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Infill Architecture: Contextualizing Design in An Urban Setting

Febrianta Rahmat¹, Nensi Golda Yuli², Ilya Fadjar Maharika³

¹ Magister of Architecture, Universitas Islam Indonesia, Gedung M Natsir, Kampus Terpadu UII, Sleman, Yogyakarta, Indonesia

² Department of Architecture, Universitas Islam Indonesia, Gedung M Natsir, Kampus Terpadu UII, Sleman, Yogyakarta, Indonesia

³ Department, of Architecture, Universitas Islam Indonesia, Gedung M Natsir, Kampus Terpadu UII, Sleman, Yogyakarta, Indonesia

Correspondence: Nensi Golda Yuli. Email: nensi@uii.ac.id

Abstract

Contextuality is one of the main issues in urban architectural design. The addition of new non-context construction is likely to reduce the urbanized features. An infill design is needed as one of the maintenance strategies. This strategy is found to focus more on the heritage buildings unobserved in ordinary architecture. Therefore, this study aims to evaluate the contextualization of designs in an urban setting, using the infill architecture strategy. A semi-systematic literature review was used through the exploration of Google Scholar and ScienceDirect within the last five years, where 30 articles were found and analytically explored to determine the main elements and methods of infill architecture. The results showed that this strategy was based on material and details, form, scale, place, position, and usage. Besides the maintenance of contextuality, innovation was also observed through a creative combination of building elements and infill methods.

Keywords: Infill Architecture, Contextualism, Method, Elements

1. Introduction

Architectural contextuality is often a problem in urban area designs, due to being an approach to considering and responding to the situation and conditions of a specific location. This indicates that the building design is selectively connected to the cultural or physical context of the site. Furthermore, contextualism aims to create a unified dialogue of context components, concepts, and parts (Feisal, 2019). This is a reality every building needs to encounter when it occurs as a physical material, with the existing environment being considered a mediator of new designs (Ostanevics, 2017). Contextuality also emphasizes the ability of a building to seamlessly blend with its environment, as infill architecture is observed as one of the design strategies (Gaber and Akçay, 2020). Several previous studies have reportedly been carried out on this strategy, based on the application of infill at the building scale (Noorifard, Reza, and Mehdizadeh, 2020; Wang, Yang, Nyunn, and Azim, 2020). These focused on the

method of inserting new building components such as concrete and bricks, although did not essentially observe the regional context.

Despite the relationship of the present actual conditions to the application of infill on an urban scale, the consideration of area was still very crucial. This was due to its effect on the area contextuality and relationship to the infill process at the building scale. Some previous reports on an urban scale also explained the infill process in heritage building areas (Navickienė, 2017; Amirul, Zamri, and Abdullah, 2018; Parvizi, 2020), where the architectural strategy was observed based on the insertions of new designs, as well as elements and methods.

Until presently, most studies on an urban scale infill have highly focused on heritage area developments, with less evaluation of ordinary building. This proves that subsequent studies are needed to analyze many essential elements and methods of infill architecture, despite the present reflection of ordinary buildings on the area and as a historical buffer. Therefore, this study aims to assess various appropriate infill elements and methods, to observe the regional context in ordinary buildings.

1.1. The History of Infill Architecture

The infill architecture approach was initially proposed by the Dutch architect, N.J. Habraken, in 1962, where the separation between the building structure (support), as well as the strategy in designing and constructing residential houses, were explained (Bukit, Hanan, and Wibowo, 2012). This perspective was then developed on a wider scale based on the inclusion of the approach in urban areas, which was initially developed in 1976 at the Second United Nations Conference on Human Settlements (Habitat II) and formally defined by American real estate in 1979 (Pormousavi, Naser, and Shokouhi, 2014). Moreover, the theory was subsequently developed (Brolin, 1980), which explained the importance of the regional contextuality elements due to strengthening the characteristic values of an area (Wirawan, 2014). In the historical context, the application of infill architecture realized some design criteria, including scale, material and detailing, landscape, view and landmark, historical development, as well as urban structure, grain, density, and mix. These are expected to be a guide for designers and policymakers in the process of inserting new buildings (Warren, 1998). In the urban heritage environment, the use of visual and spatial characters of building elements is applied as a criterion for the success of infill application to the context (Soosani, 2013). Despite this application obtaining a responsive design in public buildings, a bond is still needed to unify the new and old structures (Alfirevic and Simonovic, 2015). Additionally, a design guideline for urban planning has presently been developed by the development commission, among the infill implementation in regional planning (Dillon, 2021).

1.2. The Definition of Infill Architecture

Many reports have reportedly defined infill architecture and its various contexts since the 1980s, indicating the significance of these insertions in vacant and scattered locations (Schultz, Marilyn, and Vivian, 1984), or focusing on the construction of new housing, workplaces, shops, and other facilities within existing urban or suburban areas. These developments contained several types, such as design rehabilitation or expansion, vacant land building, and reuse of underutilized sites, e.g., parking lots and old industrial areas (Wheeler, 2002). Infill also occurs within a largely developed area, based on the improvement in built-up, established, developing, and existing developed sites surrounded by older growth (Listokin et al, 2006). From several definitions, infill development was often applied to underdeveloped land, including unsuitable buildings, due to the location component. In the function component, this process was residentially or non-residentially directed for reconstruction or reuse, even in historical buildings. Therefore, this report is expected to subsequently observe the embodiment of these definitions, regarding the developmental elements and methods used in infill architecture.

