climate shifts to the uncharted waters of the housing crisis, underscore an urgent need for reimagining architectural principles. Throughout history, the creative methodologies utilized in the field of architecture have consistently derived inspiration from a wide array of sources, incorporating advancements achieved in numerous disciplines (Kolarevic & Parlac, 2020; Crysler, C. et al., 2012; Myers, W., 2012; Kwinter, 2002; Pérez-Gómez, 1983). This study

focuses on two approaches that provide a rich backdrop for imaginative exploration: Design Fiction and Science Fiction.

Design Fiction, often associated with product design and technological advancements, brings narrative and speculative thinking into the design process (Bleecker, 2009). By creating “what-if” scenarios, it encourages architects to reflect on and talk about the numerous possibilities of our built environment. In addition, Sci-Fi has frequently predicted technological advancements through its intricate stories and comprehensive visions, making it a rich source of innovative concepts (Clarke, 1972). From megastructures to underwater cities, it offers a lens to visualize and examine potential futures, reflecting societal, environmental, and technological trajectories.

Given the increasing number of electronic products in facilitating our social and cultural interactions, it is crucial for designers to explore the potential of electronic interfaces to augment our daily experiences (Dunne, 2006). XR, encompassing a range of technologies such as Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), emerges as an innovative architectural representation technique for the future by offering unique ways of experiencing and interacting with spaces (Jang et al., 2023; Moneta, 2020). Especially when drawing from the well of Sci-Fi, XR allows designers a sneak peek into the architectural future, forging a connection between the imaginative and the tangible (Kitchin & Kneale, 2002). The melding of Design Fiction, Sci-Fi, and XR creates an avenue for a novel approach to foreseeing and shaping architectural landscapes, ensuring adaptability and resilience in our unpredictable world.

This paper aims to investigate further the utilization of our prior exploration with the Design Fiction tool, which leverages XR for speculative design (Moralioglu & Gül, 2023). In this paper, we introduce the FictionXR framework, which combines Design Fiction and Sci-Fi methodologies. We explore the intricate connections between Design Fiction, Sci-Fi, and XR technology and analyze the FictionXR Framework, its structure, and its practical implementation. This study aims to examine the potential of this novel fusion to facilitate and establish significant dialogues within the field of architecture, situating them within the context of existing and emerging global challenges. In the following sections, we will explain our distinctive methodology, present insights derived from evaluations of workshops, and examine the broader implications of the FictionXR Framework on the future of architectural design. By extracting and refining these elements, we aim to offer a thorough outlook

on the various avenues that can be explored to utilize XR technologies and fictional narratives to redefine architectural paradigms for future generations.

## **2 Accelerated Imaginaries: Merging Design Fiction and Science Fiction in Future Architecture**

Throughout history, envisioning future architecture has involved a combination of imaginative thinking and pragmatic considerations. During the Renaissance, there was a notable rise in utopian architectural concepts influenced by humanist ideals (Kostof, 1985). After the industrial revolution, new materials like steel and concrete and innovations in construction technology brought about ideas that changed how people lived in cities and how space was planned out (Trachtenberg & Hyman, 2003). During the 20th century, notable individuals such as Buckminster Fuller proposed self-sustaining communities, focusing on promoting sustainability and achieving ecological harmony (Fuller, 1969; Soleri, 1969).

In the rapidly evolving landscape of the 21st century, staying updated on a broad range of emerging technologies presents an enormous task. The rapid pace poses challenges in seamlessly integrating these technologies within the framework of architectural design principles. However, the constantly changing global landscape necessitates that architects overcome traditional limitations. Design Fiction can serve as a forward-thinking tool, allowing designers to imagine, debate, and analyze future spaces with the adaptation of recent technologies. According to Sterling (2005), it is imperative for Design Fiction scenarios to be firmly rooted in reality, thereby capturing and reflecting current trends and developments. By extrapolating from these existing elements, Design Fiction can effectively envision and present plausible futures. Architects can use it to harness the power of speculative narratives, imagining structures that address both current and future challenges.

