Intelligent Spectacle and Interactive Interference for Cultural Sustainability via Research-Creation

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ABSTRACT

Media ecology characterized by intelligence and interaction has emerged as a critical platform for sustainable cultural communication in digital being. This evolving field integrates various forms of media to facilitate the preservation and communication of cultural values in an increasingly interconnected world. The domain of art design, particularly through digital animation, experienced a transformative milestone since 2020s' with the rise of Artificial Intelligence Generated Content (AIGC) as a phenomenon-level spectacle in media ecology. AIGC not only signifies a shift towards technology-driven creativity but also heralds new paradigms in artistic expression and audience engagement. Interactive animation plays a pivotal role in this context, serving as a bridge between the languages of art and technology, from sophisticated game engines to immersive art installations. It enables creators to convey complex messages and emotions, fostering deeper connections with audiences across different cultural backgrounds. While the interplay of interaction and interference fosters artistic innovation, it also presents significant challenges to traditional media communication models and the principles of cultural sustainability. The dynamic nature of intelligent interactions can disrupt established cultural narratives,

leading to both opportunities for novel expressions and dilemmas regarding the authenticity and continuity of cultural heritage. This article adopts research-creation as methodology, a mixed-methods approach via academic analyses with creative artwork, predominantly qualitative research supplemented by case studies and quantitative survey questionnaires, to explore these impacts. By integrating diverse research techniques, the communication study aims to provide a comprehensive understanding of how interactive technologies influence the preservation and evolution of cultural expressions, which delves into the balance between embracing technological advancements and maintaining cultural integrity, seeking strategies that promote sustainable cultural practices in the face of rapid digital transformation. Through this exploration, the article contributes to the ongoing meditation on balancing tradition and innovation within the dynamic environment of digital media ecology.

Keywords: *AIGC, Intelligent spectacle, Interactive animation, Media interference, Research-Creation,*

INTRODUCTION

The research aims to explain the methodology in the Interactive Animation (IA), which introduces the artistic creation of cultural sustainability and interactive creativity through three-dimensional skill. The research explores the challenges of control and interference with artificial intelligence-generated content (AIGC). The article also introduces interactive animation, which demonstrates the crossover integration of art and technology through the power of digital media in conveying humanistic creativity and promoting cultural communications. In an era of ever-changing technology, animated images have been endowed with more intelligence and interaction that can convey artistic language in both virtual and real spaces. In the context of the booming technology of intelligent interaction and media integration, this topic explores the context of interactive spectacle and multicultural artistic expression from the perspective of multicultural communication and integration and thinks about how to use interactive animation art to convey cultural value and humanistic care.

LITERATURE REVIEW

Interactive Animation

From the Art Origin, Interactive Animation (IA) is a complex system that combines visual, auditory, and behavioural elements to create unique forms of artistic expression (Vodislav & Vazirgiannis, 2000, p. 95). Tracing back to its roots of animation, the 'action of imparting life' (Wells, 2011, p. 14) , and further research is needed to understand its impact on society and culture. Traditional animation is rooted in film art (Crafton, 2011, p. 105), while interactive animation (IA) focuses on the representation and expression of the mind's fantasies and illusions. It uses computer technology as the medium (Baecker, 1969, p. 2) to create interactions between humans and machines (Seifert, 2008, p. 10) through new and cross-media (Nusselder, 2009, pp. 4, 67; Zhao, 2016, p. 15). It also enables users to interact with virtual environments using smart devices such as touchscreens, haptic devices, and motion sensors. From the Interactive Tech perspective, the interdisciplinary nature of Interactive Animation is explored, combining different disciplines to study design, (SIGCHI, 1992, pp. 5–6), understanding the relationship between human meaning-making and technology (Mateas & Stern, 2005, pp. 1–2), and the distinction between linear and interactive animation (Tomlinson, 2005, pp. 4–6). AI research (Millington, 2006, pp. 43–44) and the Hybrid Network of humans and machines (Seifert, 2008, p. 10) are also discussed. Technologies used in interactive animation include game engines (Foxman, 2019, p. 1, 3; Gregory, 2009, pp. 8–11;

Politowski et al., 2021, p. 8), scripting languages (Gervautz & Schmalstieg, 1994, p. 156), virtual reality (Millington, 2006, p. 77), and hardware (Horton et al., 2010, p. 1, 2).

