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The Most Appropriate Reuse of Historic Buildings

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ABSTRACT

A widespread tendency is the adaptive reuse of historic buildings, which has an impact negatively or positively on their heritage significance. The aim of the current paper which depends on an analytical descriptive approach is to analyze several global experiences that have adopted "Most Appropriate Reuse" of historic buildings to provide a theoretical basis for a comprehensive methodology for this policy through analyses and comparisons to derive the most important methodologies for reuse in general and "Most Appropriate Reuse" in particular, using criteria and indicators from studies to build the theoretical framework of the proposed methodology, which could serve as a basis for future practical studies. Contributors to the project will benefit from this paper by learning about reuse mechanisms and gaining more knowledge about the best reuse mechanism and how to access and implement it in accordance with predetermined criteria and indications.

1. INTRODUCTION

The trend towards the conservation of historic buildings and heritage installations has recently increased due to the values and significance they carry that bring many benefits to society if properly exploited. As it constitutes heritage constitutes society's identity and is regarded as a point of reference and a positive tool for irreplaceable growth and change [1]. The responsibility for its management and adherence to international charters and conventions to preserve it belongs to the society it produced [2]. Heritage buildings possess social, historical, aesthetic, spiritual, artistic, natural, cultural, and scientific values when determining and understanding these values. This contributes to choosing the type of interventions required to preserve them and extend their life expectancy [3]. Cultural heritage is exposed to a range of threats that weaken its potential and reduce its life expectancy by poor land management and planning, global economic changes, contemporary construction practices, unrestricted tourism in sites, armed conflict, and wars [4]. Therefore, most are directed to conservation which is a process that extends the life of the natural and cultural heritage [5]. The basic rule of conservation is that increasing the level of intervention will make the destruction of historic buildings so must attention is taken in choosing and implementing the conservation strategy [6], the degree of intervention requires is determined by the condition of the building and the minimum intervention is always preferred in the conservation process [3].

In most countries, the immovable cultural heritage is used badly by allocating it to functions that are incompatible with the values of the buildings and their importance, which causes a reduction in the physical life of the building [7]. Attention is directed lately globally to adaptive reuse policy as a result of the challenges faced by newly constructed buildings [8]. Most historic buildings are characterized by their ability to absorb changes and adapt to the requirements of new functions, and this contributes to creating links with the past, enhancing a sense of place, and stimulating creativity, growth, and development. During the past fifty years, attention has been paid to the sustainability of the urban environment, as the reuse of historical buildings is considered one of the most important practices used to achieve this [9].

This study leans on the analytical descriptive approach by reviewing the literature published on reuse in recent years and extracting its most important findings. As a result of the knowledge lack about a comprehensive methodology for selecting the appropriate function for historic buildings through their reuse and contributing to increasing their operational and physical life. This study tries to answer whether the most appropriate reuse mechanism requires a methodology to manage this process? So, this study contributes to creating a theoretical framework for most appropriate reuse methodology for historic buildings which aims to establish a theoretical basis for an inclusive methodology for "Most Appropriate Reuse" of historic buildings, it will help project contributors to learn about reuse mechanisms and expand knowledge about it and how to access and achieve it according to specific criteria and indicators.

2. REUSE OF HISTORIC BUILDINGS

Reuse is the policy of changing and modifying an ineffective origin to a modernistic one that can be used for another purpose [10]. Recourse to reuse due to old structures no longer performing an economically viable function, or due to changes in architectural needs resulting from social and economic changes and the nature and strength of residential

areas requiring enhancement of the performance of existing buildings in desired locations [11]. It plays a leading role in the sustainability of buildings by extending the productive life of existing buildings and reducing the costs of materials, transport, energy, and pollution when matched with the construction of new buildings [6], through which historic buildings of their cultural value can be developed with new economic, social and cultural uses of a sustainable nature, Retaining historic construction and urban fabric stock to create and promote values related to history, continuity, familiarity, identity and sustainable human development as an additional stimulus to the economic revitalization of the region and the city as a whole, the process is carried out through the development of clear guidelines to avoid destruction rather than the development of heritage [11].

2.1 Reuse challenges

Reuse policy encounters several challenges, including the information reliable lack, technicians, skilled labor, compatible materials, compatible laws and legislation with the requirements for use, views on the buildings by the community and government agencies, the continuity and promotion of the community's life, and the management of pollutant and risky materials [12], the cultural significance of the building, the policy of defining the new function, trying to harmonize the building with the new function with the least change, opportunities for effective and appropriate community participation, economic viability and cost of acquisition and associated costs, obtaining approval for the change of use, enhancing the values of the building and trying not to lose it [11]. It is necessary to avoid fallacies during the process in order to avoid visual distortion, detriment, and decay in the architectural and urban aspects [13].