1.3. The Elements and Methods of Infill Architecture

Based on the experts' perspectives, filler architectural elements were used as design criteria in the contextual development process. This showed that the new filling process elements at the heritage design urban scale are building, function, height, orientation, material, color, surface, proportion, opening, shape, scale, linear, plane, enclosure, style, and order (Feisal, 2019). It also proved that functional visually related buildings should be harmonious regarding elevation, ceiling line, mass size, structure scale, facade treatment, finishing materials,

openings, colors, and boundaries (Al Hasany, 2018). Furthermore, the infill process needs to consider the materials and details of the surrounding buildings based on elements, such as colour, shape, structure, texture, and opening directions (Alfirevic and Simonovic, 2015). To appropriately understand the original condition of the area, the scale, position, and function of the surrounding buildings, archaeology, and the existing environmental structures should also be necessarily considered, respectively. This led to the consideration of three infill approaches (Alfirevic and Simonovic, 2015), namely (1) the mimesis approach, which reflects or imitates visual effects and other neighboring object characteristics, (2) the association approach, where the infill building adapts to the features of a location by transferring or projecting the characteristics of the surrounding designs, and (3) the contrast approach, which uses the infill development design method by denying part or all the characteristics of the surrounding environment. This leads to the visual deviation of the new object from the pattern of the surrounding buildings, due to the possession of a harmonious impression.

Despite having different terms, other several approaches still had specific similarities, including (1) the literal replication approach, which imitated existing elements or shapes, (2) the intervention approach, where a new element is added to the character. This aims to apply similar specifications without imitating the surrounding character, to protect their suitability in an urban context, (3) the abstract reference approach, where a reference was provided to the old environment, accompanied by the historical elimination of replication or work, and (4) the intention opposition approach, which deliberately provided a different form due to consciously conflicting the context (Feisal, 2019). The new additions to the old context affecting the physical and non-physical aspects, hence the accepted approaches are urbanism, architecture, and preservation strategies (Gharebaglou, Nejad, Ahad, and Ardabilchi, 2019). This shows that an urbanism approach focuses on sustainable development regarding land use and facilities, to meet user needs. The completion of new developments is also more emphasized by the architectural strategy, confirming that the initial option is to preserve the existing style, as well as fill in and use a contemporary and neutral modern pattern as a unified method. Meanwhile, the preservation approach is developed by preserving or improving social, economic, and architectural aspects.

2. Methods

A semi-systematic literature review was used in this study, with the initial stage utilizing the keyword- Infill Architecture- in Google Scholar and ScienceDirect. This was conducted with the subject area of engineering between 2015 to 2021. To explore the history and main theory of infill architecture development, some literature was observed before 2015. This method was adopted from the systematic literature review of an adaptation study (Table 1), with the involved nine steps shown in Figure 1.

Table 1: Proposed components of a systematic review

Components	Strategy
Study question/aims	<ol style="list-style-type: none"> 1. The explicit aims and objectives of the review. 2. A clear description of the theoretical or conceptual approach used to guide the review.
Data source and document selection	<ol style="list-style-type: none"> 1. The justification and description of the literature source, as well as the consideration of bias from the selection medium. 2. The description of criteria for inclusion and exclusion. 3. The documentation of included and excluded literature.
Analysis and presentation of results	<ol style="list-style-type: none"> B. The description of analytical methods. C. The critical appraisal of information quality.

(Source: Pearce et al., 2012)

In Table 1, the systematic review steps focused on the strategy to explore related literature and summarized the literature through a critical appraisal of information quality. However, Figure 1 explicitly showed the technical steps involved in the systematic review. This observed the identification, screening, and eligibility, and included steps as the filtering process to obtain related and appropriate literature.

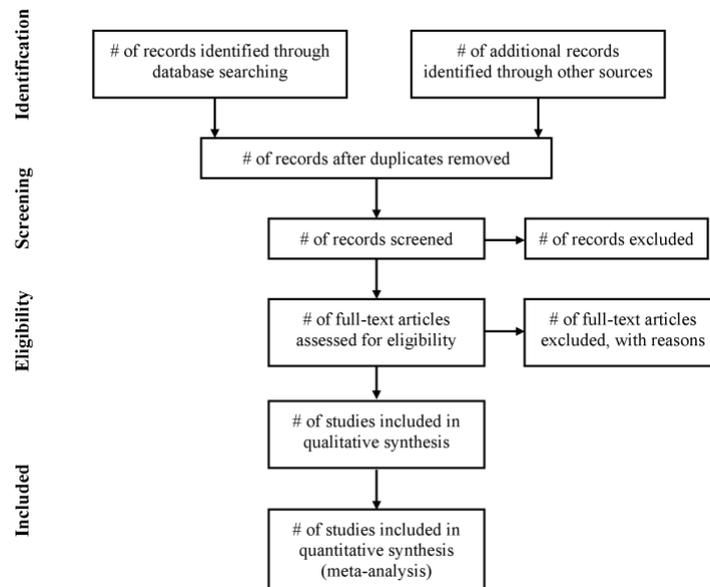


Figure 1: The flow of information through the different phases of a systematic review

(Source: Ansari and Moher, 2013)

This semi-systematic literature review method was designed in 5 stages while combining the Google Scholar and ScienceDirect exploration with basic theoretical concepts, as shown in Figure 2.