Cultural Sustainability

The adoption of the Sustainable Development Goals (SDGs) adopted in September 2015 by the United Nations has highlighted the significance of safeguarding and promoting culture, emphasizing its contribution to the SDGs and the implementation of development initiatives. Bruni (2015, p. 115) introduces the concept of technological convergence and traces the historical progression of cognitive technologies. Sparviero and Ragnedda (2021, p. 217) underscore the significance of communication and culture in establishing a sustainable society and explore UNESCO's definition of digital literacy.

Media Ecology

The terminology media ecology provides a more expansive interpretation of media than merely a mechanism of communication. Media ecologists, such as Innis, McLuhan, Postman, Kellner, Manovich and others, have focused more on how media technologies create a social atmosphere for both society and humanity overall, rather than only the information or messages conveyed through them. Postman (2000, p. 11) suggests that the combination of 'media ecology' indicates interest in the dynamics between media and humanity, which contributes to a culture's identity and helps maintain balance (Strate, 2004, p. 3). Nystrom (1974, p. 18) proposed that media ecology, focusing on human communication systems and their relationship with technology and culture, is a large component of general systems theory. An integrated research paradigm for media ecology considers communication as a process that links two or more elements of an interacting system, each of which is more than the sum of its parts (Nystrom, 1974, p. 296). The media ecology, originally a research perspective that explored unknown communication contexts, is applicable to discussions of the roots, present, and future of communication and media. The concept of media ecology holds that understanding and studying media can help us understand and possibly change our world. This is exemplified by Ludwig Wittgenstein's observation that the limits of our media are the limits of our world (Laskowska & Marcyński, 2019, p. 65). Interactive spectacle (Best & Kellner, 1999, p. 152) even intelligent spectacle enriches the ontology of media ecology.

Media Interference

Media interference has been present throughout the history of human communication. The concept of 'Idol of the Theatre' (Bacon, 2000, p. 42) has had a profound impact on people's civilized accumulation and cognitive judgment, from reality to virtuality (Le Bon, 1896, p. 56), through theatre, film, television, the Internet, and mobile phone videos (Strate, 2018, p. 231). Media interference affects human perception subjectively, (Nusselder, 2009, p. 22) no matter through mediate or unmediated effect (VanderWeele, 2015, p. 402). Krämer (2015, p. 57) proposed that 'Communication: No Form without Interference.' Excessive entertainment programs and dazzling commercial advertisements (Innis, 1951, p. xix; Levisky, 1999, p. 329; Sharp et al., 2019, p. 244) continuously stimulate the optic nerve and disturb people's information memory and value judgment.
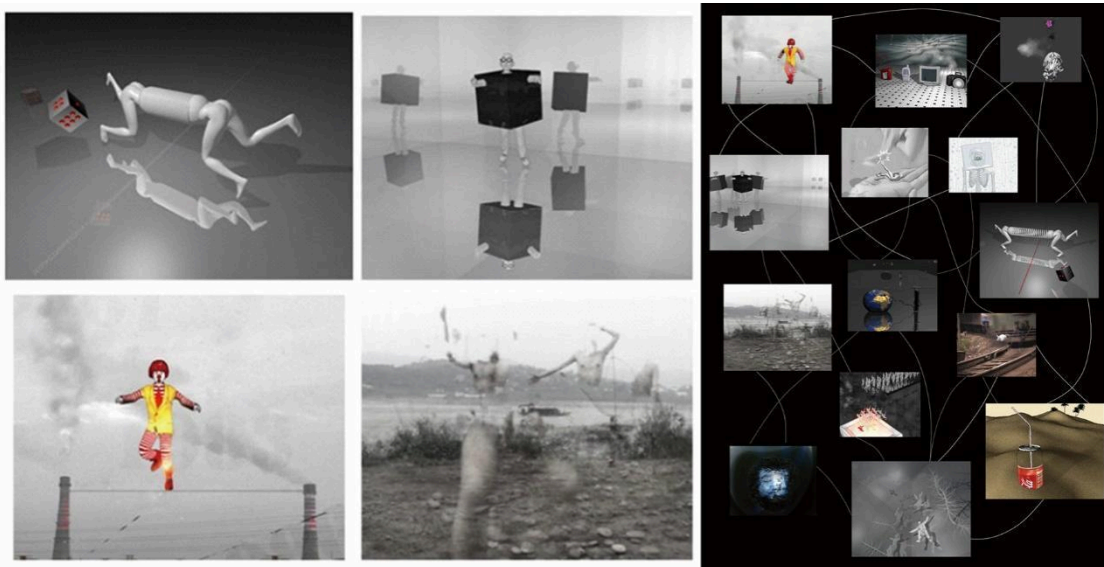
RESEARCH-CREATION

