SPACE AND EVENT: PUBLIC SPACE IN THE HOUSING OF ADAPTIVE REUSE OF THE EUROPEAN HISTORIC BUILDING

Figure 1. A Residential Area In Edinburgh

CONTENTS

ACKNOWLEDGEMENT

This academic dissertation will be based on the socio-cultural and historical background of the European region, and from the perspective of building users, evaluate and reflect on the design of adaptive reuse of public spaces in residential buildings. The completion of this degree dissertation cannot be separated from the help and support of multiple parties. Here, I would like to express my sincere gratitude to all those who have provided me with help and companionship.

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INTRODUCTION

There are numerous historical buildings in many cities in Europe. A small portion of these historical buildings will be developed for conservation purposes as historical heritage, while the majority will be adapted for reuse as part of new urban planning. In Europe, adaptive reuse of historic buildings is an important component of the housing market. However, the living experience of some houses of adaptive reuse of the historic building is not satisfactory. The core task of adaptive reuse of buildings is to functionally transform or partially transform existing building frameworks, emphasizing the design logic of integrating existing frameworks with current needs (Lanz & Pendlebury, 2022). However, existing building frameworks often limit the transformation of building functions. This academic dissertation will be based on the socio-cultural and historical background of the European region, and from the perspective of building users, evaluate and reflect on the design of adaptive reuse of public spaces in residential buildings.

The adaptive reuse of historical buildings in residential areas has many advantages in cultural value, emotional identification, sustainability, and other aspects. However, when existing historical buildings are used as fixed building frameworks, they inevitably encounter difficult problems such as narrow windows, low space utilization, and high maintenance costs. At the same time, architects often approach architectural design from a macro perspective and tend to bring in a "relatively rational" objective perspective (Schumacher, 1999). When carrying out adaptive reuse of historical buildings, many architects pursue the functionality of the building while ensuring historical preservation (Arfa et al., 2022). This dissertation will be based on the field of interior design to bridge the gap between objective architectural design and subjective user experience. This dissertation will adhere to a people-centered design philosophy, analyzing and reflecting on existing interior design cases to find potential optimal design methods for improving the comfort of adaptive reuse homes.

Before evaluating the category of adaptive reuse residential design for historical buildings, researchers need to have a clear evaluation standard. Most contemporary architectural evaluation models and standards indicate that architecture is not a constant geometric entity (Nedeljkovic et al., 2023). At the same time, the phenomenon of adaptive reuse of buildings itself has proven that architecture is a dynamic process. Therefore, when evaluating the adaptive reuse of historical buildings in residential design, this study will introduce a fourth dimension beyond three dimensions, the time dimension, to more objectively restore the materiality of the buildings themselves in the real world. When evaluating and reflecting on design, researchers cannot avoid the question of whether the research topic itself has practicality. Or is it that the design theory being studied is actually a design concept. Since modernism, the diversified development of architectural theory has made the entire system overly complex. Therefore, this dissertation will draw on the perspective of architectural phenomenology and prove the existence of architecture through the use of users. Regard architecture as a process of perception and experience.

This study will first conduct a literature review and establish a discussion framework for subsequent evaluation and discussion by referencing and integrating existing architectural theory systems. The main body of the research will be based on a case study of adaptive reuse of historic buildings in Edinburgh. Meantime, a comparative analysis will be conducted with two cases of adaptive reuse of historic buildings from other regions of Europe to draw conclusions. Architecture, as a human creative activity, cannot exist as a Euclidean geometry without human activity (Janson & Tigges, 2014). Architecture is a constantly growing process, and humans constantly adjust it in the process of using it. We cannot ignore the dynamism in architecture.

CHAPTER I: ARCHITECTURAL HERITAGE, DYNAMICS, AND HOUSING

1.1 Postmodernism and Dynamics in Architecture

Before the 20th century, when critics evaluated a building, besides its economic benefits, functionality and aesthetics were the most commonly used criteria to measure the quality of its design. The architectural review system before Modernism has always adhered to Holism, that is, "good architecture=function+aesthetics+..." (Bannister, 1944). Until the early 20th century, with the advancement of material technology and the rise of anti-tradition ideological trend, the Modernist movement overturned the traditional architectural evaluation system. In 1896, Louis Sullivan proposed a famous saying that influenced the field of architectural design in the last century, "Form follows function" (Sullivan, 1922). In short, beauty is born from functionality. This viewpoint helps architectural evaluation standards break free from the doctrine of holism. At the same time, this critical thinking laid the groundwork for the emergence of Postmodernism later on.

In the mid to late 20th century, with the widespread promotion of Modernist architecture, its limitations gradually became apparent. The rationalization, absolutization, and homogenization exhibited by Modernist Cubic / Box architecture severely limit the development of society (Heynen, 2000). In the 1960s, Postmodernism reflected on and deconstructed Modernist architecture (Venturi, 1977). In Postmodernist architecture, the dynamic in architecture has become one of the important issues in postmodernism (Jencks, 2002). This issue emphasizes the diversity and flexibility of architectural design in expressing form, function, and meaning. The function of a building is determined by multiple factors such as the building site, user needs, and social background (Watson et al., 2014). At the same

time, human activities in buildings are uncertain, so strictly speaking, we cannot accurately predict the function of buildings (Preiser & Vischer, 2006).

