Exploring the Application of Multiple Contradictory Space Elements and Principles of M.C. Escher

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ABSTRACT

M.C. Escher, a renowned graphic artist, merged art and science to produce seemingly 'unreasonable' contradictory spaces that expand our vision into an infinite loop. Numerous designs have been influenced by his works. However, findings from the literature reveal that most adapt only a single contradictory space element or principle, while few explore more intriguing visual effects by incorporating multiple elements and principles. This study aims to explore the application of multiple Escher's contradictory space elements through creative practice. A two-phase practice-based research approach was used. A graphic illustration was created in the first phase and was used as a stimulus in the second phase for semi-structured interviews with five conveniently selected individuals to assess their views on works integrating contradictory spatial elements and principles. The findings revealed contrasting opinions: while visitors found the work stimulating, triggering associations with the depicted subjects' symbolic meanings and producing exciting spatial effects, they also perceived a lack of compositional order. While the creative practice and outcome could provide valuable references for other creative practitioners, the qualitative findings may inspire future research in related areas.

INTRODUCTION

M.C. Escher (1898-1972), a renowned Dutch visual illusionist painter, made significant contributions to the field of modern design in the first half of the 20th century. Known as an artist "difficult to be classified by faction", Escher's unique contradictory composition concept has influenced many aspects of

design. By exploring different principles of spatial composition and key attributes of three-dimensional (3D) design, Escher utilised creative manipulation of light and shadow, line, form, size, and proportion to extend the visual expression of contradictory space in his works (Amorim, 2019). Contradictory space, as defined by Ernst and Escher (2022), is the use of visual illusion on the 2D plane to create an erroneous expression of reality that appears in 3D. Escher's works defy the principles of perspective and create a mysterious visual illusion.

While previous studies on Escher's art have predominantly focused on scientific and psychological perspectives (e.g., Ivars, 2001; Ede, 2005; Gombrich, 2000), few have examined the artistic aspects of his works. In light of this, the current study argues for a need to summarise different elements and principles of Escher's contradictory spaces in the creation of graphic illustrations, showcasing the creative possibilities of his artistic concepts and ideas. In an era of commercialization, illustration creation has become increasingly static (Little, 2017), leading to visual fatigue. Therefore, it is crucial to apply innovative ideas in illustration design. Furthermore, Udris-Borodavko and Pavliuk (2021) suggest that modern illustration design should explore more styles that integrate ideas from science, psychology, philosophy, and other fields.

Merrell (2009) points out that using visual illusion in illustration design can attract and enhance viewers' attention, stimulating their desire for creative exploration and thinking. Thus, the overall purpose of the study is to explore the integration of Escher's contradictory space elements and principles into graphic illustration design and investigate how people perceive these creations.

LITERATURE REVIEW

M.C Escher's Life and His Artistic Career

M.C. Escher (1898-1972) was an artist who defied classification (Ernst & Escher, 2022). Living in an era where modernism prevailed in the West, Escher's artistic career spanned significant events and diverse experiences. The modernist artistic trend, which emerged in the 20th century, differed greatly from traditional art forms and ideologies (Emmer, 1984). Throughout his career, Escher's travels and life experiences significantly influenced his creative output.

The Elements of Escher's Contradictory Space Concept
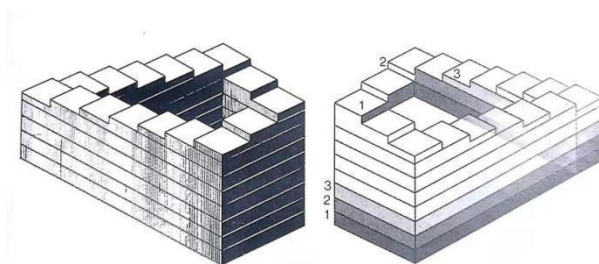
Penrose Triangle

The Penrose Triangle, as shown in **Figure 1**, is one of many impossible objects first made by Swedish artist Oscar Reutersvard in 1934. British mathematician and physicist Roger Penrose and his father also designed and promoted this pattern, and called it the impossibility of its purest form in the February 1958 issue of British Psychological Monthly (Draper, 1978).

Figure 1. Penrose Triangle
*(Source: https://www.illusionsindex.org/i/impossible-triangle)*

As **Figure 2** shows, on the stairs to the roof, Escher used 'the Impossible Penrose Triangle' to create an impossible space, turning the stairs that were originally on the same plane into an infinite spiral (Penrose & Penrose, 1958). Looking in the direction of the characters, the stairs seem to never end. The stairs on the top of the building cannot tell which is the highest point and which is the lowest point. It is just a bizarre architectural work drawn by Escher on a 2D surface based on the element of Penrose Triangle (Goffi, 2015).