The terminology 'Research-Creation' is an approach to research that combines creative and academic research practices and supports the development of knowledge and innovation through artistic expression, scholarly investigation, and experimentation. The creation process is situated within the research activity and produces critically informed work in a variety of media (art forms). Research-Creation cannot be limited to the interpretation or analysis of a creator's work, conventional works of technological development, or work that focuses on the creation of curricula (Loveless, 2020, p. 206). Research creation as a methodology (Zhao et al., 2025) used by artist-researchers in academia has been used both in connection with traditional art forms and digital arts, e.g. in the research of games (Lelièvre, 2018, p. 2).

Methodology & Research Design

This study of Interactive Animation Art requires a comprehensive research methodology that considers a variety of qualitative, theoretical, and practical research methods. The research methodology used is mainly qualitative induction by literature review by grounded theory and case study based on media ecology. The qualitative methodologies such as Research-Creation, Semiotics, Media Ecology, and Case Studies, as well as Literature Research and Design Thinking, explore the creative process and motivation of interactive animation art. This approach is particularly valuable, as traditional surveys often lack interactive tools capable of reflecting academic analysis through the examination of objective behavioral data. The methodology will explore an interactive questionnaire as an instrument to assess the implications of media technology development in the field of interactive animation art, and to assess humanistic engagement with interactive technology.

Research-creation for interactive animation art is a hybrid form between arts and science (Lupton & Watson, 2021, p. 5). It combines creative and academic research practices to develop knowledge and innovation through artistic expression, scholarly investigation, and experimentation. This methodology is a critically motivated approach to practice, and provides creative iteration and advancement in the field (Khoury, 2017, p. 260).

Figure 1. Interactive Animation by Flash
(Source: Author's personal collection)

The career in interactive animation creation and research began in 2006 when utilizing Flash to create my undergraduate graduation work at Sichuan Fine Arts Institute. Flash provided 2D animation functions and software and hardware interaction codes, becoming an important creation tool for early interactive animation.

In the interactive work 'Dream of Life: Thought Fragments' shown in Figure 1 which was created in 2006, the interactive control link used connecting lines to derive the two poles of the keyboard pad touch points, and the extension lines were connected to the seat. Through the pressure button, the designated key was pressed and released, and these events were used for Flash ActionScript programming to control the playback of the experimental short film. Flash is not only an animation production tool as commonly known, but also a creative media often used in early online interactive media art.

Since the late 1990s, a group of online artists have emerged in the Internet era with Flash as the media creation platform. Chinese flasher Wang Bo and Dutch visual artist Han Hoogerbrugge are both examples of using Flash network interactive platforms for artistic creation. Wang Bo, whose online name is Pi San, is a rare all-round flasher in China. In 2001, he created animation scenes in Meng Jinghui's film 'Flying Like Chicken Feathers' and in 2004, Jia Zhangke's 'The World'; and in 2002, he created the 'Serial Dream' and 'Play Me' series of flash works on the Internet. From Wang Bo's works, viewers can see thinking, a pure art, and can feel a movement different from two-dimensional video, which is the unique charm given by flash.

