

Modern art visual characteristic transformation to a full-scale model by first-year architecture students

Marchelia Gupita Sari^{1*}, Ardi Makki Pantow Gunawan²

Architecture¹, Visual Communication Design², Faculty of Science and Technology, Pradita Scientia Business Park University

Jl. Gading Serpong Boulevard No. 1 Rower 1, Curug Sangereng, Kec. Klp. Dua, Kabupaten Tangerang, Banten 15810, Indonesia

*Correspondence author: marchelia.gupita@pradita.ac.id

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Abstract. First-year architectural design studio as basic design learning often intersects with other disciplines, especially fine art and graphic design; considering they share both the same historical roots and utilize similar visual design principles. This paper aims to explore the shared visual design principles through students' experience in making a three-dimensional full-scale model based on the modern art movement paintings. The research problems are: 1) What are elements and visual design principles which are commonly implemented to the full-scale model? 2) What are the reasons behind the implemented visual design principles? Therefore, a quasi-qualitative research method is conducted. Semi-structured interview and visual observation become the data collection technique. Analysis has been carried out with theme categorization with researcher's interpretation. The result of this study for the first research problem, a three-dimensional model has similar visual design principles used: 1) Repetition and rhythm, 2) assemblages of basic forms to achieve desired composition vertically, and 3) the existence of hierarchy. For the second research problem, this study indicates that the students made an effort to achieve depth for presenting solid-void or spatial quality for the model. The students still need guidance from tutors for full-scale scale models to maintain the art movement's visual characteristics from 1:10, 1:5, to full-scale models. Discussion with peers is needed to support the learning process. Full-scale models in model-making helped the students to understand the structure logic and imagine the real environment. Collaboration with other disciplines related to the theme is strongly recommended.

Keywords: architecture, art movement, fine-art, first-year student, full-scale model

Introduction

Art, graphic design, and architecture have coexisted in the built environment for centuries. Although they might seem different because they speak distinctive language in their discipline, they are trying to build dialogue with each other (Poulin, 2012). The idea of intersection between art and architecture dates back to the beginnings of these disciplines. The intersection of art, graphic design, and architectural history emerged in our physical environment as a result of the social, cultural, and economic conditions of the specific era. They share the same historical roots. In his book, Richard Poulin divided graphic design and architecture integration into four periods, i.e. 1). Pre-20th century influences; 2). The modern ages (1900-1950); 3). The Postwar World (1950 -2000); and 4). The Beginning of the 21st Century.

Since humanity exists, art has always played an integral role in life. However, it acquired new meanings and purposes during the Avant-Garde movement of the early 20th century, which became one of the most defining characteristics of modernism. Modernism arose as an expectation of material reconstruction of a world technological acceleration and devastated society impacted by the Great War. Artistic expression was used to shape the emotions of the user and a new way to see reality. Modern art movement is associated with the shifting of traditional style to a more abstract and experimental approach for creating art. The modern art movement and architecture have a close relationship because they are influenced by each other.

The importance of art movement knowledge for the architects and First-Year-Student

On the other hand, art knowledge is one of the 13 points of Association of Indonesian Architects (*Ikatan Arsitek Indonesia or IAI*) competence for architects. (Peter, 2018) suggests the importance of having deeper knowledge of art for an architect. That is why the first-year architecture students need to broaden their insight and knowledge with the related disciplines so they can strengthen their creative thinking from various points of views. Via this project, this paper aims to reintegrate the seemingly divided disciplines: the collaboration between fine art, graphic design, and architecture as a learning experience. Three modern art movements are explored because they have significant value and represent both art and architecture: 1). Futurism; 2). Constructivism; and 3). De Stijl.

Various institutions have conducted many studies about first-year architectural design studio experience, but not so many emphasize the connections between architecture to fine art and graphic design. Via this project, this paper aims to reintegrate the seemingly divided disciplines: the collaboration between fine art, graphic design, and architecture as a learning experience. Exploring student's points of view about the learning experience of the chosen art movement in a first-year design studio becomes this paper's concern. The research objectives to guide this study are:

1. This study tries to understand modern art characteristics (elements and visual design principles) that were the most implemented by the students for the full-scale model
2. This study tries to understand the reason behind the implemented visual characteristics conducted by the first-year architecture students.