Figure 2. Application of Penrose Triangle in Escher's Works
(Source: Ernst and Escher, 2022)

The *Waterfall* is one of Escher's most renowned works. As **Figure 3** illustrates, the analytical diagram reveals that the image is primarily composed of two Penrose triangles. The two zigzagging waterways at the edge of the Penrose Triangle are extended one level above their original location at the end of the channel. This painting also features a creative method of overlaying multiple spaces. The Penrose Triangle is situated in the same flat and middle dimensions. Water ultimately forms a waterfall in this channel, which then powers a waterwheel through the flowing water of a wet cloth. Undoubtedly, the waterfall has become a completely closed system, driving the waterwheel like a perpetual motion machine. Although this violates the law of conservation of energy, upon closer examination, the image still employs people's linear logical thinking patterns and leads them into this impossible space unawares (Amorim, 2019).
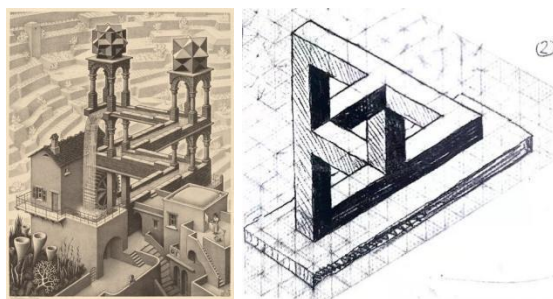
Figure 3. Waterfall, 1961 and Penrose Triangle in Waterfall
(Source: Ernst and Escher, 2022)

Mobius Strip

Art gives people a more vivid phenomenon of reality and also gives people a deeper insight into the formal structure of reality. Many of Escher's prints reflect the principle of the Mobius Strip in topology (Emmer & Schattschneider, 2007). For example, the works created in 1961 and 1963 *Mobius Strip* Ⅰ and *Mobius Strip* Ⅱ (see **Figure 4**). In the book The Golden Ribbon by Hofstadter (2000), Escher's works of this type of element are explained in detail. The connection between topology and relativity in Escher's art is also discussed in the book.

Figure 4. Mobius Strip I and Mobius **Strip II**
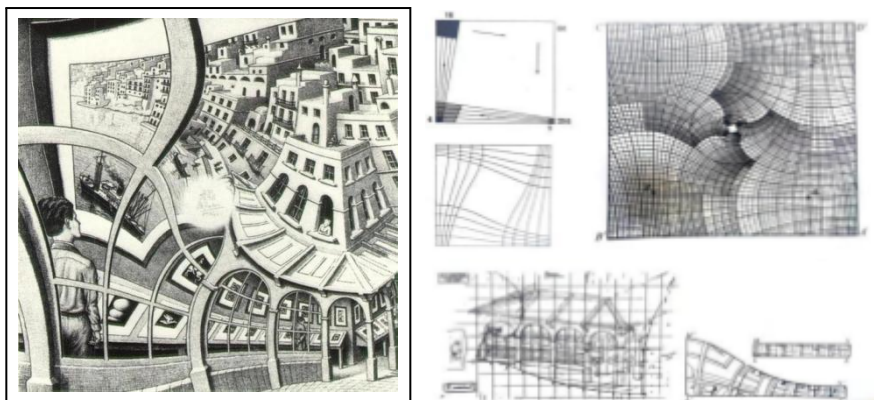*(Source: Ernst and Escher, 2022)*

Escher's favourite graphic is undoubtedly the Mobius Strip. It can be seen from the path diagram of the ant tracing in *Mobius Strip* Ⅱ (see **Figure 4** right-side) that this belt-like shape appears to have two different faces, neither a starting point nor an ending point. If a person walks on the geometric plane, no matter where he or she starts, he or she will eventually return to the original starting point (Ovios, 2003). Assuming that one side of these two continuous surfaces is space and the other side is time, this characteristic cannot help but remind people that the unity of time and space in relativity is 3D space as one, time as another, the unity of space and time.

Riemann Surface

A Riemann Surface is a surface proposed by Riemann, a German mathematician to imagine a single-valued domain for a multi-valued analytic function. In simpler terms, a Riemann surface is a connected one-dimensional complex manifold (Zhu & Li, 2022).

Based on this idea, Escher created a lithograph *Gallery* in 1956 (see **Figure 5** left-side). The lower left corner of the picture is the entrance to the gallery, where a grand exhibition is being held. There is a young man on the left who is looking at the work in front of him attentively at the entrance (Emmer &

Schattschneider, 2007). There is a boat in the work, and there are infinite buildings on the pier in the distance, the entrance of the building is both the entrance of the gallery, and the gallery holding an exhibition.

Figure 5. Gallery, 1946 and the Gallery Grid Graph
(Source: Ernst and Escher,2022)

As **Figure 5** right-side shown, the grid diagram in the upper left corner features some irregular quadrilaterals arranged in a counterclockwise order. This grid will continue to enlarge. Initially, the original quadrilateral is enlarged four times when it develops to the left. When it develops upward, it is enlarged by 64 times and then 256 times. In other words, after multiple expansions, the original 1cm figure will transform into a trapezoid measuring approximately 2.5 metres (Ernst & Escher, 2022).

Escher underwent twofold expansion during the creative process, possibly because the third level and subsequent stages could only be expressed through mathematics (Sack, 2013). As **Figure 5** demonstrates, the space of the *Gallery* has reached its maximum capacity, and further expansion and enlargement are no longer possible within it. Through these two rheological expansions, Escher managed to bring this magical gallery to life in the painting, only to vanish into nothingness.