2.2 Reuse mechanism

Reuse policy can be classified into a group of mechanisms:

2.2.1 Adaptive reuse mechanism

It refers to the least degree of adaptation that is based on the intervention strategy. As the new elements completely alter the existing ones, they lose its initial integrity, making it a strategy with a high degree of integration. To make adaption easier, it could be necessary to remove some of the original structure. The architect imposes a series of changes in an existing building to facilitate the needs of its users, making it structurally sound, and usable, and giving it the necessary aesthetic quality. This strategy is frequently used with buildings that are already in poor condition or in need of major changes to facilitate new use. The interventions cause the building to transform permanently and irrevocably. There are two stages to the modifications. The first is stripping, which entails getting clear of excessive construction modifications or components that aren't necessary and could endanger the stability of the structure [9]. Important building characteristics are maintained during these abstraction processes, the majority of which are required to comply with current building codes [6]. The second is the addition of new components made to fit the original structure. New objects can be differentiated from the period and place in which they were created [9].

2.2.2 Compatible reuse mechanism

The process of integrating a new component into an existing structure is the second level of adaptation, which is dependent on the insertion strategy. The inserted components typically fit perfectly and are challenging to remove. The new component might be adjacent to or surrounding the existing building rather than inside its walls. This strategy makes minimal changes to the existing structure, creates a space for the new element inside the existing structure, and clearly distinguishes it from the original structure. The new element is typically a complex element made up of many parts assembled for a single purpose, and it usually serves as an essential element in the structure of the building and benefits users by facilitating their demands [9]. This approach typically respects the integrity, character, and shape of the structure while being acceptable to the local community [14], does not harm the location or its cultural significance, and does not significantly contribute to the structure's sustainability [15].

2.2.3 Sustainable or green reuse mechanism

It is ecologically, economically, and socially sustainable use [9], which requires profitability, flexibility, energy efficiency, and environmentally friendly materials [16]. It contributes to strengthening the historical building and preserving its social, historical, and cultural values, highlighting the role of financing and governance models in preserving heritage, increasing opportunities for cooperation between multiple actors, reducing the use of resources, and renewing values, capital, and knowledge [17].

2.2.4 Highest and best reuse mechanism

As it represents the most highly profitable outcome, it is defined as the use that represents the highest value among the values in the building's current and proposed uses. The highest and best reuse is those that are economically sensible, technologically viable, urban permitted, and financially sustainable [7]. This method is distinguished by giving society the largest level of economic and social comfort, establishing the greatest degree of agreement among all parties involved in the decision-making process, and making sure that historical legacy and cultural values are promoted [18].

2.2.5 Most appropriate reuse mechanism

It represents the highest and optimal level of adaptation based on the Installation strategy by adding new parts or elements to the existing building without a change in the structure [9]. This mechanism contributes to the compatibility of the building and enhances understanding of the cultural relevance of the historic place [15]. The classification of the heritage building is taken into account to determine the amount of intervention permitted and to preserve all architectural elements, details, and finishing materials that give a building a unique character [13]. Attention is also tailored to the needs and desires of the community, the provision of long-term management, the use of interchangeable systems, and the provision of site amenities with convenient facilities [15]. It is the most efficient or profitable use of the building and is a fundamental principle of assessment and zoning used in the assessment of land or buildings. It is an important factor in the determination of obsolescence [19]. Therefore, most appropriate use alternative that can be incorporated with historic buildings leads to the conservation success of heritage [5]. The constraints of “Most Appropriate Reuse” are the need to distinguish new additions and the lack of their impact on the hallmarks of the heritage building, and the changes should be as low as possible if it is necessary to make internal or external

extensions or additions to the building, without altering or damaging parts of the building with new functions [15], allowing users easy access to all building facilities, meeting the wishes of owners and users as well as their spatial needs, preferably through the day, with full use of the building and all its floors [20].

3. MULTI CRITERIA DECISION-MAKING PROCESS

It's a cognitively complex process that leads to a course choice of action among many available alternatives that include a set of steps to reach the best alternative, namely, identifying the problem and then articulating it in clear and measurable terms, thus enabling the administrator to develop alternatives and then summarizing the advantages and disadvantages of each alternative and evaluating it to choose the best alternative to achieve goals [21]. Multi Criteria Decision-Making (MCDM) is a structured and multidimensional procedure developed to address decision-making problems in diverse fields by seeking the most appropriate alternative, and improve the quality of decision-making, and making more rational and efficient decisions. MCDM methods are classified into two categories due to various problem settings, the first is multi-attribute decision-making (MADM) describes decision problems that have a limited number of alternatives and attributes, and the second is multi-objective decision-making (MODM) describes problems with a multitude number of alternatives and attributes [22].

