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Sustainable Valorization of Cultural Heritage:
A Systematic Literature Review of Adaptive Reuse

ABSTRACT

The worldwide cultural heritage is an origin's cradle of many historical events, cultural integration and technological innovation. It represents an asset to preserve memory as well as the identity of a place. However, maintaining and using such places could prove challenging, given the initial purpose and the specific era in which they were built. As a consequence, many sites are now abandoned, partially destroyed, or in the worst cases, condemned. Adaptive reuse, seen as a possible solution to this phenomenon, nonetheless as a process of valorization of cultural heritage, can be initiated and employed in many ways, some of those addressed to modern use.

The adoption of Adaptive Reuse (AR) strategies is the subject of diverse debates, from preliminary assessment to post-evaluation outcomes. However, there is a lack of understanding of why and how some projects succeed, or more generally speaking, what is considered success at all when AR practices occur. Accordingly, this thesis seeks to answer the question: "How can adaptive reuse strategies effectively balance the preservation of cultural heritage with sustainability goals and economic viability?".

The research is organized as a Systematic Literature Review covering pertinent papers that have been published within the previous fifteen years. The process is based on screening many papers at each stage of the flowchart (identification, screening, eligibility, and inclusion) using a PRISMA diagram. The literature review process began with 440 papers, and concluded with the final results of 40 papers. By integrating the taxonomy adopted by the authors of the literature, this research identifies six factors categories impacting the success of AR strategies, which include social, cultural, economic, environmental and functional factors. When combined, these offer an in-depth understanding of the variables influencing adaptive reuse's effectiveness as a heritage building revitalization tactic. Factors such as minimal structure intervention, social amenity, cultural identity of the community, saving embodied energy, increase of cultural demand and job opportunities, and innovative design, represent all critical factors to achieve in order to ensure success in AR initiatives. This thesis aims to aid professionals, entrepreneurs, designers and real estate developers regarding the complex decision-making of adopting as well as evaluating Adaptive Reuse strategies.

Keywords: Adaptive Reuse, Cultural Heritage, Sustainability, Valorization, Economic Feasibility.

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1. Introduction

According to UNESCO (2023), the term Cultural Heritage encompasses: " groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of Outstanding Universal Value from the point of view of history, art or science".

The term valorization of cultural heritage then, can be interpreted in different ways according to the institutions and policies established in a specific country. For this thesis, the definition that mostly completes and embraces the different concepts of this broad topic is the one included in the Italian Code of Cultural Heritage and Landscape. In particular, Art.6 of the above-mentioned Code, affirms:

"Enhancement consists in the exercise of the functions and in the regulation of the activities aimed at promoting knowledge of the cultural heritage and at ensuring the best conditions for the utilization and public enjoyment of the same heritage. Enhancement also includes the promotion and the support of conservation work on the cultural heritage" (Code of Cultural Heritage and Landscape, 2004).

The premise from which the research stems is the importance of preserving and enhancing the cultural heritage of neglected areas, which nowadays represents a subject of debate amongst many international organizations (Foster & Saleh, 2021). During the Consortium of Cultural Heritage Counts for Europe in 2015, for instance, it has been discussed the evolution of the concept of cultural heritage, led to a growing interest in evaluating the economic, social, environmental, and cultural impact of heritage sites (Giraud-Labalte et al., 2015).

It has been noted also the increasing importance of justifying public expenditure on preserving and valorizing heritage by demonstrating its advantages. The importance lies indeed in the achievement of sustainable growth and social cohesion, positioning heritage as a source of democracy and well-being. Furthermore, regarding the valorization of cultural heritage, during the World Heritage Convention, it has been stated that a core component of human growth ought to be the active promotion and preservation of the diversity of cultures and heritages around the world (UNESCO, 2023).

After delineating the relevance of valorization, it is noteworthy to mention when an action of valorization can be assessed as successful. As noted by Anelli and Tajani (2022), an effective

valorization of the current cultural heritage assets needs to be able to: (i) guarantee the transmission of history that is represented for the current and future generations; (ii) minimize urban deterioration; and (iii) prevent additional natural soil consumption with the construction of new buildings.

To do so, one of the practices that has become increasingly popular in the last few decades is Adaptive Reuse; defined as an intricate process that seeks to foster the buildings' historical value while transforming them for modern use and future generations (Arfa et al., 2022).

First coined in 1973 (Davies, 2023) AR has been known as the process of repurposing an old building in order to provide a different use than its original one, typically after the property has reached a more mature stage in its life cycle. Making a building that was previously underutilized into one with a profitable purpose is a basic aspect of AR. This latter concept, cultural heritage as economic heritage, introduced by Lorusso et al. (2017), in the sense of creating and establishing a new economically viable goal, is the nexus of the ongoing discussion about AR.

In some cases, the reuse of the cultural heritage has led to business-oriented initiatives such as hospitality, restaurants, multifunctional spaces, etc. (Bullen & Love, 2011b; Meurs, 2021), representing an alteration that is not the same as just keeping the building intact for museum-like exhibits (Cohen, 2011). Other cases have shown, instead, different purposes for the building valorization process, which are more cultural and historical oriented (Marocco, 2017; Abdulameer, 2020; DEH, 2004).

Clearly, AR consists of renovating and remodeling, which also means dealing with the sustainability approach of the project, defined as the balanced integration of economic performance, social inclusiveness, and environmental resilience, to the benefit of current and future generations (Bosone et al., 2021; Dyson et al., 2016). Hence, AR initiatives have to be seen also in an economically sustainable approach, meaning that AR goes beyond the mere conservation of cultural heritage, but also ensures economic resilience (Armstrong et al., 2023). In this sense, Abdulameer and Abbas (2020) pointed out that, although consideration of sustainability has grown in importance when making reuse decisions, buildings are typically evaluated on their capacity to generate a profit. Moreover, AR is usually oriented to a modern demand, meaning that the community as a whole can truly experience the valorization of the site, while its historic and cultural significance are being preserved (Abdulameer & Abbas, 2020). This modern demand, however, could involve modern materials, designs and purposes, which generate discussion about the conflict between the old and the new.

According to Della Spina (2020), in addition to extending the life cycle of cultural assets, AR can be a critical urban strategy that can create new values (such as economic, aesthetic, cultural, educational, and political), foster creative local development dynamics, and emphasize the significance of protecting cultural assets and their instrumental values in a sustainable perspective. Having recognized the relationship between AR, sustainability and economic feasibility, this research will seek to answer the following question:*" How can adaptive reuse strategies effectively balance the preservation of cultural heritage with sustainability goals and economic viability?"*. To answer this question, it is crucial to define the notion of success in heritage AR projects, thus identify the critical success factors. However, given many different perspectives involved in the process of defining success of AR of cultural heritage, later to be discussed, the most suitable approach to face this matter was conducting a Systematic Literature Review.

In order to effectively execute adaptive reuse, a site or building must be converted for a new, appropriate use while maintaining its cultural heritage value (ICOMOS New Zealand, 2010). On one hand, this process requires a careful balance between maintaining the original integrity of historic buildings and adding contemporary elements that enhance their relevance for future generations (DEH, 2004). On the other hand, the key factors contributing to successful AR include monetary, legislative, architectural, and structural considerations, alongside thorough pre-project research on structural conditions and innovative design solutions (Shipley & Parsons, 2006; Dyson et al., 2016). Consequently, post-renovation activities that enhance the recreational appeal and thoughtfully designed activities are equally crucial for the project's success (Tu, 2020). Lastly, it has also been mentioned that collaboration among a diverse network of professionals and the community is essential, ensuring that all stakeholders, from architects to government representatives, are involved in the process (Conejos et al., 2017; Gravagnuolo et al., 2021; Amato et al., 2021; Bullen & Love, 2011b; Mısırlısoy & Günçe, 2016; Della Spina, 2020).
Despite the widespread literature about the phenomenon of AR, there is not one universal approach to define adaptive reuse strategy's success.
In fact, Plevoets and Van Cleempoel (2019) claimed that despite the abundance of academic research, there isn't a recognized, clearly established phrase that refers to the process of making architectural and functional modifications to pre-existing buildings.
Nonetheless, the process of AR is complex, both in terms of evaluation and realization. Maintaining the building's originality requires more than just preserving it for a new use; it also requires analyzing the existing fabric that interacts with the heritage building (Othman & Elsaay, 2018).

In addition, one modern feature of the developed world is the premature destruction of built assets for economic purposes with little consideration for social and environmental consequences. Instead, when applicable, reuse, adaptation, renovation, and preservation can be better options that require careful consideration. Indeed, integrating AR techniques into newly constructed buildings and repurposing existing architectural heritage are responsible social, environmental, and economic decisions (Conejos et al. 2011).