Incorporating the dynamic indicator of architecture into the design process allows us to more accurately anticipate the appearance of the building after completion (Wang et al., 2021). Architecture is not the ideal geometric form expressed in architectural drawings. Architectural activities are the actions of human creations (Quintal, 2024). In this process, architecture is added with dimensions of "symbolic," "humanistic," "subjective," or "iconic" (Rimmer, 1997). In order to accurately describe and discuss the dynamics and related issues in the process of adaptive reuse of buildings using language, this article will use the theory and perspective of architectural phenomenology for discussion. In short, consider architecture as a process of spatial experience and perception. Moreover, this article will use phenomena instead of symbols to analyze a series of functional elements in architecture, in order to accurately express the materiality of architecture and the existence of related issues as much as possible. At the same time, the dynamic of architecture will mainly discuss the dynamic attributes that human activities bring to architecture.

1.2 The Destruction and Liberation of Building Functions Caused by Dynamics

From 1970 to 1980, the architectural community began to pay attention to how architecture affects and responds to changes in human behavior. Architects and scholars represented by Bill Hillier have studied how the built environment affects user behavior. At that time, architectural space was considered not only as a physical container, but also as a means of promoting or constraining the behavioral expectations of users (Hillier & Hanson, 1989). In 1990, the widespread application of computer-aided design (CAD) and building information modeling (BIM) technologies greatly advanced research on the dynamic adaptability and variability of

buildings (Juan & Hsing, 2017). Just like the Modernist movement, design theory updates are often driven by advances in production technology. During this period, architecture began to focus on the fluidity and adaptability of space (Speaks, 1993). Architecture is no longer a single, static space, but a process that can respond to environmental changes, usage needs, and the passage of time (Meagher, 2015).

Interior, as an inalienable part of architectural design, has also been influenced by architectural theories such as dynamic space. At the end of the 20th century, the deconstruction of architectural functions by dynamics was largely reflected in the layout of indoor spaces. The design of the interior of a single room is no longer limited to predetermined functions and fixed partitions (Johnson & Wigley, 1988). Some designers enhance functional adaptability through designs such as movable furniture and multifunctional spaces. Meanwhile, the fluidity of the space is enhanced through designs such as open floor plan layouts and movable partitions (Magdziak, 2019). Taking the design approach of integrating kitchens and restaurants as an example, which became popular in Europe in the mid-20th century. The kitchen can be used as a social space while cooking, and the dining room can also be transformed into a workspace when not cooking (Blaszczyk, 2012). The dynamic design thinking drives the seamless transformation of this functionality. With the change of architectural design concepts, space is no longer an idealized geometry, but an interactive environment. The design of individual rooms is beginning to incorporate personalized user needs, allowing the space to adapt to user behavior patterns through flexible configuration.

By incorporating the temporal dimension (i.e. dynamic) into the perspective of architectural observation, the observed results of functional architectural elements will change. The manifestation of architectural dynamics represented by human activities is difficult to predict, so the mismatch between the architectural dynamics and its predetermined functions is inevitable (Safin et al., 2008). When this situation occurs in a pre planned space design, two situations can occur: one is to directly overturn the

original functional plan, and the other is to maintain the original functional settings and then engage in additional activities (Badiou, 2007). Rather than saying that human activities have overturned predetermined functions, it is more accurate to say that human activities have liberated the functionality of buildings. There is no inherent contradiction between the dynamic represented by human activities and the order reflected in architecture. Because human activities cannot occur in a chaotic state, the original functional order of buildings is important. Only in a certain order can activities have a basis for occurrence. Therefore, the dynamic represented by human activities is more like an extension of the building itself.

1.3 Dynamic Factors in the Housing of Adaptive Reuse of the European Historic Building

It is evident that the relationship between humans and architecture is bidirectional, which has been fully demonstrated in the adaptive reuse process of buildings. The existing building shell, as the shell that carries the adaptive reuse process, limits the evolution of the internal space form of the building, and indirectly restricts the functionality carried by the spatial form (Lanz & Pendlebury, 2022). At the same time, the adaptive reuse process of architecture itself is often triggered by the displacement of architectural identity brought about by social development (Gauger, 2020).

In fact, the phenomenon of adaptive reuse of buildings is very common in Europe, where there are a large number of historic buildings, whose rich cultural and historical value makes demolition and reconstruction costly and unsuitable (Statista, 2024). Taking Edinburgh Scotland as an example, the old town of Edinburgh has been certified as a World Cultural Heritage by UNESCO. Under the constraints of cultural ethics and building regulations, modern buildings are difficult to construct in the old town of Edinburgh. In addition, similar phenomena exist not only in the ancient city of Edinburgh, but also in most historical European cities. Therefore, issues related to the adaptive reuse of buildings urgently need to be fully researched and developed in

the European region. This article will explore and study the relationship between human activities and the internal evolution of buildings based on the adaptive reuse of public spaces in historic buildings in Europe.

