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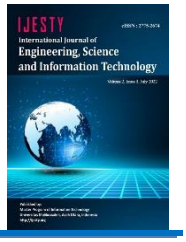

Study of the Transformation of New Forms in Development National Gallery of Indonesia

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Abstract

The transformation of existing buildings at the National Gallery of Indonesia has undergone several transitions, ranging from colonial residences and educational spaces to exhibition spaces. This transitional need became an important consideration in terms of the function and identity of the word 'National' contained in it until finally, a proposal for the development of the National Gallery of Indonesia in 2013 was initiated, which focuses on exploring the mass of new buildings that support exhibition spaces with conservation considerations in mind. The form of the mass becomes visually unimportant because it can give a provocative and inviting impression. References are based on mass transformation, new mass response to sustainable buildings, and visual response to the front area. This research aims to explore new building forms of the National Gallery, which can be considered in the subsequent development process and the discourse on architectural forms in development buildings with elongated tread characters and sustainable buildings in the middle. The research method uses literature research and case studies. The data collection technique was carried out by literature observation. It was concluded that the eight study samples did not simultaneously have the second criterion (contrast - symmetric or dynamic - proactive) but rather the configuration form of the four criteria. Consideration of balanced form is dominant rather than different balance. While the application of rhythm is found in the principle of height difference resulting from the mass transformation process.

Keywords: *New building Mass, Mass Transformation, Mass Character, Conservation Response.*

1. Introduction

The National Gallery of Indonesia is a building where the collection of works of art belonging to the state is stored and displayed in the form of a showroom. The history of the existing showroom was not explicitly planned as a showroom building but a legacy of a colonial house which was transformed into a dormitory on the middle side and a row of classrooms on both sides of the site [1]. After successfully identifying conservation by the Cultural Conservation Expert Team, only two were designated as sustainable buildings, namely building A and the Multipurpose building [2], [3]. This decision made the basis for consideration by the National Gallery to try to transform classrooms into areas of exploration of forms that support exhibition spaces with consideration of conservation principles through the proposal for the competition to 'development of the National Gallery of Indonesia in 2013' [1]. Conservation buildings at the National Gallery meet the criteria for cultural heritage with essential knowledge and historical and cultural values [2]. Based on Law No. 11 of 2010 concerning cultural heritage confirms that buildings designated as cultural heritage are allowed to undergo changes if they have undergone a revitalization study and adaptation of the building in accordance with the planned needs [4]. According to the DKI Jakarta Regional Regulation No. 9 of 1999, the building on the National Gallery site meets the criteria for cultural heritage in class B, where changes in the main body shape, main structure, front view pattern, roof shape, and detail components are not allowed to change [2], [4]. Based on the 'Term of Reference for the development of the National Gallery of Indonesia in 2013', the land size of the development area is 2.4 hectares. The characteristics of the tread extend backward with a provision of 81 meters wide and 287 meters long. The existing conditions supporting the area at this time, the site is flanked by four buildings, one river, and one area that affect the formation of the constituent mass [5]. The typology of the elongated footprint with a sustainable building in the middle makes the transformation of the shape of the constituent mass into a rectangular prism or beam with a height parallel to the conservation building highly recommended. The appropriate form grouping is linear and configuration form with continuous access criteria. Initiation in transforming the form makes an ideal solution that must be included in the concept because it can increase the effectiveness of the building and the selling value of the National Gallery visually.

2. Literature review

2.1. Transformation of mass

Consideration of the shape of the building is essential because it is the starting point between mass and space [6]. According to Francis D. K Ching, form refers to a recognizable external appearance. Within the scope of the study, the form will refer to the internal and external structure based on the principles that give unity to the whole. The composition has various forms, but in the preparation, it is often adjusted to the extent and context of a particular area [7]. Form and articulation of form are classified into six factors: architectural form, the factor that embodies form, typology of forms, transformation, compound form, and articulation. The discussion only focuses on changes in shape, where this process is a stage of transformation from primary solids to variations in shapes that arise through adjustment of one or several dimensions, such as changes in dimensions, subtraction, addition, and configuration [7]–[10].

2.2. Characters of mass

Elements of form and space in the design are categorized into two elements, where the concept of contrast is caused by different tendency factors from existing buildings in specific proportions, while harmony is generated by factors that are harmonious, similar, and based on existing provisions [10]. Architectural form is a visual feature of a building as an identity and differentiator from other forms. As the main visible component, it is a significant aspect of the aesthetic enjoyment of the architecture of a building. In the process of designing and analyzing this form, there are important factors, including the mass of the building, which refers to the three-dimensional configuration of surfaces and edges, texture and color, which is the final touch that has an attachment to the material that can change the sensitivity of each form displayed, composition of architectural elements, the proportion of one part to another and the influence of another, the lighting conditions or the point at which the building is viewed [11]. Mass characters are classified into twelve principles: Contrast, Balance, Pressure, Scale, Proportion, Hierarchy, repetitions, Rhythm, white areas, Movement, Variation, and Unity. Meanwhile, the research article only focuses on assessing the principles of contrast, balance, and rhythm applied to the shapes to be identified. The principle of contrast has used an emphasis on aesthetics in functional designs. The basic principle of balance is color, size, and texture, so this principle is divided into two, namely asymmetric (proactive and free) and symmetric (stable and neutral). The principle of rhythm refers to patterned repetition in regular or irregular forms so that the grouping is divided into three: static, dynamic, and progressive [12]–[14].

2.3. Conservation Response

The concentration of building development for the National Gallery of Indonesia involves considering the existing building elements on the site (conservation buildings), existing outside the site (buildings that affect the design form), regional landmarks (Monas), and other supporting factors. The existing buildings on the site consist of two conservation buildings [5], [15]. The term conservation activity is divided based on the type of activity and the level of change, such as maintenance and care, restoration, development, utilization, and demolition [4], [16]. Maintenance and activities are in the form of physical conditions in good condition, or minor damage occurs, there are no significant physical and functional changes and aims to maintain and care for the condition of cultural heritage buildings to remain sustainable. Restoration activities in the form of the physical condition of the building are damaged, and there is no plan for significant physical and functional changes. In detail, the handling of this condition is divided into four factors: reconstruction (rebuilding parts that have been lost according to the previous document), consolidation (maintaining the remaining mass through stabilization and strengthening efforts), rehabilitation (restoring the condition of the building and allowing limited changes taking into account the use of current functions), and restoration (returning the physical form as accurately as possible with a mass that is adapted to a certain period, based on strong document considerations). Development activities include plans for significant physical additions, functions, and capacity usage changes. In detail, the handling of development activities is divided into two: revitalization (in the form of regrowing the critical value (significance of cultural heritage buildings by increasing physical, economic, and social aspects) and adaptation (in the form of extending life span and maintaining the sustainability of buildings by incorporating new functions and activities). According to current needs, utilization activities are utilizing or inserting new functions inside or outside cultural heritage buildings without making significant physical change plans. Demolition activities are in the form of efforts to dismantle cultural heritage buildings that have been declared to be heavily damaged and endanger users, based on careful study and instructions to revoke the status of cultural heritage buildings [4].

3. Methods

This article uses a literature study research method, with the type of qualitative research method that uses in-depth information and data from various journal articles, case studies from the results of the competition to 'development of the National Gallery of Indonesia in 2013' and redevelopment studies by students to obtain answers and theoretical basis for the problem under study. The main characteristic of the literature study method is that researchers deal directly with texts, numerical data, and related images and not with direct knowledge from the field or eyewitnesses of other events, people, or objects [17], [18]. The research subjects consisted of eight samples, of which six categories of proposals were directly involved in the competition for 'the development of the National Gallery of Indonesia in and two categories of proposals that carried out redevelopment. The eight samples are participant mass sample, first winner mass sample, second winning mass sample, third winning mass sample, citation winning mass sample, top ten winning mass sample, 2015 redevelopment mass sample, and 2021 redevelopment mass sample [19]–[23].