Thus, through the analysis of relevant literature, both theoretical and empirical, the objective of this research is to identify the sets of success factors in terms of sustainable valorization, also considering financial feasibility as well as the new purpose (function) of cultural heritage. The research problem is the lack of understanding of the factors (cultural, economic, social, environmental and functional) AR can achieve considering the preservation of historical significance, and economic sustainability, while also meeting modern sustainability goals. Because of the wide variety of interpretations from different perspectives, the scope of the research, and an overlap of measurable and non-measurable parameters, assessing and identifying criteria that affect the success of AR projects, can result challenging (Vafaie et al., 2023). Thus, a Systematic Literature Review method is used to enable a comprehensive classification. It will follow a methodology section, highlighting the process as well as the guidelines used for the Systematic Literature Review. Finally, results will be presented, hence, divided into 6 success factor categories, which include social, cultural, economic, environmental and functional.

2. Theoretical Framework

This section focuses on providing a theoretical background that can be useful when trying to answer the research question: *How can adaptive reuse strategies effectively balance the preservation of cultural heritage with sustainability goals and economic viability?*

To begin with, Adaptive Reuse is examined as a pivotal strategy of preservation and valorization of cultural heritage while fostering urban development and economic growth.

The second part is dedicated to the analysis of AR in regard to a sustainability approach, highlighting the multiple and diverse critical factors to consider during evaluation phases, according to relevant literature. The third section will discuss how academics have analyzed the complex strategies of AR assisting the decision-making of the new function of the structures.

2.1 Adaptive Reuse in Literature

In recent years, preserving and valorizing Cultural Heritage has been an important objective to address both on behalf of international institution and policymakers. The European Commission has emphasized how rich heritage and thriving creative industries support the continent's sense of identity and belonging. In Europe and around the world, culture fosters inclusiveness, common values, active citizenship, and cross-cultural communication. Along with improving lives and transforming communities, culture and the creative industries may also encourage economic growth and employment creation, which can have an indirect impact on other areas of the economy (European Commission, 2018).

Cultural heritage is seen as an essential aspect of the identities and distinctiveness of cities and regions, with the potential to improve people's health and well-being as well as to create jobs, revitalize the environment, and make a place more appealing. However, heritage protection requires significant financial outlays, and investment initiatives encounter difficulties with uncertainty due to a lack of available resources (Bosone et al., 2021; Van Laar et al., 2024).

According to this viewpoint, AR can be extremely important for extending the life of cultural assets as well as serving as an urban strategy that can create new values in terms of economic, artistic, cultural, educational, and political aspects, thereby fostering innovative local development dynamics (Della Spina, 2020).

Despite the European-centric approach towards the preservation of cultural heritage through AR, this latter concept and its relevance have also spread worldwide. The Government of Australia, for instance, has acknowledged the importance of preserving the built heritage through a successful match between existing heritage structures and cutting-edge architectural design (DEH, 2004).

According to DEH (2004), AR is known as the act of converting an obsolete or inefficient object into a new one that can be used for a different purpose. Premised on the impossibility of the building to function with its original use, a new use through adaptation may be the only way to preserve the heritage site (DEH, 2004).

Adaptive Reuse is a common term used to characterize the process of repairing and repurposing old structures for continuous use (Plevoets & Van Cleempoel, 2011). Although the phrase "Adaptive Reuse," sometimes has been referred to as "retrofitting," "conversion," "adaptation," "reworking," "rehabilitation," or "furbishment," the key element of AR approach is a thorough renovation of a building in which the primary difference is its usage (Brooker & Stone, 2004).

Accordingly, AR can be defined as any activity done on a structure that goes beyond maintenance to alter its capacity, functionality, or performance, that is, any action taken to modify, repurpose, or upgrade a facility to meet new needs or circumstances (Douglas, 2004).

In this context, deciding how to repurpose a heritage building is a complex task, given the numerous factors involved. It is indeed crucial to approach this decision process with analytical and scientific methods to ensure the most suitable strategy, as well as economic, social and physical sustainability. An inappropriate strategy, indeed, could eventually lead to the building's (re)abandonment or compromise its original character (Mısırlısoy & Günçe, 2016). Selecting which of the many possible solutions could guarantee the preservation of tangible characteristics along with intangible values, promoting economic development, represents a strategic management assessment as well as a policy and a design issue (Oppio et al., 2016).

Despite the large body of literature about AR strategies and evaluation, there is still a lack of understanding of the factors AR can achieve considering the preservation of historical significance, and economic sustainability, while also meeting modern sustainability goals.

Along with this, it is still ambiguous the definition as well as identification of critical success factors, thereby whether and how an AR project can be considered successful on multiple sustainability levels. Indeed, some authors have provided different definitions according to their research. For instance, a successful heritage adaptive reuse project has been defined as capable of transforming a location or building for compatible use while maintaining its cultural heritage value (ICOMOS New Zealand, 2010).

International conventions and charters typically give careful consideration to the original value and integrity of historic buildings (ICOMOS, 2000; DEH, 2004). The most effective heritage AR projects, according to the Australian Department of Environment and Heritage, are those that preserve and respect the property's original value while also adding a significant contemporary layer

for future generations (DEH, 2004). Shipley and Parsons (2006), instead, define successful adaptive reuse initiatives, by examining the monetary, legislative, architectural, and structural factors that contribute such initiatives contribute to.

On top of that, before undertaking any projects in order to accomplish the success of AR, an important phase is represented by conducting research, both in terms of conditions of the structural elements and innovative design. In this sense, Dyson et al. (2016) have shown four critical success factors for AR of heritage buildings, namely research, matching function, design and minimal change. In addition, post-renovation activities are thought to be essential for creating recreational appeal, and activity design is a key factor in the process of successfully repurposing adaptive heritage (Tu, 2020). For other academics the success of AR strategies has to be found in the network, interaction and thus consultations of professionals including architects, project managers, engineers, conservation managers, government and heritage trust representatives, investors, but most importantly the community (Conejos et al., 2017; Gravagnuolo et al., 2021; Amato et al., 2021; Bullen & Love, 2011b; Mısırlısoy & Günçe, 2016; Della Spina, 2020).

As the research will show, the topic of AR has been analyzed from many different perspectives (i.e., performance-based, level of preservation and conservation of cultural heritage, social impact, generation of cultural values, urban regeneration and policies).

However, the absence of a comprehensive and holistic approach to what makes AR projects successful poses the basis of the research aim. This thesis will seek to fill this gap through a literature review of different AR strategies (both theoretical and empirical) involving success factors, evaluation, achievements, and performances of AR projects. Hence, adopting a Systematic Literature Review turns out to be a suitable design method according to the purpose of the research. In addition, a recurring theme in the literature has been the focus on sustainability objectives. Therefore, the factors were categorized using the original studies' classification as a guide. Certain studies, for instance, included a list of indicators for every sustainability dimension, which helped categorize the particular factors inside the suggested taxonomy. In cases where the original studies' classification was ambiguous, a comprehensive and reliable classification was determined by comparing the indicators with those that were included in other research that expressed a clear classification in relation to the suggested taxonomy. Every factor that was chosen after this procedure was categorized using all of the taxonomy categories. Consequently, the results have been classified according to the following categories of sustainability: Architectural, Environmental, Cultural, Economic, Social and Functional.

2.2. Toward a Sustainable Approach

Since the term sustainability can be interpreted in several ways, it is essential to outline this concept concerning AR strategies, in terms of definitions, objectives and characteristics to have a comprehensive theoretical background of analysis for this research's topic.

As a tool of urban development, AR strategy has been recently linked with sustainability purposes. This has led to the creation of development strategic plans that meet the socially conscious process of making decisions that aim to prevent or minimize negative impacts while maintaining the equilibrium between ecological resilience, economic welfare, socio-political justice. (Vardopoulos et al., 2021)

Speaking of urban development, the AR of architectural heritage is one of the main expressions of urban culture's sustainability. The most appropriate reuse strategy, indeed, makes the building genuinely become a new source of vitality within the urban sustainable development process (Zhang & Zhang, 2023).

Also, Vardopoulos et al. (2021) pointed out that sustainable development has become a focal point in urban planning and management. According to their findings of quantitative analysis, the benefits of adaptive reuse outweigh the drawbacks, indicating that it can serve as a sustainable strategy for urban development. It has been highlighted how this practice not only revitalizes urban spaces but also fosters cultural and social interaction.

Achieving sustainable urban regeneration criteria can also represent a way to measure the effectiveness of AR sustainability level (Bullen & Love, 2009). For instance, it is possible to identify and measure improvements in existing market values of older buildings or repopulation of urban areas in order to ensure sustainable development of communities and a better quality of life (Bullen & Love, 2009).