The impact of human activities on architecture is particularly evident in residential buildings. This is because residential spaces are considered private spaces, and residents are not subject to legal or ethical restrictions when taking actions within the residential space. This leads to a higher frequency of interaction between humans and space in residential spaces, making the relationship between human activities and spatial evolution more likely to be observed (Leclercq & Pojani, 2021). At the same time, public spaces in residential buildings can more effectively reflect the dynamics of the building. Taking the living room as an example, this type of space has a certain degree of sociality, which leads to more frequent activities for users in this type of space. The mutual influence between human activities and spatial forms will be more pronounced.

At present, in many historical cities in Europe, a large number of residential buildings have evolved from the adaptive reuse of historical buildings, such as Barcelona, Venice, Edinburgh and other cities (Mérai et al., 2022). These areas typically have a large amount of historical architectural heritage, while cities are unable to expand due to geographical or socio-economic reasons (Salvati et al., 2018). Adaptive reuse of existing buildings can effectively accommodate the growing population year by year, while avoiding vacancy and waste of existing buildings. However, it cannot be ignored that the existing building framework limits the indoor space form after adaptive reuse of the building. These rooms generated through zero sum games often fail to fully meet the needs of users. For example, some historical buildings have limited spatial spans, resulting in narrow rooms after interior planning that cannot accommodate essential functions simultaneously (Arfa et al., 2022). This dissertation will explore the relationship between human activities and architectural evolution in

the adaptive reuse of public spaces within residential buildings. Intended to propose potential development directions for the adaptive reuse of buildings.

CHAPTER II: RESEARCH METHODOLOGY & LIMITATIONS

2.1 Research Methods

This dissertation uses literature review, field research, and comparative analysis methods to study design strategies for adaptive reuse of buildings. The research focuses on the adaptive reuse of historical buildings in residential areas, aiming to reveal the relationship between human activities, existing buildings, and design strategies.

2.1.1 Literature Review

This study conducted literature review on databases such as Web of Science, Scopus, and IEEE Xplore to clarify the background and development direction of the project. Review the changes in architectural evaluation standards from Modernism to the present through literature review. Thus, a brief overview of the position and significance of the topic of architectural dynamic nature in the architectural discipline system is provided. Then, based on the evaluation criteria, review how the issue of the relationship between human activities and architectural form has changed with the development of the times since the 1970s. Finally, from a historical perspective, this article elaborates on the existing research on architectural dynamics in historical cities across Europe and the relationship between the adaptive reuse of historical buildings and residential properties under different location factors. At the same time, the spatial form and functional conflicts faced by historical buildings in the process of reuse, as well as the potential of dynamic perspectives in promoting research on adaptive reuse design strategies, will be demonstrated.

2.1.2 Field Research

This study focuses on the housing of adaptive reuse of a historic building in the ancient city of Edinburgh in Scotland, UK, as one practical field research object, supplemented by relevant cases from other historical cities in Europe for

comparison. The research will focus on the dynamic of public spaces such as open kitchens and living rooms. Explore the correlation between architectural form and user behavior. And, the case study and discussion will be conducted through three methods: drawing analysis, video recording, and in-depth interviews of the case located in Edinburgh.

Firstly, by analyzing the architectural technical drawings of different periods, the changes in the enclosed structure of buildings that have occurred with the development of society and the passage of time are explained. And, analyze the architect's strategy for redesigning existing buildings through drawings. Further analyze the behavior and activities of residential users in public spaces through video recording. Aim to discover the mechanism and underlying reasons for the mutual influence between the spatial form of the site and its users through observation. Afterwards, individual in-depth interviews were conducted to understand the users' views on the adaptive reuse of historical buildings in residential areas, as well as their willingness to adjust the indoor spatial form of their residence. The aim is to analyze the potential of residents to redesign indoor spaces through activities, in order to promote the inclusion of dynamic factors brought about by user activities into the consideration of building adaptive reuse design.

2.1.3 Comparative Analysis

This study validates the validity and universality of the previous conclusions by introducing two other adaptive reuse cases of historical buildings located in Europe. At the same time, by comparing and analyzing cases from different backgrounds, the preliminary conclusions drawn can be further deepened and expanded.

These two cases will be selected from common European housing trading platforms such as Rightmove, Idealista, HomeEspana, etc. to have universality. Due to the fact that the existing field research cases are located in Northern Europe, the remaining two cases will be selected from Southern and Western Europe to reduce bias caused

by regional cultural backgrounds. When analyzing the selected cases, elements related to the preliminary conclusions will be selected for analysis, and other influencing factors will be temporarily suspended to verify and develop the preliminary conclusions obtained.

