Sustainable Regeneration through the Cultural Conversion of Urban Heritage

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Abstract: As the industrial structure rapidly changed, the buildings and facilities at the helm of the previous industrialization era lost their original functions and became idle. These spaces contain elements of local history, culture, and time and provide the basis for this study. Therefore, it focuses on the role of a city's sustainable media if they are converted to fit the city's social and local context. In this study, we examine sustainable regeneration by adopting the methodology of the "new directions in planning theory" method, which means a contradictory approach to the sustainable values of long-standing industrial heritages from both physical and cognitive perspectives. We argue that its physical appearance, landscaping, and tectonic relation, composed of a specific spectrum of time accumulation, help people experience a sense of collective memory. In this way, a sense of time and place are embedded in materiality and are important to consider when moving toward urban sustainability. Our findings have implications for a new perspective on concrete regeneration strategies.

Keywords: sustainable regeneration; cultural conversion; urban heritage; physical approach; perceptional approach; time accumulation

1. Introduction

As the industrial structure changed and the de-industrialization and informatization era arrived, industrial facilities centered on secondary industries—which were essential for economic development in the previous industrialization era—lost their original functions and became idle. In many cities, these idle industrial facilities are left unattended, making them desolate. This is because the buildings' values were depleted as once-vital industrial facilities lost their original functions. However, it is necessary to look at such idle industrial facilities in various ways, rather than simply as exhausted inventory. The reason for this is that there is potential for historical and socio-cultural values that have formed and accumulated over long periods of economic and social play within the community. Therefore, if the building can be reproduced based on its own various values, it is estimated that the building can become a great resource for the area.

However, with modernization happening within a short period, the urbanization process of development and growth has recently taken place. There has been a surge in urban spaces not fully considered for cultural use. Accordingly, the qualitative improvement of urban cultural space is becoming an important task. This is a worldwide phenomenon and can be said to be in line with the regeneration paradigm. In European society, where the history of cities dates far back, architectural approaches towards industrial heritages have been taking place for quite some time. In Korea, architectural movements have been happening since 2010, focusing on the value of industrial heritage with a sense of urban rebirth [1].

In 2013, when a redevelopment contest was developed by Seoul Research Institute as part of its master plan to utilize the Mapo Oil Depot, the site was mostly unknown. The oil reserve base was left over from the past industrial era and had lost its use. Instead, the redevelopers wanted to build an "open park", a new site that would provide citizens with facilities for performances, exhibitions, information exchange, and relaxation. They saw building a new cultural depot as the most important part of the plan to change the site from a place to store oil into a place to store Seoul citizens' cultural values. In light of this, the development team dictated a vision for the redevelopment: To make the Depot a "civic place and complex cultural space centered around the environment and recycling" while including spaces for "performance and lecture, exhibition and experience, and information exchange". Participation and experience of Seoul citizens in this Mapo Depot (Figure 1) is as follows

To this end, a variety of usages for the site were proposed, including a digital media center, environmental exhibition education center, video culture complex, etc. [2].

Figure 1. Participation and experience of Seoul citizens (photo credit: Author).

In particular, museum architecture targeting the public reveals a variety of architectures today. However, there are many aspects, ranging from simple forms that are extremely restrained to museums that boast their structure and beauty. Therefore, even the same area can appear to be completely different depending on the architect's capacity and situation. Along with their original mission of preserving and displaying works as public buildings, they can function as cultural by-products of a city and be considered as works themselves. If the museum remembers and expresses the city as a work, the library acts as a window into the city's past and present as literature. To store the present memory as well, it can be seen as a process of shaping a new memory in the form of a building. Namely, not only the physical preservation of literature, but also the local history and living environment can accumulate and regenerate.

The tendency to build new buildings on historical sites is not new. Bernard Tschumi's New Acropolis museum, for example, both reflects the ancient Greek archaeological site on which it is built and its identity as a thoroughly new museum. As visitors move from the ground-floor archeological site to the top floor, which offers a 360 degree view of the Acropolis and the rest of Athens, they receive a strong message about the relationship between the past and the present. Likewise, Peter Zumthor's Kolumba Museum in Cologne, Germany was built on the ruins of a late-Gothic cathedral destroyed during World War II [3]. New gray bricks and columns expand the relationship between the old cathedral and the new exhibition space, thus harmonizing the past and present. The process of designing new architecture on top of existing historical structures is a complex process in which structural stability, visual beauty, and ease of use must be balanced together. Architects and designers must also determine how to maintain the existing structures to bring past eras together with the present; this will have a large impact on the new space. In the case of the Mapo Oil Depot in Seoul, which is several facilities rather than a single structure, designers chose to highlight the relationships between the various structures and harmonize them with the design of the upper level [2].

From this viewpoint, converting the industrial heritage space into a museum or public library can add value to the sustainable existence of the region. As these spaces contain elements of local history, culture, and time, they also provide the basis for this study. In addition, it examines the hypothesis

that industrial heritages can act as sustainable mediums of a city if converted to fit the social and local context. The study's subjects were selected from urban heritages of Europe and Seoul that were converted into public museums and libraries. The justification of selection is based on the similarities of history of urbanization. Since they were converted with the public in the long period of urbanization, those architectural buildings can be valued as urban heritages.

Therefore, this study focuses on examining sustainable regeneration by adopting the methodology of the "new directions in planning theory" method, which means a contradictory approach to the sustainable values of long-standing industrial heritages from both physical and cognitive perspectives. This is an attempt to give implications for a new perspective on concrete regeneration strategies.