Modern art movement and architecture movement

Modern art movement and architecture have been introduced by studio assignments in various institutions. For example, the basic design course in architecture and interior design have been conducted in art movement research as a case study to trigger the student creativity (Uluçay, 2023). According to Uluçay, basic design education is a primary way to learn elements and principles of design. The result of Uluçay's study indicated that the students can implement the elements and principles of design concepts they had learned throughout the term while creating two dimensional or three-dimensional compositions in the chosen theme. The study of art movement paintings (two dimensional) in architecture studio can facilitate the conversion of a distinctive two-dimensional pictorial arrangement into three-dimensional geometric shapes, and alters these components into distinctive design elements by removing their pictorial attributes (Terece, 2023).

The difference between this paper and the previous study is the exploration for the comprehensive process from translating the visual characteristic from two-dimensional art movement paintings in different scales to a full-scale three-dimensional model. The criteria of art movement used is having influence on architectural projects. Art movements like De Stijl, Futurism, and Constructivism offer architects frameworks for examining composition, abstraction, and the application of color, line, and form to inspire emotions and convey meaning. These movements question traditional standards and foster creative thinking, allowing

architects to create a distinctive visual characteristic while following essential design principles. Both architecture and visual art share common ground because they implement not only the element of design: point, line, color, texture and form and also the visual principles of design, which include 1. Hierarchy; 2. Repetition; 3. Symmetry; 4. Balance; 5. Unity; 6. Harmony; and 7. Datum (Ching, 2014) or Gestalt Principles (Balmer, 2019).

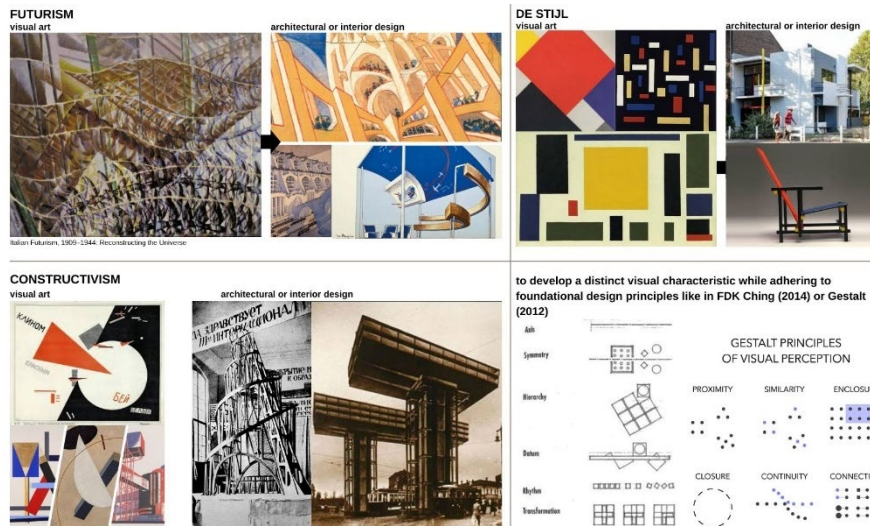


Figure 1. Modern art movement and modern architecture can be analyzed by visual design principles
Source: <http://exhibitions.guggenheim.org/futurism/architecture/#0>

Figure 1 shows the examples of modern art movement and modern architecture which can be analyzed by visual design principle. There are distinctive visual characteristics in each category which have been discussed among the scholars. Those three art movements can be read below:

Art Movement - Italian Futurism

Italian Futurism, originating in Italy, was a groundbreaking avant-garde movement led by Filippo Marinetti. It emerged at the beginning of the 20th century with radical intentions, aiming to infuse art with revolutionary power. The movement's manifesto of 1909, spearheaded by Marinetti, boldly rejected historical influences and embraced a forward-looking vision. This rejection of the past was a direct response to the societal and technological changes occurring globally during the era, including the rapid industrialization and technological advancements that defined the early 20th century (Bhaskaran, 2005).

Visual Characteristics of Italian Futurism

Italian Futurism was characterized by a dynamic representation of movement and speed, echoing the influence of industrial and technological progress. The artists of this movement, inspired by advancements like mass automobile production and aviation, sought to capture the essence of modernity. Visual characteristics included the use of lines and diagonal compositions to convey speed and dynamism. The movement was also influenced by Cubism and sequential photography, incorporating fragmented forms and a sense of temporal progression in their artworks. The explicitly drawn movement can be seen on Figure 2.