## The Principles of Escher's Contradictory Space Concept

Relativity of Vanishing Point

In the process of perspective projection, a set of parallel lines parallel to the projection surface will maintain their parallelism in the projection, while parallel lines that are not parallel to the projection surface will eventually converge to a single point, which is what we refer to as the vanishing point (Sizemore, 2017). This is the interpretation of the vanishing point in perspective. Due to the difference in the angle formed between the line segment and the picture, the vanishing point can assume various roles, such as the focus, sky point, residual point, location, and so on.

From this explanation, it is clear that the vanishing point can represent various points, such as the centre point, the residual point, the location, and so on. Therefore, the point it represents in the picture depends on the artist's creative intention (Sizemore, 2017). Escher ingeniously discovered a new principle, which is the relativity of vanishing points.

As **Figure 6** left-side shows, Escher used the zenith as a vanishing point for the first time in his woodcut *We Will Come Out* (1946, woodcut) for the Dutch Library Book Club. In **Figure 6** right-side, Escher's *The Other Side I* (1946, copper engraving), the vanishing point of space can be seen from the windows in four directions and the bird standing on the window and the cosmic starry sky as the background at the same time (Emmer & Schattschneider, 2007). The sky point, the location and the

horizon point are integrated, so that a seemingly normal space perspective work is subverted by Escher by using the principle of vanishing point relativity.
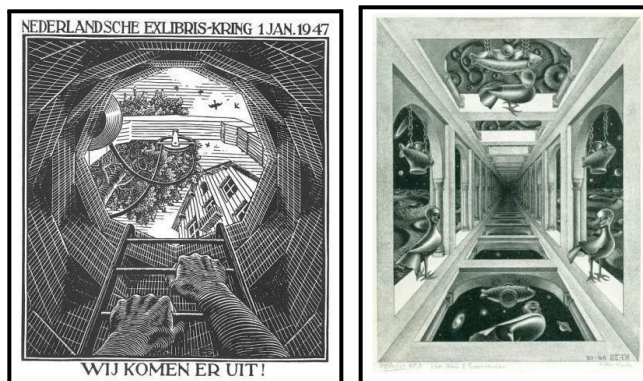
Figure 6. We Will Come Out and The Other Side I
(Source: Ernst and Escher,2022)

The New Discovery of Cubic Space Filling

In **Figure 7**, *Ladder Palace* (1951, lithograph), Escher's use of curved perspective can be observed. These curves significantly enhance the spatial depth of the image (Ernst & Escher, 2022). Monsters, undoubtedly, are a means to deceive people. From the perspective of this little monster's space, everything might seem normal, but upon careful observation, its peculiar nature becomes apparent. At the same time, we notice two vanishing points in the sky. These two vanishing points serve as both the sky point and the ground simultaneously, making it impossible to determine the top and bottom of this beautiful face, and the real space becomes distorted once again (Escher, 1992). *Ladder Palace* differs slightly from Escher's previous works. In this fascinating space, the unique combination and structure make the trend cycle of another space an infinite loop (Escher & Bool, 1992). Artists undergo a long and complex dialectical process during the course of artistic creation. Through repeated revisions, their artistic creations meet their own psychological expectations. There is always a strong subjective consciousness among artists during this process. Therefore, each cognitive strategy is associated with the form and symbolic effect of the image it addresses (Papucha, 2019).
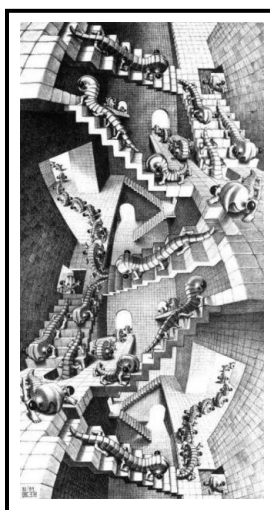

Figure 7. Ladder Palace
(Source: Ernst and Escher, 2022)

Curved Perspective

Today, when people use a camera without macro adjustment to shoot at close range, straight-line objects appear curved, and the same is true for our eyes (Tanizaki & Takahashi, 2021). When looking up, the straight line that was originally parallel to the ground or perpendicular to the ground will become a curved line in the painting, which is what is called curved perspective. The principle of curved perspective was not discovered by Escher, but artists at that time simply applied this principle to artistic creation to enhance the visual effect of their works (Amorim, 2019). It was after Escher discovered the relativity of the vanishing point that he made this new discovery, which emerged from a multitude of creative experiments.