3.1. Method of collecting data

The data collection method is done through digital imaging in the form of documentation of existing National Gallery of Indonesia buildings found on the National Gallery website, the youtube channel of the Jakarta Architects Association, the coroflot website, and supporting literature sources. The resulting collection of images is processed and then redrawn through AutoCAD (scaled measurement), SketchUp (modeling), and Photoshop (final finishing or retouching) applications. Meanwhile, in the descriptive stage, the intersecting data are quoted from various ebook pages, journals, research, theses, online magazines, and articles. Then the collected data results are classified into two categories: supporting data and sample data.

3.2. Data analysis method

The research will begin with the collection of supporting data and sample data. The supporting data in the form of literature explains the flow of the sample data discussion. In contrast, the sample data is in the form of case data that becomes the test material. This data is then divided into two, namely the current cultural heritage building data and the collective data from the competition (in the form of 8 samples of the mass form). Both data underwent a redrawing step 1 by importing drawing findings (i.e., floor plans) into the AutoCAD application by means of scalar measurements through a drawing scale tracing system and two-dimensional model drawing. The final result of this process is then imported into the process of redrawing step 2 in the form of making a three-dimensional model in the SketchUp application. This process is divided into two, namely, the creation of model 1 and the creation of model 2. The creation of model 1 is the presentation of a three-dimensional model of a form legally designated as a sustainable building with the addition of several new forms (which occurred at certain phases in its era). Meanwhile, model 2 is the process of presenting a three-dimensional model regarding the transformation of the shape model from the initial phase to the final phase. The process of drawing the model has been adjusted to the demand for the points contained in the analysis of model 2. After that, the two models underwent retouching or finishing in the Photoshop application, in the form of adding supporting information and markings. The final result of model 1 is the identification of the original cultural heritage buildings and the extent to which the addition of forms has occurred so far. The presentation of model 2 is a model that has been adjusted as closely as possible to the existing sample and is presented in a similar basic form, namely a rectangular prism or a beam shape, to produce an objective and uniform mass transformation. Session 1 testing was carried out by identifying models 1 and 2 based on considering the sample relationship in responding to the current state of the cultural heritage building and the building in its mass. Session 2 testing is done by analyzing model 2 based on the number and types of transformations performed on each sample. Session 3 is done by analyzing model 2, especially in the final mass transformation and drawing two-dimensional planes on the front side so as to produce shape characters for each sample. The final results of the study on models 1 and 2 above with criteria (elongated tread shape, there is a sustainable building in the middle, and continuous orientation considerations), it will produce alternative designs (mass transformation process can apply all existing components of shape change), alternative shape characters (all the final forms of mass that have been transformed have contrasting properties - symmetrical or dynamic - proactive so that they can still be applied to development with basic conceptual accountability), and alternative responses to conservation activities that allow it to be applied to the development of the National Gallery building (is activity maintenance and care, utilization, development, restoration, and demolition). Discussion studies are an alternative to model studies that are limited in nature based on the researcher's point of view, so different study results may be possible. The conclusion is the final method of a series of discussion contexts described so that the results obtained at this stage have a clear basis and process.

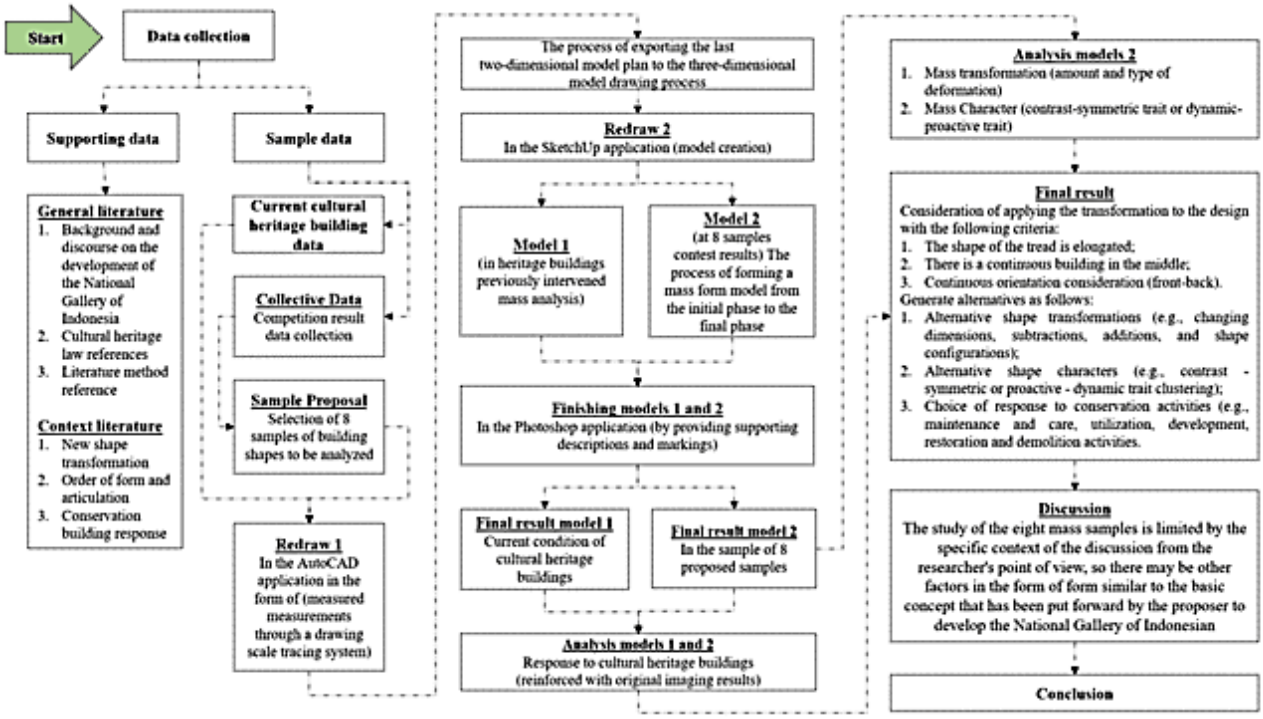

Fig 1. Flowchart of methodology

4. Results and discussions

4.1. Conservation activity analysis

Conservation activities that are close to the case of building A are development activities with detailed work in the form of revitalization. A new form of intervention is in the form of closing the front porch area wall on both left and right sides. In contrast, the utilization activity is the addition of a new building in the rear area, which in its mass, functioned as a dormitory kitchen activity as well as a transition room in 1930 (figure 2, point a) [2]. When viewed structurally, the closure of the front porch area is a wall plane closure. While the additional structure of the rear area is supported by the central column structure (figure 2, point b). The detail elements and the shape of the front facade are still maintained, only the window opening area is closed because it adjusts to the current function of the building as a temporary exhibition area. While the detailed elements of the back area are only in the form of a massive wall area, two openings in the form of doors, and the details of the head of the Tuscan column are crushed (figure 2, point c).

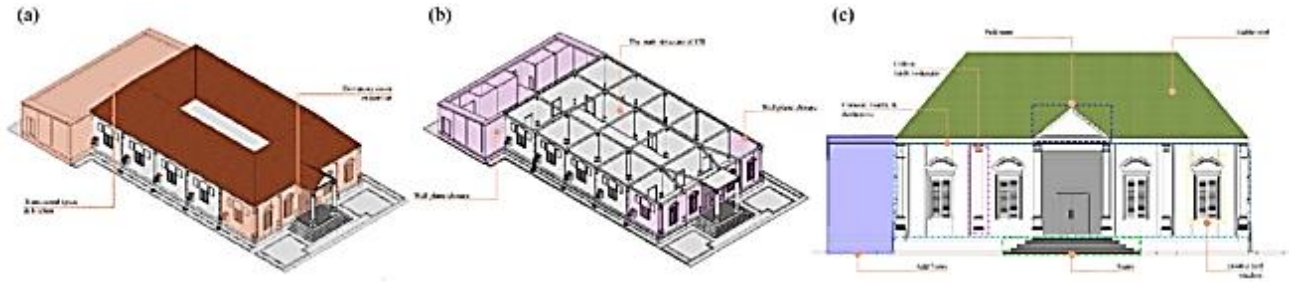

Fig. 2: Analysis of conservation activities that occurred in building A. (a) Closure of the front porch area and the addition of new mass in the rear area when it functioned as a 1930 dormitory, (b) Identification of the effect of the wall area and additional mass in the rear area on the main structure of the reserve building culture, (c) Identification of the detail elements of the front facade of building A – a sustainable building that is used as a reference for the proportion of additional mass.
Source: Mahendra, 2018 (reprocessed)

Conservation activities that are close to the case of the Multipurpose building are utilization activities, namely providing new functions in the lobby area as a women's toilet and the outdoor area as a men's toilet (figure 3, point a). Structurally, the addition of a wall area does not interfere with the activities of the main building structure because it uses a semi-permanent wall (Hebel brick) as high as the outermost column head (figure 3, point b). The addition of a wall area does not damage the detailed elements of the main building facade (figure 3, point c).