2. Methodology for a Critical Approach to Heritage Value

Historical Remnants of Cultural Heritage

There are several viewpoints dealing with contemporary trends in urban design. Some focus on philosophical aspects. Others emphasize the scientific contributions of the authors. Frequently, those are mixed together. Based on this, the methods of making a critical approach can be classified. The following are representative methodologies. In an international context, the theories and ideals dominating today's urban design discourse have been examined and defined in various ways, resulting in differing categorizations and definitions, such as "territories of urban design", "images of perfection", "urban design force fields", "integrated paradigms in urbanism", "urbanist cultures and approaches to city-making", "new directions in planning theory", "models of good design", and "typologies of urban design" [4]. Among these methodologies, this study follows the "new directions in planning theory" method. The theoretical content is the value of sustainability, and the new direction is to find the value of heritage. This regeneration has value as a critical approach. The logical connections between chapters are described in Figure 2.
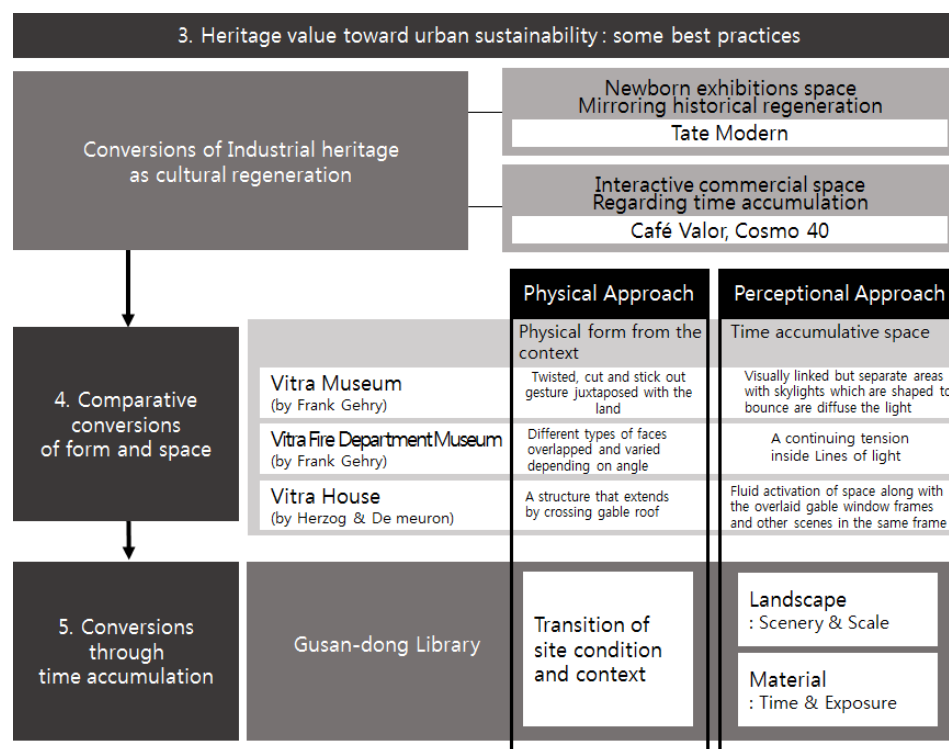

Figure 2. Critical approach to heritage value (credit: Authors).

3. Heritage Value Toward Urban Sustainability: Some Best Practices

3.1. Conversion of Industrial Heritage as Cultural Regeneration

Culture refers to high culture, in terms of consultation, and denotes culture as mainly an artistic expression. This includes music, art, theatre, architecture, and literature. In a broader sense, culture means a lifestyle and collectively refers to the life of a country or region, including social relations. Regarding the use of idle spaces, culture needs to be interpreted in a broad sense, and it can be understood that it goes beyond artistic expressions to refer to human lifestyle. Therefore, the cultural use of idle spaces encompasses not only high-end arts—such as art galleries, museums, creative studios, and performance halls—but also everyday life environments, such as parks, plazas, and community centers. Idle spaces, or vacant places that are not used, are left to be improved or overcome by situations that come with a lack of use. This is a phenomenon in which the negative meaning of the idle space is emphasized, which is attributed to the recognition of the idle space as a useless space, an abandoned space, and thus an object to be newly renovated. In this case, the use of idle spaces also moves toward clearing traces of the past and filling new shapes and contents corresponding to the present use. The faster the change, the more emphasized this trend. However, "idle" is simply a "state" which is not currently used, implying opportunities and possibilities. Therefore, idle space use also needs to be approached concerning the expression of inherent possibilities. In other words, it is necessary to understand a place's identity through the accumulated experiences and memories—as well as its creation, which renders possible states into reality. The place making of the idle space can be explained by the process of transforming into a state of place, or place reality, by combining temporal and human elements in the presently declining state of "possible place". Here, the temporal element involves making the place sustainable by making sufficient use of the overlap of past memories and experiences to maintain the future. Furthermore, physical elements, such as form and material, and non-physical elements, such as character and form, should be encompassed. This includes preserving elements and facilities that can be left in the facilities and facilities left as idle space. The human element means that people who create the place form a relationship with it as users or suppliers. It is the user's role to give meaning to places through various activities and it is the supplier's role to supply and create places. Strengthening the human factor in the use of idle spaces means creating an environment that can accommodate a variety of activities. Creating a place of idle space is a process of preserving the tangible and intangible traces of the past to maintain the passage of time and to create a spatial and programmatic environment in which various activities can transpire. Therefore, various actors should be able to participate in the planning stage of the utilization of idle space, and utilizing existing context should be free. The spatial and cultural policies of the government and local governments must also be implemented when making these places, and the consideration of time and spatial place and the participation of local communities should be involved in the process and utilization [5].