In 1947, Escher's lithograph *High and Low* utilised a novel discovery, as seen in **Figure 8**. Upon close inspection, it's clear that both the upper and lower sections incorporate curved perspective, including the columns, vaults, and trees on the right (Escher, 1992). The building's original direction has been shifted, and although this may not be immediately apparent, a deeper understanding of the image's spatial depth is revealed upon further examination. This work not only employs curved perspective but also the relativity of the vanishing point, producing a stunning effect (Ernst & Escher, 2022). The vanishing point serves as a link between the top and bottom, representing both the sky point of the lower half and the location of the upper half, subtly creating a perfect unity between the two parts of the image (Sizemore, 2017).
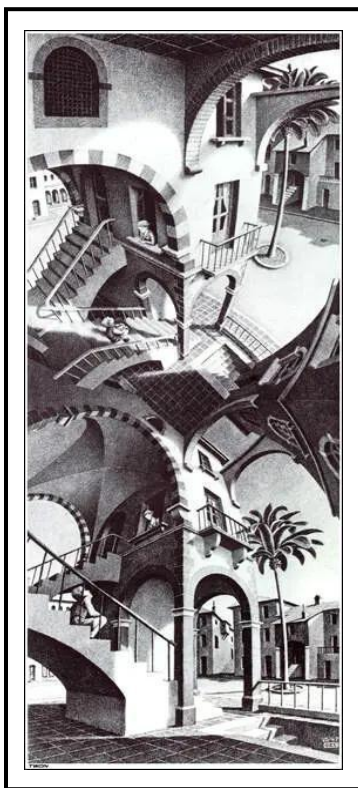
Figure 8. High and Low
(Source: Ernst and Escher,2022)

In this work, Escher once again presented an impossible world. This exquisite impossible space structure perfectly tricks our vision on the plane. The picture's two distinct perspectives appear logical, yet both are seamlessly integrated and equally significant, making it impossible to determine the real subject (Ernst & Escher, 2022). This seemingly incompatible approach constituted a perfect fusion for Escher. Since then, he continuously delved into new contradictions of space from science and philosophy,

creating numerous contradictory space works in various styles (Escher & Bool, 1992). According to Escher, space is no longer the space we encounter in our daily lives. His works reveal his exploration and development of deep space.

The Impact Escher's Work in Modern Design Works

Escher's unique contradictory space constitution concept, characterised by its rational thinking, not only conveys his distinctive ideas but also demonstrates his innovative approach (Gombrich, 2000). The endless steps and streams frequently featured in his works not only captivate viewers visually but also introduce a fresh concept for modern art design. Until now, more and more buildings, movies, and games have further extended the definition of space, such as the movie *Inception* (see **Figure 9** left-side) and the game *Monument Valley* (see **Figure 9** right-side).

Figure 9. The Stairs in Movie Inception and Monument Valley
(Source: https://www.imdb.com/title/tt1375666, https://www.monumentvalleygame.com/mvpc)

As illustrated in **Figure 9** right-side, the game *Monument Valley* allows players to navigate between different worlds and exit the monument maze by shifting, rotating, and flipping upside down (Kibby, 2016). These path connections, which integrate Escher's contradictory space concept, challenge common sense and create an intriguing spatial experience. *La Muralla Roja* is akin to a real-life *Monument Valley* (refer to **Figure 10** left-side). This magical castle-like structure appears as if it's straight out of an Escher work, with an intricate design that changes perspective impressively. When bathed in daylight, it creates a striking visual impact.

**Figure 10. La Muralla Roja Design by Ricardo Bofill and China Central Television's Building**
(Source: https://ricardobofill.com/projects/la-muralla-roja,Yeti-Hunter, 2017)

CCTV's building, inspired by the Mobius Strip (see **Figure 10** right-side), was designed by Ole Scheeren and Rem Koolhaas. It connects the four functional areas of the building to form a ring, creating a seamless whole, much like the Mobius Strip. Viewed from the side, it appears as an 'S', while from the

front, it looks like an 'O', making it unique and subtle (Lin et al., 2018). Despite the absence of curves on the exterior, the building exudes dynamism, with small angular deviations hinting at a distorted treatment of space.

The renowned contemporary designer Shigeo Fukuda was once captivated by Escher's works. As illustrated in **Figure 11**, Shigeo Fukuda employed cubes and the principles of impossible figures to create an astonishing contradictory space (Shim, 2020).
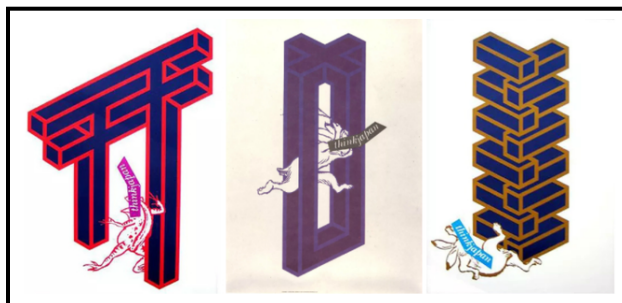
Figure 11. Shigeo Fukuda's Poster
(Source: https://www.artsy.net/artist/shigeo-fukuda)

As **Figure 12** demonstrates, there are striking similarities between the style of Gunter Rambow's works and those of Escher. In his book series poster designs, we can observe the contradictory space relationship created by the interaction of various elements and books (Vinnychuk et al., 2019). Much like Escher's *Drawing Hands*, Gunter Rambow employs books and other elements to transform space, resulting in a series of intriguing contradictions. He transcends the limitations of two-dimensional space, creating a powerful sense of depth that sparks people's imagination and leaves a lasting impression.