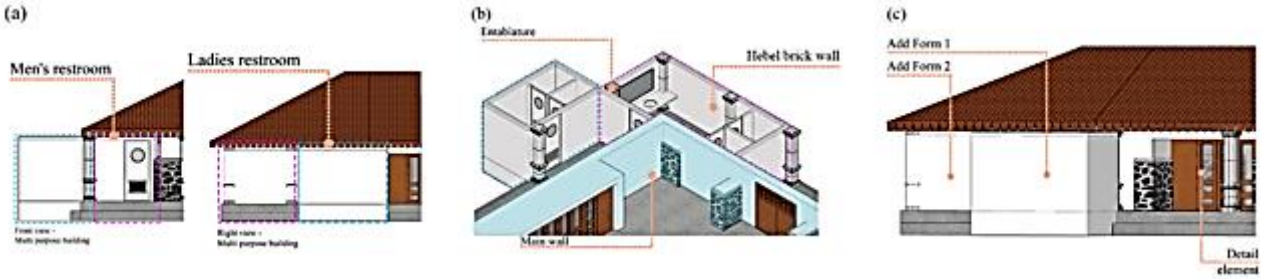

Fig 3. Analysis of conservation activities that occur in the Multipurpose building. (a) Adding a new shape to the back area of the Multipurpose building that functions as a men's and women's toilet, (b) Identification the effect of the wall area or the shape of the new building on the structure of the Multipurpose building, (c) Identification of additional forms and their effects on the detail elements of the facade.
Source: Mahendra, 2018 (reprocessed)

4.2. Applicative mass analysis

The applicative building mass analysis consisted of eight selected samples, involving quality samples with the selection of these masses as winners and participants in the competition to 'development of the National Gallery of Indonesia in 2013' and two samples of mass contributors from students in the context of redevelopment. Mass samples have different variances with different conceptual considerations. The indicators focus on identifying the formation of the building mass in the form of transformation of mass, characters of mass, and samples response to cultural heritage buildings. Transformation of mass is identified into four aspects, namely dimension change, subtraction, addition, and configuration form. The final result that will be obtained is the number and types of transformations that can be applied with specific criteria (elongated footprint shape, sustainable building in the middle, and continuous orientation considerations) and refers to discussion **2.1. Transformation of mass**. The mass character can be visually assessed based on the final result of the three-dimensional mass transformation and the two-dimensional plane on the front face area (because this point is the main face that will be seen first). There are criteria for this response analysis, namely: surface area, three-dimensional edge, Texture and color (material), Composition of architectural elements (formulation), and The proportion and balance of one part to another (height of new and old buildings). The final result will be summed up in contrasting properties - symmetrical or dynamic - proactive properties, which refer to discussion **2.2. Characters of mass**. The response of each sample to the cultural heritage building is displayed in the form of an original floor plan image. The existing sample responses are then linked to the conservation buildings (building A and the Multipurpose building) and the transition area of the two buildings. The final result is in the form of alternative conservation activities that can be applied to developing cultural heritage buildings to produce a clear connection. Details of the testing process for the final results of conservation activities will refer to the discussion criteria **2.3. Conservation Response**. All test samples will be analyzed at points **4.2.1 Analysis of sample 1** to **4.2.8 Analysis of sample 8** as follows:

4.2.1. Analysis of Sample 1

The transformation of mass consists of six segments: The base mass is in the form of a rectangular prism, then the first segment is reduced in the form of cutting the upper area of the middle side to the right side to produce an indentation resembling the shape of the letter L; The reduction of the second segment in the form of an indentation was previously cut in the middle area to leave two rectangular prism masses on both sides; The addition of segment one in the form of procurement of a new form in the rear area; Reduction of the third segment in the form of giving a left mass pattern in the middle area of the bottom side; Reduction of the fourth segment in the form of giving a circular pattern on the three parts of the mass (bottom, middle, and top); The final shape is juxtaposed with the conservation building (figure 4, point a). Characteristics of mass are resulting: The surface of the front area is two rectangular planes with different heights; The edges of the three-dimensional corners are symmetrical and firm; Application of texture and color using reinforced concrete, light brick, and tempered glass with a combination of neutral (white) paint finish; The composition of the new form is composed of the right and left masses, the criteria for the right mass are typical or solid masses, while the left mass has two variations in the form of a vertical solid mass arrangement with a combination of three gaped transition masses (bottom, middle, and top sides); The proportions will be assessed based on the three constituent masses present in the composition of the new form. The three masses have a ratio of 1:1.5:3, so the final proportion obtained is that the mass of heritage buildings as a comparison mass is lower than the mass on the right and left sides, and the mass balance

has different heights (figure 4, point b). The final sample's response to heritage buildings is in the form of conservation activities with the type of use (no significant restoration, in other words, the old building is maintained). The effort to utilize building A is the proposed new function as a temporary exhibition area and reception area (lobby, ticketing, and media center). Meanwhile, the Multipurpose building was proposed as a conference room. The side between building A and the Multipurpose building is an open space and accessibility (figure 4, point c).

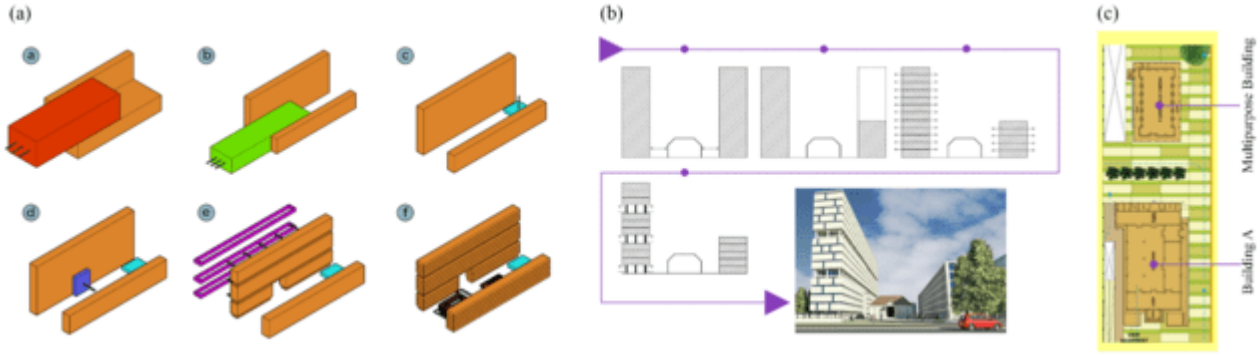

Fig 4. Analysis of the mass applied by the participants of the competition to 'developing the National Gallery of Indonesia in 2013'. (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to cultural heritage buildings and proposed conservation activities.
Source: The sample was taken from Pratiwi, 2013 (reprocessed, 2022)