Modern cities are focusing on revitalizing their cultural heritage in architecture and other fields. Renovating urban industrial heritage buildings is an important part of this process—one that cities have long been engaging in as urbanization continues to increase. This has become even more pressing in recent years, as urban problems have threatened people's quality of life and changed the nature of community, thereby increasing the need for sustainable urban development. In this context, sustainability includes not just development-related practices, but also an increase in well-being and social bonds, community building, social support, and urban infrastructure renewal. Restoring long-standing industrial remnants can be a way to both enhance urban sustainability and reinforce a city's heritage, thereby putting sustainable design into a city's vernacular. Buildings like the Tate Modern maximize cultural heritage while redeveloping historical industrial property. Similarly, the Wapping Hydraulic Power Station, built in 1890, provided power to central London for 100 years. However, according to the trend of the times, its usefulness ran out; it closed in 1977 and was left to pollute the area. It remained in this state until the art director Jules Wright discovered its cultural value and transformed it into a sensuous space. The Wapping Project merged with the surrounding historical

sites while preserving the old 19th century façade. Throughout history, as industrial societies have grown, there have been examples of cultural reproduction of traces of industrial heritage in various ways in different cities. They include London's Tate Modern Art Museum, Paris's Orsay Museum, and the Kanazawa Citizens' Art Village in Japan. The names that represent the cultures of each region were formerly closed thermal power plants, railway stations, and textile mills. The Soho district, which represents New York's arts and fashion, was a slum area where abandoned warehouses were left unattended, and Zona Tortona, representing Milan's design, was a dense factory of waste. However, as they were reborn as cultural facilities and creative studios, they were remarkably transformed as the centers of the regions and the driving force of cultural regeneration.

Conversion can be used as an architectural method for the regeneration of these idle industrial facilities. Conversion means a method of regenerating a building by applying a new planning method to an existing building. In other words, it is an effort to modify the nature of the building by focusing on changing its function, not form, while respecting the existing physical and non-physical elements. Idle industrial facilities are industrial facilities that have lost their function due to changes in the social structure of the times. Industrial facilities—which played a role in production, processing, storage, and transportation in the age of industrialization—are no longer functional and are left as stock buildings. From a multifaceted perspective, idle industrial facilities accumulate historical, symbolic, and sociocultural meanings formed by people who have experienced times of industrialization, interacting with communities or cities. Idle industrial facilities with inherent traces of the times can convey past experiences to the generations who did not experience the industrialization era. Moreover, they can serve as a medium for connecting the past, present, and future. Regardless of whether the use of the building changes, the preservation method that appears inside and outside the building is presented. Since conversion focuses on the functional change of a building, transformation occurs naturally in certain parts of the building to accommodate new and old elements simultaneously when repurposing the space. During conversion, the elements of the past, which have important meanings, are partially preserved, and the newly introduced elements are introduced or expanded after partially transforming existing buildings. They are also restored to preserve the historical symbolic value of existing buildings [1].

3.2. Newborn Exhibition Space Mirroring Historical Regeneration: Tate Modern

Tate Modern was born out of the Roto Lottery as part of the Millennium Project, dreaming of a revival of British art. In the UK, lottery-based funds have been heavily invested in cultural businesses, leading to a revival of the content powerhouse. The most famous of them is the Tate Modern. The entrance of the museum is an enormous open space that utilizes the turbine hall as it is, giving the visitor a great sense of space [4]. The power plant—a product of the past industrialization era—has been transformed into a symbol of modern art in the city, becoming a cultural space in the city's waterfront. The redevelopment of the Southwark region, which was neglected as ruins, facilitated the redevelopment of the cultural realm. The interior space was replaced with modern art exhibition space while maintaining the power plant's original shape from 65 years ago. Through the continuous preservation and utilization of historical and cultural assets, there is a distinctive rebirth, in the modern sense, in the continuity of the times [5].

The most distinctive feature of the space shown by the conversion is that, first, the synchronous sequential motion of a certain direction showed priority. In the past, the space where a power plant's turbines were located became an open, square-shaped hall. One side is located away from the central position, but with a high floor height and a skylight that integrates the entire floor of the exhibition space, the hall functions like a turbine hall with centrality. The hall's interior space has become a dynamic complex that can be used as an entertainment art museum by giving it the function of an open exhibition space that allows large exhibitions, installations, and event planning. All exhibition spaces are secured as independent spaces on one side of the hall area. The exhibition space is arranged to have regular floor divisions in a formal form that exists as a static space according to the characteristics of the existing