Figure 12. Poster Series by Gunter Rambow
(Source: https://www.gunter-rambow.com)

Through observation and a review of previous literature, it has been noted that many designs are created using a single element or principle. For instance, Gunter Rambow's series of book posters solely refers to the paradox of Escher's *Drawing Hands*; Shigeo Fukuda developed a collection of posters using only impossible figures. Despite the widespread study and appreciation of Escher's works, Zhang and Wang (2023) argue that there is still much potential for exploring the manipulation of elements and principles from his creations. They emphasise that the symmetry and mirror symmetry present in Escher's works can be expanded to generate various visual expressions. Furthermore, Tressoldi (2012) suggests that the sense of space and depth in Escher's works can be further explored by employing different

techniques and methods. In this context, the study posits that it is necessary to summarise the various elements and principles of Escher's contradictory spaces in the creation of graphic illustrations to showcase the creative potential of his artistic concepts and ideas. This research aims to investigate the possibility of combining contradictory space elements and principles. The specific research questions are as follows:

1. How to integrate multiple Escher's contradictory space elements and principles for the creation of a graphic illustration?
2. What are the opinions of the viewers on the created graphic illustration using Escher's contradictory space elements and principles?

RESEARCH METHODOLOGY

Research Design and Methods

Practice-based research is a research approach that is rooted in practical experience, fusing practice with theory, and emphasising the active involvement of practitioners in the research process (Gibson, 2018). This approach centres on practical operations, experiences, and knowledge, combining them with theoretical understanding and academic theories. Practice-based research is primarily utilised in artistic, design, performance, and other creative fields, where practitioners typically investigate, test, and validate their ideas through practical applications (Gibson, 2018). Given the nature of this study, a practice-based research approach is deemed suitable. More specifically, this study consists of two phases.

Phase 1: Creative Practice

Based on the analysis of previous literature, Escher's contradictory space elements are the Penrose Triangle, Mobius Strip, and Riemann Surface. Each of these three impossible figures has its own unique expression. Furthermore, the basic principles include changing the vanishing point of the picture, filling the picture, and employing new methods of curved perspective. These elements and principles serve as important references in the creation of his works and therefore were considered in the creative practice (first phase) of the study.

The creation process of the work lasted approximately two months. The creative process employed was based on the seven steps proposed by Black (2019), Chae (2019), and Rudd (2022). They mentioned that creativity is the essence and soul of most reflective design ideas (Black, 2019). It is primarily manifested in the imagination, fantasy, analysis, reasoning, and creative thinking abilities of the design project, which ultimately generate a great creative idea and capture people's hearts (Chae, 2019). The illustration design is unrestricted in form, and the creation method is highly versatile; it is natural to express the artistic form through painting (Rudd, 2022). Specifically, the creative practice of the study employed the following steps when creating the graphic illustration to answer the first research question:

1. Establishing the theme: First, establish a clear design theme. This work will be based on this theme.
2. Gathering materials: Collect materials related to the theme of the illustration to aid in the later creation process.
3. Meditating on creativity: Reflect on creativity based on the collected materials and find inspiration to create an illustration.
4. Determining the creation method: Select the appropriate creative method according to the inspiration and ideas.
5. Establishing a style: Choose the most suitable style for the illustration.

6. Sketching and documentation: Based on the previous accumulation, quickly sketch the inspiration, creating a comprehensive sketch. This becomes the foundation for later creative development.
7. Creating illustrations: According to the completed sketches, integrate the elements and principles of contradictory space to fill the picture, and ultimately complete the illustration creation.

Phase 2: Semi-structured Interview

After completing the work, to address the second research question, the researcher collected people's opinions about the created work. In other words, the created graphic illustration served as a stimulus in the second phase of the study. The researcher took the finished piece to a theatre where it could be exhibited offline, and observed the viewers' reactions to the images through a camera, gathering some of the viewers' opinions about the works.

The exhibition location is a relatively prosperous local shopping street, and most of the visitors are young people aged 20-30. According to Van Eck (2015), young people generally have a hobby of watching films, and most of them are literary youths, who are sensitive to artworks and have a better acceptance of new things. Considering the reliability and foresight of the interview results, such people are suitable to be interviewed. Some studies have indicated that viewers only need 5 seconds to browse the general content of an entire image, after which they are inclined to explore the details (You et al., 2016). Therefore, the second phase of this study observed and selected viewers who spent more than 30 seconds in front of the work for the interview.

Figure 13. Location of the Exhibition and the Situation of the Visitors
(Source: Captured by the author)

The observation process lasted for five days. As shown in **Figure 13**, the work was displayed in a small theatre. Based on the cashier data and registration forms in the theatre, the total number of observed visitors is 271. In this study, viewers who expressed interest upon introduction by the staff were counted, as reflected in the 'Interested' column of **Table 1**. According to prior research, viewers who spent more than 30 seconds in front of the image showed interest in the artwork (Xu & Ye, 2020). Therefore, these viewers were considered long-stayers and were included in the 'Long-Stayers' category in **Table 2**. This suggests that the stimulus had initially resonated with the viewers, prompting them to explore and closely inspect the works.

Table 1 Number of Interest Visitors Within the Five Days (N=271).