After reuse has been identified, benefits, determinants, and mechanisms we notice that, most appropriate reuse is the most comprehensive mechanism, and the highest level of adaptation coveted in the conservation and promotion of historic building values, This mechanism requires a complicated methodology for selecting the appropriate function for historic buildings based on a theoretical framework that includes a set of important aspects, criteria, and indicators in the process of evaluating and appointing most appropriate use, as a result, the absence of a broad methodology for selecting the appropriate function of historic buildings through their reuse and contributing to the extension of their operational life, the present paper aims to establish a theoretical basis for a broad methodology for most appropriate reuse mechanism for historic buildings. The following section analyses and compares a group of relevant studies intending to extract “aspects, criteria, and indicators of ‘Most Appropriate Reuse’ mechanism”.

4. LITERATURE REVIEW

In order to determine the level of attitude, a review of some existing studies on “Most Appropriate Reuse” was performed in the current paper. 15 papers related to reuse in general and 10 papers in particular about “Most Appropriate Reuse” were analyzed and compared in order to extract the most important results and come up with the most important aspects and criteria that represent the theoretical basis for the methodology for determining “Most Appropriate Reuse” of historical buildings.

4.1 Reuse studies

1. The main variables to take into account when implementing an adaptive reuse policy as a component of a sustainability plan are presented to decision-makers in this article and aim for a thorough analysis of the elements influencing the choice to use an adaptive reuse approach [23].

2. The ARP model will be used in this study to verify AdaptSTAR. The hybrid study's methodology—qualitative and quantitative—explores the first phase of 12 Australian adaptive reuse projects to determine what aspects of the initial project design contributed to the success of adaptive reuse. In the subsequent stage, weights are assigned to the factors on this list based on a questionnaire that gauges their relative importance. The performance of the resulting model is assessed in the third stage. Each of the twelve case studies is evaluated using the ARP model to assess potential at the time of redevelopment and AdaptSTAR to measure performance [24].

3. Explained how to handle the many criteria for evaluating the reuse of industrial buildings in Hong Kong. For decision-making the fuzzy AR Model has been developed. The physical, economic, environmental, social, and legal components of the evaluation process were the main emphasis of this study [25].

4. This study investigates the obstacles to Australian adaptive reuse programs' success. This study identified and established six criteria that were specific to the difficulties faced by professionals conducting adaptive reuse: "High remediation cost and construction delays; Availability of materials and lack of skilled tradesmen; Building codes and regulations/legal constraints; Physical restrictions; complexity and technical difficulties; and Inaccuracy of Information and Drawings, Acoustics, Fire Safety, and Disability Access Modern Technologies". These challenges are grouped into two categories: Compliance with codes and regulations and Current design requirements [26].

5. Based on the Nara grid, this study evaluates the viability of the private sector's adaptive reuse of a historic building, Kashan's Manouchehri House, as a method for determining the authenticity of cultural heritage. The criteria (form and design, materials, use and function, tradition and techniques, and location) were used to determine the authenticity. The results of the analysis of the questionnaire data showed that the application of adaptive reuse to the buildings leads to the revival of historical contexts by linking the historical buildings with the current lifestyle [27].

6. This paper investigates the current situation surrounding the adaptive reuse of industrial buildings in Hong Kong and compiles a list of variables influencing this practice. SPSS has been used in data analysis, 33 variables have been broken down into eight primary categories including sustainability, economics and finance, the market, changeability, location and neighborhood, culture and public interests, legal and regulatory issues, and the building's physical state. The physical, economic, functional, environmental, and cultural aspects of adaptive reuse were investigated in this study [28].

7. It seeks to learn how effective adaptive reuse is as a novel strategy for creating long-term values for historic structures in developing nations. A strategy was created to facilitate the adaptive reuse of historic buildings in developing countries (SARHB), outlining the various measures that the governments in charge of heritage and monuments in developing countries can take to revitalize and generate sustainability. The literature was reviewed, followed by the presentation of two case studies and their analysis to investigate the role of adaptive reuse in increasing the sustainable value of heritage buildings. The economic,

environmental, social, legal, and technological elements of adaptive reuse were covered in this study [29].

8. With a focus on the reuse of buildings in Sri Lanka, the study's goals were to identify reasons for and adaptable building parameters and features for reuse, determine its advantages, constraints, and challenges in Sri Lanka, and propose remedial measures to overcome obstacles and challenges for maximum social, cultural, environmental, and economic benefits. The barriers identified were divided into six categories: social, environmental, economic, legal and regulatory, physical, and technological [30].