building. However, interlayer continuity and mobility are ensured by various arrangement methods and the narrow foyer space of the escalator connected to the hall. The turbine hole encompassing the entire space is present in a static space and, simultaneously, contains kinetic properties oriented by some inclined bottom surfaces. Between the exhibition spaces where the uniform movement of the escalator takes place, the dynamic movements forced by the foyer are constantly maintained. Movement between the hall and exhibition space occurs concurrently. Accordingly, the independence and concurrency of the hall and the exhibition space are continuously maintained by the constant—but not intersecting—sequential movement process. In addition, the exhibition space, consisting of halls vertically extended to encompass each floor foyer and the exhibition space, and simultaneous spaces, prioritizing the continuous movement process, are divided into movements. At the same time, they form a space with dynamics unlike the formal space composition [6]. The second is the attempt at expansion and integration using skip floor level changes of the inner and outer space boundaries. The Southwark region—located north of the Thames River, with poor access from the city center—was constructed with urban public spaces, including cultural facilities, in the waterfront area around the dock, and the power plant, which was a factory area. In addition, access was improved with the completion of the project through the Millennium Bridge. Access from the Millennium Pedestrian Bridge continues into the entrance plaza and extends around the museum, which is connected to the waterfront's open space. By doubling the gallery space, Tate Modern 2 will create a variety of public spaces dedicated to relaxation and reflection, creation and group and personal learning. This space is spread throughout the building and connected by a generous public circulation. The vertical direction of this space is clear in the same way that the horizontal direction becomes apparent in the first stages of Tate Modern. At the same time, we felt it was important for the building to be seen from the north. When approaching the Tate Modern from the river, you can see it rising behind the power plant without competing with the iconic chimneys. The conversion extends from perceptual aspects to visual illusions using fluidity. Herzog and de Meuron allow a single surface to be perceived by the observer in various ways. "Time" is involved behind this perceptual control and multiplicity. "Time", as it is used here, is meant to be involved with the observer's movement. Time intervenes in the viewer's perception and, over time, appears to change into a completely different physical state. By showing shocking scenes or backgrounds instead of conventional usages, the essences of things or events can be seen and newly interpreted. Integrating the new building into the existing structure was a fundamental element of the project—integrating it into the city's skyline, allowing internal and external visitors to orient themselves. They have gathered the combined elements of the modern and former Tate to bring them together to function as a single organism. Using bricks and brickwork of the same basic pallet in a radical new way, they created perforated brick screens that filter the light during the day and illuminate the building at night. The brickwork also reacts to the sloping face of the form by stepping purely on the geometry. These simple motions, textures, and perforations transform bricks from solid, massive materials into blocks that cover the concrete skeleton of a new building. The façade changes shape depending on the viewer's perspective, not only from transparent to opaque, but also in pattern and orientation. The continuous pavement of this perforated brickwork introduces horizontal cuts to provide daylight and natural ventilation in the interior space and allow for viewing. The locations of these "cuts" directly relate to the internal programming and planning of the building. Conversion of physical spaces and perceptual materials in Tate Modern (Figure 3) is as follows. The result is a unique, distinctively new, and symbiotic presentation along the London skyline [7].
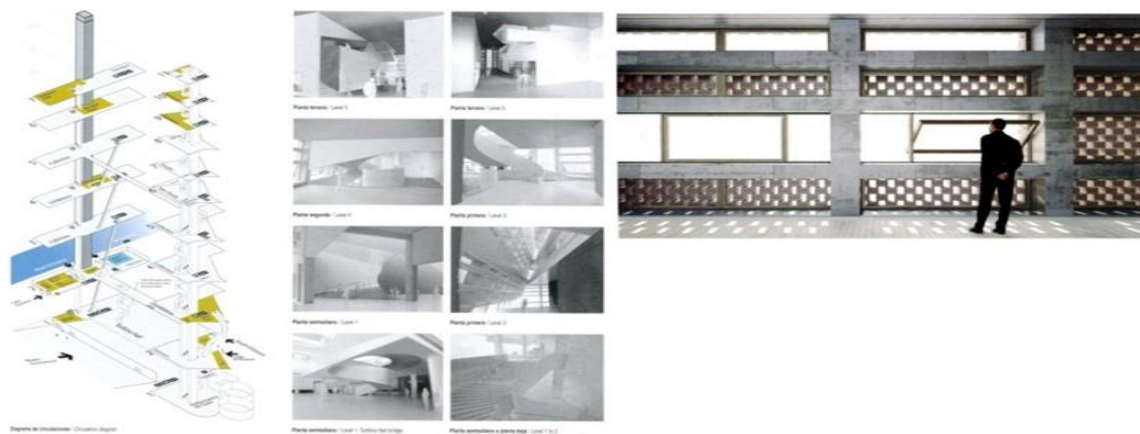
Figure 3. Conversion of physical spaces and perceptual materials in Tate Modern [8].

The environment where the administrative power is concentrated in urban regeneration projects—such as a decline in industry, decrease in settlement population, old city centers turning into slums, and overseas relocation of factories due to economic recession—is constantly attracting people toward an interest in regeneration [9]. There is a transformation of a steel factory of the past 40 years in Korea. Café Valor in Incheon near Seoul has been constantly calling for projects to recycle abandoned industrial heritages. For more than 10 years, the interpretation of all abandoned thingshas been practicing. The appearance of an abandoned industrial factory in the Incheon urban regeneration project is the first incubation and successful urban regeneration project. Today, it has been transformed into a complex cultural space and is being spotlighted by broadcasters and productions. On weekends, there are visitors not only from Korea, but also from overseas to see Café Valor. Because it is a successful urban regeneration project, other local governments are constantly visiting to interview it. The café, which was thoroughly planned and renovated considering the stories, history, and place of the people, has now expanded into a huge studio and café space of over 2100 square meters. It is the largest café and studio in Incheon. More than 3000 industrial and vintage furniture pieces reveal the its unique colors. In the vintage atmosphere, a charm keeps one fixated due to the remnants of time. Thousands of production tools unfold in the 1000 square meter space, stimulating the imaginations of directors and producers [10].