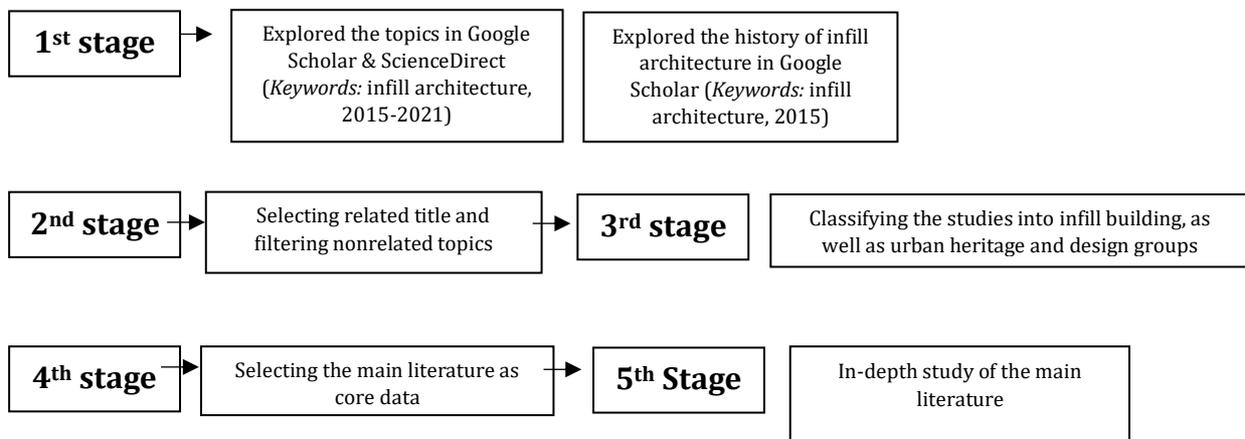


Figure 2: Study methodology

3. Results

Based on Figure 2, the first stage produced 16,400 and 58 articles through searches on Google Scholar and ScienceDirect, using the keyword and subject area, "Infill architecture and Engineering (2015-2021)", respectively. Meanwhile, 13 articles were obtained through Google Scholar regarding the searches related to the history of this theory before 2015, by directly referring to the author and/ or book title. In the second stage, the selection of titles through Google Scholar and ScienceDirect led to the acceptance of 16,400 and 58 articles, which were subsequently filtered for architectural studies to obtain 20 and 10 relevant studies, respectively.

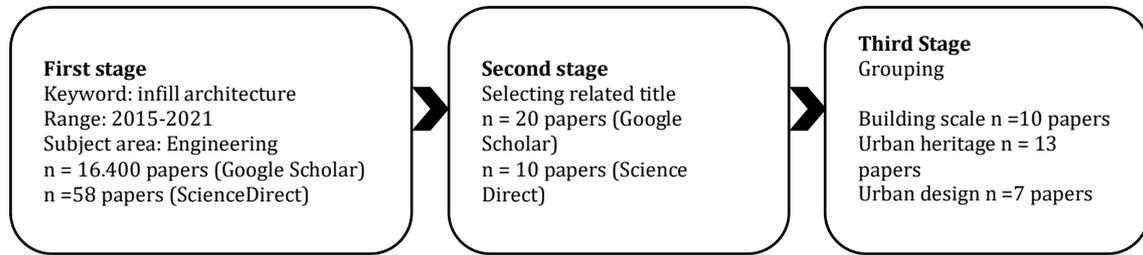


Figure 3: Article filtering for related infill architectural topic

According to the third stage, the obtained infill articles were grouped based on the building, as well as the urban heritage and general design scales, respectively. In this condition, the initial literature group highlighted those ten titles reviewed the application of infill at a building scale, with an analysis observed for the walls in structural modelling (Noorifard, Reza, and Mehdizadeh, 2020). Furthermore, the identification of Torsion was carried out in the final architectural design stage, by assessing the infilled frame in Chuan-dou. This is a traditional style widely found in rural China, with most of the partitions often utilizing wood as raw material (Tu et al, 2021). Another study analyzed the seismic behavior of the Chuan-dou frames filled with wood panels (Wang, Yang, Wang, and Iftikhar, 2021), to evaluate steel frames for infill walls. This subsequently explained the laboratory tests on two steel beam-to-column sub-assemblies with unsupported center column scenarios, namely truss (SF) and SLSW infill frame (IF).

Using 13 articles, the second group explained infill architecture at the urban heritage scale through specific evolution stages of conservation and heritage site development. This was subsequently carried out through the recommendations of new architectural elements, for integration into urban heritage sites (Navickienė, 2017). Besides this, other studies also focused on infill development theory by evaluating building structures and proposing a suitable design approach in heritage schools (Amirul, Zamri, and Abdullah, 2018). Despite these reports, subsequent architectural approaches were still analyzed with an interdisciplinary technique in an interactive framework, involving the architecture, urbanism, and restoration in Mashruteh Complex, Tabriz, Iran (Gharebaglou, Nejad, Ahad, and Ardabilchi, 2019). The interactive pattern of the filler design with legacy was also carried out by related infill studies (Feisal, 2019), with the main assessment based on the examples of the buildings inserted in heritage sites. Moreover, the third group contained seven articles presenting infill architecture results on a general urban design scale (Alfirevic and Simonovic S. 2015). This was carried out through the assessment of design ties among infilled buildings. It also observed the possibility of a filler approach through mimesis, association, and contrast techniques as new filling methods. One of the studies evaluating design guidelines which were conducted in Marion County, Indiana (Dillon, 2021). This described the guidelines for infill housing development, which were in line with adopted city policies such as smart growth, resilience, sustainability, and the use of existing infrastructure. For the urban facade variations, the combination of two architectural styles, sizes, scales, and openings, was observed as a reference for creating new building designs (Ali, 2021). Figure 4 shows the distribution of architectural infill topics from the obtained literature review.