4.2.2. Analysis of Sample 2

The transformation of the mass consists of six segments: The base mass is in the form of a rectangular prism, then the first segment is reduced in the form of a thin cut on the middle side, leaving two limiting masses on both sides; Reduction of the second segment in the form of cutting the middle side to produce a prism mass parallel on both sides; The third-segment reduction is in the form of cutting the mass parallel on both sides so that it leaves a one-third ellipse pattern; Changes in the dimensions of the first segment in the form of transforming the shape of the mass of one-third of the ellipse inward with a specific proportion arrangement, to produce a stepped base mass form; The addition of segment one is in the form of providing two transverse rectangular prism shapes, which are placed in the middle area and the back area of the upper side; The final shape is juxtaposed with the conservation building (figure 5, point a). Characteristics of mass are resulting: The surface of the front area is a square which is then transformed by the presence of curved sections of the top side to the bottom side at opposite angles, then this shape is mirror-copied to create two typical and parallel planes; Three-dimensional corner edges create dynamic shapes resembling one-third of the plane of an ellipse; Application of textures and colors using exposed pre-cast concrete, steel frames, and tempered glass with natural landscape color finishing, namely green (not included in neutral colors, then the nature of the color is the contrast); The composition of the new form consists of two typical longitudinal masses on both sides and two transverse masses on the middle and rear sides of the conservation building; The proportions will be judged based on the four constituent masses present in the composition of the new forms. The four masses have a ratio of 1:1:2 or 1:1:1:1:2 (the comparison of the extended version), so that the final proportion obtained is the mass of heritage buildings parallel to the mass of both sides and the mass of the cross-section of the middle area, while the mass of the rear cross is twice higher than the heritage buildings (figure 5, point b). The final sample response to heritage buildings is restoration (type of treatment is rehabilitation) and development activities (type of treatment is revitalization). Restoration activities are limited to making changes to additional buildings in the rear area, which are then transformed parallel in size and width with building A. Building A development activities are elaborating important values by not making significant changes but making spatial layout arrangements to improve aspects economic and social. The arrangement is in the form of making building A the main reception area (lobby, ticketing, information center, and souvenir shop). The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of demolishing the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the critical value of the Multipurpose building). Development activities in the form of structuring the layout into a conference and seminar area. The side between building A and the Multipurpose building is undergoing development in the form of adding a new form, which will function as a space for connecting left and right masses in the upper area, as well as a direct transition space between heritage buildings at the bottom (figure 5, point c).

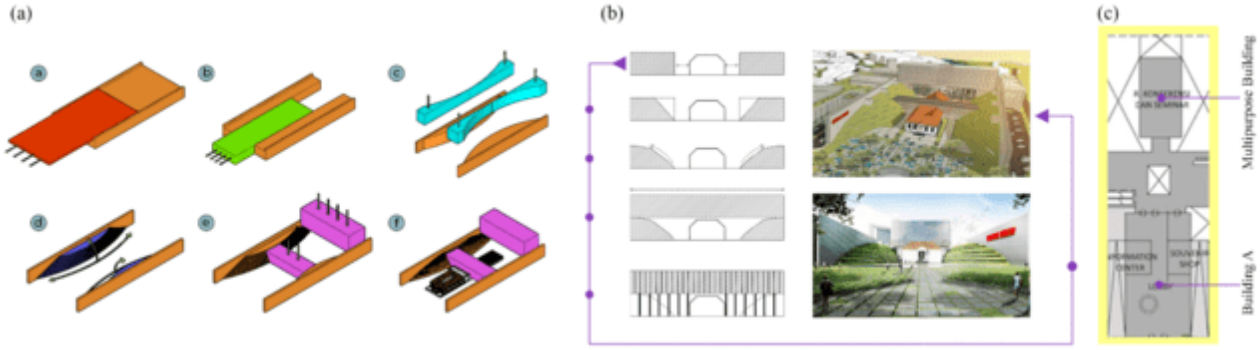

Fig 5. Analysis of the mass applied by the first winner of the competition to 'developing the National Gallery of Indonesia in 2013'. (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from the youtube channel of the Jakarta Architects Association, 2013 (reprocessed, 2022)

4.2.3. Analysis of Sample 3

The transformation of the mass consists of five segments: The base mass is in the form of a rectangular prism, then the first segment is reduced in the form of cutting the mass of the upper area in a hierarchical pattern, resulting in an up-and-down mass; The reduction of the

second segment is in the form of cutting the middle area of the intermediate side, resulting in a space in the transition area; The reduction of the third segment in the form of periodic cuts in the mass of the front side, the right and left transition mass of the middle area, the transition mass of the left side of the back area, and the cutting of the high mass of the right side of the back area; Reduction of the fourth segment in the form of cutting the front and middle areas of the high mass across the bottom side; Form the final mass juxtaposed with the conservation building mass (figure 6, point a). Characteristics of mass are resulting: The surface area of the front area, is rectangular (additional mass is proposed across the front area of the heritage building). The rectangular field is then transformed to form an access space in the middle area of the lower side (this space is linear with building A). Three-dimensional corner edges create symmetrical and defined shapes; Application of texture and color using a combination of aluminum lattice and pre-cast concrete as well as neutral-colored paint finishing (white and gray); The composition of the new form is composed of three transverse forms and two longitudinal forms. The transverse shape is placed in the front area of building A, the transition area of building A and the Multipurpose building, and the back area of the Multipurpose building. While the elongated shape is placed on both the left and right sides of the heritage buildings, The proportions will be judged based on the five constituent masses present in the composition of the new form. The five masses have a ratio of 1:2:2.5 or 1:1:1:2:2:2:2.5 (the comparison of the extended version), so the final proportion obtained is that the mass of heritage buildings is parallel to the masses of both sides, the cross-sectional mass of the front and center areas has ratio is twice the height of heritage buildings, and the cross-sectional mass of the rear area is two and a half times higher than the mass of the heritage buildings (figure 6, point b). The response of the final sample to heritage buildings is in the form of restoration activities (type of treatment is rehabilitation and restoration) and development activity (type of treatment is revitalization). The restoration activity is the restoration of the condition of building A in accordance with the colonial house period (returning building A to its original form, which was designated as a heritage building). Building A development activities are elaborating on important values by not making significant changes but structuring the spatial layout to improve social aspects. The arrangement is in the form of building A, a reception area (lobby, ticketing, information center) and a temporary exhibition. The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of the demolition of the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the important value of the Multipurpose building). Development activities in the form of structuring the layout into a permanent exhibition lobby area. The side between building A and the Multipurpose building is undergoing development in the form of adding a new form (mass across the middle area), which will function as a temporary exhibition, hall, prayer room, and toilet (figure 6, point c).

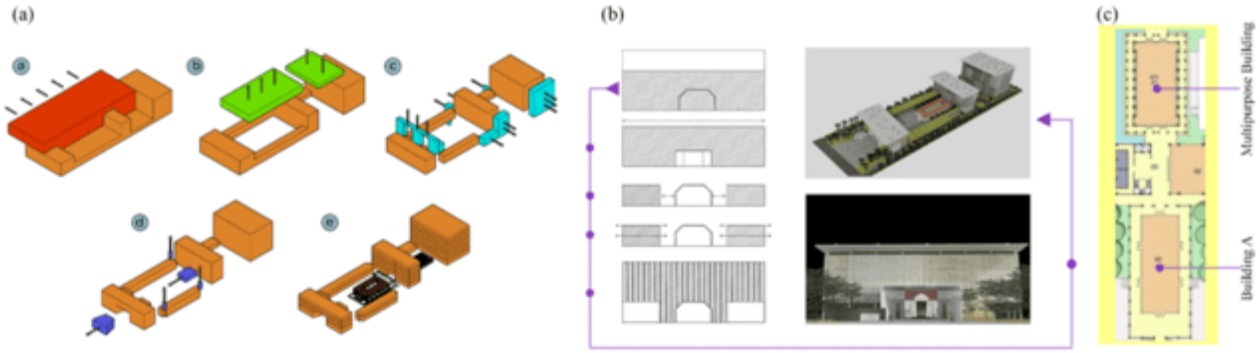

Fig 6. Analysis of the mass applied by the second winner of the competition to 'developing the National Gallery of Indonesia in 2013', (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from the youtube channel of the Jakarta Architects Association, 2013 (reprocessed, 2022)