Café Valor 1 is a space worthy of music videos, dramatic films, and commercials, among thers. It is a wonderful and successful complex cultural space in Incheon, filled with stories and contents of thousands of people who accept the flea market of Incheon citizens and live busking of Incheon university students. Artists' music videos and visual content are produced there. The café's second store applied interiors with styling that maximized the possibilities of the space. A successful urban regeneration project can emerge only when the triplex of "urban regeneration + media + design" is done alternately. There are many exotic cafeterias like those found in Brooklyn and New York's back streets, which is why video shoots and various music broadcasts happen regularly. Conversion of physical spaces and perceptual materials in Café Valor (Figure 4) is as follows. This appears to attract a large number of people to this inaccessible factory complex, contributing to the attracting power of fandom [11].
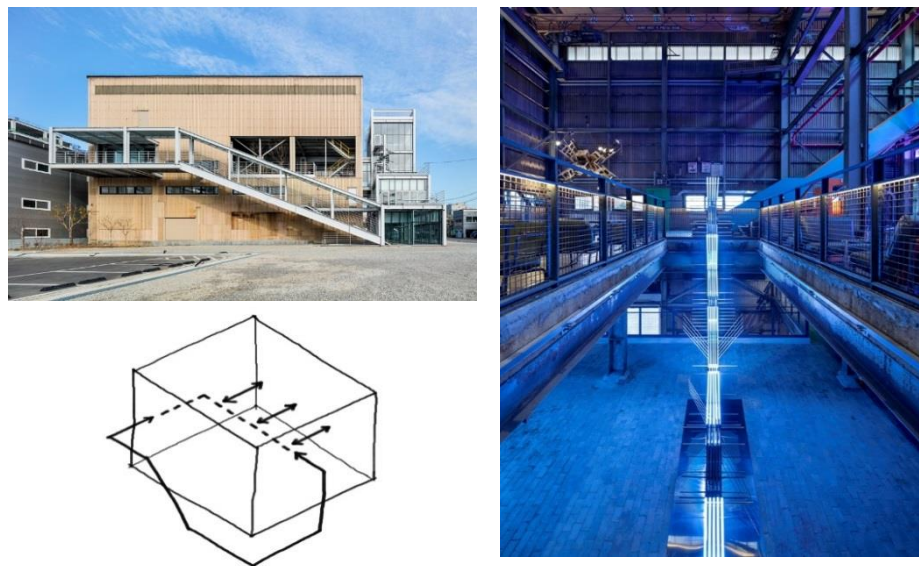
Figure 4. Conversion of physical spaces and perceptual materials in Café Valor (photo credit: Authors).

Cosmo40 is the result of a regeneration construction project that remodels 40 buildings—which were previously refining facilities of the Cosmo Chemical Plant Complex in Incheon—into a complex cultural space. More locals dislike than favor it. Therefore, the former company decided to move the plant so it would not be excessively in the view of the city and district. Residents have lived in a hanok about 50 m away from the area for about 300 years (13 generations), a local company that has been doing business. The project began with a willingness to regenerate the building for other uses that could contribute to the area instead of demolishing the building. As the buildings and facilities that had historical values throughout Incheon were demolished by capital logic, the project team wanted to see the factory in an unfamiliar and new way. What is the importance of preserving an old factory? The result of thinking about the restoration and preservation of various perspectives is the unique form of the prefecture. The existing building is preserved as much as possible, and the facilities needed for operation have been expanded and filled. The original factory building is developed thoroughly and functionally, without the pursuit of aesthetic value. The function-driven space—filled with tanks, reactors, pipes, etc.—was transformed into a large, versatile space once the equipment was sold to scrap metal. The main hall is on the first floor, and the hoist hall is on the third. Large spaces—with a ceiling height of 8 m in the main hall and 12 m in the hoist hall, respectively—intuitively show the suitability for various cultural programs, such as exhibitions. The hoist (crane), which was used in the past, has also been repaired and restarted, helping to install the work in one aspect or another. The new building's structure connects in an unusual way, intruding into the old building, and functions as a supporting facility for cafés and shops in cultural spaces [12].

The fact that the cultural contents have a high deficiency if we take a step away from Seoul is also a big reason for Cosmo40's role as a cultural space, rather than another purpose. The space functioned as a refining plant that reused solvents that were utilized at all plant sites. It is interesting to note that the plant is now reactivated under the banner of regeneration. Space without inspiration is the concept that it aims for. This is valid not only from the architectural point of view of when walking through the building, but also from the old building and the new building. Photo exhibitions are held in the main hall, overlapping with spaces, such as "rundown" (a performance program that is held overnight from 2 p.m. to 6 a.m.), or cases where skateboarders ride between exhibits. The word "inspiration" reflects the willingness not to instigate a program that can inspire, but rather to be bound by a specific category of space, such as exhibitions and performances. Normally, the physical boundary of the theater is Zone A, the cinema is Zone B, and the cafe is Zone C, with the programs planned and operated within these constraints. Conversion of physical spaces and perceptual materials in Cosmo 40 (Figure 5) is as follows. Cosmo 40 continues to explore what kinds of free projects will come from removing the earliest physical constraints [13].

Figure 5. Conversion of physical spaces and perceptual materials in Cosmo 40 (photo credit: Authors).

4. Comparative Conversion of Form and Space In Vitra Campus

Among the architectural types, museum architecture, especially, can be considered as a work, with its original mission to be preserved and displayed as a public building. As a monument, it serves as a cultural object and landmark within the city. In addition, considering the artistic attributes of architecture, the museum—which is constructed for exhibition—stimulates the artistic and intellectual temperament of architects to attempt theoretical inquiry and architectural experimentation.

4.1. Vitra Museum, Designed by Frank Gehry

From these perspectives, the museum is the most effective form of architecture, which can express regional context uniquely according to the artistic and sensory characteristics of the architect. The Vitra Museum, located on the Vitra campus, is one of the best examples of this attempt.

From the perspective of the physical approach, the transition between site condition and context was mainly focused upon. This project encompasses three major parts: 1) A seating assembly plant with an adjacent office, mezzanine, and distribution areas, 2) a small furniture museum to house the owner's collection of furniture (19th century through today), as well as their library of manufacturer's catalogues and other information, and, finally, 3) preparation of a master plan for this project, which also includes a new entrance road and gate house, a future expansion of the factory, museum parking, and ancillary facilities. The factory is a concrete frame construction with a stucco finish, skylights, and large windows. The offices located on the north mezzanine have spectacular views of the adjacent mountains, as well as of the museum and a Claes Oldenburg sculpture. This north façade faces the main road and forms the public face of the factory, and is also a backdrop for the museum. Ramps and entrance canopies flank this factory façade, creating sculptural "bookends" for the museum. These forms relate to each other and extend the visual impact of the project as a whole. They become the scale, providing "decoration" to the big simple factory volume, and they add to the campus-like environment. A consistent, albeit differentiated, formal vocabulary ties the various pieces together as one moves through and around the buildings [14].