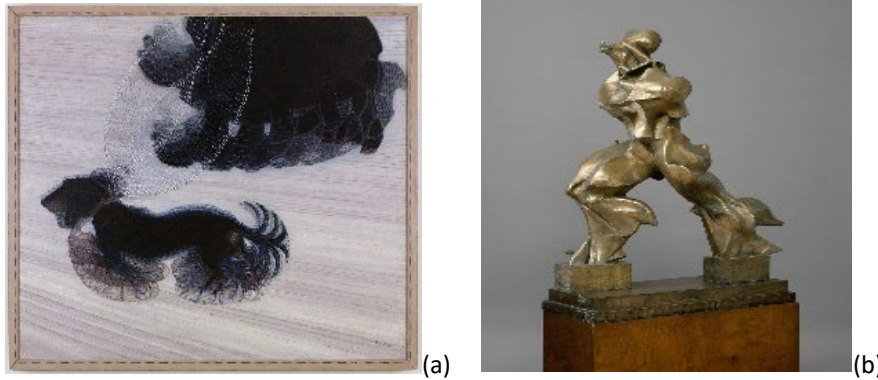


Figure 2. (a) Giacomo Balla's "Dynamism of a Dog on a Leash", (b) Umberto Boccioni's masterpiece, "Unique Forms of Continuity in Space"

Source:

(a) [https://en.wikipedia.org/wiki/Dynamism_of_a_Dog_on_a_Leash#:~:text=Dynamism%20of%20a%20Dog%20on%20a%20Leash%20\(Italian%3A%20Dinamismo%20di,studies%20of%20animals%20in%20motion](https://en.wikipedia.org/wiki/Dynamism_of_a_Dog_on_a_Leash#:~:text=Dynamism%20of%20a%20Dog%20on%20a%20Leash%20(Italian%3A%20Dinamismo%20di,studies%20of%20animals%20in%20motion)

(b) <https://www.metmuseum.org/art/collection/search/485540>

Giacomo Balla's "Dynamism of a Dog on a Leash" vividly illustrates the Futurist fascination with movement. The portrayal of a walking dachshund captures the dynamism through the strategic use of lines and diagonal compositions. Meanwhile, Umberto Boccioni's masterpiece, "Unique Forms of Continuity in Space" exemplifies Futurist art. The sculpture conveys the dynamics of speed through the sculptural forms that nearly merge, portraying a futuristic and dynamic vision. While not an artwork, an image of Filippo Marinetti's Futurist Manifesto of 1909 is essential. This document symbolizes the movement's radical intentions and the rejection of the artistic past, providing insight into the ideological foundations of Italian Futurism (Noblet, 1993).

Art Movement - Constructivism

Constructivism, originating in Russia, was a revolutionary art movement that emerged in the early 20th century, particularly in the aftermath of the 1917 Bolshevik Revolution. The movement was deeply influenced by the socio-political changes brought about by the revolution, as artists sought to align their work with the new Communist ideology. Constructivism aimed to bridge the gap between art and everyday life, emphasizing a utilitarian and functional approach to artistic creation. Artists associated with Constructivism considered themselves engineers of a new society, rejecting traditional art forms in favor of geometric abstraction and the integration of industrial materials (Bhaskaran, 2005).

Visual Characteristics of Constructivism

Constructivism was characterized by a focus on geometric forms, utilitarian design, and the use of industrial materials. Artists sought to create works that served a practical purpose, often emphasizing functionality over aesthetics. The movement embraced a mathematical and scientific approach to art, incorporating precise lines, shapes, and structures. Constructivist works often featured a stark and bold visual language, with an emphasis on simplicity and clarity. The movement had a significant impact on various art forms, including painting, sculpture, architecture, and graphic design. Alexander Rodchenko's 'Spatial Construction no. 12' exemplifies Constructivist principles. The use of geometric shapes and industrial materials reflects the movement's commitment to functional and utilitarian art.

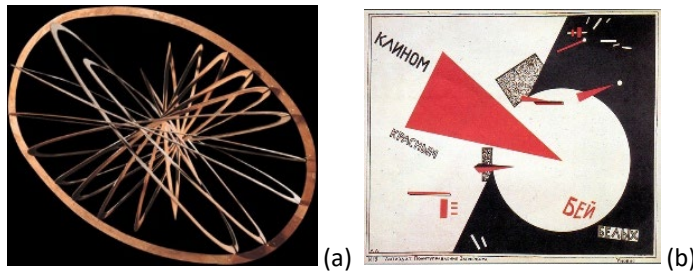


Figure 3. (a) Alexander Rodchenko's 'Spatial Construction no. 12', (b) El Lissitzky's iconic propaganda 'Beat the Whites with the Red Wedge'

Source:

(a) https://www.moma.org/interactives/exhibitions/1998/rodchenko/texts/spatial_construct.jpg.html,

(b) https://en.wikipedia.org/wiki/Beat_the_Whites_with_the_Red_Wedge#/media/File:Klinom_Krasnym_Bej_Belych.JPG

Figure 3 (b) shows El Lissitzky's iconic propaganda poster, 'Beat the Whites with the Red Wedge' as seen on Figure 3(b) is a powerful representation of Constructivist graphic design. The bold geometric shapes and dynamic composition convey a clear political message, aligning with the movement's commitment to social and political change (Honour & Fleming, 2005).