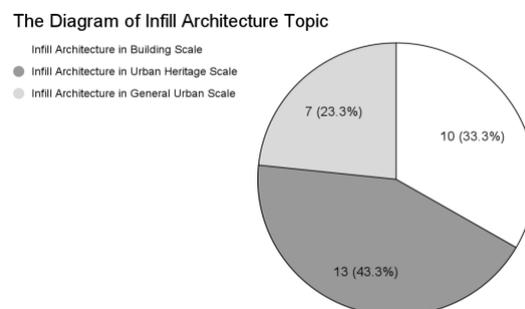


Figure 4: Infill architecture literatures findings diagram

In this condition, all thirty articles were used to analyze and classify the elements and method of infill architecture into three groups, namely building scale, as well as urban heritage and design.

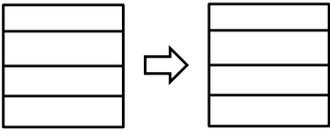
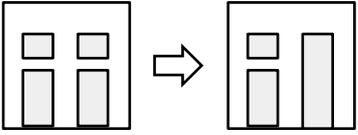
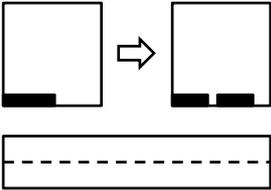
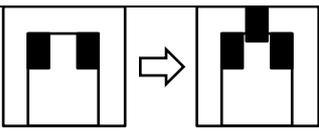
3.1. The Elements of Infill Architecture

Several experts explained the elements of infill architecture from a building to an urban scale, where the regional context was observed as an essential factor in determining the design basis for new developments. The following are the variables used to examine the elements of this architecture, based on the ordinary building urban scale.

3.1.1 Materials and details

These were used to observe some factors such as colour, texture, or material, in the application of infill architecture (Alfirevic and Simonovic, 2015). Besides that, openings/ air vents and decorations were also considered (Nasrollah, Ghafari, and Taheri, 2019). In a heritage environment, the use of different colors was often outstanding, although not easily applied in a general residential setting with numerous taste diversities. Despite the similar formation patterns, the use of textures led to identical and different results in the heritage and ordinary buildings, respectively. For the openings and decorations on doors, windows, and air vents, all elements should also match the context of both environments. This is because the opening has a direct effect on the appearance of the building, which subsequently influences the design structure. Meanwhile, the direction of the building should be on the main axis of the road due to being related to regional activities, with this specific infrastructure being the central circulation (Table 2).

Table 2: Infill architecture guidelines on materials and details

Colour	
Texture	
Opening	
Direction context	
Decoration	

3.1.2 Form

Heritage buildings have a strong character based on architectural details, where the application of infill design needs to observe the shape or style of the surrounding environments, to provide insight and input on new installations (Nasrollah, Ghafari, and Taheri, 2019). This was in line with the pattern of blocks, roads, and surrounding environments, with the public building styles experiencing difficulties in supporting the similarities. However, it was observed from the composition of the building mass, such as the height and size of the design. The bonding of the new building roof shape to the old type should also be considered due to influencing the skyline of the area (Alfirevic and Simonovic, 2015).

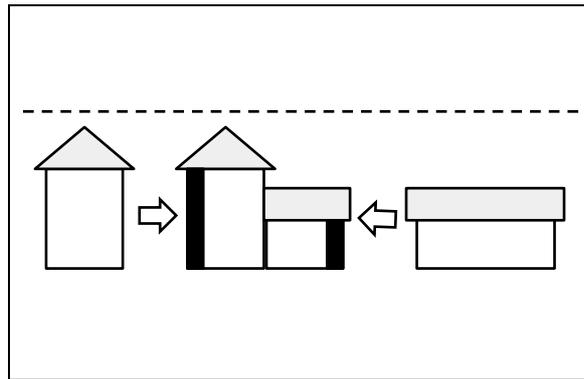


Figure 5: Elements of style and the influence of skylines in urban context

3.1.3 Scale

In applying infill architecture on an urban heritage scale, the consideration of the scale and hierarchy of new buildings to the surrounding environments was very essential (Nasrollah, Ghafari, and Taheri, 2019). This indicated that the architectural elements in ordinary buildings were subsequently observed by assessing the building frame related to the height and size of the surrounding structures (Figure 6). The application of new scale was also applied to the harmony and sustainability of the buildings within the area. This led to the new building being scaled according to the surrounding structures (Alfirevic and Simonovic, 2015).

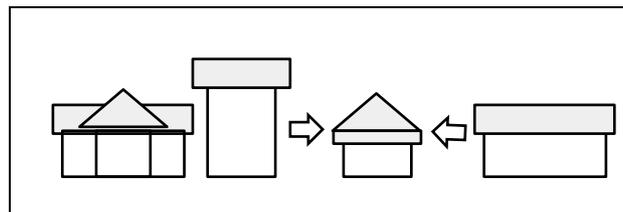


Figure 6: New building scale context to the old structures

3.1.4 Placement position

This is the placement of new buildings in the area affecting the visual space, with considerations necessarily needed on the mass pattern of old structures (Nasrollah, Ghafari, and Taheri, 2019). It also has similarities to the building direction, by extending the surface of the surrounding environment facade to the new ones (Alfirevic and Simonovic, 2015). Meanwhile, the placement of new buildings in the public areas is positioned according to that of the existing surrounding structures. In these areas, the implementation of new buildings was carried out by adjusting the boundaries and considering the open spaces. This indicated that the building placement needs to also consider the archaeology of the area (see Figure 7).