Nowadays, AR is seen and approached according to sustainable development strategies, capable of generating a set of benefits such as social, environmental, and economic and cultural. Dyson et al. (2016) stated that social benefits lie in the utility of investment in an AR program, which means a revitalization of those places that have been neglected, improving living conditions in the neighborhood. Bullen and Love (2009) cited also a social aspect which refers to the repercussions of a city's community when there are a lot of abandoned buildings because this creates a conducive climate for crime and other antisocial conduct.

On an environmental level, the benefits are more concerned with the notion that recycling and repurposing take priority over demolition as a way of construction. Bullen and Love (2011a), for

instance, referred to the rising energy cost that will drive to improve energy efficiency, reducing operational costs and lowering their environmental footprint.

In addition, Dyson et al. (2016) highlighted that a clear definition of economic benefits, for AR projects, is challenging due to perceived higher risk. This includes difficulties in determining project profits, uncertainties related to decontamination, and material matching.

In regard to cultural benefits, Bullen and Love (2011b) underlined the significance of heritage buildings as landmarks that enhance community identity and well-being. By preserving historical narratives and offering aesthetic amenities, cultural heritage promotes social sustainability. However, balancing the objectives of sustainable urban planning with the preservation of cultural heritage presents difficulties. The regulations pertaining to historic structures might conflict with the application of modern materials or methods required for AR. This conflict draws attention to the necessity of an accurate assessment that considers both sustainability and heritage values. Furthermore, technical and practical aspects, such as sourcing rare materials and finding skilled craftsmen, can make a project less financially feasible. Legislative measures, including tax concession and streamlined planning regulations, play a crucial role in the process of reaching financial feasibility (Bullen and Love 2011b).

A central debate discussed by the relevant literature also dealt with possible ways to achieve sustainability cautiously focusing on stakeholders and users of renovated historic buildings. Firstly, identifying the actors involved in the AR project is crucial both in terms of effective planning and execution. These include policy institutions, developers, architects, entrepreneurs, investors and professionals in the fields of real estate, tourism and cultural heritage (Gravagnuolo et al., 2021; Bullen & Love, 2011b; Dyson et al., 2016; Van Laar et al., 2024). Each stakeholder brings unique perspectives, expertise and interests to the project, influencing the decision process related to design, funding and execution (Niemczewska, 2020. Consequently, the benefits derived from AR projects should be carefully assessed and distributed among stakeholders, with a particular focus on users (Della Spina, 2021b). As mentioned by many authors, (Mısırlısoy & Günçe, 2016; Bullen & Love, 2009; Della Spina, 2021; Foster, 2020; Bottero et al., 2019) Bullen & Love (2011b) emphasized the importance of the needs of end users of the new facilities, corresponding to a potential risk in terms of utilization of the asset. Addressing the needs and desires of users ensures that the adaptive reuse project aligns with community values and improves user satisfaction (Aigwi et al., 2020).

2.3. Decision-making process

This section will address the complex issue of making decisions regarding built heritage, which requires careful consideration of several factors. After engaging with many stakeholders, developing a management plan is an important stage in the decision-making process. The accomplishment of the project's goals depends in large part on this stage (Misirlisory & Gunce, 2016).

In order to successfully repurpose historical properties, Nasr & Khalil (2022) have emphasized the importance of effective management, which is essential for promoting the local economy, upholding social values, preserving cultural identity, and adapting to the local environment.

Since the process of AR strategies has further developed in the last years, scholars have analyzed possible ways to define the adaptability of historic buildings for new purposes in the realm of sustainability. The majority of historic buildings in the urban complex system are unable to concentrate on their original purpose. Therefore, it is relevant to provide insights about new reuse strategies (new function of the structure) in order to meet the demands of urban growth. This incorporates both tangible and intangible elements such as the physical environment, monetary policy, and a wide range of interest groups. Given the difficulty of such multi-criteria decision-making, this section will discuss evaluation techniques or models that have been designed to empirically address AR decision-making about the new use.

To begin with, Wang and Song-Fu (2021) designed a method for evaluating the adaptability of historic buildings and outlined AR strategies based on Complex Adaptive System (CAS) theory and Analytics Hierarchy Process (AHP) (Saaty, 1990). The designed framework aids in identifying the complex characteristics and adaptive mechanisms of historic buildings within urban systems, delineating three principal strategies of AR. By assessing factors such as architectural type, construction time, historic value and preservation status, developers can determine the most appropriate adaptive reuse approach for each building (Wang & Song-Fu, 2021).

Mısırlısoy and Günçe (2016), instead, offered a framework for creating adaptive reuse plans for historic structures that are neglected, misused, or abandoned, identifying factors affecting AR decision-making. The aim of the model was to determine the most appropriate function for the AR of heritage buildings. Accordingly, decisions regarding the building's new function can take three forms: maintaining the original purpose with modern modifications, adapting for mixed-use to sustain heritage value, or assigning a completely new purpose based on the building's value and

ownership. In some other cases, the decision-making process can involve an assessment regarding whether to demolish or re-use an existing built asset. Following this path, Bullen and Love (2011c) developed a model for professionals in order to support decision-making. By considering aspects such as capital investment, asset condition, regulation, and sustainability tenets (environmental, economic, and social), the model offers a comprehensive approach to evaluating the feasibility and benefits of adaptive reuse. The research has highlighted that economic factors, including the development and construction cost, investment returns, market considerations, as well as short-term profits, are driving factors in assessing the feasibility of projects of AR. When analyzing AR alternatives, this model emphasizes another crucial component, which is the asset condition. Through the consideration of several factors such as internal layout, location, residual service life, and structural integrity, stakeholders can be guided in comprehending the building's physical condition and the possibility of renovation (Bullen and Love 2011c).

The decision-making process about AR projects has experienced a decisive step forward through the so-called Adaptive Reuse Potential (ARP) model (Langston et al., 2008). Through this model, it is possible to identify and rank the adaptive reuse potential of existing buildings, assisting stakeholders towards more sustainable practices and strategies of AR. Because of early obsolescence, it has historically been particularly challenging to estimate the useful (effective) life of a building or other asset (Seeley, 1983). In the ARP model, the seven obsolesce categories — physical, economic, functional, technological, legal and political — are based on Seeley (1983). The ARP model calculates the *useful life* as a function (discounted) of physical life and obsolesce. Such model has been extensively disseminated and is recognized as reliable due to its retrospective testing on 64 adaptive reuse projects worldwide (Conejos et al., 2011). It offered a conceptual framework for the evaluation of AR possibilities in existing buildings at a strategic management level, which was originally illustrated through a case study in Hong Kong (Bullen & Love, 2011c). Likewise, Della Spina (2021) presented remarkable research about the ranking of AR strategies. Given a particular focus on the recovery and adaptation to the reuse of neglected historical public heritage, Della Spina (2021) demonstrated the relevance of a multilevel decision-making process that aids decision-makers in optimizing investment choices for the efficient allocation of public resources. The study employs two methodologies: a multi-criteria analysis to examine alternative reuse scenarios and a discounted cash flow analysis to confirm the investment's financial viability. In order to accomplish the former, the AHP (Saaty, 1990) method was applied to determine the Highest and Best Use (HBU) and evaluate social, cultural, and economic impacts.

The second part of the research has shown the applicability of the multi-criteria AHP implementation through a specific case study based in Italy. To evaluate the alternatives, the decision problem was organized using a structure based on a hierarchy that separates objectives, criteria, and sub-criteria.
Analogously, in order to rank adaptive reuse alternatives for abandoned industrial legacy in vulnerable environments, Bottero et al. (2019) provide a multi-criteria decision-assisting technique using the Preference Ranking Organization Method for Enrichment of Evaluations (PROMETHEE) (Brans & Vincke, 1985). With a specific focus on industrial historic sites in danger of deterioration, the study intends to promote the design and implementation of AR options for the preservation of cultural assets. The data collection process included gathering relevant information about the abandoned industrial heritage sites, focusing on criteria such as accessibility, available building space, architectural significance, and property value. The objective was to identify, through a pairwise comparison of criteria and alternatives, and thus rank, the best suited to establish a new activity. Experts concur that prioritizing building typology architectural features is essential, drawing attention to the accessibility of the ground area and flexibility in internal space layout (Bottero et al. 2019).

All things considered, it is important to mention that the success factors in this study encompass a broader range of factors in other dimensions in addition to reviewing the pillars of sustainability. Said differently, when a project is deemed to be reasonably successful, it may also be sustainable because some adaptive reuse success indicators align with sustainability requirements. As a result, success in this study has broader definitions than sustainability. It is essential to emphasize that achieving success entails not only fulfilling sustainability standards but also conforming to the parameters and inputs of adaptive reuse decision-making models (Vafaie et al., 2023).

