Cross-programming to reuse old buildings for new functions: The case of Omah Lawa in Surakarta

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Abstract. Old buildings are a living testament of the past. Although reminiscent of colonial times, buildings from the Dutch colonial era in Indonesia contain a lot of knowledge of building art. One building in the city of Surakarta that is still considered beautiful is Omah Lawa. Unfortunately, the building has not been used for a long time, so it is inhabited by bats. This paper addresses the problem of finding a new function so that this building can be used optimally. First, the paper addresses the concept of conservation of buildings. Adaptive reuse is a conservation theory that allows changes in function in old buildings to adapt to current conditions. This case uses the design method of cross-programming which was introduced by Bernhard Tsumi. Old buildings used to have simple functions such as residences. Now, these buildings are no longer in the residential zone but in the zone of public buildings. As such, its former utilization is no longer permitted. This study used cross-programming to change the function of Omah Lawa in Surakarta into a gallery and a location to market art products. The internal layout was changed to host the new functions while making as few changes as possible to the building.

1. Introduction

1.1. Old Buildings in Surakarta

In 1989, Darsiti Suratman stated that Surakarta or Desa Sala has been known since ancient times as a global trade node even before the Palace of Kasunanan moved from Kartosura to Surakarta in 1745AD. As such, Surakarta facilitated other nations to trade in the city[1]. Likewise, the Dutch were interested in trading in Surakarta and even turned it a colonial settlement. The sharing of power between the Kasunanan Palace and the Dutch led to the existence of two powers in Surakarta. Many Dutch buildings were erected in Surakarta, some of which are reused with new functions, while others have not been utilized and remain in their original form.

Heritage in architecture relates to any historical building or district and all forms related to it. Heritage is defined as something inherited at birth; anything deriving from the past or tradition; a historical site; and regarded as valuable inheritance for contemporary society. Historical buildings cause a longing of wanting to know more about the people and culture that produced these buildings. Heritage in architecture is divided into three groups, i.e., monuments, buildings and neighborhoods that have an attraction in terms of history, architecture, archeology, and technology, be artistic or have social relevance. This discussion in this paper specifically addresses the legacy of historic buildings that are present today. In 2013, the mayor of Surakarta determined that at least 69 old buildings have to be preserved in the city. This leads to the question of what to do with these old buildings. It would
be easier to demolish these buildings and replace them with a new one. However, this begs the question of how about the sustainability of Surakarta as a cultural city that values heritage and utilizes its heritage to ensure the sustainability of the city.

| No. | Name                           | Function           | Address                                  |
|-----|--------------------------------|--------------------|------------------------------------------|
| 12  | PasarGedeHardjoNagoro           | Public Facility    | UripSumoharjo Street, Surakarta          |
| 13  | Bank Indonesia                 | Office Building    | JendralSudirman Street, Surakarta        |
| 14  | Baron House                    | Office Building    | Dr. Rajiman Street, Surakarta            |
| 15  | Madrasah Aliyah Negeri 2       | Academic Building  | Slamet Riyadi Street, Surakarta          |
| 16  | Ex Veteran Office (Omah Lawa)  | Office Building    | Slamet Riyadi Street, Surakarta          |
| 17  | Bondho Lumakso Office          | Office Building    | Baluwarti Surakarta                      |

One building that causes the concern of the people of Surakarta is Omah Lawa, located on Slamet Riyadi Street. This was once a veteran office and is one of the 69 buildings that must be preserved based on the mayor’s decision.

![Figure 1. Omah Lawa](image)

### Table 1. List of Historic Building and Historic Areas in Surakarta based on Decision of the Mayor of Surakarta 2013.

1.2. Problems

The recognition from the city government of conservation activities is a form of appreciation of (a) the architectural value of old buildings; (b) the historical and cultural values in the city; (c) educational value for future generations; and (e) of tourism and recreation activities in the city [2]. Therefore, conservation efforts are an option to maintain old buildings to ensure the architectural diversity of a city. This leads to two questions: (a) what is the concept of conservation? and (b) what are the functions appropriate for the building?