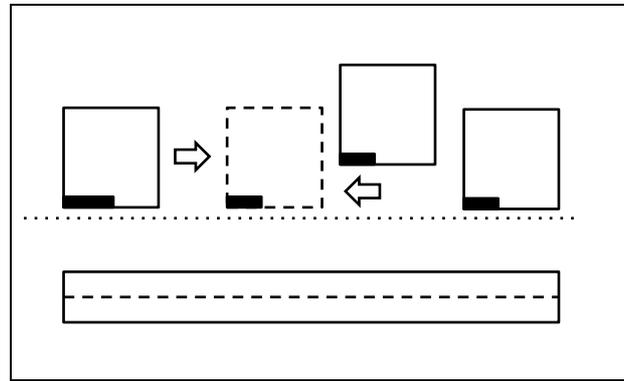


Figure 7: The setting of the new building in the urban context

3.1.5 Use

In urban heritage, the building's functional elements contained cultural, social, economic, and political functions (Nasrollah, Ghafari, and Taheri, 2019). This affected the typology as regards its position, based on a public building. The form of the residential opening function was also different from that of a shop (Figure 8), indicating that new buildings need to consider the typology of the surrounding essentiality.

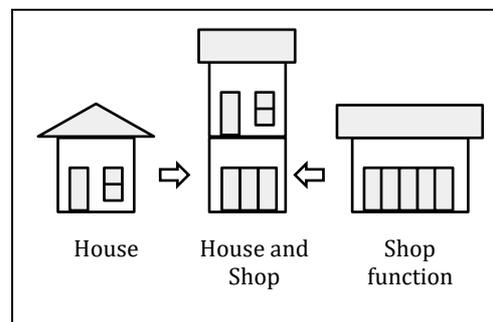


Figure 8: Building function context

3.2. The Methods of Infill Architecture

Based on the experts' proposal, the following are the infill architecture methods adopted for ordinary building applications. Subsequently, these were applied in combination of heritage and ordinary buildings. The result was a review of the method to be used in ordinary buildings, with two techniques being grouped from the 2 main literature, for instance, Alfirevic and Simonovic (2015) and Feisal (2019). The initial method was the contextual technique, containing the mimesis, association, literal replication, invention, and abstract reference approaches. Meanwhile, the second method was the non-contextual approach, containing the contrast and intention opposition techniques.

3.2.1 The mimesis and the literal replication approaches

The mimesis approach is often used in infill architecture, imitating the visual characteristics of neighboring objects (Alfirevic and Simonovic, 2015). This indicates that new buildings need to apply existing visual elements to surrounding structures, due to the imitation of paint colors, materials, textures, openings, and directions, as well as decorations. Therefore, the new building is expected to have similar architectural elements as the neighboring design. Using the literal replication approach for heritage buildings, similar results are still observed through the imitation of existing elements or forms (Figure 9). This is mostly applied to heritage buildings due to having high similarities to the mimesis method. In ordinary buildings, the application of this method is used by imitating the roof shape, opening, colour, and texture from an existing building to a new one. This confirms that the new building is expected to have similar visual elements to the old building.

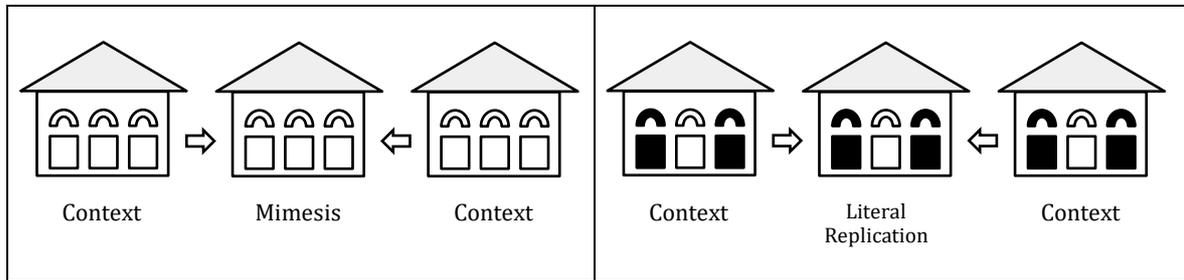


Figure 9: Mimesis and literal replication approaches

3.2.2 The association and the invention approaches

The association method often emphasizes or reinforces the existing surrounding architectural elements, by transposing the characters from neighboring objects to produce uniform design features (Alfirevic and Simonovic, 2015). In the urban heritage, the use of a similar structural style as local architecture is the leading choice in inserting new buildings, which is often carried out through the incorporation of modern contemporary elements. However, modern buildings need to adapt to the existing designs, with the new installation expected to emphasize the elements of the surrounding building style. The application of the invention is also carried out with innovations, due to intervening with similar or related styles. In this method, a new element is often added to the character, to implement similar specifications without imitating the surrounding surfaces (Feisal, 2019). For ordinary buildings, the application in urban areas is conducted through the determination of a surrounding architectural style in the surrounding architecture. Subsequently, the new building is observed to apply the results of a unique style to the existing character (Figure 10). This confirms that the realization of a new technique is expected, although with a similar character as the existing context.