Art Movement - De Stijl

De Stijl, meaning 'The Style' in Dutch, originated in the Netherlands in the early 20th century. Founded in 1917 by Theo van Doesburg, De Stijl sought to create a new visual language that reflected the utopian ideals of the post-World War I era. Influenced by ideas of harmony, order, and abstraction, the movement aimed to achieve a universal aesthetic by reducing artistic expression to its most fundamental elements. De Stijl artists believed in the transformative power of art and design to create a harmonious society, free from the chaos of war and social unrest. The movement was characterized by a strict use of geometric forms, primary colors, and a grid-based composition, reflecting a commitment to simplicity, purity, and universality (Honour & Fleming, 1981).

Visual Characteristics of De Stijl

De Stijl's visual characteristics include the use of geometric shapes, particularly rectangles and squares, primary colors (red, blue, yellow), and a strict grid structure. The movement sought to eliminate unnecessary ornamentation and decoration, emphasizing a reductionist approach to form and color. Artists associated with De Stijl, such as Piet Mondrian and Theo van Doesburg, created works that aimed to achieve a sense of balance and harmony through precise arrangements of lines and colors. The movement extended its influence to various art forms, including painting, architecture, design, and typography, contributing to the development of Modernism.

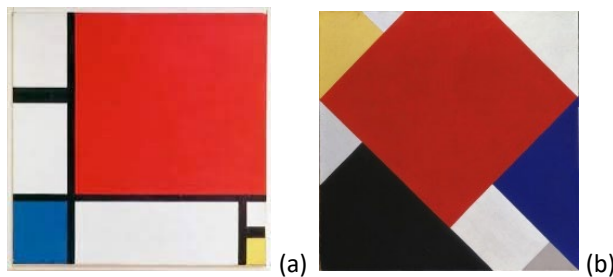


Figure 4. Composition with Red, Blue, and Yellow, (b) Counter-Composition V

Source:

(a) https://en.wikipedia.org/wiki/Composition_with_Red,_Blue_and_Yellow,

(b) https://en.wikipedia.org/wiki/File:Theo_van_Doesburg_Counter-CompositionV_%281924%29.jpg



Figure 4 shows Piet Mondrian's "Composition with Red, Blue, and Yellow" is a quintessential example of De Stijl painting. The use of primary colors and a grid structure reflects the movement's commitment to simplicity and abstraction. Theo van Doesburg's "Counter-Composition V" exemplifies De Stijl principles with its geometric forms, primary colors, and meticulous arrangement. The work reflects the movement's exploration of balance and rhythm. Gerrit Rietveld's "Red Blue Chair" represents De Stijl in furniture design. The chair's geometric shapes and primary colors align with the movement's emphasis on functional simplicity and visual harmony (Bhaskaran, 2005).

The importance of full-scale model-making in Studio Learning for First-Year Student

First year architecture students experienced a fundamental shift in learning mode from high school to university. In architecture major, design studios are active learning environments with a focus on hands-on experience. It is not merely lecture-based where knowledge is given, but knowledge is gained through direct experience. This is the culture of a design studio where students should be encouraged to make mistakes and solve them, and be open to revisions under the guidance of a tutor. Students should learn by proposing solutions actively to open-ended problems rather than by listening to lectures passively (Al Maani, 2019). It is expected that the students can engage socially and prudently in drawing, model-making, and exploring the assignment object themes for the study. The active, hands-on culture of design studios and discourse, peer discussion, and critical feedback exercises are a vital part of a studio setting; they help students feel confident enough to voice their thoughts. Students should adapt to the design studio culture to survive their first-year design studio.