2.2 Limitations

The field research of this study mainly focuses on an adaptive reuse residential building in the Scottish Edinburgh area of the UK, which is limited by time, resources, and research scope. In addition, due to the limited number of field research and comparative analysis cases, research conclusions may be influenced to some extent by geographical limitations and individual differences. At the same time, the selected cases are all residential projects that have been built for a period of time, and there is also a certain lag in data updates. In the process of comparative analysis, the qualitative part relies on the researcher's judgment of the relationship between architectural form and human activities, which may have a certain subjective tendency.

CHAPTER III: EDINBURGH FIELD RESEARCH CASE STUDY

As shown in Figure 1, the historical building adaptive reuse residential mentioned in the field research case is located on 30/1 Lady Lawson Street (UK Postcode: EH3 9DS) near Lady Lawson Street in the old town of Edinburgh. The site is located within the Edinburgh Historic Preservation Area, and the other residential buildings around the site, like the field research case, are typical historical building adaptive reuse residential design projects. Therefore, this case can represent historical buildings of adaptive reuse commonly used and inhabited by residents of Edinburgh.
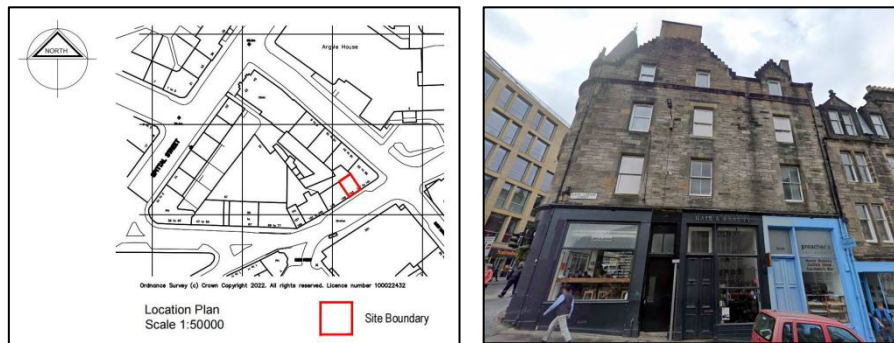

Figure 2. Location and Appearance of the Field Research Case Building

Source: The above drawings are exclusively provided by Jefcoate Anderson Architects for this study, and the on-site photos are sourced from Google Maps

3.1 Generation and Regeneration of Indoor Space

The two floor plans in Figure 2 respectively show the interior layout of the house before 2023 and after 2023. According to publicly disclosed transaction information, the residence was purchased by an Edinburgh resident in the first half of 2023, and the new owner of the building decided to rent it out to students at the University of Edinburgh as an apartment after renovating the historic building.

Before the renovation of the building in the research case, its interior space was divided into two bedrooms, a living room, a kitchen, a bathroom, and a storage room. Afterwards, due to various reasons such as economic benefits, the original living

room was renovated into a third bedroom. However, the designer did not make significant changes to the spatial form. The designer added a storage room within the existing historical building framework to meet the daily storage needs of the owner. At the same time, the designer also moved the entrance of the room to the side of the corridor to help the owner increase the privacy of the room. It can be seen that the function of a room is not absolute, and the same room can exhibit completely different functions under different definitions and uses. When the form of the building deviates from the expectations of the users, the users will take action on the space.

Figure 3. Interior Layout of the Case Building Before 2023 & After 2023

Source: The above drawings are exclusively provided by Jefcoate Anderson Architects for this study

Another noteworthy feature is that the original storage room has been merged into the bathroom area (See Figure 2). This is mainly to meet the increasing demand for bathroom use by users, while also designing a dry wet separation system for the bathroom. The room where the removed living room function is merged into the kitchen function. When the demand for space usage increases, due to the limitations of existing frameworks, some building functions will be merged. The limitation of the spatial framework in the housing of adaptive reuse of the historical building is the main reason for the problems in room design after adaptive reuse.

Figure 3 shows the demolished and newly added enclosure structures during the

building renovation process. The wall is the main means of dividing spatial boundaries. In this process, the designer mainly adjusts the enclosure structure inside the building to reassign the proportion of different functional areas and the order in which different functions are arranged and connected in the building plan. This sets a foundation for the development of events in the use of spatial functions by subsequent residents, thereby avoiding the decrease in building efficiency caused by vague spatial design. However, this also to some extent limits the user's usage of spatial functions. For example, the dining table placed against the wall in an open kitchen to some extent limits the user's dining position and eating style. There is inevitably a mismatch between overly detailed designs and user behavior habits.
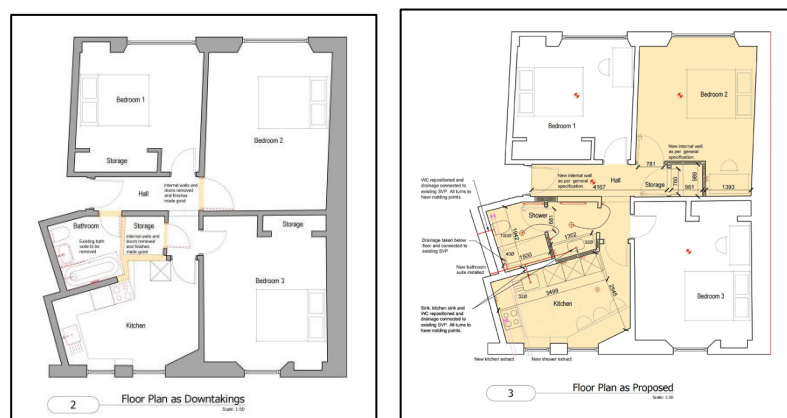