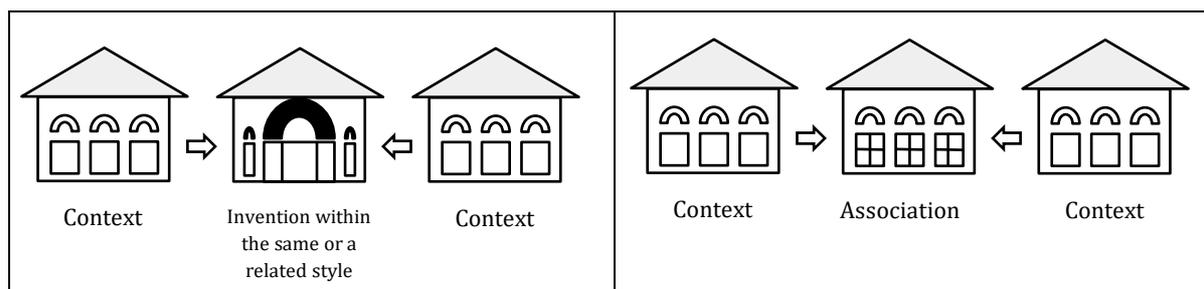


Figure 10: The association and the invention approaches within the same or related style

3.2.3 The Abstract reference

In this approach, the implementation of infill is often disguised, due to being similar to the historical environment while eliminating replication with the existing old style. This was operated by reducing the composite to an abstract form. Based on the facade, the colors, materials, and textures of the elements were found to imitate context, with the shape using a modern style to reflect a blend of styles (Figure 11). However, the shape and the materials of the building used contextual characteristics and modern elements, including glass, respectively (Feisal, 2019). This proves that the designer's imaginative work is expected to maintain context with varied styles.

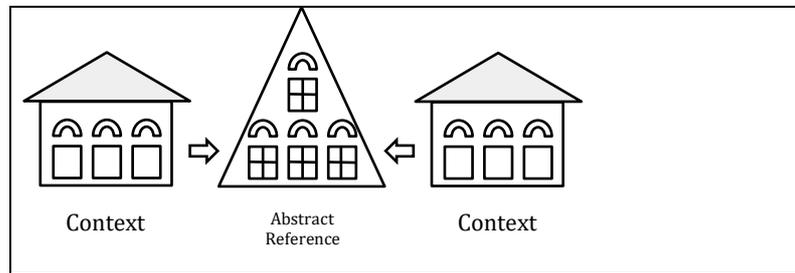


Figure 11: Application of the abstract reference approach to the building style

3.2.4 The contrast and intention opposition approaches

According to the contrasting approach, the new building is often different from the existing type, due to being strikingly different from the regional context (Figure 12). Meanwhile, the juxtaposition of two different styles is emphasized in this method. This highlights that the architecture of the new building is considered to represent the era of construction, with intensive care being recommended when using this approach (Alfirevic and Simonovic, 2015). The intention opposition method also has similarities with the contrast approach, due to being intentionally conducted to provide a different shape. Despite being a conscious counter approach, it is still observed to change the contextual character of the region, regarding the achievement of unity through independent ideas (Feisal, 2019).

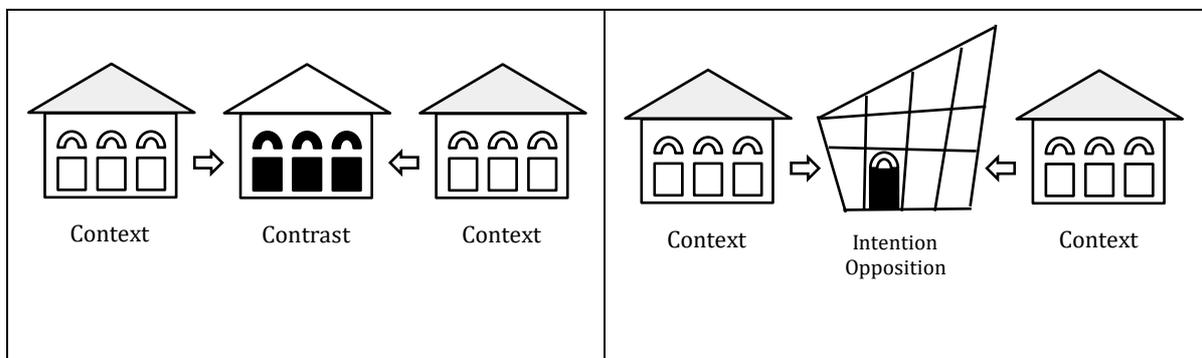


Figure 12: Application of the contrast and the intention opposition approach

From these reviews, the simple observations on recent infill architecture studies, especially in ordinary building contexts, are shown in Figure 13.