Before experiencing the advanced studio with architectural software as an aid tool for drawing or form finding, first-year students have to work with model making. Model-making can be similar to sculpting, the designer uses his hands and experience to discover a new realm and create aesthetic objects even if he does not intend to do it artistically. (Ozorhon, 2016) highlighted there are many benefits of working with a full-scale model for architectural students. Using manual methods in the initial phases of design education to emulate modern design and construction tools has the potential to enhance students' creativity by fostering a deeper comprehension of the manufacturing tools. The student's progress on the full-scale model might require a reconsideration of the previous design stage and revision in previously made decisions due to details concerning the production process. Full-scale models can help students gain knowledge about their design in a real environment.

Methods

This paper presents quasi-qualitative methods due to its two main objectives: 1.) interpretation about the result of visual characteristics conducted by the students, and 2) Based on the interview, the reason for visual design principles implementation. (Creswell, 2016) qualitative study using researchers as its own research instrument. At the end of the assignment, 13 students were interviewed and were given open-ended questions as the informant. The data were analyzed by theme categorization. The result of this study is a narrative description about student experience with themes, and the summary of the visual principles that were the most implemented by the students for the full-scale model. This paper does not intend to prove any hypotheses, rather it explores the principles found in researcher's interpretation. However, the researchers performed triangulation in the interview by comparing the students' answers for verification. The method used by this paper can be seen in Figure 5.

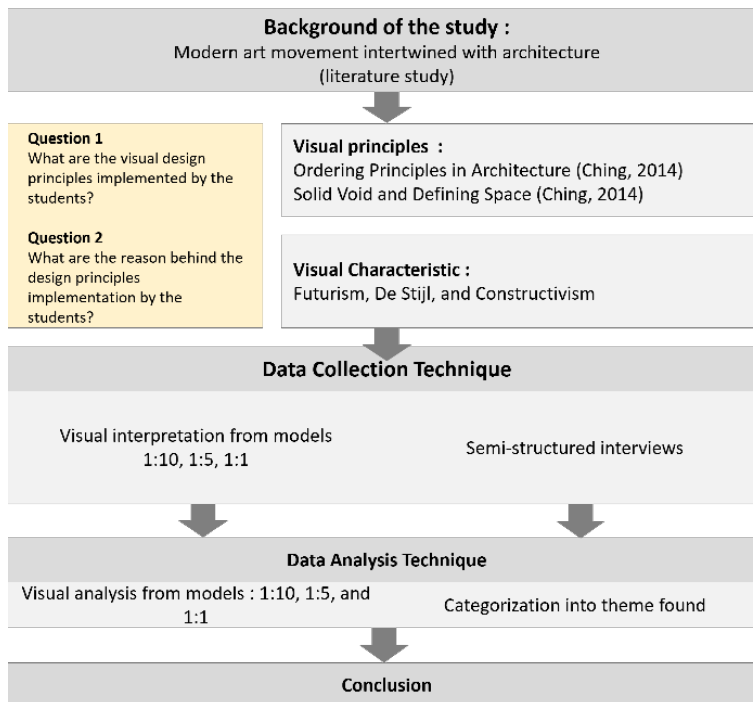


Figure 5. Methods
Source: author, 2023

Phase I: Visual characterization of the art movement

The Modern Art Movement was introduced to the students in a lecture session. Students explored visual characteristics of the art movement by analyzing at least 3 (three) influential artists and their notable works. Each student has to research and conclude with the founded keywords to be implemented to their 1:10, 1:5, and full-scale model.

Phase II: Review / 'Crit' / 'Pinup' to Decide Selected Works

Institutional culture of review and assessment includes what-so-called- 'crit' or 'pinup' scenarios, and the college students are always welcome to attend sessions and participate in discussion as seen in Figure 6. Internal reviewer from the Visual Communication Design and Fine Art Department was expected to test the students' comprehension about the theme.



Figure 6. Review or Critic Session by internal and external reviewer and the selected 1:5 model
Source: author, 2023

Phase III: Full-Scale Model Production

During the production phase, modifying the model is commonly done as seen in Figure 7. The improvisations are often in the form of reduction. Initially students tend to simplify the initial design due to material knowledge constraints: joints of the material, the construction of the material, and the durability. Students optimize their design by making a compromise between the constructability and the initial ideation. Improvisations by reducing design or altering the design elements occurred on this phase.



Figure 7. Production of Full-Scale Model in university wood working laboratory
Source: author, 2023

Phase IV: Reflection of the students

Student's learning experiences were collected by the open-ended questionnaires and semi-structured interviews. Theme categorization is performed by the researchers. The data analysis theme is being analyzed to find the tendency of visual elements and visual design principles implemented.