Also, Sci-Fi has played a crucial and influential role in envisioning and projecting potential future technologies and societal circumstances for years. Sci-Fi literature has served as a platform for the exploration of imaginative concepts such as space travel, as depicted in Jules Verne's "From the Earth to the Moon" (1865), and the contemplation of robotics, as seen in the writings of Asimov's "I, Robot" (1950). In the field of cinema, Ridley Scott's "Blade Runner" (1982) depicted a futuristic society characterized by the existence of bioengineered individuals, and Steven Spielberg's "Minority Report" (2002) presented a vision of a society where predictive law enforcement and sophisticated human-computer interactions were prevalent. This genre, in both literature and film, has consistently stimulated the human imagination, thereby

significantly influencing the development of actual technological innovations (Kirby, 2010). The concept of Sci-Fi prototyping emerges from the convergence of speculative fiction and design, employing narratives to envision and assess prospective futures (Kohno & Johnson, 2011).

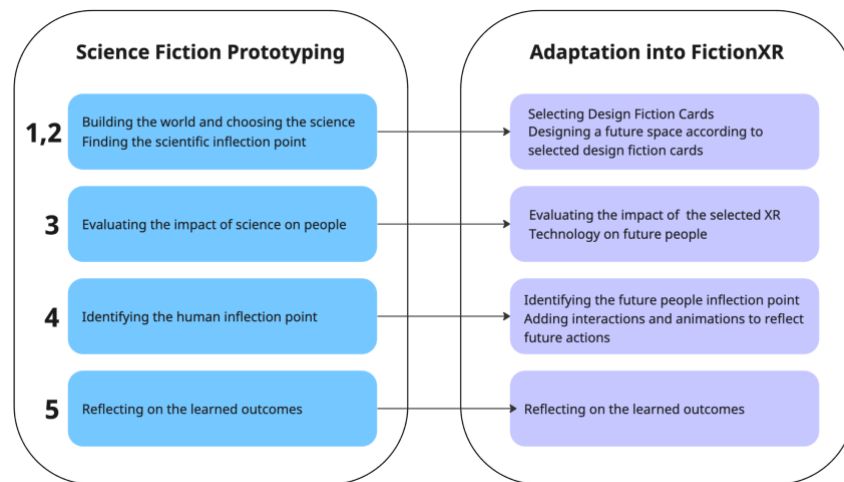
The effectiveness of Sci-Fi prototyping resides in its capacity to offer a well-organized account centered on a concept, enabling designers to thoroughly engage with the context, obstacles, and potentialities of the anticipated future (Johnson, 2011). The facilitation of designers in posing the fundamental question “What if?” enables the exploration of innovative solutions that may not have been readily apparent using conventional design methodologies. Sci-Fi prototyping can be of great value, particularly in architecture, where the intersection of human interaction, space, and technology is important. The concept of Sci-Fi Prototyping, as outlined by Brian David Johnson (2011), presents a systematic and progressive approach to generating future scenarios. These five essential steps are crucial for carefully mapping out the path from a scientific premise to its profound social implications:

- Building the world and choosing the science: The first step in creating a science-based world is to choose a basic scientific premise and explain its implications. It establishes the foundation on which the story’s authenticity is built.
- Finding the scientific inflection point: At this point, science moves from being well-known to being transformative. It serves as the turning point, directing the story away from our current reality and toward a new paradigm.
- Evaluating the impact of science on people: There is no such thing as pure science. Our story has depth because of the societal ramifications which affect people’s daily lives and interpersonal relationships.
- Identifying the human inflection point: This is the point in our story where people, or society as a whole, wrestle with the implications of the new scientific paradigm. It is frequently an emotional or moral pivot.
- Reflecting on the learned outcomes: A retrospective lens, this step involves gleaning insights, lessons, and potential strategies from our constructed narrative, offering tangible takeaways for the real world.

Integrating Sci-Fi prototyping into architectural design takes these envisioning exercises a step further (Figure 1). By adding scene and animation capabilities, for instance, designers are not just conceptualizing structures but are also witnessing their interplay with inhabitants, environment, and technology in a simulated real-time scenario. Observing the development and

vitality of a city can provide significant knowledge regarding possible obstacles and prospects.