The book 'Animation Unlimited' specifically introduces Hoogerbrugge. This visual artist was born in Rotterdam, the Netherlands in 1963 and studied painting at the Art Academy in this city. After graduation, Hoogerbrugge conducted a series of experimental works, exploring different media such as painting, illustration, and sculpture. In 1996, after being exposed to the Internet, he gradually became familiar with hypertext language and basic operating procedures. He realized that the Internet was not the best medium for static comic strips. Hoogerbrugge also created an online interactive Flash animation work 'Flow', 'Hotel', and 'Nails'. From his works, we can feel his exploration of the vital elements of this era. As he said: 'The characters I created vividly show the spiritual connotation of this era, and the best way to achieve all this is not language, but images.' Hoogerbrugge Flash interactive work uses the image of a middle-aged man with a moustache to show the absurd inner world of modern people through his body language and life stories.

Figure 2. Interactive 3D Animation 'Journey to the Modern' online
(Source: Author's personal collection)

Based on the concept of learning from ancient literature and combining it with life, which inspires nourishment from the modelling of Chinese classical literary and artistic characters. Metaphor as an artistic language, when creating 'Journey to the Modern' shown in Figure 2, I arranged four occupations of

modern office workers for the four masters and apprentices in 'Journey to the West'. Monk Tang is an accountant, Pigsy is a boss, Monk Sha is a courier, and Monkey King is a rebellious but busy clerk. The character characteristics revealed in ancient books are combined with current life and workplace to create new character images. Utilizing Unity as a game engine and the WebGL format to explore an interactive 3D animation online, which technologically prepared for the creation of the interactive questionnaire in this doctoral research.

In 2016, a special study tour on 'Virtual Reality and Network Technology in New Media Art' with an opportunity to visit many new media art institutions and studios in Germany, including the Multimedia and Virtual Interactive Design Centre (MMVR) of the Halle Academy of Art and Design, the Cultural Integrated Education centre of Karlsruhe Institute of Technology (KIT), the Intelligent Sensing and Actuation System Research Centre (ISAS), and the Karlsruhe centre for Art and Media (ZKM). I also had professional discussions and exchanges with German new media creators and technical experts. Based on the methodology of giving equal weight to research and creation, Based on the artistic practice of interactive animation and the exchange results during my study visit in Germany I published two academic monographs showed in Figure 3: 'Interactive Animation Design: Zbrush + Autodesk + Unity + Kinect + Arduino 3D Somatosensory Technology Integration' (2016) and 'New Media Crossover Interaction Design' (2017). The practice of combining creation with theoretical research has strengthened and deepened my understanding of the 'Research-Creation' methodology.

Figure 3. Monographs based on methodological 'Research-Creation'
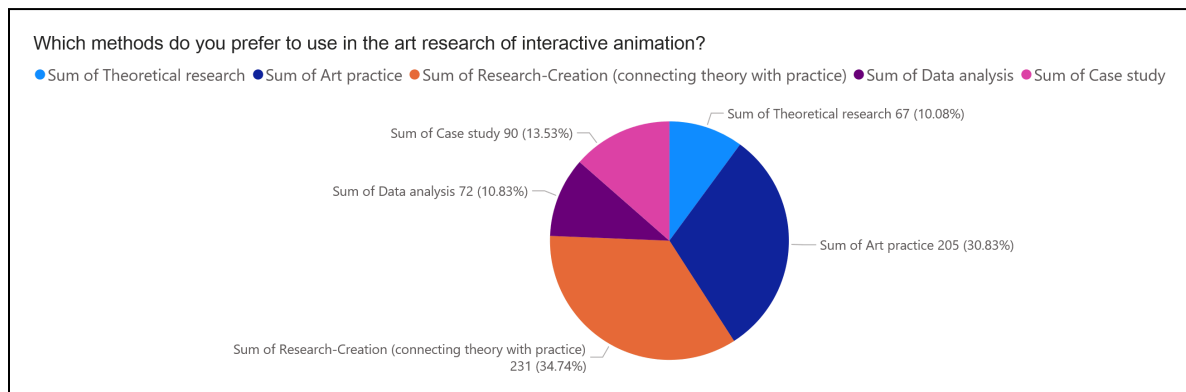*(Source: Author's personal collection)*