3. Methods

Nowadays, the subject of AR is considered a relevant topic in terms of cultural management, architectural and design urban development, as well as strategy for towards conservation of cultural heritage (Brooker & Stone, 2004; Plevoets & Van Cleempoel, 2011).

However, the concept of AR has started gaining attention just in the last decade, resulting in a subject widely studied by scholars and academics and eventually leading to an increasing variety of literature. Being a topic that concerns different kinds of fields of study (from engineering to policy), the current literature now provides a diverse and broad theoretical analysis. Nonetheless, insights on whether this is a suitable approach to satisfy the evolving needs and requirements of shareholders, developers, and community are still fragmented. In light of the scarcity of published research on success factors and benefits of AR, especially in regard to sustainability, a thorough analysis of the relevant literature is conducted to fill this gap.

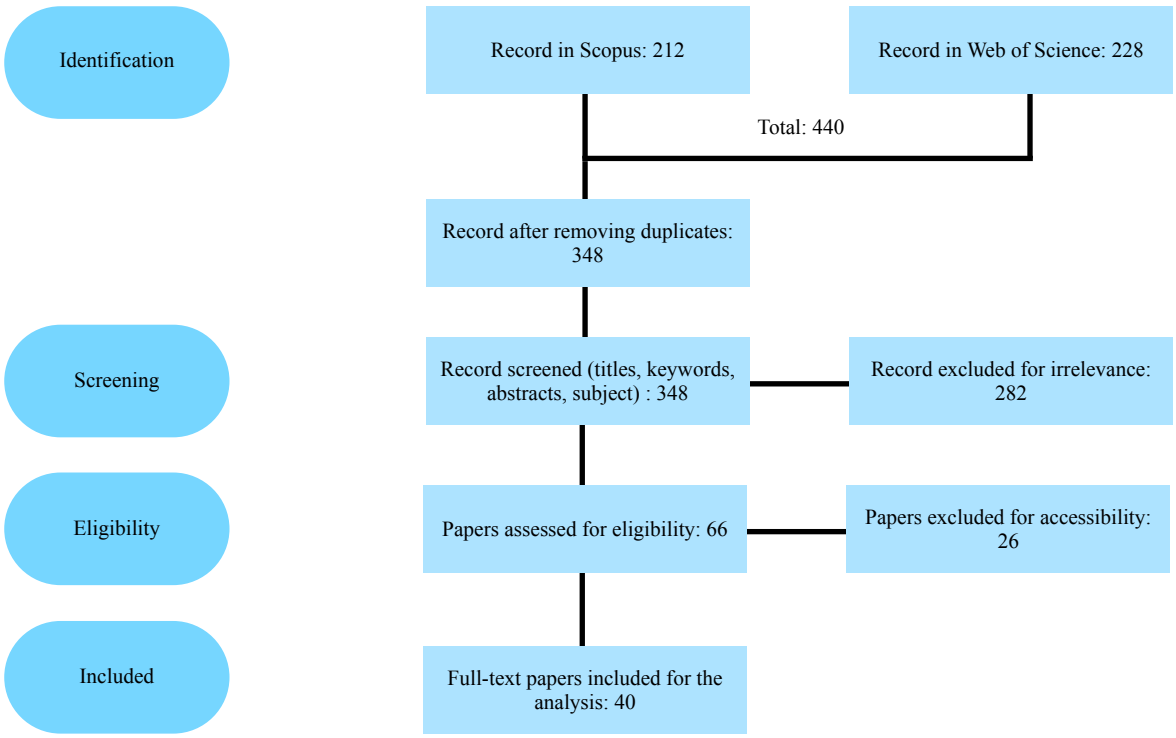
3.1 Research Design and Strategy

The methodology employs a content analysis covering papers written after 2009, in order to have a comprehensive review of the latest 15 years of academic literature.

Therefore, the aim of a systematic literature review (SLR) methodology is to examine, identify, and classify the elements that contribute to AR success in the realm of sustainability. As the theoretical basis for the review, "Preferred Reporting Items for Systematic Review and Meta-Analyses" (PRISMA) guidelines have been adopted (Moher et al., 2009).

The PRISMA method is a widely used framework for conducting systematic literature reviews and meta-analyses. It is designed to ensure transparency, clarity, and completeness in reporting the findings of systematic reviews. It consists of a flow diagram (See Figure 1), which guides researchers through the process of identifying, screening, and including studies in a review.

Figure 1



The process is divided into four stages: identification, screening, eligibility and inclusion. During the identification phase, records are gathered through database searches. In the screening phase, these records are reviewed based on titles and abstracts, leading to the exclusion of irrelevant studies. The eligibility phase involves assessing the full-text articles of the remaining studies to determine if they meet the inclusion criteria. Finally, in the inclusion phase, the studies that pass the eligibility assessment are included in the review and synthesis. This diagram helps to clearly illustrate the number of studies at each stage and the reasons for excluding certain studies, ensuring transparency and reproducibility in the review process. In addition, PRISMA emphasizes the importance of conducting a comprehensive literature search, and evaluating pertinent research critically, which results in robust conclusions (Moher et al., 2009).

3.2. Data Sampling and Collection

The data have been gained through Scopus and Web of Science databases.

Finding and carefully selecting the appropriate keywords or subjects to search for in databases is an essential step when conducting a systematic literature review (Vafaie et al., 2023). In this sense, the term "Adaptive Reuse of Cultural Heritage" and its synonyms describe the field of study. However, the term “Adaptive Reuse" can be defined using a broad range of synonyms. For instance, adaptation activities can be defined also through the phrases ‘remodeling’, ‘retrofitting’, ‘conversion’, ‘adaptation’, ‘reworking’, ‘rehabilitation’, or ‘refurbishment’(Wilkinson et al., 2014). The fundamental component of adaptive reuse, which provides an underutilized or abandoned

structure with a new function, is the change of use (Wong, 2016). Therefore, the selection of the synonyms of AR was made taking into consideration the employment of different terms aiming the field of interest of the research. An accurate definition of Adaptive Reuse follows:

Any work to a building and above maintenance to change its capacity, function or performance, in other words, any intervention to adjust, reuse, or upgrade a building to suit new conditions or requirements. (Douglas, 2004, p.4).

Thus, the research on the key terms was limited to three sections.
The first section encompasses the concept of adaptive reuse, including also the terms "Adapt*" (meaning adaptation, adaptability) and "Conversion", which is specifically defined as changing the building's use from one to another (Wilkinson et al., 2014). The second set of terms was then added by "AND" to obtain the data closer to the field of heritage, namely "built heritage" OR "cultural heritage,". Finally, since the focus of the research is on sustainability goals and objectives the third section of terms consisted of integrating ("AND") the phrase "sustainable" OR "sustainability".
The combination of the keywords applied to titles, abstracts and keywords resulted in 440 papers identified both in Scopus and Web of Science, respectively 212 and 228.
As 92 papers were duplicates, thereby eliminated, before the review process began the total of papers became 348. After the identification phase, the next step consisted of a thorough examination of the abstracts, titles, keywords as well as subject area, in order to exclude the publications unrelated to the inquiry of the research.
Carefully screening the subject areas was essential to provide a consistent analysis of the final research. Since the focus of this research is the understanding of sustainability factors achieved through AR of heritage buildings, the eligibility phase consisted of the exclusion of papers belonging to fields of inquiry not relevant in terms of sustainability values influencing the decision-making process for its use. Indeed, the definition of success for heritage AR can be read in a variety of ways throughout different sources (Vafaie et al., 2023). For instance, the publications that encompassed specific technical aspects (i.e., lightning and energy) of adaptive reuse were removed, as well as those that focused more on cultural heritage such as landscape, entire neighborhoods or valorization of normal buildings, instead of heritage buildings. To do so, the studies characterized by a specialized field of study such as Engineering, Architecture, Energy, Computer Science and Earth and Planetary Science were removed (282 papers). In this sense, the final subject areas selected were: Arts and Humanities, Environmental Science, Social Science, Business, Management

and Economics. However, those articles (not belonging to the disciplines of interest) that have been published in relevant academic journals that were consistent with the purpose of this research, (i.e., Journal of Cultural Heritage, Management and Sustainable Development; Tourism, Culture and Heritage; Sustainable City and Society; Building Pathology and Adaptation), were included in the selections of the papers. Given the high variables involved in this phase of the selection, this latter was conducted manually and resulted in a selection of 66 papers. The screening process resulted in a selection of papers for an in-depth assessment of their full contents. Thus, it has been created an excel file with the Author(s) name, Titles, Keywords, Method of Analysis (theoretical or case study), Subject Area and Country. After one last check to exclude publications that weren't accessible (26), the final corpus consisted of 40 extremely relevant papers, which have been thematically analyzed.