Furthermore, the incorporation of XR technologies enhances the immersive nature of these scenarios. Architects have transcended the constraints of traditional 2D sketches and static 3D models, as they now possess the ability to navigate through virtual representations of architectural designs. This technological advancement allows architects to explore the hypothetical structure's corridors, evaluate its lighting conditions at various times of the day, and gain insights into the socio-cultural interactions facilitated by its spatial layout.



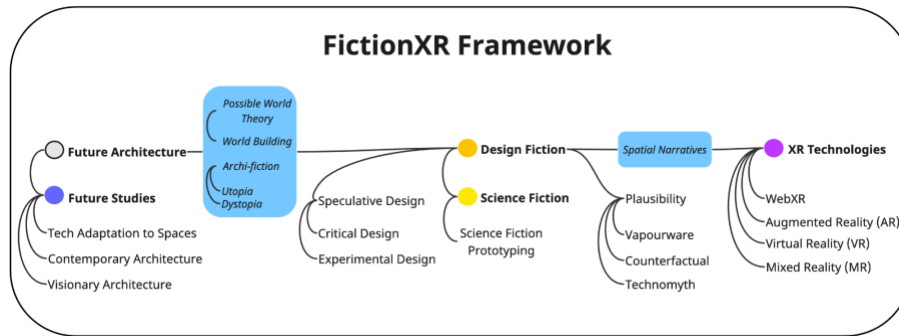
**Figure 1.** Adaptation of Sci-Fi prototyping steps into the FictionXR framework.

In this paper, we incorporate this notion of Sci-Fi prototyping into the FictionXR framework. With its unique blend of Design Fiction, Sci-Fi, and XR, this framework offers a comprehensive tool for architects to imagine, experience, and iterate upon their visions for future architectural spaces.

### 3 The Evolution of the FictionXR Framework: Making Future Architectural Stories Come to Life

The FictionXR framework stands at the intersection of storytelling and architectural innovation, providing architects a medium for conceptualizing and immersing themselves in imagined futures (Figure 2). The FictionXR framework

has evolved significantly from its early stages, with the primary objective of enriching the process of architectural envisioning through technological integration.



**Figure 2.** The methodology of FictionXR framework.

Initially, our focus was solely on Design Fiction methodologies. This initial framework used six categories of Design Fiction cards embedded within a WebXR environment (Figure 3). Each card served as a prompt, directing users to consider and visualize various aspects of future spaces. This method can help architects and architecture students conceptualize plausible, realistic futures based on potential real-world challenges.



**Figure 3.** The Design Fiction cards in FictionXR framework.

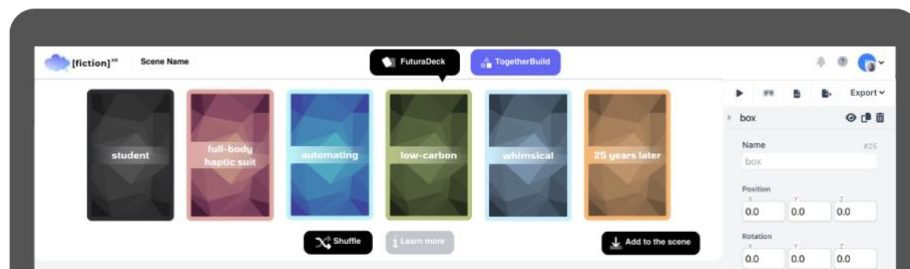
The decision to include Sci-Fi prototyping evolved from the need to turn these ideas into tangible prototypes. With its methodical steps, Sci-Fi prototyping provides a structured path from narrative-driven hypotheses to interactive designs. Design Fiction cards play a crucial role in laying the groundwork for the narrative by adapting the steps of Sci-Fi prototyping, such as selecting the technology, identifying both technological and human inflection points, and then reflecting on the ramifications. Following that, these narratives guide the design process, ensuring that prototypes are based on both plausibility and human-centered considerations.

We decided to infuse the framework with narrative depth that went beyond mere visual representation by incorporating elements from Sci-Fi prototyping.