This research proposal provides a comprehensive approach to the study of interactive animation. To assess the implications and implications of the research results, the research design is split into two stages. The first stage will involve a theoretical analysis, which includes a literature review to understand the concept of interactive animation art and an analysis of case studies. Additionally, a theoretical framework will be formulated which defines how to bridge the gap between scientific and humanistic cultures via media ecology and cultural sustainability. The second stage of the research design involves the artistic creation of an interactive 3D animation online. In addition, user-friendly controls and code-based interactions will be integrated to allow viewers to interact with the 3D animation. Apply an interactive questionnaire as an instrument for assessing humanistic engagement with interactive technology shown in Figure 4.
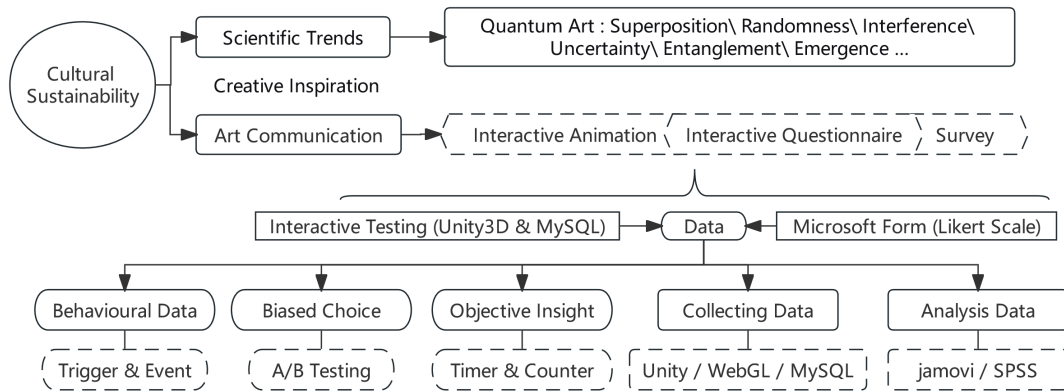
Figure 4. Framework of Research Design
(Source: Author's personal collection)

Methods In Art Research

The questionnaire by Microsoft Form shown in Figure 5, including 307 valid responses. 'Research-Creation (connecting theory with practice)' had the highest response rate at 34.74%, followed by 'Art practice' at 30.83%. Popularity rates further emphasized this trend, with 'Research-Creation' at 75.24% and 'Art practice' at 66.78%. These findings highlight the respondents' preference for methods that integrate theory and practice and emphasize hands-on artistic engagement. The results showed significance ($\chi^2 = 185.820$, p = 0.000 < 0.05), indicating significant differences among the options. Specifically, 'Research-Creation' (connecting theory with practice) and 'Art practice' emerged as significantly more popular.

Figure 5. Methods Survey in Art Research of Interactive Animation
(Source: Author's personal collection)

The data suggest that integrating theory and practice, particularly through 'Research-Creation,' is highly valued in interactive animation art research. The strong preference for 'Art practice' underscores the importance of practical, experimental approaches in this field. Conversely, lower response and popularity rates for 'Theoretical research,' 'Data analysis,' and 'Case study' indicate that while these methods remain relevant, they are less central to the respondents' research practices. This highlights the field's inclination towards practical and integrative research methodologies shown in Table 1.

Table 1. Methods in Art Research of Interactive Animation

Item	Response		Popularity Rate ($n = 307$)
	n	Response Rate	
Theoretical research	67	10.08%	21.82%
Art practice	205	30.83%	66.78%
Research-Creation (connecting theory with practice)	231	34.74%	75.24%
Data analysis	72	10.83%	23.45%
Case study	90	13.53%	29.32%
Total	665	100%	216.61%