3.3. Data Analysis

The coding part of the final corpus of 40 papers was conducted manually going through each text and identifying the relevant aspects (i.e. success factors, evaluation, achievements, and performances of AR projects). As a result, the factors were organized according to the original study's classification. Some research, for example, provided a list of indicators for each sustainability dimension, which aided in classifying the specific elements within the proposed taxonomy. When the categorization of the original studies was unclear, a thorough classification was established by comparing the indicators with those found in additional studies that stated a clear classification with respect to the proposed taxonomy. The second step consisted of gathering all the papers in an Excel file and for each of them (if available) classifying the variables of sustainability into 6 success factor groups: Architectural, Social, Cultural, Economic, Environmental and Functional elements.

Moreover, a deductive approach was used to begin the coding step since it was important to comprehend the following components: discipline, research design, and geographic coverage. The majority of papers analyzed in the final corpus belong to Art, Culture and Heritage studies (55%) (See figure 2). Other studies pertain to the Economics discipline (17,5%) or Construction Management (12,5%). Then they follow papers in the fields of Environmental Science Building Pathology and Adaptation (7,5%).

This distribution can be attributed to several reasons. Firstly, projects involving AR entail the preservation and conversion of historic structures. Researchers in the fields of art, culture, and heritage studies are actively investigating ways to preserve cultural relevance while making

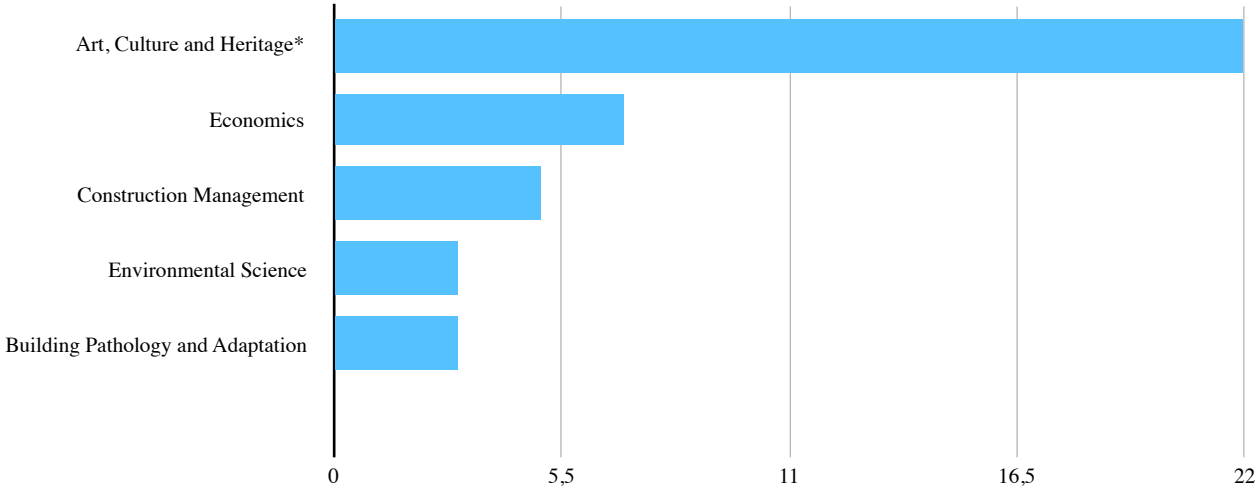


Figure 2: Distribution of the paper review based on their their discipline (source: elaboration of the author)

* This category encompasses the following sub-area: Art and Heritage; Cultural Heritage; Tourism, Culture and Heritage; Cultural Heritage and Sustainable Development; Conservation of Built Heritage; Sustainable City and Society

necessary structural modifications for modern use (Della Spina, 2021; Niemczewska, 2021; Conejos et al. 2011). These domains naturally contribute to studies on AR sustainability because they emphasize the fusion of historical significance with contemporary functioning. Furthermore, the integration of artistic, cultural, and heritage perspectives provides a holistic view of sustainability that encompasses not only environmental and economic factors but also social and cultural dimensions (Mısırlısoy & Günçe, 2016; Niemczewsk, 2021). AR projects frequently seek to increase the general public's interaction with cultural heritage. These disciplines' researchers are skilled at assessing how adaptive reuse initiatives affect social cohesiveness, cultural continuity, and community identity, all of which are vital success factors for sustainability (Gravagnuolo et al., 2021; Nasr & Khalil, 2022; Niemczewska, 2020). As mentioned before, this distribution confirmed also how the economic discipline (17,5%) is crucial for assessing the financial viability and long-term economic benefits of AR projects. Researchers in Economics analyze cost-benefit scenarios, funding mechanisms, and economic impacts, providing insights into how AR projects can be sustainably financed and economically beneficial (Danieli & Ghirardi, 2023; Foster, 2020; Vardopoulos et al. 2021). The field of Construction Management (12,5%) then, provides expertise on the practical aspects of implementing AR projects. Studies from this discipline focus on project management, construction techniques, and the efficient use of materials and resources (Bullen & Love, 2011b; Othman & Elsaay, 2018).

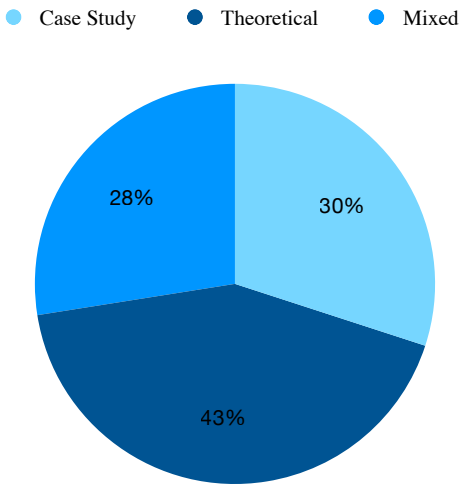


Figure 3: Distribution of the papers based on the research design (source: elaboration of the author)

Speaking of the design methods of the papers, a slightly higher percentage of them analyze the topic of AR based on a theoretical approach (43%) (See Figure 3). In this section, the authors focus on the assessment of the initiatives of AR through different analysis methods. Some have developed frameworks for (pre/post) evaluation of projects of AR (i.e, Foster, 2020; Conejos et al, 2011; Vardopoulos et al, 2021) or literature review of factors influencing the decision-making process (i.e., Mısırlısoy & Günçe, 2016; Bosone et al., 2021; Arbab & Alborzi, 2021; Bullen & Love, 2011a). In other cases, the method followed an investigation purpose, drawing semi-structured interviews or distributing surveys either to professionals of the sectors or to the community (i.e., Bullen & Love, 2011b; Dyson et al., 2016; Guo et al. 2021; Niemczewska, 2020). Whilst other studies (28%) follow a mixed method design, encompassing a theoretical framework for the evaluation of AR projects followed by the application of a case study. For instance, some authors make use of AHP (Analytic Hierarchy Process) or PROMETHEE (Preference Ranking Organization Method for Enrichment of Evaluations) to construct the adaptability evaluation index or rank the alternatives of AR design, thereby evaluating samples to calculate the adaptability evaluation results (Wang & Song-Fu, 2021; Bottero et al., 2019).

The remaining distribution (30%) shows an empirical approach, analyzing case studies of AR by measuring specific criteria or conducting surveys/interviews, and presenting diverse evidence for its assessments (i.e. Zhang & Zhang, 2023; Gravagnuolo et al., 2021; Aigwi et al.,2019; Alavi et al., 2022).