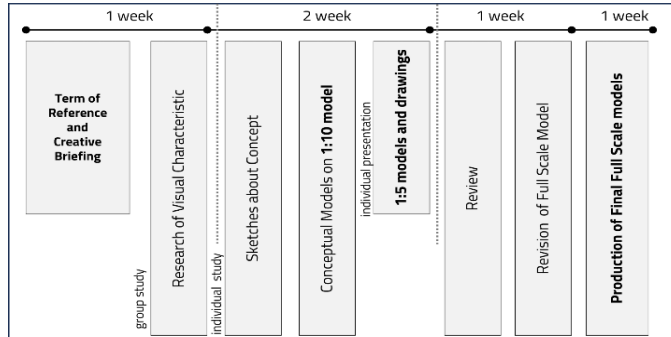


Figure 8. Term of References timeline for the studio assignment
Source: author, 2023

Figure 8 shows the term of references timeline given to the students. With a 6 week duration, the students are expected to: understand the art movement visual characteristic, testing the conceptual models on 1:10 models, and testing the prototype on 1:5 model. After the review and choosing the selected works, students were divided into three groups and made revision for a full-scale model. It was expected to conduct improvisation or optimization in production of the final full-scale model in a group with peer discussions. After conducting six weeks of performing the works, the students are interviewed as seen on table 1.

Table 1. Data collection techniques methods

No	Data collection techniques	Source	Instrument
1	Semi-structured interview	13 participants (students)	Studio learning experience

2	Semi-structured interview	13 participants (students)	The reason visual principles implemented based on study
3	Visual observation from students' model from researcher:	Researcher as the research instrument itself	Researchers interpreted the students' work by using design principles
<ul style="list-style-type: none"> - series of 1:10 model, - series of 1:5 model, - 1:1 model perspective 			

Source: author, 2023

Result and Discussion

Result and discussion are framed by the two research objectives 1. Visual principles implemented by the students by conducting interpretation, and 2. The reason behind the implementation.

The implementation of visual characteristic principles based on researcher visual observation

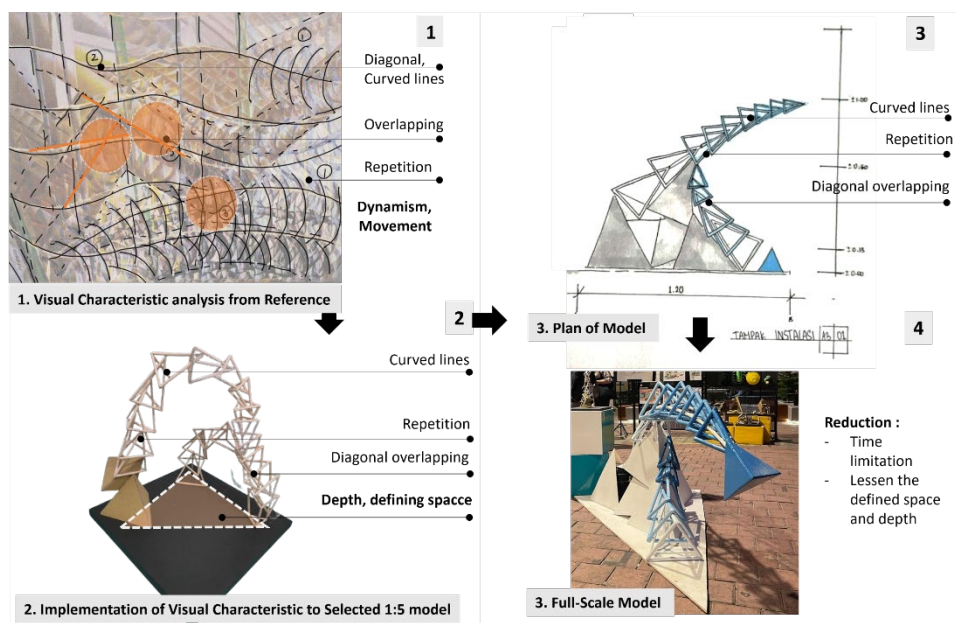


Figure 9. The full-scale model of Futurism

Source: author, 2023

The full-scale model, as seen in figure 9, is rooted in the principles of Futurism. The model seeks to capture the dynamism of human body motion through a sequence of repetitive prisms that visually represent the direction of movement. These prisms are abstracted from the twisting motion of the human spine, particularly as it shifts forward.