From the viewpoint of the perceptional approach, the architectural concept was mainly the main focus. In the case of the Vitra Design Museum, the exhibition is intrusive, volume-connected, and interlaced, spaced by a roof with chaotic apertures of directly connected—and seemingly different—angles and shapes, with four corners adhering to the right angle. Chairs, which are part of the exhibit, are displayed individually or collectively in three exhibition rooms and one library room used for exhibition. Morphological features can be applied to reveal complex characteristics

regarding composition, either as a contrasting combination of stereotypes and atypicalities in materials and forms or as morphological heterogeneity of constituent volumes. The museum building is composed of a catalog library, office, storage, and support spaces in addition to exhibition space. The galleries are treated as connected volumes spatially interpenetrating each other so that the exhibitions can communicate from one space to another. Each has a different character vis-à-vis natural light, volume, surface, and scale, and—although visually connected—they may all be secured separately. Natural light is introduced from skylights shaped to bounce and diffuse the light. The construction is plaster over masonry on vertical and inverted surfaces, as well as metal roofing panels on sloped water-shedding surfaces. The master plan calls for several independent galleries to be added to the initial museum building and additional factories to be added to the west side of the new entrance road. Parking is to be eventually expanded at the west and south ends of the site [15].

4.2. Vitra Fire Department Museum, Designed by Zaha Hadid

From the perspective of the physical approach, the transition of site condition and context was the main focus. The Vitra Fire Department was originally created for use as a factory building. However, the redevelopment of the fire zone changed its functionality, and Zaha Hadid began simplifying all elements in line with the site's architectural characteristics. Instead of deciding and simplifying the initial diagram, an attempt was made to transform the two-dimensional element of the line into a three-dimensional element of the volume while crossing each other. Zaha Hadid's work shows a pictorial expression of the surroundings. The fire station building designed by Zaha Hadid was completed in 1993. It was the first work of Hadid and was noted for his unique architectural interpretation. The building was originally used as a fire station in an unofficial capacity. However, after Vitra's production facilities were included in the fire jurisdiction, the building officially became a fire station. Today, it is used for a Vitra Chair Collection. In the early design stage, Hadid worked to draw the surrounding landscape between the existing buildings. She also changed the shape of the patterns formed by the surrounding farmland and the vineyard into various shapes. The appearance of flowing around the long and narrow building feels like a line represents the scenery. However, it seems that the building, which overlaps various shapes and changes the angles simultaneously, reflects the diverse appearance of the Vitra campus. We initiated our design with a study of the overall factory site. Our intention was to place the elements of our commission in such a way that they would not be lost between the enormous factory sheds. We also used these elements to structure the whole site, giving identity and rhythm to the main street running through the complex. This street—which stretches from the chair museum to the other end of the factory site, where the fire station is now located—was envisaged as a linear landscaped zone, almost as if it were the artificial extension of the linear patterns of the adjacent agricultural fields and vineyards. Thus, rather than designing the building as an isolated object, it was developed as the outer edge of the landscaped zone—defining space rather than occupying it. This was achieved by stretching the program into a long, narrow building alongside the street that marks the edge of the factory site and functions as a screening device against the bordering buildings [16].

From the viewpoint of the perceptual approach, the architectural concept was the main focus. Zaha Hadid's 1950 museum architecture comprises atypical lines, shapes, and free colors. Innovative sense of space is realized due to spatial composition by various forms of organic connection. When crossing the spaces of the fire station, one catches glimpses of the large red fire engines, their lines of movement inscribed into the asphalt. Similarly, the ritualized exercises of the firefighters will be inscribed into the ground as a series of choreographic notations. The whole building comprises static movement; it expresses the tension of being on the alert and the potential to explode into action at any moment. The walls appear to slide past each other, while the large sliding doors form a moving wall. The whole building is constructed of exposed, reinforced in situ concrete. Special attention was given to the sharpness of all edges. Any attachments, such roof edgings or claddings, were avoided, as they distract from the simplicity of the prismatic form and the abstract quality of the architectural

concept. This same absence of detail informed the frameless glazing, large sliding planes enclosing the garage, and the treatment of the interior spaces, including the lighting scheme. The lines of light direct the necessarily precise and fast movement through the building [17].
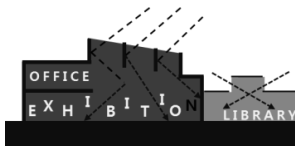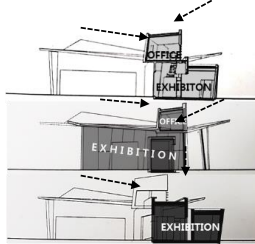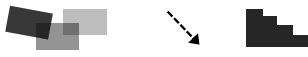
4.3. Vitra House, Designed by Herzog and de Meuron

From the perspective of the physical approach, the transition of site condition and context was the main focus. When you enter the Vitra Design Museum in Basel, Germany, you will find Vitra House, which is the first of its kind. Designed by Herzog and de Meuron, the building plays a central role as a furniture factory on the Vitra Campus. The building takes the motif of a "house" that stores furniture, and piles up a typical gable structure found in residential buildings globally. The architects combined the "houses" by crossing each other, and the resulting interior areas created new spaces and atmospheres and gained different angles and views due to the intersecting volumes [18]. Herzog and de Meuron referred to typical gable structures found in residential buildings around the world. They extended this basic form and joined a series of mass "houses", crossing each other. The resulting interior spaces create generous proportions and a stable atmosphere, while the intersecting volumes present impressive angles and views. Vitra House serves to review, define, and refine visitors' sense of design. Visiting it is like traveling through the history of design, but it also provides an opportunity to meet the works of artists who led contemporary design. The furniture and objects in the Vitra Home collection are arranged in various backgrounds, including living and working spaces. This allows visitors to get inspiration for their home furnishings, review their favorite designs, test the furniture and objects on display, and order or purchase products onsite [18].