Figure 4. Demolished & Newly Added Case Building Enclosure Structures

Source: The above drawings are exclusively provided by Jefcoate Anderson Architects for this study

3.2 Space: As the Intersection of Subject and Object

Figure 4 shows how space users use different areas of the home at different times of the day. This study comprehensively observed the daily use of indoor space by residents living in the 30/1 Lady Lawson Street building within 24 hours through real-time image tracking and recording.

Figure 5. The Use Scenario of the Kitchen Function in the Edinburgh Case Building
Source: Recorded by Zhu, S. in Edinburgh, UK in December 2024

Figure 4 shows the usage of the kitchen when four people are having dinner together. Due to the fact that pulling out the chair further reduces the width of the aisle, when used in the kitchen, the chair will be pushed back under the table. When exercising the function of a kitchen in a room, a series of furniture represented by a stove are mainly functional. It can be seen that it is necessary to pre-set the functions of different rooms in the process of architectural design. This can also drive the development of further construction plans. Although the user's subjective actions adjusted the ratio of functional areas to access areas in the room during this process, they did not have a significant impact on the user experience. This is a positive redesign.

Figure 5 shows the use of an open kitchen as a eating area. Due to the extension of the chair, the aisle space is further narrowed, which makes normal traffic impossible. At the same time, users will use the storage cabinets next to the traffic area (aisle) during this process. When using a storage cabinet, users need the person sitting in the chair to lean against the dining table in order to open the cabinet to an angle where they can retrieve items. This is due to the insufficient room space to support both the dining room and kitchen functions simultaneously, resulting in a zero sum game of space for

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users. From the perspective of adaptive reuse of buildings, the shell and internal structure of existing historical buildings limit the way the internal space is divided and the size of the divided space. The limitations of historical buildings as frameworks themselves are one of the main reasons for driving dynamic adjustments within buildings.

Figure 6. The Use Scenario of the Eating Area Function in the Edinburgh Case Building
Source: Recorded by Zhu, S. in Edinburgh, UK in December 2024

Figure 6 shows the daily use of an open kitchen when it does not perform cooking and eating area functions. Due to the fact that the current residents of the research site are students studying at the University of Edinburgh, most of the time the open kitchen space is used as a studio. More importantly, the user's usage of the space does not match the designer's predetermined usage. This is mainly because in the existing floor plan layout, tables against the wall cannot provide enough space for 2-3 people to work at the same time. So, in daily use, users will pull out the table to increase the utilization rate of furniture. In fact, this is a passive subjective action. Due to the inability of existing indoor layouts to meet the potential needs of users, they may take subjective actions to make the space environment function accordingly.

After the dinner party, the chair will be pushed back under the table. The use of the room will also return to the normal mode of use. However, the user did not push the

table back against the wall because the table was in the most reasonable" layout in the current space. The emergence of this phenomenon is mainly caused by two factors: one is that when the space layout is sufficient to support normal activities, users will not actively take action on the space (Deasy & Lasswell, 1985). The second is that after users move in, they will passively redesign the space according to their own living habits, thus creating a new normalized spatial form (Chiu, 2014).
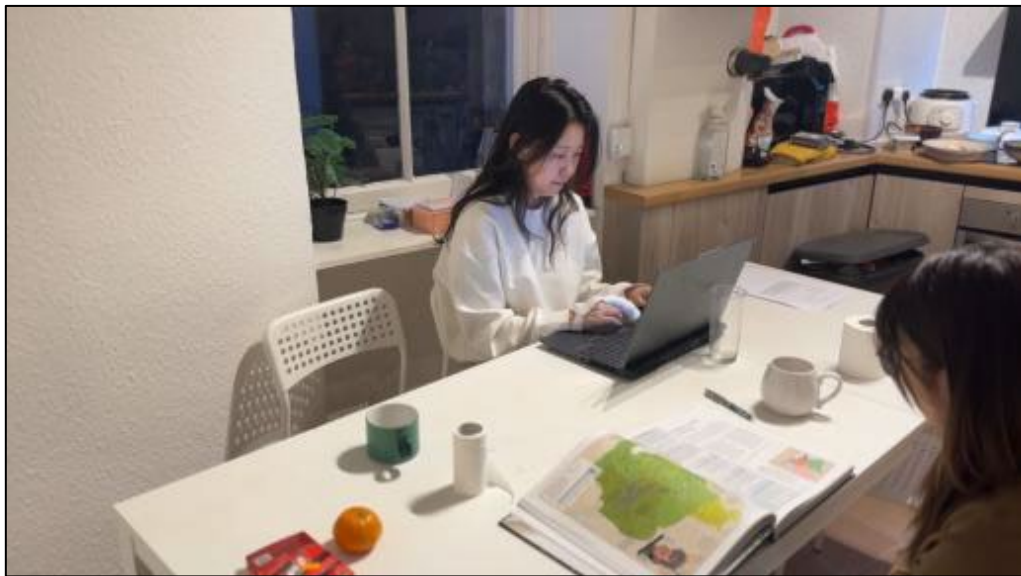