The design emphasizes vertical stacking and a curvilinear form, creating a defined space meant to function as overhead shades. The hierarchy within the structure is expressed through the contrast between solid prisms and prismatic frames, enhancing the visual interplay between mass and void. However, due to material and time constraints, the intended overhead shades were not fully realized. This limitation led to a reduction in the spatial definition and depth,

resulting in diminished spatial quality compared to the original concept. Despite this, the project demonstrates an innovative approach to translating human motion into architectural form.

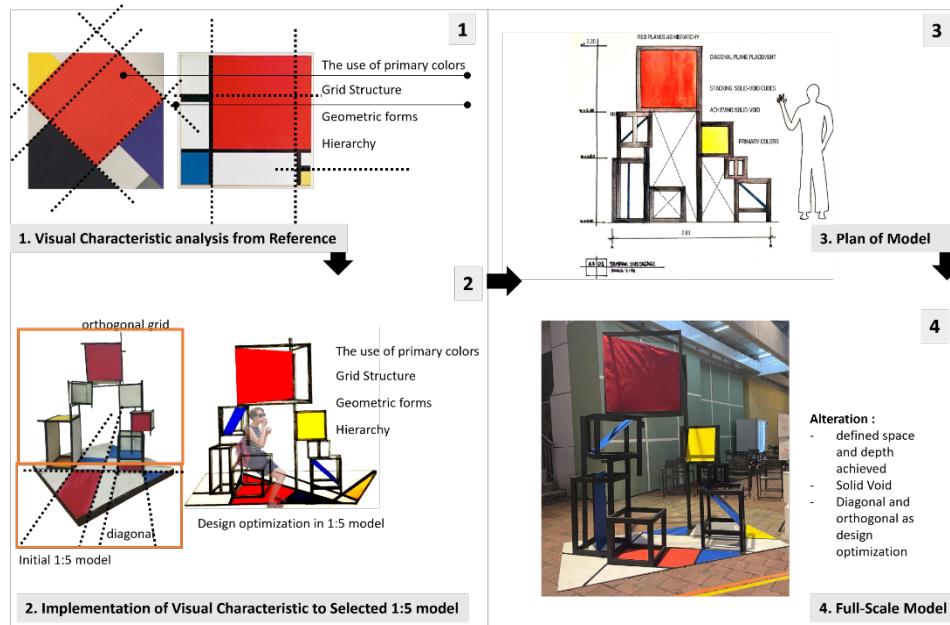


Figure 10. The full-scale model of De Stijl
Source: author, 2023

Figure 10 shows the final full-scale model of the De Stijl Art Movement. The visual principles of De Stijl were implemented through the use of primary colors, a rectangular grid structure, and geometric forms. The design incorporates a clear sense of hierarchy, achieved by positioning the red planes prominently at the top of the installation. While the grid structure maintains a regular alignment, the planes introduce dynamic movement by being placed diagonally, creating a striking contrast within the composition.

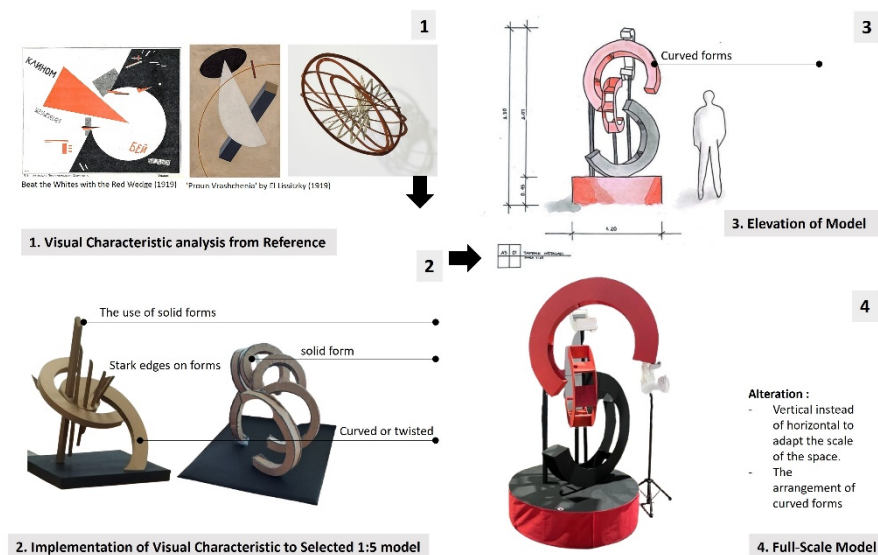


Figure 11. The full-scale model of Constructivism
Source: author, 2023

Constructivism draws inspiration from the human body motion, as seen in Figure 11. Curved solid forms are stacked and rotated. Major revision was conducted because of the technical difficulty. Stark edges were removed because of the finishing difficulty. There was arrangement of curved forms by manipulation (subtraction) and hierarchy by the red curved forms placed at the top of the installations.