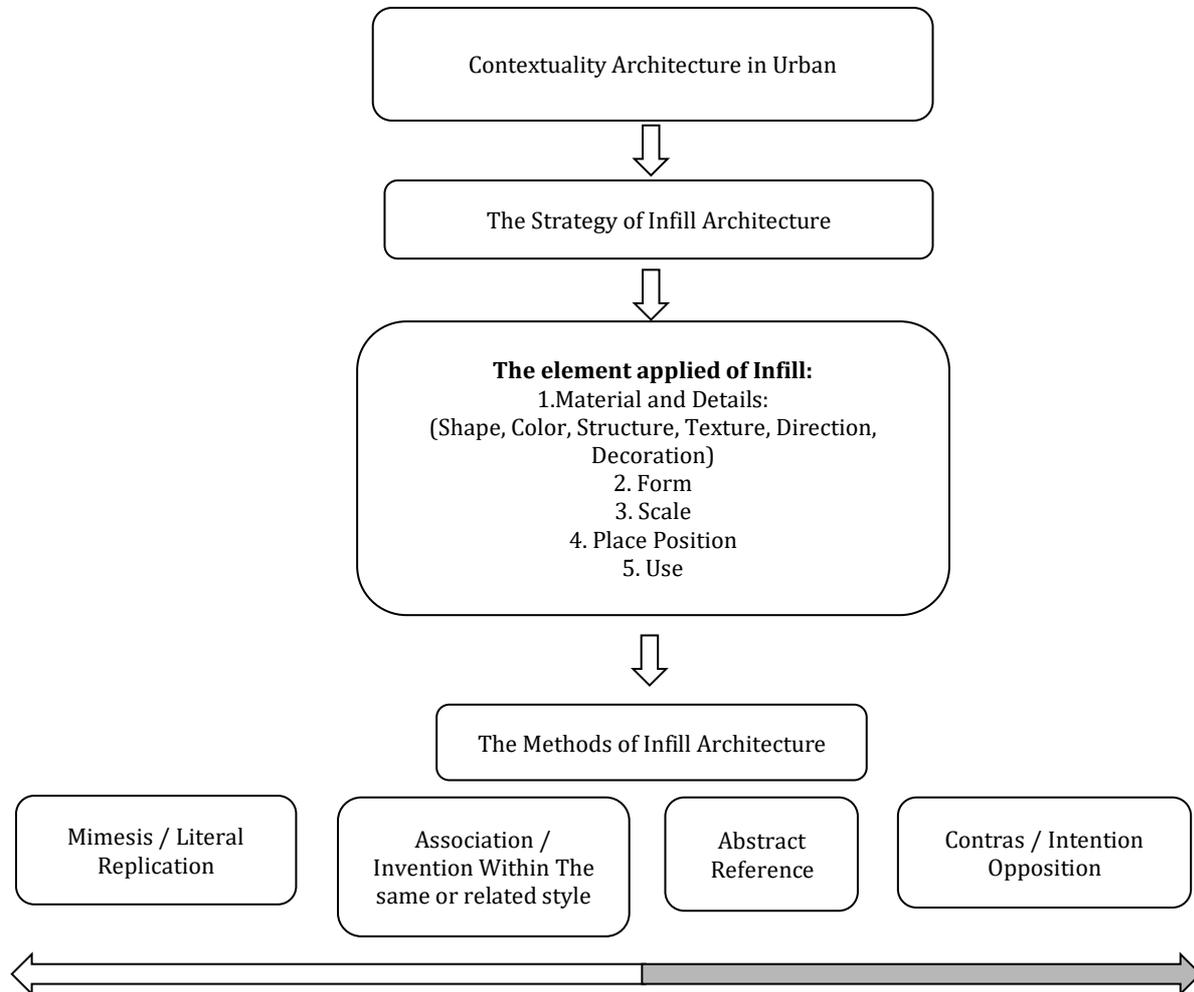


Figure 13: Infill architecture approach problem scheme

4. Discussion

4.1. Infill Architecture Application in Richmond Riverside, London

Based on this report, Richmond Riverside, London was observed to be using mimesis and literal replication approach, where the repetition of similar new building shapes was found by Erith & Terry (Soosani, 2013). In this condition, the new building applied the classic elements used by the old design. This showed that the scale of the new building was imitated as observed from the area's skyline.



Figure 14. Richmond Riverside, London

Source: richmond-riverside.com

The placement of the building was also parallel to the old type, with river and road borders observed at the front. On the windows, the clear vertical components of the building and the decorative lattice elements subsequently imitated the surrounding characteristics. Using similar paint colors as the neighbors, the new building was observed to be very similar to its surroundings. The application of the approach list is shown in Table 3.

Table 3: Infill Architecture in Richmond Riverside Building, London

Elements	Existing Context	Infill Architecture	Contextual ● Non – Contextual ○
Material and details			
Colour	Orange and white	White	●
Structure	A firm vertical and horizontal components in the opening	A firm vertical and horizontal components in the opening	●
Texture	Painted wall	Painted wall	●
Direction	The building leads to the road and river view	The building leads to the road and river view	●
Decoration	Window grilles and molding elements	Window grilles and molding elements	●
Form	Simple rectangular shape with classic British style and sloping roof.	Simple rectangular shape with classic British style and sloping roof.	●
Scale	Three floors building mass	Three floors building mass	●
Place Position	Existing buildings have river and road borders	Existing buildings have river and road borders	●
Use	Office building	Apartment	●
Summary: 9/9 infill design elements lead to a mimetic or literal replication approach with copying an existing character			

4.2. Infill Architecture Application in Al Azhar Chiefdom, Cairo

For the association and invention approaches, Al Azhar Chiefdom, Cairo was used as an example. This indicated that the application of a similar specification was carried out at this building in 1990, without imitating the surrounding objects (Feisal, 2019). Incorporating the basic hexagon shape, the new building was different from the rectangular symbol of the existing structure (Figure 15).



Figure 15: Al Azhar Chiefdom, Cairo.

Source: *alhamd.com*, 2018

However, the typical Arabic building style used on each side blended the new design with the old one. The use of decorative arches and circles was also different from the surroundings, although the square frame was a binding element for two distinguished elements. In this condition, the other infill design elements were the use of the surrounding context, such as the bright beige colour used for the existing building. The application of the approach list is shown in Table 4.