Day	Total Number	Interested	Percentage of interest
First	78	45	57.69%
Second	65	38	58.46%
Third	30	15	50.00%
Fourth	42	30	71.42%
Fifth	56	41	73.21%
Total	**271**	**169**	

Table 2 Number of Long-stayers Within the Five Days (N=271).

Day	Total Number	Long-stayers	Percentage of Long-stayers
First	78	30	38.46%
Second	65	31	47.69%
Third	30	10	33.33%
Fourth	42	22	52.38%
Fifth	56	21	37.50%
Total	**271**	**114**	

This process selected one visitor per day who observed for more than 30 seconds, left their contact information, and was informed about a gift. In other words, convenience sampling was used. They were then scheduled to receive the prize and underwent a semi-structured interview. Eventually, five participants were selected for semi-structured interviews.

The interviews took place in the rest area of the theatre where the works are displayed, making it convenient for the interviewees to observe the works at any time. The entire interview process was conducted in Chinese. The interview duration for each interviewee is approximately 20 minutes. Throughout the process, two recording devices were set up to document the interview. Prior to the interview, advance communication with the interviewee was conducted to confirm the interview location and time. Upon collection of the data, it was transcribed and then translated into English.

The study employed thematic analysis to analyse the content of the interviews and summarise the overlapping content into themes, as suggested by Braun and Clarke (2013). The collected data will be transformed into information through the process of processing, organising, and analysing using NVivo software.

FINDINGS

Application of Multiple elements and principles in graphic illustration

The four illustrations presented in **Figure 14** (left-side) are constructed using impossible figures of the Penrose Triangle. The Penrose triangle appears to be solid, consisting of three rectangles with square cross-sections. These three rectangles are combined to form a triangle, yet the angle between any two rectangles seems to be correct. These properties cannot be realised in any object within normal three-dimensional space. Firstly, various points, lines, and surfaces are combined and deformed, undergoing further deformation. During this process of deformation, different types of spaces within the image are connected through lines and surfaces, resulting in a contradictory, circular, and paradoxical composition. The shapes and lines are abstracted from conventional materials.
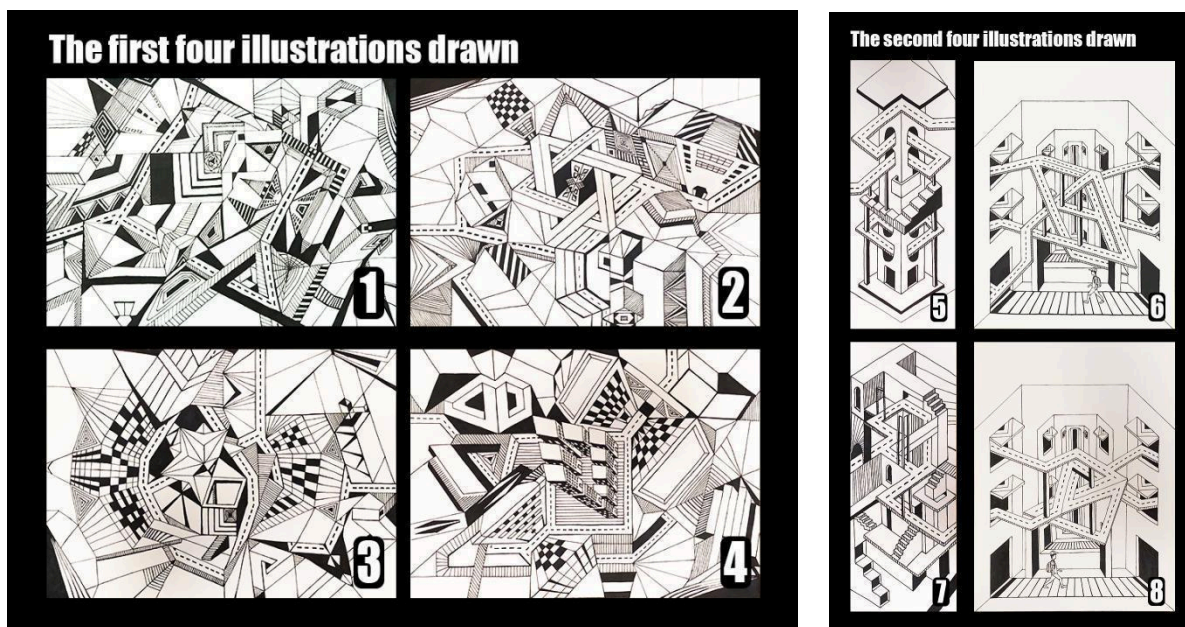
Figure 14. The First and Second Four Illustrations Drawn
(Source: Created and captured by the author)