From the theme analyzed, the general theme for the visual design principles were:

1. Repetition and Rhythm of basic forms

Repetitive basic forms are conducted to achieve massing outline characteristic, whether it is curvy or straight lines. The visual characteristic was maintained from 1:10, 1:5, to full-scale model by the outlines. Overlapping basic forms were conducted for Constructivism and Futurism, while the De Stijl installation obeyed the strict grids.

2. Assemblage the basic form vertically

Students tend to make an outline for the massing by stacking the basic forms vertically in order to make an overhead shade for the human scale. It was also conducted to adapt the exhibition space scale context. Exhibition space located in the semi-outdoor transition space and the high ceiling became the main concern.

3. The Existence of Hierarchy

Hierarchy principles exist in almost all of design. Hierarchy emerged by size is conducted by De Stijl full-scale model. The red plane is intended to be the overhead plane, but necessarily be the roof. Hierarchy by the position are seen in the Constructivism full-scale model and in the Futurism full-scale model.



Figure 12. The final full-scale model at the exhibition space (semi-outdoor)

Source: author, 2023

Figure 12 shows that the full-scale models are exhibited in a semi-outdoor space with a high ceiling feature. Vertical stacking is needed to achieve balance for exhibition space scale and proportion. The exhibition was meant to show the full-scale models' visual characteristics clearly. Visual design principles implemented in each full-scale model is the result of agreement among the students.

The reason for visual design principles implementation

Depth and Defined Space

By arranging one of the components as an overhead plane, the geometric features are intended to create depth and defined space in the spatial configurations (Ching, 2014). Solid-

void quality enhanced by the plane's composition inserted to the form. The solid-void quality emerged via natural light through the design elements.

Peer discussion is useful the uncertainty of production

Peer discussion, work with other students and helping each other are considered to be positive things. However, some students responded that certain stages of the process were arduous, especially because they had never experienced them before. It is revealed that sometimes the design decision-making was feared to be random or objectless. Therefore, a discussion forum was conducted in order to have a strong argument and eliminate the uncertainty.

Materiality knowledge is important for first-year students

Full-scale models in model-making helped the students to understand the structure logic and imagined the real environment. However, the materials used should be clearly specified. There were some changes or revision in the form of elimination from the initial design to final 1:1 full-scale model because of the unsolved technical issues. Wood working requires a large amount of time and energy. Physical activities for labor were also a challenge for the students.

Conclusion

Modern Art Movement visual principles implemented by the students are: the 1. Repetition of basic forms, 2. Assemblages of basic forms vertically, and 3. The Existence of Hierarchy. It considers spatial quality, more than two dimensional objects. The full-scale model also adapts the spatial scale of the exhibition place. It is believed that improvement and optimization occur due to the realization of the spatial scale for exhibition space. When students make 1:10 and 1:5 models, the spatial quality of the exhibition location is not considered thoroughly. When they make a 1:10 model and conduct site visits, they tend to make a vertical impression rather than horizontal.

Aligned with previous studies, students can transform two dimensional paintings to three dimensional full-scale models. The visual principles used in both architecture and modern art movements involve the manipulation and repetition of basic forms. The students retained the visual characteristics of modern art movements by capturing the essence of forms as they interpreted them. In this class, Futurism is characterized by curves, Constructivism by the manipulation of curved forms—which ideally should include sharp or stark elements but were omitted due to technical issues—and De Stijl by its grid structure featuring rectangular and diagonal elements. Students are expected to be confident to make design alternatives as solutions for the intended design.

Architectural design studio terms of reference may need to be reviewed by an interdisciplinary expert in order to achieve the specific objectives (as an example, cross disciplinary review may be conducted to achieve the proper visual characteristic). This is not intended to limit their creativity, but rather to direct the students to learn about the specific visual character. The implication of this research is to understand the relationship between modern art and architectural visual characteristics performed by the architecture students. The principles utilization tendency on the art movements by architect students are depth to defined space. However, this study evaluates the students' habitual change which benefits them to face higher design studios. The limitation of this study is the informant's quantity. Accordingly, the generalization of the result is subject to certain limitations.

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