Figure 7. The Daily Use Scenario in the Edinburgh Case Building
Source: Recorded by participant B in Edinburgh, UK in December 2024

3.3 Passivity and Proactivity of Subject Behavior

The operation inside a building is composed of both the material elements of the building and the behavior of its occupants (Seaman, 1994). After analyzing the evolution and observation of residential enclosure structures, this study conducted independent interviews with 5 participants who participated in the observation records, aiming to understand their views on the adaptive reuse of historical buildings in residential areas and their motivations for subjective actions towards the living environment.

The volunteers participating in the interview & field research are 3 males and 2 females, aged between 20 and 25 years old. These 5 individuals (A/B/C/D/E) are all

international students at the University of Edinburgh in the UK, and most of them have experience renting the housing of adaptive reuse of the historic building.

Based on the feedback from participant A, A made minor adjustments and modifications to the layout and decoration of their room after moving into the apartment. Participant A provided two main feedback points during the interview, such as "I placed the storage box that was originally placed by the bed next to my desk as a small workbench," and "I reserved more space by moving the bed to the left and the wardrobe on the right, which is also the space I most frequently use."

The 30/1 Lady Lawson Street building in the field research case has a relatively small indoor space size, so users will subjectively adjust the indoor layout to meet functional needs and improve comfort. Most users of buildings have subjective initiative and can adjust the existing framework according to their own situation. However, when it comes to actions in public areas (open kitchens), A usually does not actively adjust the space, as A said, "because this involves the issue of ownership of the space and the items within it."

When it comes to the enthusiasm of these 5 people for the adaptive reuse of historical buildings, most participants do not tend to choose this type of residence, and even this type of residence is included in the list of non-priority housing options by participants C and D. This is mainly because most residents usually consider economic factors when choosing a house. Although the housing of adaptive reuse of the historic building can ensure functionality and economic benefits, the adaptive reuse of some historical buildings cannot avoid restriction problems such as enclosure structure, spatial dimensions, and building performance caused by already existed building frameworks.

When it comes to whether one will redesign the room they are staying in. 80% of participants will make minor adjustments to the existing indoor layout to meet

potential needs, such as freeing up storage space, changing areas, and expanding workspaces. When the architect's planning is reasonable, the user's actions are only to make the space conform to their own living habits. For example, participants A, B, and E only made the maximum semi permanent adjustment to the spatial layout by moving the position of the bed. Residents do not actively and frequently adjust the spatial layout. Most of the time, they act passively in the gaps between potential needs and functional layouts.

CHAPTER IV: DESIGN STRATEGIES IN THE HOUSING OF ADAPTIVE REUSE OF THE EUROPEAN HISTORIC BUILDING

Based on the field research of the 30/1 Lady Lawson Street building in Edinburgh, it has been shown that the main reason for designers to redesign adaptive reuse residences for historical buildings is the mismatch between existing spatial forms and expected functions. The main reason why users adjust the indoor space of the housing of adaptive reuse of the historic building is that the existing indoor layout cannot support the normal use of expected functions. However, a single case analysis cannot prove the accuracy and universality of the conclusion. Chapter IV will introduce comparative analysis of two mainstream European housing trading platforms, Rightmove and Home Espana, in this chapter to preliminarily validate potential conclusions. This study selected a residence case located in a residential area in Rome, Italy, and a residence case located in Sagunto, Spain for comparative analysis.

4.1 Case Analysis from Rome, Italy

The following is a case of adaptive reuse of historic buildings in residential areas of Rome, Italy. As is well known, although Edinburgh and Rome are world-renowned historical cities, their social and cultural backgrounds and geographical locations are completely different. However, the form of the building where the site is located is very similar to the form of the case from Edinburgh. Figure 7 shows the surroundings and appearance of the historical building where the case is located. Both of these are enclosed low rise residential buildings constructed using the block grid divided by urban planning.

Figure 8. Location and Appearance of the Rome Case Building
Source: The above drawings are sourced from Google Maps & www.rightmove.co.uk

In addition, it showcases the adaptive reuse of an open kitchen in the residential area of the historic building, which operates similarly to the Edinburgh case, combining a stove, storage, and tables and chairs (See Figure 8). However, the indoor spatial layout forms in these two cases are different. The case of Edinburgh adopts a U-shaped layout, with functional areas centered around transportation zones. The case of Rome is an I-type layout, with functional areas arranged along both sides of the transportation area. Although the spatial layout strategies adopted by the two are different due to the influence of the room enclosure structure, their operating modes are similar. In the case of Rome, tables and chairs are usually placed against the wall to provide sufficient transportation space for the kitchen function of the room. During dinner, the tables and chairs placed against the wall were pulled out to support a family gathering of 3 to 4 people. What determines the form of space use is the working mode of the space, that is, which functions are integrated into the limited space.