4.2.4. Analysis of Sample 4

The transformation of the mass consists of five segments: The base mass is in the form of a rectangular prism, then one segment is reduced by cutting the shape from the front to the back of the upper area, leaving a transverse mass in the back area; The reduction of the second segment is a cut in the middle to the back area and produces three base-forming masses on both the parallel side and the top side of the back area; Reduction of the third segment in the form of cutting the shape on the middle side and the side between the back area of the elongated mass with the high mass, to produce a separate mass shape; Reduction of the four-segment on both sides in the mass of the lower area, resulting in a lobby space; Form the final mass juxtaposed with the conservation building mass (figure 7, point a). Characteristics of mass are resulting: The surface of the front area is a rectangle arranged vertically on both sides of the mass. The rectangular plane is then transformed to form a typical square plane on both sides. Three-dimensional corner edges create symmetrical and defined shapes; The application of texture and color uses pre-cast concrete and tempered glass as well as a neutral (white) paint finish. The composition of the new forms is composed of two typical elongated shapes and one transverse form. The elongated shape is placed on the left and right sides of the heritage building, as well as a transverse shape on the upper side of the back area of the Multipurpose building; The proportions will be assessed based on the three constituent masses present in the composition of the new form. The three masses have a ratio of 1:2:4 or 1:2:2:4 (the comparison of the extended version), so the final proportion obtained is that the mass on the left and right sides is twice as high as the mass of the heritage building, and the cross-sectional mass of the rear area is four. Times higher than the mass of the heritage building (figure 6, point b). The response of the final sample to heritage buildings is in the form of restoration activities (type of treatment is rehabilitation and restoration) and development activity (type of treatment is revitalization). The restoration activity is the restoration of the condition of building A in accordance with the colonial house period (returning building A to its original form, which was designated as a heritage building). Building A development activities are elaborating important values by not making significant changes but structuring the layout of the space so as to improve social aspects. The arrangement is in the form of making building A a reception area (lobby, ticketing, receptionist, media center) and temporary exhibition (four-dimensional visual arts performances). The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of the demolition of the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the important value of the Multipurpose building). Development activities in the form of structuring the layout into a conference area. The side between building A and the Multipurpose building is used as an open space (plaza water fountain) and accessibility (figure 7, point c).

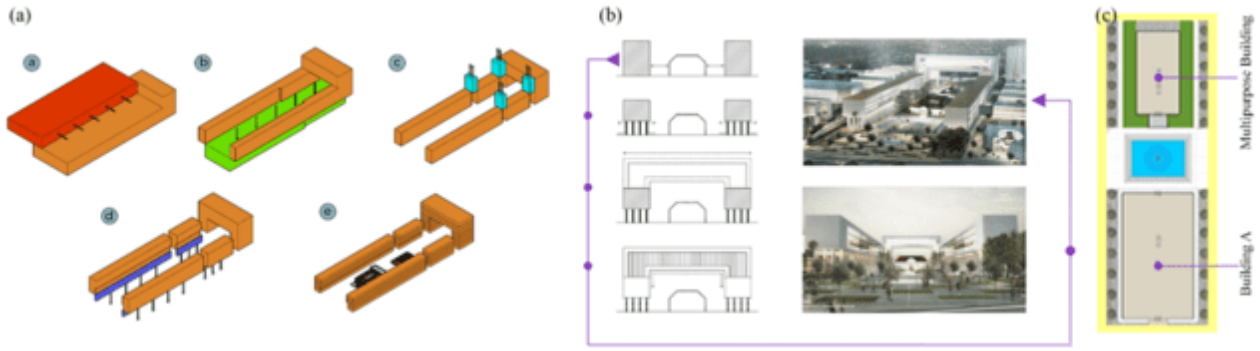

Fig 7. Analysis of the mass applied by the third winner of the competition to 'developing the National Gallery of Indonesia in 2013', (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from the youtube channel of the Jakarta Architects Association, 2013 (reprocessed, 2022)

4.2.5. Analysis of sample 5

The transformation of the mass consists of five segments: The basic shape is a rectangular prism, then one segment is reduced in the form of cutting the shape in the middle area, resulting in a flat shape; Reducing the second segment in the form of cutting the shape on the left side of the front area and the middle side of the back area; The reduction of the third segment is in the form of cutting on the left side and the middle side, resulting in a transition space; Then the previous shape undergoes a configuration of shape and changes in the dimensions of the first segment simultaneously to produce a circular mass with irregular steps with a space in the middle; Form the final mass juxtaposed with the conservation building mass (figure 8, point a). Characteristics of mass are resulting: The surface of the front area is a horizontally arranged rectangle. The rectangular field is then transformed to form a stepped field. Three-dimensional corner edges create dynamic and irregular shapes; Application of texture and color using pre-cast concrete and natural landscape color paint finishing, namely green (not included in the neutral color, so the nature of the color is the contrast). The composition of the new form is composed of two typical longitudinal shapes and two transverse shapes. The elongated shapes are placed on the left and right sides of the heritage building, and two transverse shapes are located in the front area of the A building and the back area of the Multipurpose building. The final form of these four masses, combined with each other so as to form an irregular combination of mass steps; The proportions will be judged based on the four constituent masses present in the composition of the new form. The four masses have a ratio of 1:1.25 or 1:1.25:1.25:1.25:1.25 (the comparison of the extended version), so the final proportion obtained is the four combined masses 1.25 times higher than the mass of the heritage building (figure 7, point b). The response of the final sample to heritage is in the form of restoration activities (type of treatment is rehabilitation and restoration) and development activity (type of treatment is revitalization). The restoration activity is the restoration of the condition of building A in accordance with the colonial house period (returning building A to its original form, which was designated as a heritage building). Building A development activities are elaborating on important values by not making significant changes but structuring the spatial layout to improve social aspects. The arrangement is in the form of making building A a permanent exhibition area. The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of the demolition of the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the critical value of the Multipurpose building). Development activities in the form of structuring the layout into a multipurpose area. The side between building A and the Multipurpose building is used as an infiltration area or water fountain (figure 8, point c).

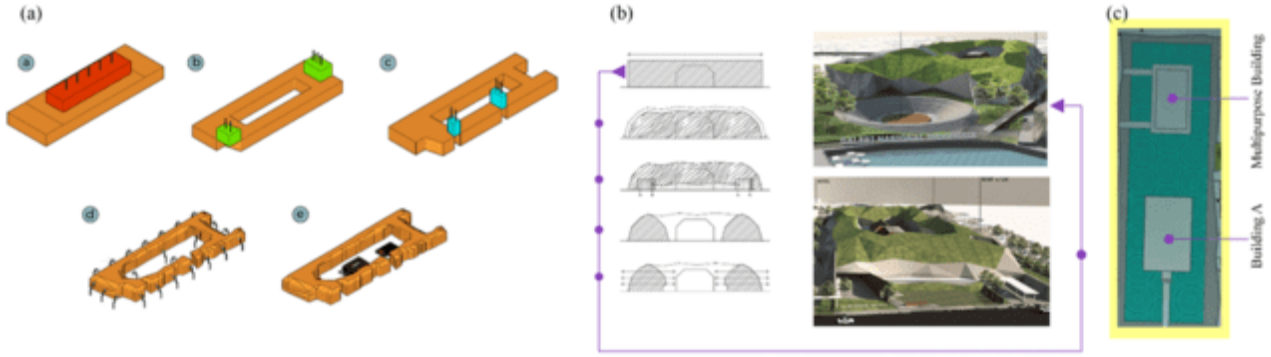

Fig 8. Analysis of the mass applied by the citation winner of the competition to 'developing the National Gallery of Indonesia in 2013', (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from the youtube channel of the Jakarta Architects Association, 2013 (reprocessed, 2022)

4.2.6. Analysis of sample 6

The transformation of the mass consists of five segments: The basic shape is a rectangular prism, then one segment is reduced by cutting the middle area, resulting in an elongated mass on both sides; The subtraction of the second segment is in the form of cutting the shape on the side mass parallel to the center area, resulting in four base masses; The reduction of the third segment is in the form of periodic cuts in the mass of the sides parallel to the bottom and top areas, leaving the middle area; The addition of segment one is in the form of providing a new mass in the form of a shield in each area over the mass of the parallel sides; Form the final mass juxtaposed with the conservation building mass (figure 9, point a). Characteristics of mass are resulting: The surface of the front area is two rectangular planes arranged vertically. The rectangular field is then transformed to form small squares in the middle area and two rectangular areas in the top and bottom areas. Three-dimensional corner edges create dynamic and bold shapes; The application of texture and color uses a combination of aluminum grating, pre-cast concrete, and neutral-colored paint finishes (white and gray). The composition of the new shape consists of two

typical shapes extending the front area and two typical shapes extending the back area. The placement of the four typical shapes are on the right and left sides of the heritage building, respectively; The proportions will be judged based on the four constituent masses present in the composition of the new form. The four masses have a ratio of 1:2 or 1:2:2:2:2 (comparison of the long version), so the final proportion obtained is that the four constituent masses are two times higher than the mass of the heritage building (figure 8, middle side, point b). The response of the final sample to heritage is in the form of restoration activities (type of treatment is rehabilitation and restoration) and development activity (type of treatment is revitalization). The restoration activity is the restoration of the condition of building A following the colonial house period (returning building A to its original form, which was designated as heritage). Building A development activities are elaborating important values by not making significant changes but structuring the layout of the space to improve social aspects. The arrangement is in the form of making building A a conference area, media center, and resource lobby. The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of the demolition of the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the critical value of the multipurpose building). Development activities include structuring the layout into a studio or workshop. The side between building A and the Multipurpose building is an open space (plaza water fountain) and accessibility (figure 9, point c).