In the structure of Sci-Fi prototyping, introducing a background story is followed by the unfolding of a future story provides a rich foundation for crafting these narratives. More than just a visualization tool, the enhanced FictionXR framework provides a platform for these future scenarios to be “lived” and “experienced” with the help of WebXR technologies. Users become active participants in these imagined futures by embedding elements that facilitate interactions like animations in immersive virtual and hybrid environments.

XR’s role in the FictionXR framework is more than just a technological addition; it is a transformative layer that connects narrative speculation and experiential reality. Architects and designers can now visualize and interact with their speculative designs in immersive virtual environments with the help of WebXR.

Imagine the architect’s journey as they engage with the FictionXR framework. They start by shuffling and selecting Design Fiction cards. A distinct set of six terms emerges from these cards, each associated with a distinct category, laying the groundwork for their creative exploration (Figure 4).



**Figure 4.** A view from FictionXR after shuffling the Design Fiction cards.

For instance, suppose the selected cards suggest a "Sustainable habitat influenced by variable climate patterns." With this directive, the architect creates an environment where structures change with the seasons. They envision a future community adapting to these structures as they incorporate elements from Sci-Fi prototyping. Surfaces may expand in the summer to provide shade, while buildings may contract in the winter to conserve heat. Residents in this story could hold communal gatherings during periods of mild weather to celebrate their habitat’s adaptability. In this way, what began as a simple architectural concept grows into a dynamic story that provides insights into possible human interactions and communal behaviors.

These imagined spaces and narratives come to life with added interactivity and animation capabilities, allowing architects to conceptualize and immerse themselves and others in these future possibilities. Within the FictionXR framework, the convergence of Design Fiction, Sci-Fi prototyping, and WebXR

exemplifies a holistic approach to futuristic architectural envisioning, emphasizing narrative depth and experiential fidelity.

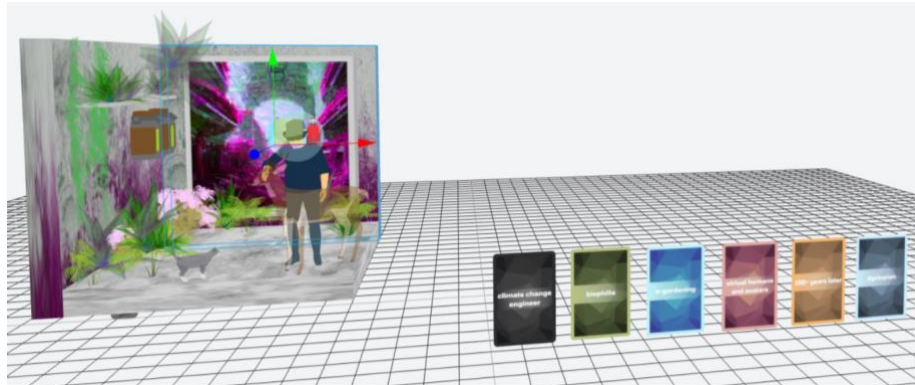
#### **4 Evaluation of the Prototype for the FictionXR Framework**

Incorporating surveys and practical workshops have been highly valuable in the iterative development of the FictionXR framework. A preliminary study was undertaken, consisting of a survey to gather insights from 22 graduate and former students of the architectural design computing program at Istanbul Technical University. Their proficiency in integrating technology and architectural designs provided them ideal contributors. The primary objective of this survey was to assess the effectiveness of our framework's Design Fiction cards in terms of comprehensiveness. Additionally, we aimed to gather feedback and recommendations for enhancing future architectural visioning endeavors.

The survey confirmed that our terms are comprehensive in their inclusivity, encompassing essential descriptors necessary for conceptualizing a wide range of future spatial scenarios. Based on the feedback, we have enhanced the existing framework by incorporating the recommended terminology into our Design Fiction cards. Adapting a toolkit influenced by the work kit of Design Fiction toolkits developed by the Near Future Laboratory (2022, 2023) was undertaken to align with our specific objectives. The categories, namely "User," "XR Technology," "Action," "Attribute," "Tone," and "Time," were carefully selected and organized to ensure that they align with the objectives of our framework.