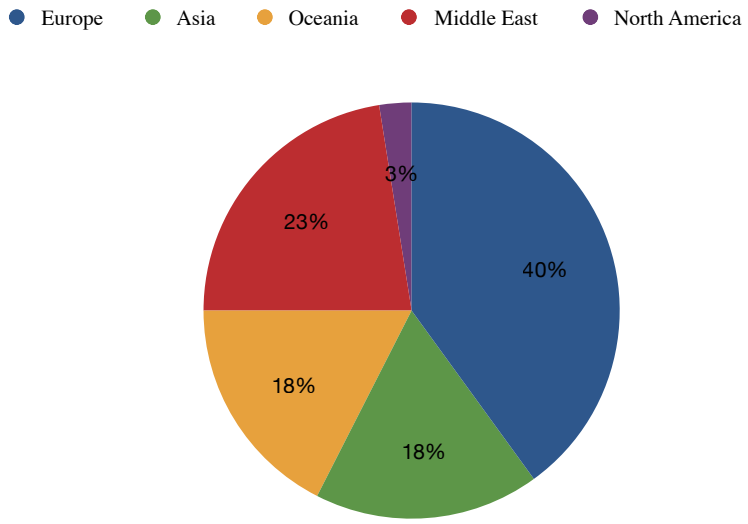


Figure 4: Distribution of the papers based on the country of affiliation of the authors (source: elaboration of the author)

In addition, the geographic distribution (in terms of affiliations of the authors) of the papers has been investigated (see Figure 4). The majority of the research focuses on Europe (41%) (8 papers from Italy, 2 from Greece, 2 from Austria, 2 from Poland, 1 from Spain, and 1 from UK), followed by Middle East (24%) (3 papers from Iran, 3 from Egypt, 2 from Turkey, 1 from Saudi Arabia), Oceania (18%) (5 papers from Australia, 2 from New Zealand), Asia (18%) (6 papers from China, 1 from Taiwan) and North America (3%) (1 paper from Canada). Overall, the geographic distribution suggests that AR is a globally recognized topic, entailing the fact that the preservation and valorization of cultural heritage is gaining more attention also outside the European area, mostly known as the cradle of cultural heritage (Foster et al., 2020).

4. Results

Based on the final body of the literature the success factors were identified and thus categorized as sustainability themes, using the original studies classification provided by the authors, as a guide. These categorizations include architectural, social, cultural, environmental, economic and functional factors. Below is a detailed discussion of every category to provide an in-depth understanding of the success criteria that have been identified.

4.1. Architectural factors

In the context of the assessment of the compatibility of new uses for heritage buildings, the term “architectural integrity” is recognized as an element AR should aim at in order to meet sustainable standards (Elsorady, 2014). This approach sees change and adaptive reuse of heritage buildings occurring on a structure-by-structure basis. This latter concept, defined as a property's ability to convey its significance, recognizes integrity as a key factor not only for identifying and assessing the values of a heritage resource but also for developing a conservation strategy. Architectural integrity is an abstract concept characterized by several factors, including style, workmanship, setting or location, materials, building type or function, and continuity (Nelson, 1982). In addition, architectural integrity encompasses the intactness of the building, which is organized by its plan, features, materials, finishes, structural system, and the presence of architectural elements (Alberts & Hazen, 2010).

That being said, adopting AR strategies for historical buildings necessitates a methodical approach, encapsulating several crucial architectural principles to ensure sustainability (See Table 1).

Firstly, a judicious approach to structural intervention is crucial, prioritizing minimal alterations to safeguard the intrinsic historical architectural significance (Zhang & Zhang, 2023; Elsorady, 2014; Godwin, 2011; Della Spina, 2021b). However, this method cannot always be applied because of the substantially damaged conditions the heritage buildings could be in. For this reason, during the pre-project phase, understanding the scope of the latent conditions is essential for the design scope of the project. As Dyson et al. (2016) pointed out, the structural components may seem to be in decent shape on the outside, but years of paint may have obscured their true state. Although latent circumstances could be seen as harmful, they are also thought to be necessary for design to manifest and develop.

In regard to this, Wang and Song-Fu (2021) used a fuzzy comprehensive evaluation method to assess the adaptability of historic buildings, considering factors such as Architectural Noumenon

(AN). The weight calculation results indicated that the architectural function has a significant influence on the Adaptability of Historic Buildings (AHB).

Thus, interventions should enhance the aesthetic allure of both the building itself and its environs, thereby contributing positively to the built environment (Aigwi et al. 2019; Othman & Elsaay, 2018; Aigwi et al., 2020; Conejos et al., 2011). Preservation efforts must extend beyond mere aesthetics, encompassing the maintenance of original materials, and decorative elements, thus safeguarding the authentic essence and historical narrative of the edifice (Wang & Song-Fu, 2021; Nasr & Khalil, 2022; Elsorady, 2014; Aigwi et al., 2020; Tu, 2020; Conejos et al., 2017).

In this context, an example of a successful AR case, meeting architectural sustainability is presented by Kee (2019). The Comix Home Base complex, based in Hong Kong, is well-known as a historically significant AR building that is now home to restaurants, public areas, and exhibition halls. Certain features, like the building's footprint, how windows relate to the backlight well, where

Table 1

Architectural	Description	Literature
Minimal structure intervention	Minimal structure intervention to preserve the historical architectural value of the building	(Zhang & Zhang, 2023; Elsorady, 2014; Godwin, 2011; Della Spina, 2021b)
Aesthetic appeal	Increase of aesthetic appeal to the built environment and the surrounding area	(Aigwi et al. 2019; Othman & Elsaay, 2018; Aigwi et al., 2020; Conejos et al., 2011)
Structural integrity and architectural value	Preserving structural integrity, material and decoration of the historic building as well as history value of the traditional and authentic features of the buildings	(Wang & Song-Fu, 2021; Nasr & Khalil, 2022; Elsorady, 2014; Aigwi et al., 2020; Tu, 2020; Conejos et al., 2017)
Functional Adaptation / Flexibility	Adaptability potential of (new) architectural function and flexibility of changeable architectural function	(Wang & Song-Fu, 2021; Dyson et al., 2016; Bottero et al., 2019; Langston et al., 2008; Conejos et al., 2017)
Maintainability	Enhancing building performance over its lifespan, where maintainability attributes are defined as the capability of a building to conserve operational resources.	(Sharifi & Farahinia, 2020; Conejos et al., 2011; Bottero et al. 2019; Karakök at al., 2023)
Upgrading physical characteristics	The building fabric is well constructed/ renovated using durable materials, providing potential retention of existing exterior and interior finishes to increase the structural stability without damaging historical components	(Sharifi & Farahinia, 2020; Kee, 2019; Dyson et al., 2016)
Creativity	Utilizing innovative design solutions to balance the needs of the present with those of the past	(Aigwi et al. 2019; Dyson et al.2016)

the access staircase is located, and how the timber joists are supported by brick corbels, are all subtle ways to convey a message about the way buildings were built in Hong Kong in the past. In order to allow the public to enjoy these architectural elements, the revitalization design not only restored historical characteristics but also incorporated contemporary uses (Kee, 2019).

This case endorse also another important aspect of architectural elements, which is the adaptability and flexibility of the building's architectural function should be maximized, facilitating seamless transitions to accommodate evolving needs (Wang & Song-Fu, 2021b; Dyson et al., 2016; Bottero et al., 2019; Langston et al., 2008; Conejos et al., 2017)

Concurrently, a focus on enhancing the building's performance over its lifespan is paramount, emphasizing attributes such as maintainability to conserve operational resources effectively. (Sharifi & Farahinia, 2020; Conejos et al., 2011; Bottero et al. 2019; Karakök et al., 2023). Renovation endeavors should utilize durable materials, thereby augmenting structural stability while preserving existing exterior and interior finishes, thus respecting the building's historical fabric (Sharifi & Farahinia, 2020; Dyson et al., 2016).

It is worth to mention also how a creative approach aimed to integrate contemporary requirements with the building's historical through innovative design solutions, could facilitate a harmonious fusion of past and present aspirations (Aigwi et al. 2019; Dyson et al.2016).

4.2. Social factors

The sustainable implementation of adaptive reuse strategies for historical buildings necessitates adherence to several socially sustainable elements (See Table 2). Prior to outlining and discussing the latter, it is critical to evaluate a practice that has been identified by the majority of studies as a critical component of AR initiatives' success. In the realm of social sustainability, the participation of the local community provides essential support for the decision-making process. Indeed, integrating the community as well as specialist knowledge ensures that the outcomes are more acceptable, fostering greater consensus and defining tactics that are as widely accepted as feasible (Della Spina, 2020).

As many researchers have shown, through surveys and interviews with stakeholders, an inclusive involvement of a diverse array of local stakeholders and citizens in the decision-making process, is essential to ensure that the project reflects the collective aspirations and needs of the community. (Gravagnuolo et al., 2021; Amato et al., 2021; Bullen & Love, 2011b; Mısırlısoy & Günçe, 2016; Della Spina, 2020; Nasr & Khalil, 2022; Foster, 2020; Della Spina, 2021b; Bosone et al., 2021; Kee, 2019; Niemczewska, 2020; Arbab & Alborzi, 2021).

In doing so, the AR projects prioritize enhancing the quality of daily life for residents in the area while effectively addressing their practical requirements (Zhang & Zhang, 2023; Alavi et al., 2022; Torrieri et al., 2019; Vardopoulos et al., 2021; Foster, 2020; Della Spina et al., 2023; Dyson et al., 2016; Guo et al., 2021; Bullen & Love, 2009; Tu, 2020).