From the visual characteristics of the case in Rome, the main reason why this space prompts users to take subjective actions towards the space is the insufficient space area. This has led to a zero sum game between designers and users in the process of redesigning the space. Therefore, it can be seen that users rarely take active actions in indoor spaces, and more often do so for passive reasons. However, the reason for this series of behaviors is the fixed limitations of the existing historical building

framework structure, which is difficult to change. So, the flexible design demonstrated in the two cases of Edinburgh and Rome is generally positive. Both of these actively or passively incorporate users' subjective actions into the system of building operation, extending limited space and functionality.

Figure 9. Public Space Area of the Rome Case Building
Source: www.rightmove.co.uk

4.2 Case Analysis from Sagunto, Spain

The following case is located in the residential area of Sagunto old town in Spain. Although Sagunto, like Edinburgh and Rome, has a rich historical heritage, it is different from Edinburgh and Rome in that it does not have a central position in politics, economy, and culture. As a small city with a focus on industry and port economy, Sagunto can provide a control group located in different socio-cultural backgrounds to increase the generalizability of the conclusions.

Figure 9 shows the building analyzed in the Sagunto old town region. The urban planning type of Sagunto is a typical Roman style city, which also introduces a grid style street layout. But unlike Rome and Edinburgh, the courtyard in the center of the block is divided into many small courtyards, enclosed within the building complex of the block. This resulted in a different architectural form of the historical building

where the site is located compared to the previous two cases. This case also aims to preliminarily illustrate that the space limitations of historical buildings are not limited to a certain form, but rather result from the insufficient spatial span caused by specific productivity technologies in a specific era background.
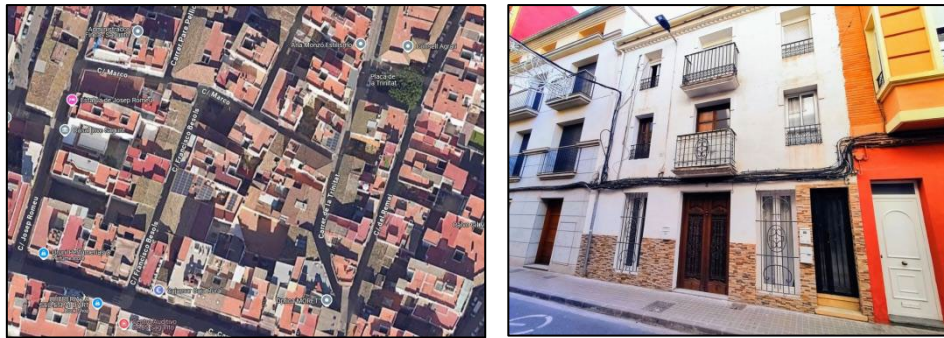

Figure 10. Location and Appearance of the Sagunto Case Building
Source: The above drawings are sourced from Google Maps & www.homeespana.com

In Sagunto case, although the space type is different from the previous two cases, there is also a situation of functional merging in this common space (See Figure 10). The office area has been integrated into the living room space. This is mainly due to the insufficient size of the space divided into bedrooms during the adaptive reuse of buildings to accommodate independent workspaces.
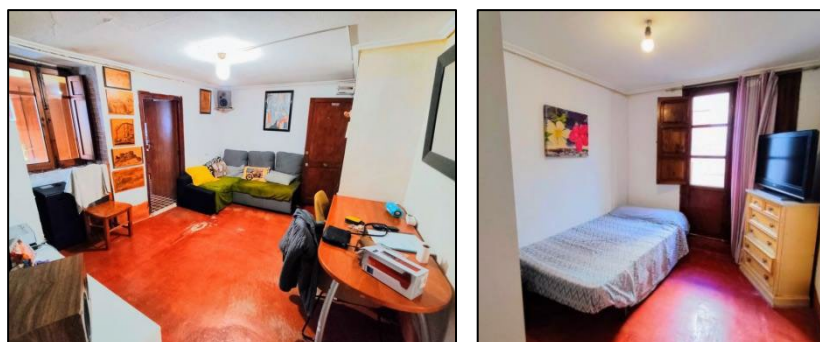

Figure 11. Public & Private Space Area of the Sagunto Case Building
Source: www.homeespana.com