Following the completion of the survey, an online workshop designed explicitly for 12 recently graduated architects was organized. The digital environment, which aligns with our WebXR prototype, created a favorable space for participants to explore the intersection of design, speculative design, and WebXR technologies. During the workshop, the participants employed the Design Fiction cards as instruments to generate ideas and conceptualize prospective architectural environments (Figure 5). The participant's ability to channel their creativity while receiving guidance was recognized as a valuable aspect of the structured approach provided by the cards. However, the feedback also brought attention to a noticeable discrepancy. The utilization of Design Fiction effectively facilitated the process of constructing narratives. However, it became evident that there was a distinct requirement for a methodology to enable the seamless transition of these narratives into tangible prototypes.





**Figure 5.** A view from one of the scenes created in our workshop with the Design Fiction cards: User as a climate change engineer, XR tech as virtual humans and avatars, action as e-gardening, attribute as biophilia, time as dystopian, and time as 100+ years later.

The feedback from the workshop demonstrated a positive reception towards integrating WebXR and Design Fiction principles. The immersive three-dimensional digital environment received positive feedback for providing enhanced perspectives in visualizing forthcoming architectural spaces. All participants demonstrated a notable increase in confidence regarding integrating Design Fiction into their design practices. Furthermore, they expressed a strong desire to engage in future activities related to this subject matter.

The incorporation of Sci-Fi prototyping within the FictionXR framework was partially motivated by the feedback received. The attendees of the workshop expressed a preference for a methodology that allowed them to put into practice their speculative designs in a tangible format. Therefore, the systematic and sequential nature of Sci-Fi prototyping was recognized as the optimal method to bridge the current gap between creating imaginative narratives and actualizing tangible designs.

The feedback consistently highlighted the potential collaboration between WebXR technologies and Design Fiction in the transformative advancement of architectural visualization. These reflections not only highlight the potential of the framework but also provide guidance for its further refinement.

In summary, our FictionXR framework prototype was evaluated through a two-fold approach consisting of a discussion survey and an online workshop. The findings confirmed the incorporation of WebXR in architectural design and revealed the extensive vocabulary of forthcoming architectural visualization. The feedback provided serves as the basis for the subsequent development of our framework.

## 5 Conclusion

In a world undergoing rapid transformations due to climate change, urbanization, and other global challenges, envisioning future architectural spaces may need more creative methods like the combination of creative storytelling and cutting-edge technology. This paper has provided an overview of the development of the FictionXR framework, a novel approach that combines the concepts of Design Fiction and Sci-Fi prototyping within the realm of XR.

The study started by examining how Design Fiction and Sci-Fi prototyping, as imaginative and speculative approaches, have traditionally functioned as channels for envisioning future architectural environments. Design Fiction has a well-established background within the field of architecture. However, the incorporation of Sci-Fi prototyping, with its systematic five-step approach, holds the potential to enhance the level of competence in envisioning future scenarios. By integrating these methodologies, the FictionXR framework aims to provide architects with a more advanced and comprehensive tool for envisioning, prototyping, and experiencing future spaces.

The evaluation of this framework, conducted via a discussion survey and an online workshop, underscored its potential and identified areas that require further improvement. The feedback received from participants shed light on the notable advantages of integrating WebXR and the enhanced perspectives it provides.

Furthermore, the FictionXR Framework's subsequent evolution, aided by a more profound integration of Sci-Fi methodology, solidifies its position as a pivotal tool in contemporary architectural discourse. As we move further into a world where the lines between the physical and virtual continue to blur, tools like the FictionXR Framework will become indispensable, allowing architects to create narratives and designs that reflect the complexities and wonders of our future realities.

Finally, the FictionXR Framework is an urgent reminder that architects worldwide can harness the power of design-based and scientific fiction in their quest to shape the architectural landscapes of tomorrow. The long-term effectiveness of this approach will be determined by its ongoing refinement, which should be informed by broader application and feedback. As we move forward, the initial findings and observations outlined in this research point out a potential change in how architects interact with design and technology in the future. The merging of these elements within the realm of XR may redefine architectural design paradigms, guiding us toward a future as imaginative as tangible.

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