The four illustrations presented in **Figure 14** (right-side) serve as the connecting component of the image, fusing the creative concepts of Monument Valley and Escher's contradictory space. They consist of four regular contradictory space pictures that link these five thematic paintings. The road and staircase in the image are inspired by Escher's Rising and Falling and Waterfall elements. The composition principle of the Penrose Triangle is utilised to deform the picture elements, ultimately incorporating light and dark variations into the image.
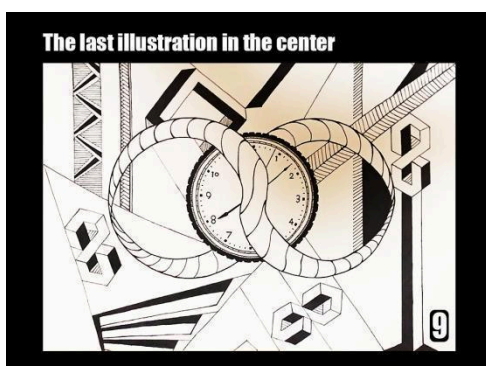
Figure 15. The Last Illustration in the Center
(Source: Created and captured by the author)

The illustrations presented in **Figure 15** serve as the core of the entire painting. This final drawing is considered crucial as it needs to connect with the remaining eight works. The image primarily features the Mobius Strip, with clocks and the symbol ∞ added to reflect the theme of infinite cycles. After the picture is stitched together, additional lines and faces are drawn to harmonise with the rest of the eight works.
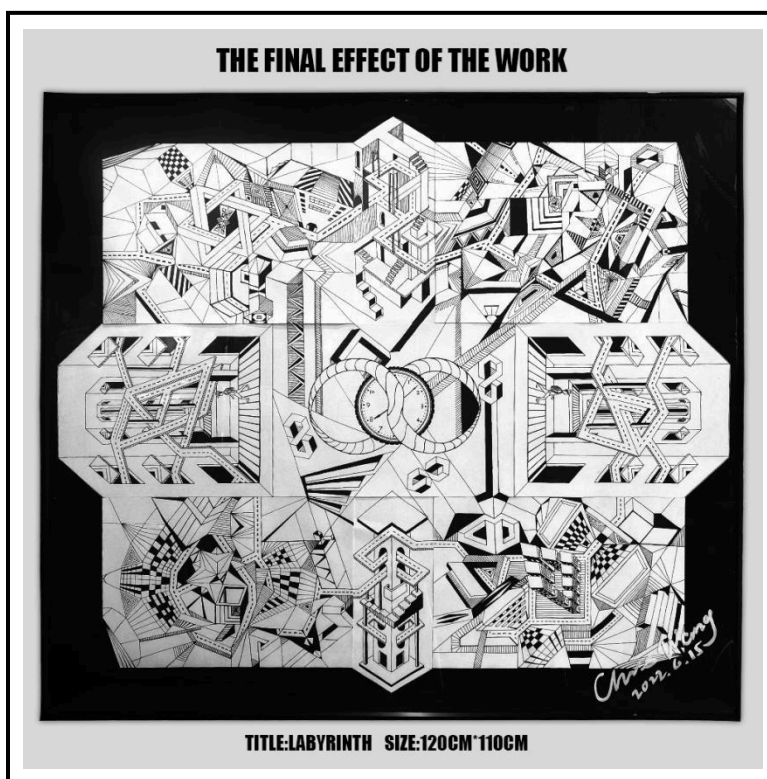
Figure 16. The Final Creative Output
(Source: Created and captured by the author)

In summary, as **Figure 16** shows, the entire painting is replete with numerous impossible shapes, and it also incorporates classic elements from Escher's work, such as *High and Low*, the Penrose Triangle distortion, the staircase in *Ascent and Descent*, the Riemann Surface distortion in the *Gallery*, and the intriguing three-dimensional shapes in *Monument Valley*. When combining these elements, some fundamental principles of contradictory space shaping are employed, including:

- Re-distorting impossible figures through extension and combination.
- Establishing different vanishing points for the image, enabling the picture to be contradictory.
- Utilising lines to partition the image, resulting in a contradictory appearance.
- Filling the picture with the sparsity of lines and colour blocks creates contradictions in the relationship between light and dark within the image.
- Using lines and faces to link different elements, forming distinct spaces.
- Blending classic elements from Escher's works with modern elements to achieve various picture effects.
- Combining impossible shapes with realistic perspective to create a logically contradictory space.

Through this creative process, it was learned that altering the perspective relationship of the image can be achieved by manipulating vanishing points and playing with spatial composition through the use of impossible graphic structures such as the Penrose Triangle and Mobius Strip. The focus and challenge of this creation practice lay in how to integrate various elements while maintaining the image's effect and order.

Combining graphic illustration with different elements and principles of contradictory space can produce diverse visual elements, realising various possibilities of the image (Bardi, 2015). As the image contains complex elements and varying principles of perspective, composition is particularly crucial in

this creation. Integrating these diverse elements poses a challenge for the creative process. In this process, the image can be enriched by extending, stitching, and filling colour blocks. By connecting different planes through lines and integrating various contradictory spatial elements in space, deforming impossible figures creates the subject of the image, while the abstract point-line surface composition outlines figurative objects. Moreover, the principle of perspective in contradictory spaces builds intricate spaces and creates suspense in the image, inviting the viewer's sense of perspective, stimulating their imagination, and providing a psychedelic visual experience.