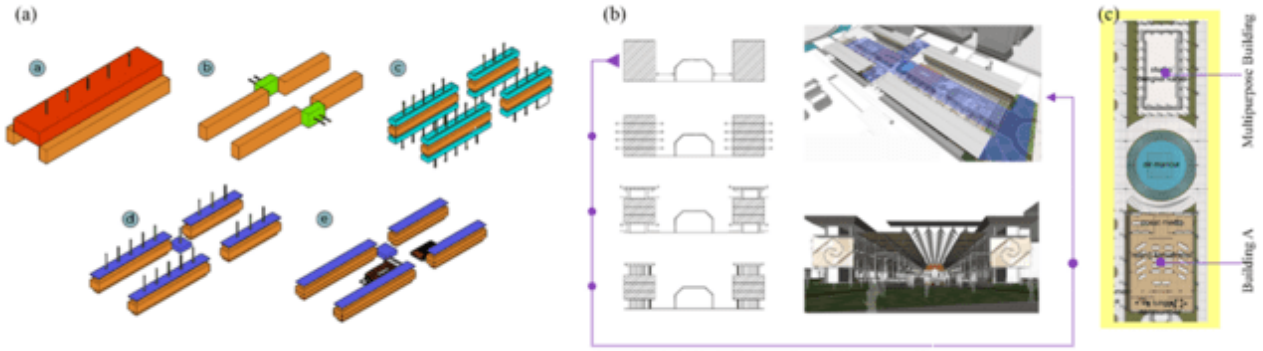

Fig. 9: Analysis of the mass applied by the top 10 categories of the competition to 'developing the National Gallery of Indonesia in 2013', (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from Rachmaputra coroflot website, 2014 (reprocessed, 2022)

4.2.7. Analysis of Sample 7

The transformation of mass consists of six segments: The basic shape is a rectangular prism, then the first segment is reduced in the form of cutting the top side of the front to the back area by leaving a high mass in the back area; The reduction of the second segment is in the form of cutting in the middle area and the side between the back area, resulting in three separate basic shapes, namely high mass and elongated mass on both sides; Furthermore, the mass of the two sides underwent a segment one configuration in the form of a mass transformation parallel to the front area which was tilted by 38 degrees to the left side, the mass pile under the oblique pile was cut parallel to the heritage building, and was used as the starting point of the oblique angle; Three-segment reduction is in the form of cutting in the center area of the parallel sides, resulting in a transition space; The addition of the first segment is in the form of providing two shield shapes placed on both sides and a semicircular mass configuration in the intermediate area; Form the final mass juxtaposed with the conservation building mass (figure 10, point a). Characteristics of mass are resulting: The surface of the front area is two rectangular planes arranged vertically. Rectangular fields are then transformed to form small fields (rectangles and arch shapes). Three-dimensional corner edges create dynamic and bold shapes; The application of texture and color uses a combination of aluminum grating, pre-cast concrete, and neutral-colored paint finishes (white and gray). The composition of the new form is composed of a 38-degree oblique shape, and the right side is advanced 25 meters from the heritage building, a 38-degree oblique shape on the left is 8 meters forward from the heritage building, two typical masses extending the middle area, one connecting mass to the middle area, a piece of a third circle shape. And a back area rectangle. The final result is that the constituent mass consists of symmetrical and dynamic shapes with similar heights; The proportions will be judged based on the six constituent masses present in the composition of the new form. To mass has a ratio of 1:2:4 or 1:2:2:2:2:2:4 (comparison of the extended version), so the final proportion obtained is that the seven constituent masses are twice as high as the mass of the heritage building (Fig. 8, point b). The final sample's response to heritage is in the form of restoration activities (type of treatment is rehabilitation and restoration) and development activities (type of treatment is revitalization). The restoration activity is the restoration of the condition of building A following the colonial house period (returning building A to its original form, which was designated as a heritage building). Building A development activities are elaborating on important values by not making significant changes but structuring the layout of the space to improve social aspects. The arrangement is in the form of making building A a permanent exhibition. The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of the demolition of the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the critical value of the multipurpose building). Development activities in the form of structuring the layout into a multipurpose room. The side between building A and the Multipurpose building is used as an open space (sculpture park) and accessibility (figure 10, point c).

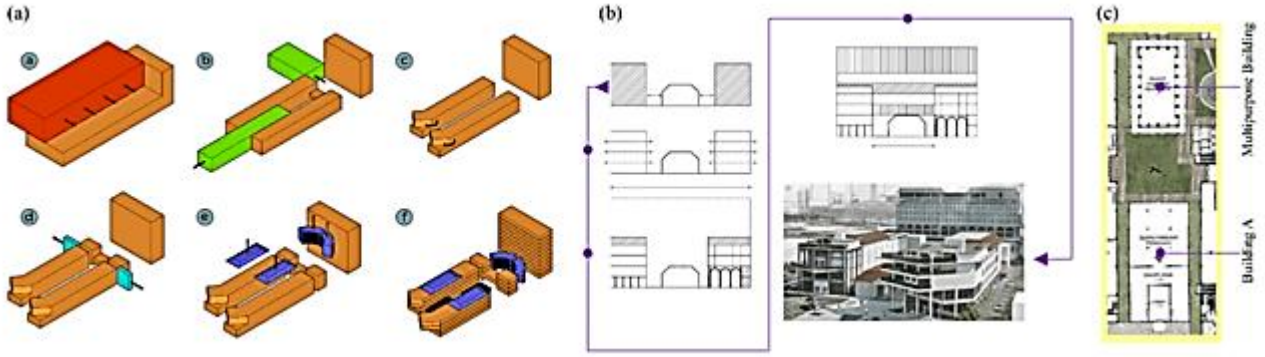

Fig 10. Analysis of the mass applied by final project students 2021 of the competition to 'developing the National Gallery of Indonesia in 2013', (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from Widanti, 2021 (reprocessed, 2022)

4.2.8. Analysis of Sample 8

The transformation of the mass consists of five segments: The basic shape is a rectangular prism, then the first segment is reduced in the form of cutting the top side of the front and middle areas, leaving mass in the back area; Reduction of the second segment in the form of cutting in the middle area, resulting in a new mass on both sides; Three-segment reduction in the form of cutting the middle area on both parallel sides; Reduction of the fourth segment in the form of cutting in the back area with a stepped pattern; The final mass form juxtaposed with the conservation building mass (figure 11, point a). Characteristics of mass are resulting: The surface of the front area is a rectangle arranged vertically on both sides of the mass. The rectangular plane is then transformed to form a typical square plane on both sides. The three-dimensional corner edges create a dynamic shape (there are curved corners due to the secondary facade sheathing); The application of texture and color uses a combination of aluminum grating, pre-cast concrete (facade structure), and tempered glass as well as a neutral colored paint finish (white). The composition of the new form is composed of two typical elongated shapes and one transverse shape. The elongated shape is placed on the left and right sides of the heritage building, as well as a transverse shape on the upper side of the back area of the Multipurpose building; The proportions will be judged based on the three constituent masses present in the composition of the new form. The three masses have a ratio of 1:1.5:3 or 1:1.5:1.5:3 (the comparison of the extended version), so the final proportion obtained is that the mass of both sides is twice as high as the mass of the heritage building, and the cross-sectional mass of the rear area is four times higher. Of the mass of the heritage building (figure 11, point b). The final sample response to heritage is in the form of restoration activities (type of treatment is rehabilitation and restoration) and development activities (type of treatment is revitalization). The restoration activity is the restoration of the condition of building A in accordance with the colonial house period (returning building A to its original form, which was designated as heritage). Building A development activities are elaborating on important values by not making significant changes but structuring the layout of the space to improve social aspects. The arrangement is in the form of making the building A permanent exhibition. The Multipurpose building is undergoing renovation and renovation. The restoration activity was in the form of demolishing the additional mass of the back lobby area, which functioned as a toilet (no impact on the destruction of the critical value of the Multipurpose building). Development activities in the form of structuring the layout into a multipurpose room. The side between building A and the Multipurpose building is used as an open space (plaza water fountain) and accessibility (figure 11, point c).