9. In order to repurpose the old Mashrooteh home in Tabriz and improve its future adaptability, this study includes forecasting and analyzing its sustainability. The AdaptSTAR model, which emphasizes physical, technological, functional, economic, social, legal, and political factors, was utilized in this study's qualitative approach to evaluate the Mashrooteh house's usability and sustainability [31].

10. The article aims to show how visitors' perceptions and actual visits are affected by the adaptive reuse of historic buildings. Through the use of a questionnaire, this study examined how visitors to Kuching, Malaysia, perceived the adaptive reuse of historic buildings. This study discovered that visitors highly regarded historic building adaptive reuse strategies, which boost a building's usability by altering its use while keeping its structure [32].

11. It aims to determine the building requirements and surroundings factors that contribute to the adaptive reuse and sustainability of historic buildings as well as the advantages of such reuse that contribute to sustainability. To explain the relationship between the advantages of adaptive reuse, the cornerstones of sustainable development, and the factors contributing to the success of the adaptive reuse process to protect heritage buildings, a theoretical framework was developed. The SPSS program is then used to apply it to regional, local, and international projects. Physical, environmental, social, economic, cultural, and political issues were all incorporated in this framework [33].

12. The aim of this study is to present a thorough analysis of the factors that affect the choice of a strategy for the sustainable adaptive reuse of historic structures. This study analyzes the benefits and drawbacks of sustainable adaptive reuse in Tlemcen's historic district, which is home to numerous mosques, madrasahs, royal palaces, and town halls. It also offers an evaluation methodology for future projects of a similar nature that can be used in other parts of the world by modifying sustainability standards in accordance with local conditions [34].

13. This study suggests using a shape grammar approach to analyze floor plans in order to increase the contribution to adaptive reuse projects of Soprado buildings. The proposed methodology aims to develop a computational tool to aid the adaptive reuse of historic residences in the historic center of So Luis. The methodology took into account the needs of economic viability and sustainability, as well as the integration and modernization of information and communication technology and automation, and it proposed a specific sequence of steps to achieve the process of adaptation while taking into account the changing factors [35].

14. The significance of reuse initiatives that aim for sustainability was underlined by this study. An instance of the adaptive reuse of a heritage structure in Pune was investigated. A photographic survey, a documentary study, and a semi-structured interview with the owner made up the methodology. The study of the fundamental building model, the shape of the reconfigured structure, and the tactics, strategies, and interventions were the three analytic approaches used in this research [36].

15. Alhojaly et al. [37] was carried out in the ancient city of Jeddah to determine the criteria for judging the adaptive reuse of historic structures. To aid in the ongoing examination of repurposed buildings, a methodology for assessing adaptive reuse of historic structures was created. The model was built around these two axes: First, background data on the structure to determine its history. Second: The criteria and elements for reuse, restoration, and repair, which are composed of seven fundamental components: the suitability of the new function, architectural and interior design, security and safety, legal and economic considerations, and repair and restoration in accordance with the Jeddah secretariat's technical restoration manual.

4.2 The most appropriate reuse studies

1. The methodology for the appropriate reuse of historical patterns that have lost their original functionality is proposed in this work. The historic pattern of Diyarbakir Hassan Basha Khan was evaluated using a methodology for the reuse of historic patterns based on the management of use and change proposed by Bond and Worthing model through six steps: the condition of the historic pattern, the condition of the environment, the integrity of the place, re-use alternatives and their benefits and drawbacks, owners' and users' requirements, and an assessment of results to determine It concentrated on characteristics that were purely physical, social, economic, cultural, functional, and environmental [20].

2. This study seeks to investigate and analyze practices of reuse in the ancient city of Mosul to provide a procedure based on the derivation of appropriate criteria and relevant for selecting most appropriate replacement for the historic building. Methodology is based on conservation challenges faced by heritage environments to develop clear design standards for future uses. The study offers specialists the opportunity to perform more targeted actions and obtain more effective achievements and discusses methods that experts can use to exploit the cultural significance of future sustainability. This study focused on the physical, cultural, environmental, social, economic, financial, and political aspects [38].

3. This study focuses on using stakeholder input to assess whether new uses for historic structures are appropriate. The Alexandria National Museum was used as a case study, with three goals in mind. The first step is to evaluate the signs gleaned from the literature, including the new building's architectural integrity, public perception, shape, and function. The second is to look into how the museum might be made more environmentally friendly. The third is to determine whether the historic structure can adhere to reuse criteria. The physical, economic, social, environmental, and cultural components of the evaluation process were the main points of attention [16].