The key attractions in illustration design are exceptional drawing skills, innovative new creative elements, and distinctive image presentation (Hirons & Brown, 2019). This also places higher demands on the designer, as sophisticated design necessitates breaking the aesthetic fatigue of images (Perold-Bull, 2020). Maintaining the overall effect of the image is a challenge, especially when the image size is large and there is a significant amount of content. This study suggests extending the image through a regular pattern of images. With various complex elements to be combined in the image, no more than three types of fill representing light and dark should be used. It is also essential to control the area of darkness in the image and combine it with easily identifiable images to enhance the image's order. The creation of innovative and interesting images that capture people's attention is vital.

The Opinion from the Viewers

Viewers provided numerous insights regarding this work. Two main themes were summarised in this study. Regarding the perception of the created graphic illustration, the majority of viewers found this work intriguing, indicating that this type of illustration is appealing to people and worthwhile exploring and developing further. The unusual sense of space mentioned by the viewers, the confusion yet regularity of the image, signifies that the work elicits a sense of visual illusion. Additionally, after viewing the piece, viewers made various associations and connections with concrete objects in reality, stimulated their imagination initially, and engaged in creative thinking during this process, which may potentially have a positive impact on innovation.

However, viewers' attention was still easily drawn to the figurative objects, a factor that merits attention. For the issues of the created graphic illustration, some viewers initially mentioned a lack of colour as a problem. Perhaps adding colour could enhance the visual impact of the image. Lastly, the emphasis on key elements requires reinforcing the sense of order in the picture, which could provide more comfortable viewing experiences for the audience.

Overall, viewers had mixed opinions about this graphic illustration work, but the overall result was successful, delivering a considerable visual impact to most people, creating a visual illusion, and interacting with the viewer. The researcher's objective in the creation stage was essentially achieved. However, certain aspects such as colour, key elements, and image order need to be considered in future practice.

IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS

This study delves into M.C. Escher's concept of contradictory space composition and its implications for modern illustration design. By analysing Escher's works, we identify the fundamental elements and principles of creating contradictory spaces, thereby offering valuable guidance and significance for contemporary illustration creation. The research showcases the application of creative practice to stimulate viewers' exploration, challenge traditional spatial perceptions, and encourage creative thinking. It examines the historical origins and influences of contradictory space painting, analysing its artistic creation method in terms of perspective relationship, space composition, and sense of direction. Furthermore, the study provides insights into expressing intriguing spaces using points, lines,

surfaces, and textures in graphic illustration design, generating multiple vanishing points and impossible graphics to establish a novel perspective. By investigating the effects of visual illusions and their principles, this research broadens the mind and maximises the breadth and depth of creative thinking, effectively conveying the message and inner meaning of the work. The findings can inspire future art creation and promote the innovation of modern illustration design, particularly in transcending the constraints of traditional concepts and fostering inclusive mindsets during the creative process.

The findings of this study reveal a significant interest in new expressions of contradictory space and an eagerness to explore this type of illustration. However, several limitations require attention: Firstly, the limited number of interviewees and insufficient saturation of content leave room for further exploration. Secondly, the study was conducted solely in the Chinese region, resulting in limited data comprehensiveness. Future consideration could be given to similar surveys abroad. Thirdly, the final creation of this study remains in black and white, without coloration or combination with actual products. Future research will explore the representation of colour in contradictory space by recreating the works in a colour-filled manner, further enhancing the significance of the research through the combination of works with actual products.

In response to the limitations of this study, several suggestions are provided for further research: Firstly, to explore specific approaches to the application of contradictory space elements and principles, more experts in the field of graphic illustration should be interviewed, while also reconsidering and reinterpreting the meanings and methods in Escher's works to form a systematic study and complement existing theories. Secondly, technological methods such as eye tracking should be incorporated to study viewer attention, enhancing the research data's rigour. Thirdly, this kind of research should be extended to more countries and regions to collect data from diverse regions, evaluating people's perception of Escher's contradictory space works in different regions. Fourthly, research should be conducted on the application of colour in contradictory space works, exploring the specific use of colour in shaping these works. Lastly, combining the works with more actual products and exploring how to apply contradictory space concepts to real life will further enrich the significance of this research.

CONCLUSION

Through the study, the researcher can have a more comprehensive understanding of Escher's concept of contradictory space composition. This study collected some information about Escher and conducted a survey on the public's perception of this type of artwork, which could provide some reference value for evaluating or creating such works in the future.

The researcher presented the artwork to the viewers and conducted interviews. Previous research mainly focused on the specific analysis of single elements. This study provides some data on the perception of works, which could provide some reference for future research.

The researcher found that the most essential method of creating illustrations using contradictory space is to break people's general perception, which includes the relationship between perspectives, directions, light, and dark. The basic principle of contradictory space is to change the vanishing point of the picture through points, lines, and surfaces, combining impossible figures such as the Penrose Triangle and Mobius Strip to form a new space, using common-sense symbols to guide people's direction. The design of multiple vanishing points in the picture changes the inherent perspective, confuses the relationship between object faces using light and dark, and adds common-sense symbols that guide people's sense of direction. In order to quickly attract the viewer's attention, the image must be given an interactive function, allowing the content and the viewer to interact, thereby increasing the viewer's desire to explore and fully capture the viewer's attention.

ACKNOWLEDGMENT

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