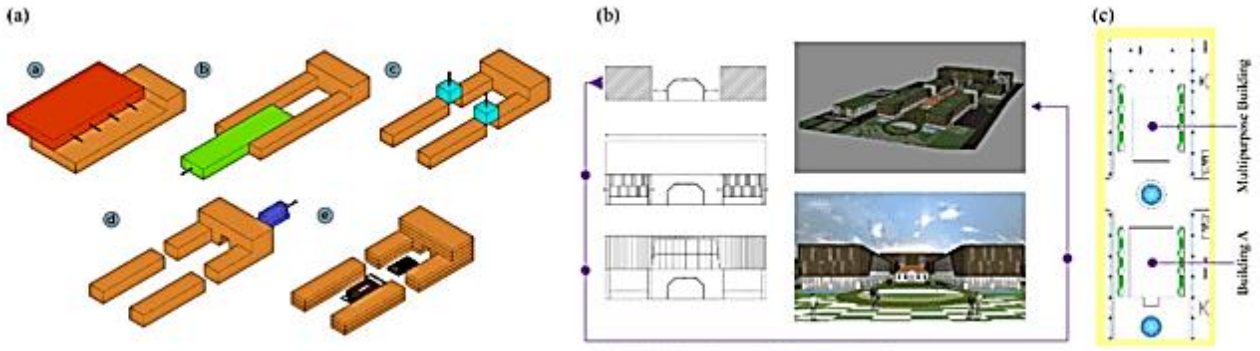

Fig 11. Analysis of the mass applied by final project students 2014 of the competition to 'developing the National Gallery of Indonesia in 2013', (a) Identification of the transformation process of mass form, (b) Identification of mass character assessed from two-dimensional and three-dimensional fields, and (c) Identification of the final form response to the protected building proposed cultural and conservation activities.
Source: The sample was taken from Rachmaputra, 2014 (reprocessed, 2022)

3.4. Recapitulation and Analysis of Sample Results

Analysis of the sample results in the form of collecting responses that have been studied previously, then grouped into a table. In table 1, there are four groups of samples, namely the name of the sample, the transformation of the shape, the character of the mass, and the response of the new mass to the heritage buildings. The shape transformation is juxtaposed with the elongated tread condition and the application of the base mass in the form of a rectangular prism. The results to be obtained are in the form of the extent to which changes in the shape of the new National Gallery of Indonesia buildings can be carried out. The mass character is related to the suitability of new buildings and old buildings by identifying the surface of the front area, the edges of three-dimensional corners, the application of texture and color, the composition of new shapes, and the resulting proportions. The final result that will be obtained is in the form of consideration of the principles of contrast, balance, and the rhythm of the new building in the proposed mass development of the National Gallery. The response of the final sample to the heritage building is illustrated using the heritage buildings building for the proposed building. The final

result that will be obtained is in the form of several alternative conservation activities that can be carried out in the National Gallery of Indonesia's development building.

Table 1. Table of mass transformation analysis, mass characters, and final mass response to cultural heritage buildings

No.	Samples and results	Mass transformation	Mass characters	Final mass response to cultural heritage buildings
1	Analysis of sample 1	The base mass is a rectangular prism; the number of reducing the shape is four times, and the addition of the shape is one time, the comparison of the final mass with the conservation building.	A rectangular area with different heights, symmetrical and firm, neutral in color (white), with an imbalance of right and left constituent masses, a height ratio of 1:1.5:3, with 1 being the height of building A (consisting of two constituent masses).	Building A and the Multipurpose building is a conservation activity with the type of utilization (no significant renovation, in other words, the old building is maintained), and the intermediate side is used as an open space (sculpture park) and accessibility.
2	Analysis of sample 2	The base mass is a rectangular prism; the number of reducing the shape is three times, adding the shape one time, and changing the dimensions of the shape one time, comparing the final mass with the conservation building.	The initial plane is a typical square which is transformed by a diagonal cutting of the corners of the top to the bottom, dynamic and regular shapes (patterns of shapes resembling a third of an ellipse), contrast (landscape colors), right and left mass balance and high mass of the back area as background, the height ratio is 1:1:1:1:2, where 1 is the height of building A (consisting of four constituent masses).	In building A in the form of restoration activities (the type of handling is rehabilitation) and development activities (the type of handling is revitalization), the Multipurpose building is in the form of restoration and development activities. The Intermediate side is experiencing the development of the addition of a new form (mass across the middle area). The Intermediate side is experiencing development by adding a new shape, which will function as a space for connecting left and right masses in the upper area and a direct transition space between heritage building at the bottom.
3	Analysis of sample 3	The base mass is a rectangular prism, the number of reduced shapes is four times, and the final mass is compared with the conservation building.	A rectangular area (additional mass is proposed across the front area of the heritage building), symmetrical and firm shape, neutral colors (white and gray), right and left mass balance and two high masses of the rear area as a background, height ratio 1:1:1:2:2:2.5, where 1 is the height of building A (consisting of five constituent masses).	In building A in the form of restoration activities (type of handling is rehabilitation and restoration) and development activities (type of handling is revitalization), the Multipurpose building is in the form of restoration and development activities, and the Intermediate side is experiencing the development of adding a new form (mass across the middle area), which will function as a temporary exhibition, hall, prayer room, and toilet.
4	Analysis of sample 4	The base mass is a rectangular prism, the number of reduced shapes is four times, and the final mass is compared with the conservation building.	A rectangular area arranged vertically on both sides of the mass, symmetrical and firm shape, neutral in color (white), right and left mass balance and one mass height of the back area as a background, height ratio 1:2:2:4, with 1 being the height building A (consisting of three constituent masses).	In building A in the form of restoration activities (the type of handling is rehabilitation and restoration) and development activities (the type of handling is revitalization), the Multipurpose building is in the form of restoration and development activities, and the intermediate side is used as an open space (plaza water fountain) and accessibility.
5	Analysis of sample 5	The base mass is a rectangular prism, the number of reductions is three times, the dimension changes are one time, the shape configuration is one time, and the final mass is compared with the conservation building.	Horizontally arranged rectangular fields (transformed to form terraced fields), dynamic and irregular shapes (stepped shape patterns), contrast (landscape colors), the balance of all masses (right, left, front, and back), comparison height 1:1.25:1.25:1.25:1.25, where 1 is the height of building A (consisting of four constituent masses).	In building A, in the form of restoration activities (the type of handling is rehabilitation and restoration) and development activities (the type of handling is revitalization), the Multipurpose building is in the form of restoration and development activities, the intermediate side is used as an open space area, or water fountain and accessibility.
6	Analysis of sample 6	The base mass is a rectangular prism, the number of reducing the shape is four times, and the addition of the shape is one time, comparing the final mass	Two vertically arranged rectangular fields, dynamic and firm, neutral in color (white and gray), right and left mass balance, height ratio 1:2:2:2:2:2, where 1 is the height of building A (consisting of of the four constituent masses).	In building A in the form of restoration activities (the type of treatment is rehabilitation and restoration) and development activities (the type of handling is revitalization), the Multipurpose building is in the form of restoration and development activities, and the