2. Literature review

2.1. Building conservation

Conservation is understood in two terms, namely preservation and conservation. Preservation refers to returning old buildings to their original state whereas conservation emphasizes the adaptation of old buildings to new conditions. There are several definitions of conservation, namely:

a. Conservation is an effort to preserve a building or neighborhood while regulating the use and direction of its development in accordance with current and future needs so that its cultural meaning will be preserved [3].

b. "Conservation is an effort to preserve, protect and utilize the resources of a place, such as old buildings that have historical or cultural significance, areas with ideal occupation densities, cultural reserves, protected forests and so on" [2]. Thus, conservation is also a form of preservation by still utilizing buildings in their original function or for an entirely new activity so that the activities can finance its own existence.
c. Davidson (1996) discussed the Burra Charter, which provides an understanding of conservation. Notably, it is a process of managing a place so that the existing cultural significance is well-preserved according to local situations and conditions. Therefore, conservation activities can also cover the scope of preservation, restoration, reconstruction, adaptation, and revitalization (Marquis-Kyle & Walker, 1996; Alvares, 2006 in [2]).

d. Conservation involves the preservation of historical monuments. These then develop into urban environments that have a rare historical value, which is the basis for conservation actions. Essentially, conservation and preservation are inseparable from culture. Therefore, conservation is an effort to maintain land, a building area or a group of buildings including the neighborhood [4].

In conclusion, conservation is a preservation effort by utilizing a place to accommodate its original activity or for a completely new function so that it can finance its own continued existence. In other words, conservation is the process of recycling the resources of a place. Its development is directed in accordance with current and future needs in such a way as to maintain its cultural meaning. There are various types of conservation activities [2]:

a. Restoration is an action or process that aims to restore accurately the form and details of a property and its settings as it was in a certain period. This is done by removing parts that were added later or by replacing missing parts.

b. Rehabilitation is the act or process of returning an object to a state that enables it to be reused. This is done through repairs or changes that allow efficient temporary use while retaining forms that have historical, architectural, and cultural value.

c. Reconstruction is an act or process of rebuilding a building, structure or object or parts of it that have been lost or damaged as it was in a certain period.

d. Adaptive reuse is generally carried out as an alternative to protect and maintain historic buildings by using it for new functions that are beneficial to the surrounding community and the region.

e. Renovation is the modernization of historic buildings. Sometimes improper repairs eliminate important shapes and details.

f. Revitalization is a process of harmonizing and increasing social and economic activities in a building/neighborhood.

2.2. Adaptive reuse

Adaptive reuse is a process of modifying or changing something to give it a new function [5]. Adaptive reuse generally modifies a place for a new function or adjusts the building to strengthen an existing function. Studies on adaptive reuse provide three benefits related to environmental, social, and economic aspects. Furthermore, in the context of disaster mitigation, adaptive reuse is an alternative strategy in providing temporary shelter [6]. Bridging the gap between the past and the present, adaptive reuse makes changes to buildings to accommodate new needs. These adaptations must add value and quality to historic buildings.

2.3. Deconstructivist architecture

From the perspective of phenomenological studies, deconstructivism is seen as an effort or a critical method to remodel and restructure various theories or works through elements, structures, infrastructure, and contexts. Moreover, the forces at play in the concept will strip works of their attributes and trace its origins and development, looking for links with other concepts and presenting possible positions and contributions to anything [7]. Seven architects presented their works during the first exhibition on deconstructivist architecture, i.e., Peter Eisenman, Bernard Tschumi, Daniel Libeskind, Frank Gehry, Zaha Hadid, Rem Koolhaas, and Coop Himmelblau. Specifically, the concept of deconstructivism used by Bernard Tschumi can be divided into three programs: Cross-Programming, Trans-Programming, and Dis-Programming [7].
a. Cross-programming is the use of space or a spatial configuration that is incompatible with the original function. For example, a place of worship is used as a nightclub, placing a configuration in an unrelated location, or locating a museum in a parking building[8]. Cross-programming includes two aspects: activities must be overlapping and buildings must be able to adapt to different programs from time to time. Both concepts allow for dialogue by emphasizing transformation, adaptation, and change as a design flow. According to this concept, buildings must be designed for several functions to have a longer and more sustainable life. This concept will also improve the relationship between users and the surrounding environment [7].

b. Trans-programming combines two programs with different properties and spatial configurations regardless of compatibility. For example, a library could be combined with a race course [8].

c. Dis-programming is the combination of two programs in such a way that the spatial configuration of the first program interferes with the other. For example, supermarkets combined with offices [8].