4. The goal of this study is to pinpoint the most significant variables that influenced the choice of most appropriate reuse for Tehran's abandoned historic homes. This choice was made using the Simple Additive Weighting method, one of several multi-attribute decision-making techniques. The study discovered that the opinions of the people involved, subject-matter specialists, local populations, local visitors, and foreigners, as well as the relationship between reuse and the

new form, are the most significant influences on decision-making for the reuse of historic homes, it concentrated on the physical, economic, social, and cultural factors [39].

5. This study was applied to the Convent of Santa Maria del Gesù, an unused building with significant cultural value in the historic center of Ragusa Ibla, in Sicily, this study aims to help select the most appropriate design among many compatible alternatives in four phases: identifying the impediments to the transformation of the building defined by its historic and artistic characteristics; designing alternative solutions to restore the building, and evaluate alternative design solutions about conservation needs and adaptation to new use. The method integrates AHP&EVAMIX approaches, were arrange alternatives and builds an evaluation matrix, and then use the EVAMIX method taking into account the previously attributed weights by AHP. This study concentrated on the physical elements of evaluation and the choice of most appropriate alternative [40].

6. This study on the investigation into the evaluation of Alexandria's Aziza Fahmi Palace and the determination of its most appropriate reuse. To create a complete set of criteria to aid in the decision-making process, the theoretical literature on the elements influencing the adaptive reuse of heritage buildings was examined. The best tool for the study area will then be identified by evaluating the most popular decision-making tools, and the tool will then be applied to minors to discover how best to utilize it. The Microsoft Excel program and the analytical hierarchy approach were the best tools for making decisions. In applying the assessment methodology based on cultural, physical, economic, social, and environmental aspects to Aziza Fahmi, the best use has been shown to be a versatile building according to the selected criteria and their relative relevance [41].

7. The goal of the paper is to develop an economic evaluation model that will aid decision-makers in selecting historic structures that are compatible with historic traditions, their technical and structural qualities, and both the present and future needs of the community. The study outlines a sequence of steps that start with the initial selection of a building's potential functions, continue with the identification of criteria and sub-criteria, assign weights to the criteria, and then implement hierarchical analysis algorithms to reorder the final alternatives and ascertain the building's highest and best use. The social, cultural, and financial considerations in selecting the highest and best use for historic structures were the main topics of this study [7].

8. This study intends to identify appropriate roles for architectural monuments generally and the Othello Castle in the walled city of Famagusta in particular, and to provide a decision-making framework for the reuse of historic buildings using a variety of research approaches. The framework's first step entails analytical research based on a review of the literature and site observation, followed by an examination of the architectural and historic benefits of defining architectural layers and changes over time, followed by a consideration of heritage values and a determination of relevance as possible end users of the reuse functions, the local populace and cultural visitors participated in the survey. The study's main focus was on the physical and cultural factors that go into selecting acceptable functions [5].

9. By relying on the opinions of many stakeholders (the local community and specialists), employing statistical techniques and (11 Choice Expert), and applying the decision-making program this study seeks to propose an appropriate use evaluation model. As a case study, the Administrative Hospital in Kyrenia, Cyprus, was chosen. Material, cultural, economic, social, and legal components of the review process were all considered in the methodology [42].

10. In which the common features of adaptive reuse models and environmental rating systems were reviewed to produce a proposed prerequisite criteria schema, which can be used for project development and revision ensuring the continuing relevance of heritage. Include physical, social, economic, environmental, functional, legal, political, and technological aspects in this scheme [43].

5. DISCUSSION

The aforementioned studies provided information on both the "Most Appropriate Reuse" and the reuse policy in general. In order to develop and analyze a theoretical framework for a comprehensive methodology for "Most Appropriate Reuse" mechanism, it was necessary to extract from the studies the most important methodologies, tools, application scale, and the most important aspects effective to "Most Appropriate Reuse" mechanism, as shown in Table 1. It is noted that the methodologies in the literature were used to evaluate and select “Most Appropriate Reuse” on a building more applied than the fabric after the studies were reviewed and a scale of application was extracted for the examples taken, as shown in Figure 1.

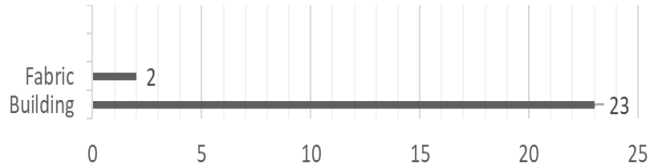

Figure 1. Scale of methodologies application (researchers)

The most important tools used to test the efficacy of the suggested methodologies in the research were extracted, along with the final findings, discovered that the interview is the most common tool used to verify the success of the methodology, as shown in Figure 2.