From the viewpoint of the perceptional approach, the architectural concept was the main focus. "Window" shows different landscapes in the same frame. Once inside, the gable-shaped window that shows the outside boldly becomes the first thing you will notice. They all consist of the same shape and the same-sized window. However, due to the volume overlapping from various angles, the outside view shown by the window reveals various views, including the Vittoria's lawn yard, the mountain on the north side of the Vitra campus, and the plant site on the east side. The window detail is designed to focus on the foreground and the light. Inside the long, thin mullion is a large glass with the outer frame hidden inside the wall. The roller part of the curtain is also hidden inside the wall, so you can see the intention of concealing anything other than the foreground of the window. The interior windows are organized differently from the outside. At first glance, the windows of each floor are opened in various ways in a randomly stacked manner, showing only the variances in form. In addition, the level layer created in the process of overlapping and intersection acts as a milestone for predicting space by looking at different levels.

The diversity of levels is the most distinct spatial characteristic. In order to move the floor of Vitra House, the stairs are relocated to the main moving line. The stairs of Vitra House are thought to play the role of the "gallery" as an "object", rather than just a moving passage. Because the volume is stacked at different angles, each floor's stairs are shaped differently. Because of the different forms, users move between floors and sense various atmospheres, making the staircase act as an "object" with a different shape in the interior space. In addition, the stairway structure is moved and opened to reveal the space above and below. As a result, the staircase acts as a moving passage and, simultaneously, acts as a "gallery" that can be viewed. In the interior space, there is furniture that can be used and purchased directly, and this furniture creates the atmosphere of the interior spaceA comparative analysis of how form and spaces are converted in each design is illustrated in Table 1.

Table 1. Comparative conversion of form and space.

	Frank Gehry	Zaha Hadid	Herzog & De Meuron
Physical Approach: Physical form from the context			
	Twisted, cut and stick out gesture juxtaposed with the land	Different types of faces overlapped and varied depending on angle	A structure that extends by crossing gable roof
Perceptional Approach: time accumulative space			
	Visually linked but separate areas with skylights which are shaped to bounce are diffuse the light	A continuing tension inside the lines of light which direct the fast movement throught the building	Fluid activation of space along with the overlaid gable window frames and other scenes in the same frame
Conversion of form and space			
	Overlapped Scenes / Infused Light	Overlapped Scenes / Infused Light	Overlapped Scenes / Infused Light / Step

5. Conversion through Time Accumulation: Gusan-Dong Library in Seoul

Libraries relate to our heritage. We collect books, maps, manuscripts, and artwork, including books from valuable fairy tales to rare works of art. We also fill the space with a variety of sounds, from reading small books to talking aloud. The Gusan-dong Village Municipal Library, which was renovated in 2018, is located in Gusan-dong, Seoul, Korea. It is an example of revival, showing the shapes of large and small houses built from 1972 to 2002 and the context of the story.

5.1. Transition of Site Condition and Context

From the perspective of the physical approach, the transition of site condition and context was the main focus. The program has transformed houses into libraries and villages into multicultural spaces. The following three constraints greatly influenced the program configuration. Transition of site condition through time accumulation (Figure 6) is as follow. The first is the context of the site, which consists of eight existing housing groups around one closed alley. The second is the full-scale transformation of the architecture type that requires residential buildings to be converted into public buildings, called libraries. Third, the Gusan-dong Village Municipal Library was a participant-type public building, which required program planning to be done through consultation with the residents [19].

Figure 6. Transition of site condition through time accumulation [19].

Consequently, the proposal was that alleys were to become bookshelves and the rooms used for reading. The rooms are connected by two simple corridors. These horizontal corridors originated in the site associated with the context. New corridors are added to existing alley seats to connect existing houses, and some walls are demolished to connect rooms to corridors. In particular, the use of the new corridor as a library, considering the conditions of houses with different libraries and load standards, was an approach that reflected the structural requirements in the plan [19].

Another feature is that it shows a set of various vertical layers. Existing buildings are internalized, with a plan to fully view the elevations of the existing buildings from the inside. The first layer is the layer of memory, which is a layer that gives the identity of each area by using recycled building materials, and the next one is the layer of traces, where the exterior wall of an existing building is internalized to reveal traces of the past. The third one is the layer of knowledge.

The corridors are bridged at a distance from the existing building, allowing them to meet other existing buildings at various heights and angles.

5.2. Landscape and Material Regarding Time Accumulation

From the viewpoint of the perceptional approach, landscape and material were the main focuses. There are three stairways in this project. Unlike general libraries with one path of circulation, they are vertically woven in various ways. Two existing sets of stairs were used in their original condition, and the stairs located between the two corridors were designed as cross stairs to be used for both books and reading books. It was proposed to form a village that is tightly woven in all directions [19].

Firstly, the landscape can be clarified with scenery and scale. Gusan-dong Village Municipal Library has yards on various floors, as the rooftop of each building—gradually lowering—was used as a yard for each floor. The landscape starts with part of the village. Approaching through the road and courtyard, along with the performance hall and the new building's façade, is the mass of the comic library at the corner. This allowed for a landscape not so different from what it was before the library was built. The library was naturally absorbed into the village as if it had always been there. Roof landscape with contextual scenery and various scales (Figure 7) is as follow.