AR aims to raise social awareness regarding the intrinsic value of cultural heritage, seeking a deeper appreciation and understanding among the populace (Alavi et al., 2022; Bullen & Love, 2011b; Nasr & Khalil, 2022; Sharifi & Farahinia, 2020; Aigwi et al., 2020; Conejos et al., 2011; Bosone et al., 2021; Bullen & Love, 2009; Kee, 2019; Tu, 2020; Niemczewska, 2020). For instance, Gravagnuolo et al. (2021), studying ways in which local communities can actively and successfully contribute to the AR and valorization of cultural property, showed a significant level of interest in this issue within the local community. They reveal curiosity as well as an intention to increase their own level of knowledge about their cultural heritage and the potential tools to ensure its preservation, valorization, and regeneration.

This awareness could consequently result in educational endeavors aimed at instilling cultural and historical appreciation through various initiatives and programs that further contribute to this objective (Gravagnuolo et al., 2021; Alavi et al., 2022; Amato et al., 2021; Niemczewska, 2021; Tu, 2020; Niemczewska, 2020). For instance, this is happening in the area of Ruvoli, near Salerno (Italy), where two operational furnaces for the production of high-quality manufactured terracotta, Fornaci De Martino, are serving as catalysts for international artists. One of the two furnaces is used for the manufacturing and cooking of cotto, while the other furnace is primarily utilized for workshops and educational reasons (Gravagnuolo et al., 2021). Amato et al., (2021) also presented results of a multicriteria analysis applied to the case study of Certosa di Pisa in Calci (Tuscany), a former Carthusian Monastery, to determine possible scenarios where new features were integrated with the aim to pay for management and restoration expenses. One of these was to establish a University Complementary Education facility providing accommodation for participants. Accordingly, this scenario may provide a chance to expand the scope of its educational offerings, such as by providing master's and specialized training programs, summer and winter schools (Amato et al., 2021).

As a result, the investigation and development of new cultural markets can be made possible by the repurposing of these venues through the use of creative curatorial techniques in exhibitions and culture (Danieli & Ghirardi, 2023).

Additionally, the successful AR of historical buildings inevitably foster a sense of place attachment, community pride, and connections, thereby strengthening the fabric of local identity and public

perception (Aigwi et al., 2019; Bullen & Love, 2011b; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Vardopoulos et al., 2020; Aigwi et al., 2020; Conejos et al., 2011; Bosone et al., 2021; Bottero et al, 2019; Bullen & Love, 2009; Conejos et al., 2017; Mazzetto & Vanini, 2023).

Table 2

Social	Description	Literature
Community involvement	Involving diverse local stakeholders and citizens in the decision-making process for the adaptive reuse	(Gravagnuolo et al., 2021; Amato et al., 2021; Bullen & Love, 2011b; Mısırlısoy & Günçe, 2016; Della Spina, 2020; Nasr & Khalil, 2022; Foster, 2020; Della Spina, 2021b; Bosone et al., 2021; Kee, 2019; Niemczewska, 2020; Arbab & Alborzi, 2021)
Improving the quality of life	Enhance the standard of living for local residents and respond to their needs	(Zhang & Zhang, 2023; Alavi et al., 2022; Torrieri et al., 2019; Vardopoulos et al., 2021; Foster, 2020; Della Spina et al., 2023; Dyson et al., 2016; Guo et al., 2021; Bullen & Love, 2009; Tu, 2020)
Social awareness	Raising social awareness about the importance of cultural heritage	(Gravagnuolo et al., 2021; Alavi et al., 2022; Bullen & Love, 2011b; Nasr & Khalil, 2022; Sharifi & Farahinia, 2020; Aigwi et al., 2020; Conejos et al., 2011; Bosone et al., 2021; Bullen & Love, 2009; Kee, 2019; Tu, 2020; Niemczewska, 2020)
Educational purpose	Educational purpose toward cultural and historical values through cultural initiatives and programs	(Gravagnuolo et al., 2021; Alavi et al., 2022; Amato et al., 2021; Niemczewska, 2021; Tu, 2020; Niemczewska, 2020)
Local identity, sense of belonging	The building's capacity to foster a sense of place attachment	(Aigwi et al., 2019; Bullen & Love, 2011b; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Vardopoulos et al., 2020; Aigwi et al., 2020; Conejos et al., 2011; Bosone et al., 2021; Bottero et al, 2019; Bullen & Love, 2009; Conejos et al., 2017; Mazzetto & Vanini, 2023)
Social amenity	Increasing the liveability of historic quarters, improving the physical condition and of the neighbourhoods and adding value to the local community	(Alavi et al., 2022; Bullen & Love, 2011b; Mısırlısoy & Günçe, 2016; Othman & Elsaay, 2018; Nasr & Khalil, 2022; Danieli & Ghirardi, 2023; Foster, 2020; Vardopoulos et al., 2020; Dyson et al., 2016; Aigwi et al., 2020; Conejos et al., 2011; Bosone et al., 2021; Bullen & Love, 2009; Kee, 2019; Conejos et al., 2017)
Social Inclusion	Capability to involve citizens in social issues	(Mısırlısoy & Günçe, 2016; Torrieri et al., 2019; Danieli & Ghirardi, 2023; Vardopoulos et al., 2020; Sharifi & Farahinia, 2020; Bullen & Love, 2009; Mazzetto & Vanini, 2023)
Actractiveness	Giving a new function to the historic resource has a positive effect on the visual attractiveness of the place, from tourist, locals and public institutions	(Niemczewska, 2021; Aigwi et al., 2020; Bullen & Love, 2009; Karakök et al., 2023)

By separating a cultural object from its typical context, such museums, adaptive spaces allow the environment to be reconfigured for new and creative purposes. This procedure facilitates the development of social inclusion methods by altering alternative venues (Danieli & Ghirardi, 2023). The literature deals with another important social pillar of sustainability, which is encouraging the creation of an environment that achieves social justice in terms of the internal distribution of resources (Othman & Elsaay, 2018).

By enhancing the liveability and physical condition of historic quarters and neglected areas, such initiatives not only add value to the local community but also stimulate social engagement by addressing pertinent issues. (Alavi et al., 2022; Bullen & Love, 2011b; Mısırlısoy & Günçe, 2016; Othman & Elsaay, 2018; Nasr & Khalil, 2022; Danieli & Ghirardi, 2023; Foster, 2020; Vardopoulos et al., 2020; Dyson et al., 2016; Aigwi et al., 2020; Conejos et al., 2011; Bosone et al., 2021; Bullen & Love, 2009; Kee, 2019; Conejos et al., 2017)

Furthermore, the repurposing of historical resources imbues the surrounding environment with enhanced visual appeal, attracting tourists, locals, and public institutions alike, thus underlining the positive impact of such endeavors on the broader social landscape (Niemczewska, 2021; Aigwi et al., 2020; Bullen & Love, 2009; Karakök et al., 2023).

4.3. Cultural factor

When speaking of the cultural dimensions of sustainability of AR, the preservation of intrinsic historical and cultural assets, as well as their appropriate utilization when feasible, are essential components of sustainable urban development and regeneration (See Table 3). On one hand, reviving iconic historic buildings strengthens the local community's identity and fosters a feeling of familiarity. On the other hand, it promotes historical and cultural development while concurrently safeguarding the intrinsic historical and cultural worth of the property (Vardopoulos et al. 2021). These two objectives underscore the necessity for balance between preservation and adaptation, ensuring that the historical narrative remains intact while accommodating contemporary needs (Aigwi et al., 2019; Wang & Song-Fu, 2021; Alavi et al., 2022; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Foster, 2020; Della Spina et al., 2023; Aigwi et al., 2020; Bosone et al., 2021; Karakök et al., 2023). An explanatory case worth mentioning is the Bayt al-Kritliya, a residential Ottoman structure located in Darb al-Asfar, Cairo (Egypt), commissioned for reuse into a museum.

Now called "The Gayer-Anderson Museum”, the structure is regarded as a noteworthy preserved example of seventeenth-century Cairo residential architecture. The project's goal was to preserve

the house, its varied collections, and its distinctive surroundings. A new conservation area was built as part of the project, together with additional exhibit areas and garden landscaping to make an outdoor place for cultural events and other amenities. The building's AR is regarded as both an artistic preservation of the house's distinctive architecture and a sustainable approach to the conservation of heritage structures, while simultaneously serving to educate younger residents about the significance of heritage (Othman & Elsaay, 2018). In the case of AR initiatives for heritage houses in the Sultanate of Oman, also Nasr & Khalil (2022) highlighted the importance of finding a balance between preservation and adaptation. The assessment of AR projects in Oman revealed significant achievements in various aspects such as saving identity, representing history, safeguarding heritage, and preserving traditional crafts. However, these projects not only succeeded in conserving authentic features, but also in applying appropriate interventions, and minimizing adaptation costs, due to a comprehensive management plan that enhances socio-cultural values, and stimulates socio-economic growth.