Note: Goodness of Fit test, $\chi^2 = 185.820$ $p = 0.000$

BEHAVIOURAL BIAS IN INTERACTIVE INTERFERENCE

To investigate the impact of dynamic, scientifically-inspired elements on user engagement, an A/B test was conducted using an interactive questionnaire that integrated AI and IA (Interactive Animation) technologies. Involving over 500 participants across more than 300 unique testers in a 60-second test, MySQL served as the primary database for collecting interaction data. Two scenarios were designed: Situation A incorporated quantum aesthetics principles—uncertainty, randomness, superposition—through three game-like levels featuring elements like a transforming 'thinker', reversing flip panels, and reactive digital sculptures. Situation B was static, lacking interactivity. Participants spent an average of 33.72 seconds in Situation A versus 25.71 seconds in Situation B, with 68.01% preferring the dynamic environment. Metrics such as 'LagTimer' measured engagement differences, while 'A1B0test' indicated prolonged exposure to either area. Positive 'LagTimer' values correlated with extended stays in Area A, showing more choice more inferences showed in Figure 6.
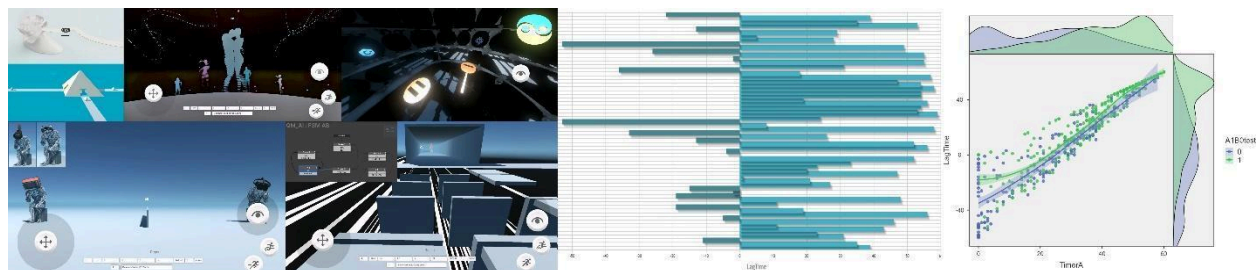
Figure 6. Interactive Animation Survey via A/B Testing
(Source: Author's personal collection)

Scatterplot analysis revealed a strong positive correlation between TimerA and Lag Time, supporting the hypothesis that dynamic elements enhance engagement. This highlights the importance of II (Interaction with Interference), suggesting no meaningful interaction occurs without interference. The study collaborated with UiTM supervisors demonstrated increased user involvement through integrating

scientific concepts into design, underscoring that Intelligent Interaction and Media Interference's defining characteristic is II—no interaction without interference (2024, p. 142; 2024, p. 20, 2025, p. 143).

DIGITALIZATION COMPARED WITH AIGC

Digital 3D and AIGC 3D (AI Generated Content) are two different approaches to creating 3D content. Here's a comparison based on the parameters from duration, difficulty, controllability, vividness, and volume. The AIGC 3D models might have a larger data volume due to the point cloud nature, Digital 3D models might offer a more optimized and efficient use of data. Both methods have their advantages and drawbacks when it comes to the volume of data. At this stage, AIGC is more suitable as a quick preview of concept drawings for 3D animations, but it is still far from being an effective digital asset.

The analysis of Dilemmas from the perspective of Time and Effort: The process of generating images using AIGC can be time-consuming and challenging. It often requires several attempts and adjustments to get the desired result. This could potentially limit its accessibility and usability. From the perspective of Unpredictability: The results generated by AIGC can be unpredictable. For instance, the author mentioned that the AI-generated image of "Bi Fang" looked like a chicken on one platform and like a girl with a bird's mouth on another. This unpredictability can pose challenges in achieving the desired output. From the perspective of Cultural Misinterpretation: While AIGC can facilitate cultural exchange, there is also a risk of cultural misinterpretation. For example, the term "Shu Hu" translates to "whose Lake", but it refers to a monster that lives near the lake. Such nuances can be lost in translation, leading to potential misunderstandings shown in Figure 7.

Figure 7. AIGC in Cultural Creation
(Source: Author's personal collection)

Since the 2020s', Artificial Intelligence Generated Content (AIGC) has made significant strides in the field of 3D digital modelling. Particularly during the conceptual design phase, in 2024, platforms based on ChatGPT such as the New Bing and Alibaba Cloud's Qwen in China have leveraged natural language processing technologies to transform textual descriptions into preliminary digital modelling concept sketches. These AI-generated concept sketches exhibit commendable performance in macro visual effects but still have room for improvement regarding detail accuracy, logical consistency, and morphological authenticity.