The phenomenon of functional merging in the above 3 cases is not caused by the spatial limitations of individual rooms, but by the space limitations of the entire

residential complex. However, the difference between this case and the previous two cases is that there is no obvious phenomenon of users subjectively taking actions on the spatial form in this public space. This may be because the size of the public space is sufficient to support multiple parallel functions within it. In indoor spaces of buildings, the frequency of movement of space users is highly correlated with whether the space size matches the carrying function. In the two cases located in Edinburgh and Rome, it is difficult to accommodate functions such as kitchen, dining room, and even living room within limited indoor space. In the process of designer design, the area of space overlap between different functional areas is relatively large. So much so that users need to frequently adjust the layout of the space when using it, in order to achieve different functions running normally in the same space at different times. However, the space dimensions of Sagunto case are sufficient to accommodate both the living room and studio functions. So, the frequency of users' actions in space is relatively low. Seemingly, the narrow space makes the frequency of users' actions denser, but in reality, it is the need to constantly adjust the weights of different functional areas in the space that leads to an increase in the frequency of users' actions. Table 1 summarizes the 3 cases mentioned in this article and provides a preliminary evaluation of their space limitations, functional layout, and user actions. The limitations of adaptive reuse space in existing historical buildings are mainly reflected in the spatial span and total spatial size. This directly affects the layout design of indoor spaces and whether there will be overlapping between different functional areas. This phenomenon is manifested as an increase in the frequency of user actions and an increase in the density of objects arranged in space.

Table 1：Comparison of Elements between Edinburgh, Rome, and Sagunto Case

	Degree of Space Limitations	Frequency of User Actions	Quality of Space Function Operation	Overlap of Space Function Areas	Density of Indoor Layout
Edinburgh	Middle	High	Middle	Middle	Middle
Rome	High	High	Middle	High	High
Sagunto	Middle	Middle	High	Low	Low

CONCLUSION

The main reason for residents to adjust their space is that the existing space layout of residence of adaptive reuse of the historic building cannot meet residents' needs. It is worth noting that the limitations brought by the historical architectural framework have also led to the phenomenon of merging between some functional areas within residential buildings, as shown in the Edinburgh case where dining area and kitchen are merged into open area.

During the literature review, this dissertation found that few researches have applied the dynamic perspective of architecture to the adaptive reuse design, and most of them remain at the theoretical level. Therefore, after introducing the dynamic perspective of architecture, this dissertation hopes to provide researchers with a new idea for the study of adaptive reuse design of buildings, incorporating the dynamic nature of user activities into the design considerations, in order to improve the comfort and accessibility of residential buildings within a limited architectural framework.

After conducting research on the adaptive reuse of historical buildings in 3 European cities, Edinburgh, Rome, and Sagunto, this dissertation preliminarily validates the final conclusion. The mismatch between the architectural space form and the expected function leads to passive subjective actions by users towards the indoor space. The framework of historical buildings will limit the adaptive reuse of indoor enclosure structures, which has led to the merging of some functional areas in the residential area and partial overlap of different functional areas.

This dissertation proposes the following potential design suggestions based on the conclusion. Designers can consider leaving buffer zones between different functional areas within the same room. By dividing the reserved buffer zones into different functional areas, users can achieve spatial functionality and even attribute

switching. If the indoor area of the room is sufficient, it is necessary to avoid the frequent occurrence of such passive spaces as much as possible. Actually, when residents demonstrate the potential for redesigning the interior space of the residence, designers should liberate their potential by leaving space for them to move around, in order to improve the comfort of the residential environment.

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ILLUSTRATION LIST

Figure 1. Created by ███ in Edinburgh, UK in May 2025.

Figure 2. Left is exclusively provided by Jefcoate Anderson Architects for this study; Right from Google Maps.

Figure 3. Left & Right are exclusively provided by Jefcoate Anderson Architects for this study.

Figure 4. Left & Right are exclusively provided by Jefcoate Anderson Architects for this study.

Figure 5. Recorded by ███. in Edinburgh, UK in December 2024.

Figure 6. Recorded by ███. in Edinburgh, UK in December 2024.

Figure 7. Recorded by participant B in Edinburgh, UK in December 2024

Figure 8. Left from Google Maps; Right from

https://www.rightmove.co.uk/properties/155666678?currencyCode=USD

#/media?id=media1&ref=photoCollage&channel=OVERSEAS

Figure 9.

https://www.rightmove.co.uk/properties/155666678?currencyCode=USD#/media?activePlan=1&currencyCode=USD&id=media13&ref=photoCollage&channel=RES_BUY

Figure 10. Left from Google Maps; Right from

https://www.homeespana.com/property/vlcd5224-apartment-for-sale-in-sagunto/#gallery-1

Figure 11. Left from

https://www.homeespana.com/property/vlcd5224-apartment-for-sale-in-sagunto/#gallery-2

Right from

https://www.homeespana.com/property/vlcd5224-apartment-for-sale-in-sagunto/#gallery-9

APPENDIX

Interview Records：

https://drive.google.com/drive/folders/1SipLZmHOaoFmjPbLcb6CuPMUlQ8qtYYu

Informed Consent Forms of Participants in the Experiment：

https://drive.google.com/drive/folders/1-0hEOfGjwArJMKA8Wl0IGOer_0jU--Vi