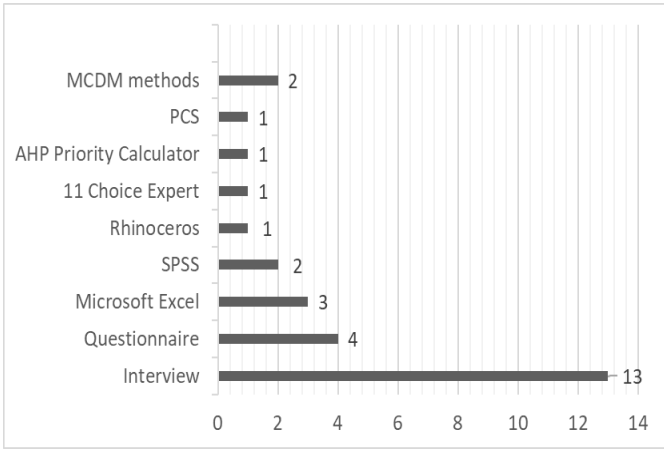

Figure 2. Methodologies tools (researchers)

Table 1. The most important results of the studies (researchers)

Scope		Reuse studies														
	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Study	Year	2011		2015	2016	2017	2018		2019		2020			2021	2022	
	Researcher	[23]	[24]	[25]	[26]	[27]	[28]	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]
Scale of application	Building	●	●	●	●	●	●	●	●	●	●	●			●	●
	Fabric												●	●		
	Interview	●	●	●	●	●		●	●	●					●	●
Measurement tools	Questionnaire					●	●				●					
	Microsoft Excel												●			
	SPSS						●					●				
	Rhinoceros													●		
	11 Choice Expert															
	AHP Priority Calculator															
	PCS															
	MCDM methods															
Aspects	Physical	●	●	●	●	●	●		●	●		●	●	●	●	●
	Social		●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Economic	●	●	●	●		●	●	●	●	●	●	●		●	●
	Environmental	●		●	●		●	●	●		●	●	●			●
	Political		●	●			●		●	●			●			
	Financial	●	●		●		●	●	●	●			●		●	
	Cultural					●	●	●			●	●	●		●	●
Methodology	Reuse Projection Framework															
	4REs															
	EVAMIX & AHP															
	AHP															
	Grounded theory															
	Fuzzy			●												
	CSFs						●									
	SARHB							●								
	AdaptSTAR									●						
	ARP		●													
	Shape Grammar													●		
	Evaluation Grid												●			
	Green adaptive reuse protocol				●											
	Nara Grid					●										
	N/A	●							●		●	●			●	●

Scope		Most Appropriate Reuse studies									
	No.	1	2	3	4	5	6	7	8	9	10
Study	Year	2012	2013	2014	2016	2017	2019		2020	2021	
	Researcher	[17]	[38]	[19]	[99]	[40]	[41]	[7]	[5]	[42]	[43]
Scale of application	Building	●	●	●	●	●	●	●	●	●	●
	Fabric										
	Interview	●		●					●		
Measurement tools	Questionnaire								●		
	Microsoft Excel		●				●				
	SPSS										
	Rhinoceros										
	11 Choice Expert									●	
	AHP Priority Calculator							●			
	PCS										●
	MCDM methods				●	●					
Aspects	Physical	●	●	●	●	●	●	●	●	●	●

	Social	●	●	●	●		●	●		●	●
	Economic	●	●	●	●		●	●		●	●
	Environmental	●	●	●		●				●	●
	Political		●							●	●
	Financial	●	●				●	●		●	●
	Cultural	●	●	●	●	●	●	●	●	●	
Methodology	Reuse Projection Framework								●		
	4REs		●								
	EVAMIX & AHP					●					
	AHP						●	●		●	
	Grounded theory										●
	Fuzzy										
	CSFs										
	SARHB										
	AdaptSTAR										
	ARP										
	Shape Grammar										
	Evaluation Grid										
	Green adaptive reuse protocol										
	Nara Grid										
	N/A	●		●	●						

Studies have given greater attention to the physical aspect of historic buildings in the process of reuse which include criteria such as (Compatibility, accessibility, differentiating old from new, flexibility, structural integrity, defining building features, determining the cultural significance of a building, building potential to meet municipal regulations, reducing the load on building structure and using technologies), then the social aspect which includes criteria such as (Improving the living conditions of the community, supporting the needs of the region, supporting community participation, increasing social interaction, enhancing a sense of place), then the economic aspect which includes criteria such as (Supporting the local economy, raising the value of the land, promoting investment), then the cultural aspect which includes criteria such as (Promote the intangible values of the community, maintain authenticity, and apply minimal intervention), then the environmental aspect which include improving environmental conditions criteria, then the financial aspect which includes criteria such as (Cost, government support), then the political aspect which include Promote projects with government support criteria. shown in Figure 3.