		with the conservation building.		intermediate side is used as an open space (plaza water fountain) and accessibility.
7	Analysis of sample 7	The base mass is a rectangular prism, the number of reduced shapes is three times, the shape is added one time, and the shape configuration is one time, the final mass compared with the conservation building.	Two vertically arranged rectangular fields, dynamic and firm shape, neutral colors (white and gray), right and left mass balance and high mass of the back area as background, height ratio 1:2:2:2:2:2:4, where 1 is the height of building A (consisting of seven constituent masses).	In building A in the form of restoration activities (the type of handling is rehabilitation and restoration) and development activities (the type of handling is revitalization), the Multipurpose building is in the form of restoration and development activities, and the Intermediate side is used as an open space (sculpture park) and accessibility.
8	Analysis of sample 8	The base mass is a rectangular prism, the number of reduced shapes is four times, and the final mass is compared with the conservation building.	A rectangular plane arranged vertically on both sides of the mass (transformed to form a typical square plane on both sides), dynamic and regular shape (there are curved angles due to the secondary skin facade), neutral color (white), right and left mass balance and mass the height of the rear area as a background, the ratio of heights is 1:1.5:1.5:3, with 1 being the height of building A (consisting of seven constituent masses).	In building A, in the form of restoration activities (the type of treatment is rehabilitation and restoration) and development activities (the type of handling is revitalization), the Multipurpose building is in the form of restoration and development, and the intermediate side is used as an open space (plaza water fountain) and accessibility.

The mass transformation process is determined by the distribution of the basic shapes of the eight samples, where the base shape chosen is a rectangular prism. This equation of form is expected to provide an objective assessment because the selection of the basic shape has been considered for its suitability with the elongated footprint typology in consideration of the conservation building in the middle. The number of transformations that occur is as follows: (1) Eight samples each require an effort to reduce the shape; (2) Four samples used the addition of shapes, namely samples one, two, six, and seven; (3) Two samples used shape configurations, namely samples five and seven; and (4) Two samples using dimensional changes, namely samples two and five. The tentative conclusion is that although the shape reduction process is more dominant than other shape changes, the four mass transformations can still be applied to the new mass proposal process in the National Gallery of Indonesia development site plan. The results of the final transformation then undergo a further identification process in the form of juxtaposing the suitability of the new and old building masses through a process of analyzing the mass character and the conservation response proposed by the new building in a limited manner or according to the context of the discussion.

The characteristics of the mass obtained are as follows: (1) The surface of the front area is preceded by a rectangular (seven samples) and square (one sample); (2) Three-dimensional assessment of corner edges obtained symmetrical and firm shapes (three samples), dynamic and regular shapes (two samples), dynamic and firm shapes (two samples), and dynamic and irregular shapes (one sample); (3) The application of texture and color is the use of neutral colors, namely white (three samples), the use of neutral colors, namely white and gray (three samples), the use of contrasting colors, namely landscape colors (two samples); (4) The components of the new form are right and left mass imbalances (one sample), right and left mass balances (two samples), and right and left mass balances and high mass of the back area as a background (five samples); and (5) The proportion of the old building with the mass of the new building is divided into two, namely the longitudinal mass form on both sides (right and left) and the transverse mass (front, middle, and rear). The shape of the elongated mass on both sides has a proportion of 1: 1 (two samples), a proportion of 1: 1.5 (a total of one sample), a proportion of 1: 2 (a total of three samples), a proportion of 1: 2.5 (a total of one sample), and a proportion of 1: 1.5: 3 (one sample). Temporary conclusions on elongated mass with typical proportions (the ratio value written is only one, due to the same or typical shape) and parallel as many as seven samples, while the longitudinal mass with the proportion of height difference is one sample. The shape of the transverse mass, namely: in the front, middle, and back areas, has a proportion of 1: 2: 2: 2: 2.5 (one sample); the front and back areas have a proportion of 1: 2: 2 (one sample); The middle and back areas have a proportion of 1: 2: 2 (one sample), the middle and back areas have a 1: 1: 2 proportion (one sample), and the back area has a 1: 3 proportion (one sample), in the back area, has a proportion of 1: 4 (one sample), and a shape that has no transverse mass (two samples). The transverse mass placement in proportion has a reference of 1: 1: 2: 2.5: 4, so the provisional conclusion is that the proposed mass height scale has taken into account the mass height scale of the conservation building (building A). In terms of frequency, there are two types of cross-mass layouts in each of the two samples, meaning that the placement of transverse masses in the middle and rear areas is recommended to provide an objective assessment of the old building. However, the results of other mass placement conclusions can be applied if they have a clear concept and basis. The conclusions of the mass character obtained are: The surface of the rectangular plane is more dominant than the shape of the square plane, and the three-dimensional assessment of the edges of the corners is that symmetrical and firm properties are more dominant than the properties of other shapes (dynamic - regular, dynamic - firm, and dynamic - irregular); Application of texture and color with neutral criteria is more dominant than contrasting forms (following the color of the landscape); The shape component is dominated by a balanced mass arrangement rather than an unbalanced shape (height difference between the right and left sides), and it is possible for variations in the height of the transverse mass (especially on the middle and back sides); The ideal proportion is the average height of the proposed building mass using a ratio scale of 1:1 or multiples of the conservation building (building A).

Based on the results of the analysis of eight samples, the response of the final mass form to the conservation building (building A), namely: conservation by type of use (one sample); restoration and development activities (a total of seven samples). The response of the final mass form to the conservation building (multipurpose building), namely: conservation by utilization type (one sample); restoration and development activities (a total of seven samples). The response of the final mass form to the transitional space of the conservation building (the space between building A and the multipurpose building), namely: Utilization of the open space transition area (plaza water fountain) and accessibility (six samples); experienced the development of a new form of mass addition (two samples). The types of handling of conservation buildings are: In utilization activities in the form of maximizing the potential function of conservation buildings in the form of structuring new layouts; Restoration activities with the type of handling are rehabilitation and restoration; Development activities with the type of handling are revitalization.

5. Conclusion

The conclusion of the study of the transformation of the new form in the development of the design of the National Gallery of Indonesia uses the three criteria of the approach to the study of mass transformation, the character of the mass, and the final mass response to the conservation building, are as follows:

1 The results of the mass transformation of the eight samples that are likened to the processing of the base mass are rectangular prisms or beams with the criteria of an elongated tread shape, there is a sustainable building in the middle, and continuous orientation considerations produce the idea that the shape of the mass of the development building is still very free to be explored. The test proves that the use of the four changes in shape (change in dimensions, subtraction, addition, and configuration) is still relevant to be applied to the development plan for the National Gallery of Indonesia. The consideration of the eight study samples did not have both criteria (contrast properties - symmetrical or dynamic - proactive) at the same time, but the configuration forms of the four criteria;

2 The final conclusion of the mass character obtained, namely: The surface of the rectangular plane is more dominant than the shape of the square plane. The three-dimensional assessment of the edges of the corners is that symmetrical and firm properties are more dominant than the properties of other shapes (dynamic - regular, dynamic - firm, and dynamic - irregular); Application of texture and color with neutral criteria is more dominant than contrasting forms (following the color of the landscape); The shape component is dominated by a balanced mass arrangement rather than an unbalanced shape (height difference between the right and left sides), and it is possible for variations in the height of the transverse mass (especially on the middle and back sides); The ideal proportion is the average height of the proposed building mass using a ratio scale of 1: 1 or multiples of the conservation building (building A). The consideration of the form in the development building is the balance criterion because as many as seven samples use these elements;

3 The response of the mass of new buildings to the heritage building resulted in one sample not making any restoration efforts (but instead using function activities through spatial layout), one sample undergoing partial restoration (aligning or cutting excess mass on the right side of the annex building A in the rear area and demolition of additional mass). In the Multipurpose building), there were six samples carrying out a total restoration (removing or dismantling additional buildings in the rear area of building A and additional areas in the Multipurpose building). The efforts to utilize buildings that have been renovated are in the form of structuring spatial layouts, adding new building forms and functions or structuring open spaces in transition areas. Meanwhile, alternative conservation activities that have been carried out have yielded results, namely, conservation activities by type of utilization, restoration activities (types of handling are restoration and rehabilitation), and development activities (type of handling is revitalization). The consideration of the rhythm game is found in the principle of the height difference game resulting from the mass transformation process.

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