Figure 7. Roof landscape with contextual scenery and various scales (photo credit: Authors).

Secondly, material can be explained as trace and exposure. Gusan-dong Village Municipal Library is an internalized village. The newly built part became the background, shedding light onto the original form. On the contrary, they chose to erase the color of the material while leaving the existing building intact. The newly constructed parts were in brick—a material that portrays time—whereas the existing buildings were painted white. Juxtaposition of materials with time accumulation (Figure 8) is as follow.
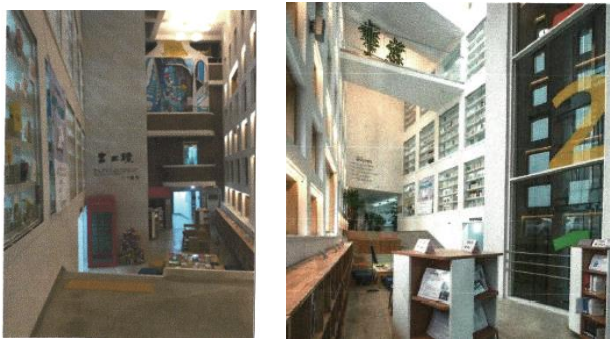

Figure 8. Juxtaposition of materials with time accumulation (photo credit: Author).

The space of memory was realized through preservation and transformation. The bricks, granite, etc. that were popular in the days of each building remained intact, with traces remaining. The rooms of the house were used as reading rooms or clubrooms instead of being destroyed. The dead-end road was transformed into a three-dimensional bookstore and used as a space for residents to use freely [19]. A comparative analysis of conversions through time accumulation is illustrated in Table 2.

Table 2. Conversions through time accumulation.
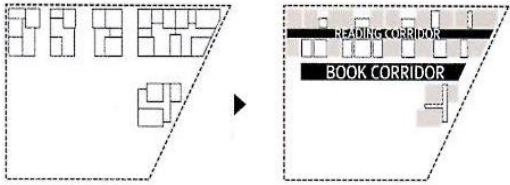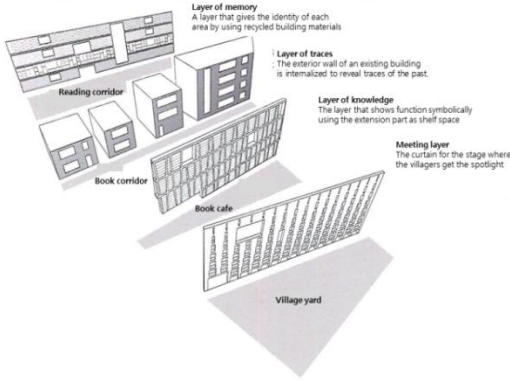
Approach	Design	
Physical Approach: Site condition and context	Horizontal corridor from the transition of the site associated with the context	
	Vertical layers of functions embracing the context	

Table 2. *Cont.*

Approach	Design	
Perceptional Approach: Time accumulative space	Landscape: Scenery and Scale	
	Material: Trace and exposure	

6. Conclusions

This study takes the contradictory approach that the industrial heritages that have existed for decades have sustainable values, both physically and cognitively, rather than being of perspective. This was significant in affording people deeper interpretations and shared meaning.

Firstly, a true heritage could recognize the importance of contemporary publicity created by citizens. The Tate Modern gives "time" intervention by the observer, thereby demonstrating the potential for a building to be a sustainable entity, rather than a form of stagnation, by embodying the spaces and forms interpreted differently according to the observer's point of view.

Secondly, the conversion of heritage should be based on the regional context. The gable structure of Herzog's building suggests the possibility of a modern interpretation of the traditional form through the external view of the window due to the overlapping volumes. In the Vitra museum, the works of each architect were used for different purposes. Frank Gehry's furniture museum—the introduction of the whole building—responds flexibly to the changing surroundings by becoming the public face of the factory as well as the background of the museum.

Thirdly, interrelations of physical and perceptional approaches have been proposed. Zaha Hadid's fire station on the Vitra campus captures the surrounding landscape and overlaps various forms. In addition, through the appearance of the building, which changes depending on the angle, it served as a canvas of the landscape that constantly changes. Herzog designed the museum to review, define, and refine visitors' sense of design. Visiting it is also like traveling through the history of design, while providing an opportunity to meet the works of artists who lead contemporary design.

Finally, time accumulation can lead to a new heritage. The Gusan-dong Village Municipal Library in Seoul consists of numerous old houses with library villages that tell the stories of the neighborhood around the alleys. As a result, the region's heritage was newly implemented.

In conclusion, the results of this study are valuable in that they form a consensus on the reasons and values of regeneration of heritages through examples converted in various ways. The cases analyzed in the article stand as prime examples of how to accomplish this, since they embrace both the architectural (physical) and emotional (perceptional) legacies of the context. They both sit in harmony with the landscape and allow people to experience and communicate their feelings of the sites through

the distributed routes, thereby allowing people to share in a sense of materiality and memory. The ways can be categorized by physical and perceptional approaches. The physical approach includes the transition of site condition and context. The perceptional approach includes landscape, including scenery and scale, and material, which is time and exposure. This study suggests that the abstract concept of urban sustainability has become a growing priority for multiple stakeholders. Such a priority will not only enrich citizens' urban experience, but ultimately play a role in raising cities' heritage value from an environmental, social, and economic perspective. In that, time accumulation can be a crucial factor to be considered in architectural design, such as in cultural conversion of urban heritage; this discussion is original and valuable for sustainable regeneration.

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