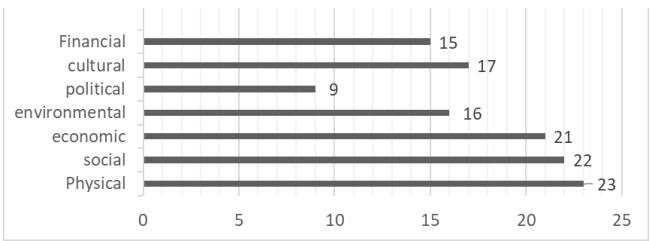

Figure 3. Aspects used in the studies(researchers)

The methodologies used in it were extracted, whether to reach an assessment of the reuse of historic buildings or to find "Most Appropriate Reuse" of it and extend their operational life. We note that the largest number of studies used an unknown methodology (N/A) in the evaluation and finding the optimal alternative, in which evaluation criteria are usually presented to experts or the community through a questionnaire, and the most appropriate or effective alternative is evaluated for reuse. Followed by the AHP methodology, the basis of which is the division of complex decision issues hierarchically into basic elements based on multiple sub-criteria, while the rest of the methodologies were in an equal number among the selected studies, as shown in Figure 4.

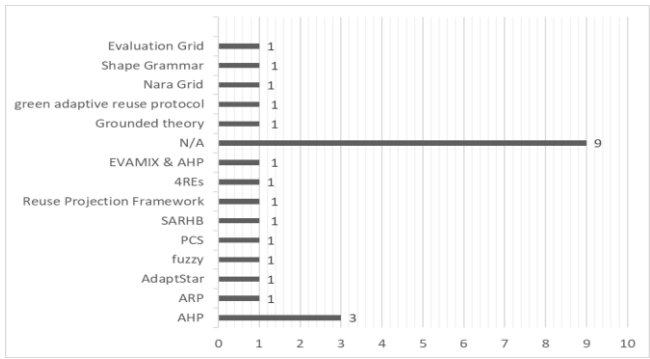

Figure 4. Methodologies used in the studies(researchers)

The aspects, criteria, and indicators affecting "Most Appropriate Reuse" mechanism were identified after the research received an exhaustive review. These findings will be used as a theoretical framework for a thorough approach to determine "Most Appropriate Reuse" of historic buildings, as shown in Table 2.

Table 2. The most important results of the studies (researchers)

Aspects	Criteria	Indicators
Physical	Compatibility	The new functionality is consistent with the history of the building
		Adapting the new function to the values of the building
		The new function is compatible with the old one
		The suitability of the proposed use of the visual character, the architectural form of the building, the interior design, and the elements of vertical and horizontal movement.
		The suitability of the proposed use of the structural elements in the building.
		The new function is consistent with the original building plan
		The new function is compatible with the building structure
		Adaptation of the building space with the new function
		Adaptation of the natural ventilation ratio with the new function
		Adapting the amount of natural light to the new job
		Compatibility of new materials added with old materials
		The elements added to the interior facade match the originality of the building
		The elements added to the exterior facade match the originality of the building
		The openings added to the interior facade match the building's originality
		The openings added to the exterior façade match the building's originality
		The materials added to the interior façade match the originality of the building
		The compatibility of the materials added to the external facade with the authenticity of the building
	Accessibility	The new function is compatible with the urban planning of the area
		The new function matches the other functions of the surrounding buildings
		Access to the building is convenient for the new function
		External motion paths are suitable for the new function
		Internal movement paths are suitable for the new function
		Easy access to the building for users with special needs
		Easy access to the building by vehicles and pedestrians
	Distinguishing between old and new	The ability to distinguish between the new element and the original element
		The ability to distinguish between new and original materials
		Easily distinguish extensions from original parts
		Distinguish between the new and the original function
	Flexibility	Using the original spaces in the activities that come with the new function
		Divide the spaces in a way that does not affect the originality of the building
		The possibility of adding spaces without changing the proportions of the building
		The ability to add items and slots to suit the new function
		The capacity of the building to accommodate the number of visitors specified for the new function
	Structural integrity	Using the original spaces in the activities that come with the new function
		Divide the spaces in a way that does not affect the originality of the building
		The possibility of adding spaces without changing the proportions of the building
		The ability to add items and slots to suit the new function
		The capacity of the building to accommodate the number of visitors specified for the new function
		The integrity of the facade from cracks and traces of destruction
		Preserving the original scale and proportions of the structure.
		The percentage change of the holes does not affect the quality of the design
		The restoration materials are suitable and of high quality, so they do not affect the safety and durability of the building
		The new spaces do not affect the structural elements of the building
	Determine building features	Classification of the building
		Building ownership
		Dimensions of spaces
		the number of floors
		Structural structure
		Materials used
		Interface elements
		Technologies used
		The context surrounding the building
	Determine the cultural significance of the building	Historical values
		Aesthetic values
		Social values
		Scientific values
	The potential of the building to meet municipal regulations	Use of the Technical Guide to Restoration of the Historic District
		Follow the use suggested by the municipality
		Application of finishing standards for building materials for the region
		Follow building and planning restrictions regulations
		Providing fire protection standards
		Providing accessibility standards for the disabled
		Provide acoustic comfort standards
		Providing optical comfort standards
		Providing thermal comfort standards
		Use of glazing and shading techniques