3. Methodology
This study uses four processes in the cross-programming of Omah Lawa.
   a. Making an inventory of the space and scale of Omah Lawa in its old function.
   b. Designing a new layout (space requirements, the amount of space and the organization of space).
   c. Replacing original spaces with new functions.
   d. Planning the layout based on the type of new functions.

4. Results and analysis
Changing the function of old buildings is not as simple as creating a new building. A problem that often arises is that the amount of space is insufficient for the new function. Thus, the available space and the requirements for space of the new function must be matched carefully and appropriately. If the problem is not too significant, technical adaptations can resolve this problem. In finding new functions for Omah Lawa, the creative wood industry is an option. Therefore, this paper develops a plan for the adaptive reuse of Omah Lawa for the creative wood industry using across-programming approach as follows:
   a. Describing the old functions and facades of Omah Lawa.
   b. Designing a layout (space requirements, amount of space, and the organization of space) for Wood Creative Industry.
   c. Cross-programming space for the creative wood industry for the Omah Lawa building.
   d. Adding space and adjusting the old façade.

4.1 The old Omah Lawa building
Old Function and Facade
The name Omah Lawa means Villa Liberty. It is located at Jalan Slamet Riyadi, in Purwosari Village, Laweyan District, Surakarta City (Solo), Central Java. Its location is in the southeast corner near the intersection of Slamet Riyadi Street and Perintis Kemerdekaan Street, or just east of Solo Center Point (SCP). Omah Lawa used to be a residence for Dutch aristocrats and officials. In 1945, this house was bought by a wealthy Chinese businessman called Sie Djian Ho. He controlled the publishing, plantation and ice factory across his home. During the war for independence, Omah Lawa was used as a hiding place for the guerrillas. After independence, this house with Dutch architecture was given to the Indonesian government, and it was used as a Veterans Building. Omah Lawa has undergone a major renovation without changing its original shape in 1983-1985.
Table 2. Types and amounts of space in the old building.

| Types of Spaces       | Amount of Space                  |
|-----------------------|----------------------------------|
| **BUILDING A**        |                                  |
| Building + first floor | 34.14 m x 23.52 m = 802.972 m²  |
| (Building)            | (30.33 m x 16.79 m = 505.431 m²) |
| Building second floor | 6.13 m x 7.72 m = 47.32 m²       |
| Wudhu Room            | 3.30 m x 2.54 m = 8.382 m²       |
| Lavatory              | 1.80 m x 2.54 m = 4.572 m²       |
| **Total**             | 863.246 m²                       |

| **BUILDING B**        |                                  |
| Building + Terrace    | 33.54 m x 18.59 m = 623.508 m²   |
| (Building)            | (31.55 m x 16.02 m = 505.431 m²) |
| Lavatory              | 2.53 m x 3.10 m = 7.843 m²       |
|                       | 2.53 m x 2.24 m = 5.667 m²       |
| **Total**             | 637.018 m²                       |

The Omah Lawa building is estimated to be around 1,500 m² in size, standing on 3,000 m² of land. It was used as a pilgrimage office and chamber of commerce around the 1990s. This colonial building has four spacious bedrooms. Two rooms are on the right side of the building, and the other two are located on the left side. Each is separated by two rooms which are also quite spacious that were used as a family room and living room. Omah Lawa is designated as a cultural heritage building that must be protected and preserved.

Figure 2. Existing layout

Figure 3. Plan and design of the original building
Evaluation and Recommendations
The concept of cross-programming is proposed as a design method by using space or spatial configuration that is not in accordance with the original design. The concept of cross-programming comprises two aspects, i.e., activities must be able to overlap and buildings must be able to adapt to different programs over time. In implementing both aspects, the old function as a residence is replaced by a gallery and a workshop. These conflicting functions require adjustments because designing a building is not merely about its facade but also its usefulness. The presentation of concepts that are not in line with the original function and adjusting existing buildings is central to the concept of cross-programming. As such, the Omah Lawa building is not only known for the creative wood industry but also as a public facility in Surakarta.