Exemplify CG Illustration 'AI Dragon Design' mainly designed via Blender 3D as shown, which compares CGI with AIGC. As rapid iteration design tools, AIGC demonstrates efficiency in the conversion process from text to image concepts. The two left sub-images in figure 8 use AIGC. However, precise representation of complex structures like clothing, scales, and hair remains a challenge for current 3D AI tools. Therefore, after generating initial concepts, traditional 3D modelling processes—including multi-view sketching, 3D model construction, character rigging, material texturing, lighting setup, and final rendering—remain essential steps to ensure high-quality output. For detailed processing of individual components, especially in costume parts, current automated solutions do not fully me et professional requirements. This underscores the importance of traditional 3D modelling skills, particularly when creating character assets suitable for game engines, where full-process management from static models to dynamically rigged characters is crucial for the effective utilization of digital assets showed in Figure 8.


Figure 8. CG Illustration 'AI Dragon Design'
(Source: Author's personal collection)

'XiWa Meta Genesis' in Figure 9, which is a digital art project that interweaves Chinese cultural heritage with speculative futures, drawing inspiration from the mythological figures Fuxi and Nüwa. Fuxi (Fu Hsi) depicted holding a solar gnomon and the Bagua (Eight Trigrams), symbolizes ancient astronomical wisdom, while Nüwa, integrated with bionic technology, represents the scientific reconfiguration of life through elements such as the Josephson junction and electronic compass.

During the early ideation phase in 2025, Artificial Intelligence Generated Content (AIGC) tools like Qwen and New Bing were utilized to generate visual concept drafts from textual descriptions, the two sub-images in the upper left corner of Figure 9, facilitating rapid exploration of design variations. However, due to limitations in detail accuracy and structural coherence, AIGC outputs proved insufficient for final production.

To ensure artistic integrity and technical precision, Blender 3D was employed for full modelling, texturing, and rendering, demonstrating how AI can support, but not yet replace, human-led creative processes, especially in culturally nuanced projects. The artwork features a quantum computer and a golden cicada alongside an electronic lotus meditator, symbolizing the fusion of mythology, technology, and ecology. The celestial view of the twenty-eight lunar mansions harmonizes with modern space

achievements such as Dongfanghong-1 and the Tiangong Space Station, reflecting a continuum from ancient astronomy to contemporary space exploration. Embodying the dialogue between Tai Chi philosophy and quantum science, 'XiWa Meta Genesis' envisions the awakening of Chinese civilization at the dawn of the technological era for an innovative exploration blending tradition and futurism with philosophical depth and global cultural resonance.
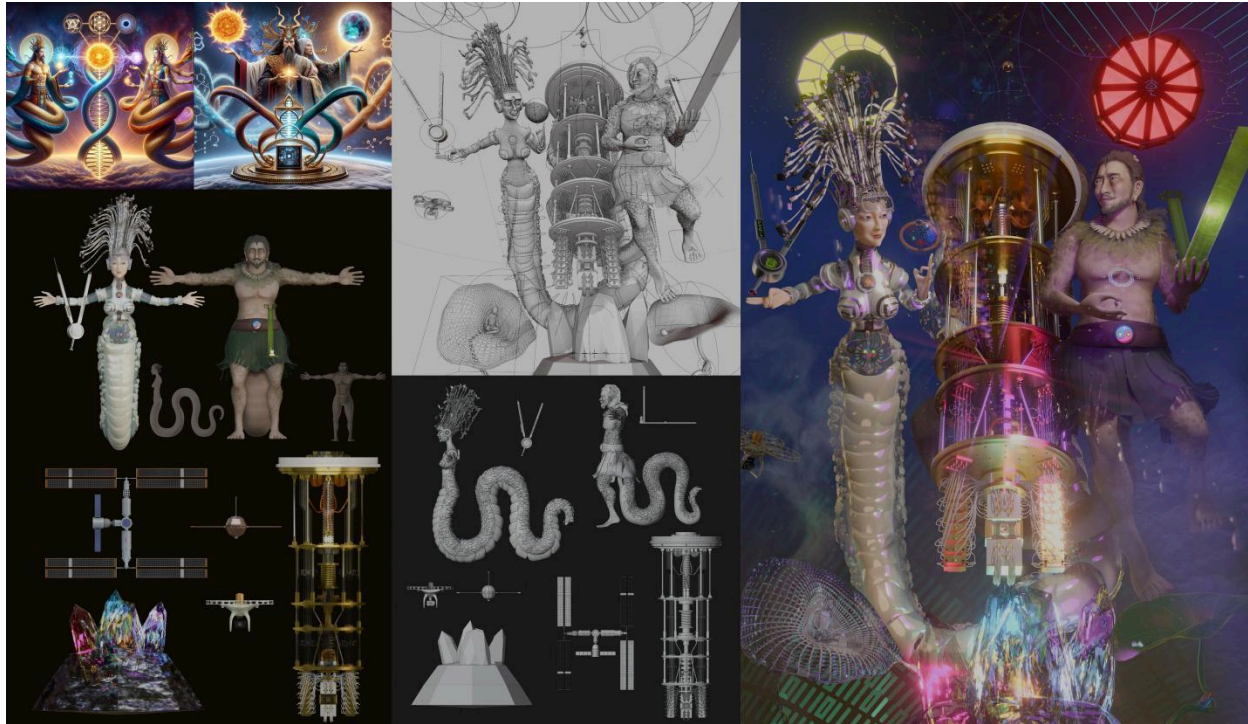
Figure 9. CG Illustration 'XiWa Meta Genesis'
(Source: Author's personal collection)