Table 4: Infill Architecture in Al Azhar Chiefdom, Cairo

Elements	Existing Context	Infill Architectural	Contextual ● Non – Contextual ○
Material and Details:			
Colour	Bright cream	Bright cream	●
Structure	The horizontal and vertical components as a large mass and fill, respectively	The horizontal and vertical components as a large mass and fill, respectively	●
Texture	Plaster wall	Plaster wall	●
Direction	The building leads to the main road at the front	The new building is in front of the old building and leads to the main road	●
Decoration	Simple square shape	Arch and circle shapes with square frames	●○
Form	Simple rectangular shape with an Arabic building style	A hexagon base with Arabic characteristics on each side	●○
Scale	Multistory building in 6 to 7 floors	Lower and parented to the old building	●
Place Position	Symmetrically parallel to the road ahead	On the axis of the old building and the road ahead	●
Use	School building	School building	●
Summary: 2/9 infill design elements lead to the association/invention approaches, 2 new model elements with the same or related styles			

4.3. Infill Architecture Application in The Memorial Park Soekarno, Blitar, Indonesia

The Memorial Park Soekarno, Blitar, Indonesia used the abstract reference approach and was developed in 2007 by architects, Widodo & Baskoro Tedjo. This was referenced as an old building with the consideration of being removed for the designation of new buildings. Its location was also in the middle of an urban settlement and observed as a Joglo, a characteristic of traditional Javanese houses. The new building observed as a modern cube covered with exposed natural stone, hence the shape of the temple was stated to have a wider historical context (Wirawan, 2014). This explained that the use of natural stone material, black color, caused a contrast to the surrounding buildings (Figure 16).



Figure 16: Map and New Building Soekarno Memorial Park, Blitar, Indonesia

Source: Google Earth and Ferdiansyah, 2022

This different strategy was impacted the new building as the background of the existing one, which is still observed as the focus of the site. Despite having a height of 2 floors, the new building was still lower than the existing Joglo. This was due to the location of the old building at a contour height (Figure 16). Subsequent details on the implementation of this approach are shown in Table 5.

Table 5: Infill Architecture in Soekarno Memorial Park

Elements	Existing Context	Infill Architectural	Contextual ● Non – Contextual ○
Material and Details:	Brown	Black	○
Colour			
Structure	Pyramid/ header vertical components	Concrete with a cube composition	○
Texture	Wood and natural effect	Natural stone and effect	●○
Direction	At the back of the site and leads to the regional road	The entry point on the front leads to the main road	●
Decoration	Decorative carvings on the pillars and building poles	Decoration as exposed natural stone and relief garden walls	●○
Form	Joglo shape with a vertical roof is a characteristic of traditional Indonesian houses	A simple square shape with a flat roof wrapped in natural stone, resembling a temple with the characteristics of cultural Indonesian sites	●○
Scale	The one-story building has a high canopy roof	A two-story building with a flat roof, although lower due to contour difference	●○
Place Position	Located in the middle of the back area	Located in the middle of the front area	●
Use	Graveyard	Museum	●○
Summary: 5/9 infill design elements lead to an abstract reference approach that can be contextual and non contextual, 2 elements are non contextual			

4.4. Infill Architecture Application in Royal Ontario Museum, Canada

In contrast/ intention opposition approach, Royal Ontario Museum, Canada is observed as an example. The original building and the outhouse, The Crystal, were developed in 1912 and 2007, respectively, by Daniel Libeskind (Hume, 2014). In this approach, additional buildings did not visually consider the historical contextual values, as well as other structures and locations, for the new design to be different from the existing one (Alfirevic and Simonovic, 2015). Therefore, the contrasting approach at the Royal Ontario Museum was highly utilized in the juxtaposition of two architectural styles representing its era (Figure 17).



Figure 17: Royal Ontario Museum, Canada

Source: Sokolov, 2021 and mapio.net, 2021

In this condition, the difference between the new building based on its iconic character added to the attractiveness of the environment and the old structure. The infill elements causing the context were also the direction of the opening that led to the main road in the neighborhood, with the silver color of the new building blending with the

grey natural grey paint of the old structure. The contrast/ intention opposition approach is also summarized in Table 6.

Table 6: Infill Architecture in The Crystal of Royal Ontario Museum

Elements	Existing Context	Infill Architectural	Contextual ● Non – Contextual ○
Material and Details:			
Colour	Grey	Silver	●○
Structure	Firm vertical and horizontal components of the opening	Dynamic components with triangular and parallelogram shapes	○
Texture	Brick	Glass and aluminum	○
Direction	The building leads to the road	The building leads to the road	●
Decoration	Arch element in the opening	Aluminum glass frame and building envelope	○
Form	Old building with classic Italian and Neo-Roman style	New building with a contemporary style	○
Scale	Elongated building with a height of 2 floors	More than two floors, with prominent vertical elements	○
Place Position	Existing buildings are regularly spaced and parallel to the road	The new building has a more protruding section towards the road at the top.	○
Use	Museum	Museum	●
Summary: 6/9 infill design elements lead to a contrasting approach or intention opposition, with 3 elements for contextualization bond			

5. Conclusion

Considering the various analyzed and evaluated methods and elements, future contextuality-based development or planning should utilize the infill architecture approach, which is carried out at the micro-scale of buildings and the urban scale. This indicated the infill application observed contextuality as an inconsiderable and considerable factor that should be preserved, based on the perspectives of a building and urban scale. According to the reviewed literature, most of the approaches were suitable for use in historical preservation areas with heritage buildings. However, a more general application with ordinary buildings in contextuality areas was used through local infill elements. In analyzing location contextuality, the suitable elements were also material and details, form, scale, place position, and use. Besides this, the infill application strategy also had various approaches, ranging from the methods intentionally similar to local architectural conditions (mimesis) to those deliberately different with contextuality maintenance (contrast).

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