4.2. New Building
The new function of this building is for hosting several creative wood industries with galleries and workshops. Besides education, it is also a facility for buying and selling creative works.

| Type of Space                  | Amount of Space          |
|-------------------------------|--------------------------|
| Lobby                         | 7.14 m x 4.81 m = 34.34 m² |
| Information center and deposit counter | 3.88 m x 4.80 m = 18.624 m² |
| Gallery (exhibition room)     | 17.77 m x 12.09 m = 214.83 m² |
| Ordering and transaction room | 3.88 m x 4.80 m = 18.624 m² |
| Storage space                 | 6.13 m x 7.72 m = 47.32 m² |
| Male lavatory                 | (1.50 m x 1.5 m = 2.25) x3 |
| Female lavatory               | (1.50 m x 1.5 m = 2.25) x3 |
| Disabled lavatory             | 2.00 m x 2.50 m = 5.00 m² |
| Male sink                     | (0.90 m x 0.6 m = 0.54 m²) x3 |
| Female sink                   | (0.90 m x 0.6 m = 0.54 m²) x3 |
| Total                         | 402.798 m²               |

| Type of Space                  | Amount of Space          |
|-------------------------------|--------------------------|
| Workshop room                 | 33.54 m x 18.54 m = 623.508 m² |
| Cleaning area for workshops    | 2.53 m x 3.10 m = 7.843 m² |
|                               | 2.53 x 2.24 m = 5.667 m² |
| Total                         | 637.018 m²               |

The exhibition space is the most important part of a museum or gallery. Its design requires special attention because this room is at the heart of various spaces in the museum or gallery. The exhibition hall specializes in differences in architectural typologies, light quality, space proportions, finishing, and material selection. Actively managing the exhibition facilitates changes and promotes the efficiency of the available installations. The exhibition space in a museum or gallery is usually shaped like a grand hall. The room has several requirements that must be met, among others; the exhibited objects must be completely protected from damage, theft, fire, and anything that can cause the quality of the exhibited objects to decline. The key things to consider in designing the exhibition space are the design of floor space and the circulation area as well as exhibition items.

Design of floor space and the circulation area
The exhibition space in the museum or gallery must be maintained and be clean and orderly. The specific aspects that must be addressed are the rooms, walls, floors, sills, ceiling, doors, and windows. In general, the minimum height of an exhibition hall is ± 3.7 - 6 meters to be flexible in the choice of
exhibition objects. Aspects that need to be considered in designing exhibition rooms in museums or galleries include an aesthetic layout which offers:

- Distance between objects or works on display, looking for relationships that are in line with their meaning, as well as similarity in flow, style, color composition, and other concepts.
- The labels or descriptions of works such as size and title.
- The awareness of the material used in the work product. Mapping is a method that can be used for structuring large spaces.
- Other supporting facilities are panels or sketches, which are used as temporary walls to avoid creating residual space. The minimum width of the temporary division is ± 12-15 meters.

**Exhibition items**

An understanding and knowledge of the exhibited art are crucial in planning the layout. Therefore, designers must consider the principles of art, including dimensions; personal, social, and physical functions; as well as the medium in the form of tools, materials, techniques, designs, themes, styles, and order. In addition to the above two aspects other things need to be considered as well, e.g., labeling; lighting; the appropriate temperature for the exhibition space which is around 20°C-21°C; humidity levels; HVA system settings; exterior coatings; the type of construction and wall material which must be able to avoid thermal heat; windows and skylights which must reduce UV light and windows that should be accessible to be able to control the amount of natural lighting in the room.

**Figure 4. Changes in the layout**

**Figure 5. Changing the facade of the old building into a new function**
5. Conclusion
Old buildings can be renewed by changing functions to be tailored to the needs of the time. The cross-programming method is an opportunity to update the type of space and the old layout of buildings. This process is an opportunity to maintain old buildings with new benefits.

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