OPPORTUNITY & DILEMMA

Artificial Intelligence Generated Content (AIGC) as intelligent spectacle in media ecology, which presents both opportunities and dilemmas in the context of cultural sustainability. The analysing of opportunities from the perspective of Creativity Enhancement: AIGC tools like New Bing and Mid-journey have shown potential in enhancing creativity. They allow for the generation of designs that might seem unreal or unconventional, such as a creature with one leg or one arm. This opens new avenues for creative expression that were previously unexplored. From the perspective of Cultural Exchange: AIGC can facilitate cultural exchange by translating and understanding terms from the past for creation. For instance, the term "Shu Hu", which refers to a monster that lives near the lake, which by creating a design with three heads, as normal acknowledge might be seen as a mistake in real life, but they find it interesting in the context of creative design. In addition, "Bi Fang", an ancient word that modern people in China may not be familiar with. These translations help bridge the gap between different cultures and time periods, contributing to cultural sustainability. From the perspective of Mythical Creature Design: AIGC allows for the creation of designs based on various mythical creatures such as Centaurs, Serpents, and Winged Beasts. This can help keep these ancient myths and legends alive in the modern world shown in Table 2.

Table 2. Opportunity and Dilemma in AIGC

Parameter	Opportunities in AIGC	Dilemmas in AIGC
Production	Enhances creativity by allowing for the generation of unconventional designs.	The process can be time-consuming and challenging
Communication	Facilitates cultural exchange by translating and understanding terms from the past.	Results can be unpredictable, leading to potential challenges
Culture	Keeps ancient myths and legends alive through the design of mythical creatures.	Risk of cultural misinterpretation and potential misunderstandings

CONCLUSION

In conclusion, while AIGC is a phenomenon-level spectacle in media ecology, which presents exciting opportunities for enhancing creativity and facilitating cultural exchange, it also poses dilemmas that need to be addressed to ensure cultural sustainability. Further research and development are needed to maximize the benefits and minimize the challenges associated with AIGC.

Although AIGC has contributed to 2D static concept art and three-dimensional digital platforms like Mesh AI, its performance in promoting the long-term value realization of digital assets has yet to meet industry expectations. Looking ahead, we anticipate innovations in intelligent processes aimed at optimizing topology structures of character models, separating hierarchical elements of design features, thereby enhancing the application efficacy of AIGC. It should serve as a bridge that connects rather than divides traditional craftsmanship, avoiding the creation of misleading or non-reusable illusions, and truly improving overall creative efficiency.

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