	Reduce the burden on the building structure and use of technologies	Use of insulation and acoustics techniques
		Use of smart ventilation systems
		Use of solar energy systems
		Renovation techniques and innovative art installations
Economical	Support the local economy	Revitalizing trade in the region
		Enhance market demands
		Contribute to cultural tourism
	Increasing the value of the land	Increasing the value of real estate in the area
		Increasing the value of the building after adjustment
		Preserving the environmental footprint
	Promote investment	Reducing energy costs
		Providing the necessary investment in the future
	Promote the intangible values of society	Highlighting the cultural heritage of the community
		Improving cultural activity in the region and diversifying its functions and activities
		Preserving cultural continuity, identity and a sense of place.
Cultural	Preserving authenticity	Form and design
		Traditions and technologies
		Materials
		Location and setting
		Spirit and feeling
		Usage and function
	Minimal intervention	Minimal change in texture
		Minimum change in use
		Minimum change in materials
		Minimal change in details
		Minimum change in masses
		Minimum change in spaces
Social	Improving the living conditions of society	Raise the population's standard of living
		Creating jobs for the population
		Raising the education level of the population
	Support the needs of the region	Meet users' needs
		Revitalization and development of neighborhoods
		Establish a landmark in the area
		Provide additional facilities in the region
		Contribute to the advancement of the region
	Support community participation	Provide professionals with training in new reuse trends and techniques
		Strengthening public and private partnerships
	Increase social interaction	Improving social cohesion
		Maintaining the daily life of the community
		Developing the population's cultural awareness and improving their behavior and customs
		Accessibility to all spaces of the building
		Supporting social needs through work, meeting and organizing creative events
	Promote a sense of place	Preserving the image and identity of the place
		Preserving the aesthetics of the area
		Preserving the history and authenticity of the place
		Preserving the human scale
Environmental	Improve environmental conditions	Improve energy management
		Pollution prevention
		Waste prevention
		Improving infrastructure networks
		Reducing carbon emissions
		Promote the use of raw materials
		Reduction in land consumption and urban degradation
		Indoor environmental quality
		The quality of the surrounding environment
Political	Support projects with state support	Allocating adequate budgets to support projects
		Prepare proposals for new uses
		Preparation of the urban general plan and zoning
		Formation of an independent body to evaluate and supervise projects
		Providing more flexible regulatory and legal requirements
		Feasibility study for future change

6. CONCLUSIONS

The reuse policy is one of the biggest progresses in historic building preservation throughout the world that serves to extend the functional and physical life of these buildings. A number of conclusions were reached by reviewing the literature, including that "Most Appropriate Reuse" is the most appropriate mechanism in preserving the building and should be followed in the process of preserving and enhancing the values of historical buildings, despite the multiplicity of mechanisms mentioned in the literature for adaptive reuse, but we found that each of the sustainable or green reuse mechanism and the highest and best reuse mechanism is actually included in "Most Appropriate Reuse" mechanism as it is part of its objectives. Previous research focused on the effective use of the most appropriate contributions to enhance the importance of historical buildings and to preserve the building from collapse as well as reduce demolitions and exploit the built environment to achieve the goals of investors. Great attention has been paid to aspects, criteria, and indicators, the most important of which are the physical, social, economic, cultural, environmental, financial, and political aspects in the process of analyzing reused buildings or proposing for reuse either by proposing a specific function for many buildings and studying the suitability of the building or proposing different functions for a specific building, the analysis is carried out according to group indicators and examining the possibility of their availability in reused historical buildings. The conceptual framework for a comprehensive methodology for determining the appropriate function for historical buildings through reuse and extending their operational life was formed by extracting these essential aspects, criteria, and indicators mentioned in the literature and which affect the process of evaluating and assigning "Most Appropriate Ruse".

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