Whereas, an important question arises when the heritage asset is designated for a new commercial purpose. Accordingly, Niemczewska (2021) analyzed whether modern commercial use related to cultural heritage promotes holistic local sustainable development and if it maintains the sustainability of the resource's cultural value.

Indeed, the study suggests that cultural sustainability reached by AR can be distinguished among two different groups of stakeholders, direct users and local community. Although the direct users represent one of the crucial factors in maintaining financial sustainability, the cultural asset could experience a decrease in terms of cultural sustainability. This latter would be much higher if the historic asset in question were aimed at encompassing, both socially and culturally, the local community (Niemczewska, 2021). To do so, possible solutions can be found in increasing local government involvement or creating opportunities for community participation in cultural events. It is important to mention that some aspects, like community participation, belong to a macro-category of socio-cultural factors, that are clearly interconnected and interdependent. Therefore, one or more analyzed factors could affect one single outcome, positively speaking, strengthen it and vice versa hinder it.

Generally, the constant pillar of cultural benefits is to maintain the profitability of the historical building while contributing to local development and retaining its cultural relevance in order to guarantee its preservation and continuous utilization.

Such initiatives indeed strive to uphold community traditions, thereby nurturing a collective cultural identity that resonates with the locality's ethos. (Zhang & Zhang, 2023; Amato et al., 2021;

Mısırlısoy & Günçe, 2016; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Elsorady, 2014; Aigwi et al., 2020; Conejos et al., 2017).

In this sense, efforts should be directed towards enhancing the cultural significance of the place, thereby enriching both its intrinsic value and the life cycle of the historical edifice (Aigwi et al., 2019; Amato et al., 2021; Mısırlısoy & Günçe, 2016; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Godwin, 2011; Bosone et al., 2021; Mazzetto & Vanini, 2023).

Integral to this endeavor is the preservation of the original memory embedded within the historic building, thereby honoring its storied past (Wang & Song-Fu, 2021; Vardopoulos et al., 2021).

A research conducted by Tu (2020), seeking to analyze the attractiveness of adaptive heritage reuse, illustrated interesting insights regarding how the respondents perceived the cultural benefits of heritage experiences, which encompass cultural inheritance and a sense of belonging. Cultural inheritance refers to the transmission of cultural knowledge across generations, as future generations will continue to engage with and discuss historical sites. A sense of belonging, instead, involves fostering recognition and pride in one's cultural heritage, exemplified by the positive emotions associated with observing changes in local heritage.

Table 3

Cultural	Description	Literature
Built heritage preservation	Promotion of historic and cultural development while preserving and conserving historical and cultural value of the property	(Aigwi et al., 2019; Wang & Song-Fu, 2021; Alavi et al., 2022; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Foster, 2020; Della Spina et al., 2023; Aigwi et al., 2020; Bosone et al., 2021; Karakök et al., 2023)
Cultural identity of the community	Maintain community tradition and foster a cultural identity for the community as a whole	(Zhang & Zhang, 2023; Amato et al., 2021; Mısırlısoy & Günçe, 2016; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Elsorady, 2014; Aigwi et al., 2020; Conejos et al., 2017)
Cultural significance	Improvement of cultural significance of place and life cycle of historical buildings	(Aigwi et al., 2019; Amato et al., 2021; Mısırlısoy & Günçe, 2016; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Godwin, 2011; Bosone et al., 2021; Tu, 2020; Mazzetto & Vanini, 2023)
Memory information	The preservation of the original memory of the historic building	(Wang & Song-Fu, 2021; Vardopoulos et al., 2021)
Promotion of cultural activities	Possibility to participate in cultural events organized in and via the historic resource adopted to the new function (festivals, exhibitions, shows, etc.)	(Della Spina, 2021b; Niemczewska, 2021; Bosone et al., 2021)

Furthermore, the adaptively repurposed structure has the potential to serve as a vibrant locus for cultural engagement, facilitating participation in a diverse array of cultural events ranging from festivals to exhibitions (Della Spina, 2021b; Niemczewska, 2021; Bosone et al., 2021). By adhering to these guiding principles, AR endeavors can engender sustainable social outcomes, fostering a symbiotic relationship between heritage preservation and contemporary community dynamics.

4.4. Environmental factors

Following an environmentally sustainable approach means focusing on safeguarding natural resources and cutting down on waste production, pollution, and emissions into the environment. Additionally, it seeks to lessen harmful effects on human health, promote the use of renewable raw materials, and get rid of harmful compounds (Othman & Elsaay, 2018).

Specifically, the growth of AR in construction has been driven by several factors, including cost-effectiveness and its practicality for repurposing buildings. Rising energy costs have been a significant driver, as they increase the expenses of new construction (e.g., materials, transport, resources), leading clients to prefer re-using existing buildings (Bosone et al., 2021; Bullen & Love, 2009; Conejos et al., 2017). The substantial increase in new building construction over the past four decades has resulted in a large stock of buildings available for refurbishment and re-use (Shah & Kumar, 2003). However, Bullen & Love (2011a) stated that many of these buildings were constructed without environmental performance codes and are not as efficient as new buildings. Thereby, AR addresses this "environmental gap" by improving a building's functionality and reducing its environmental impact.

Central to the environmental assessment for AR is the life cycle extension of buildings and materials deployed in such interventions, thereby curtailing resource consumption and mitigating the need for raw material extraction (See Table 4) (Bullen & Love, 2011b; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Elsorady, 2014; Foster, 2020; Dyson et al., 2016; Bullen & Love 2011a). Concurrently, emphasis is placed on curtailing energy expenditure (known as embodied energy) entailed in the various phases of material procurement and construction, encompassing extraction, processing, manufacture, transportation, and installation (Othman & Elsaay, 2018; Nasr, 2022; Godwin, 2011; Dyson et al., 2016; Niemczewska, 2021; Foster et al., 2020). In this way, the renovation of the structure engenders substantial reductions in carbon emissions and pollution associated with conventional construction practices, seeking a more sustainable urban ecosystem (Othman & Elsaay, 2018; Della Spina, 2020; Vardopoulos et al., 2021; Nasr, 2022; Godwin, 2011; Dyson et al., 2016: Bullen & Love 2011a).

To mention an example of high environmental performances achieved through AR projects, Mazzetto & Vanini (2023) presented in their research the case of At-Turaif, in Riyadh (Saudi Arabia), born as a residential government, now re-adapted as an open-air museum. The environmental criteria, based on three indicators (namely, Respect environmental, Reduce natural hazards, Reduce pollution and waste) reported the maximum score in each of them. This achievement is likely due to the fact that the ruins are conserved and incorporated into the open-air museum, with little to no replacement or change of the original materials and partial restoration. Although the minimum intervention, the research has shown that environmental performances are certainly an object of measurement of sustainability, therefore relevant success factors of AR for this study.

The adoption of AR strategies facilitates a concomitant diminishment in land consumption and urban sprawl, an outcome of paramount significance in the context of burgeoning urbanization and its attendant challenges (Othman & Elsaay, 2018; Della Spina, 2020; Vardopoulos et al., 2021; Nasr, 2022; Godwin, 2011; Dyson et al., 2016: Bullen & Love 2011a; Mazzetto & Vanini, 2023). Integral to the efficacy of such initiatives is the judicious integration of recycled or existing materials

Table 4

Environmental	Description	Literature
Life cycle of buildings and material	Expanding the life cycle of buildings and materials employed in the reuse intervention, thus reducing resource consumption and extraction of raw materials	(Bullen & Love, 2011b; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Elsorady, 2014; Foster, 2020; Dyson et al., 2016; Bullen & Love 2011a; Bosone et al., 2021; Bullen & Love, 2009; Conejos et al., 2017)
Saving Embodied energy	Saving energy used in the extraction, processing, manufacture, transportation, and installation of construction materials or equipment	(Othman & Elsaay, 2018; Nasr, 2022; Godwin, 2011; Dyson et al., 2016; Niemczewska, 2021; Foster et al., 2020)
Land consumption	Decreasing consumption of land and urban slump	(Bullen & Love, 2011b; Othman & Elsaay, 2018; Vardopoulos et al., 2021; Dyson et al., 2016; Bosone et al., 2021; Guo et al., 2021; Bullen & Love, 2009; Foster et al., 2020)
Reduction of emissions and pollution	Avoiding construction and demolition emissions and pollution as well as waste of environmental resources	(Othman & Elsaay, 2018; Della Spina, 2020; Vardopoulos et al., 2021; Nasr & Khalil, 2022; Godwin, 2011; Dyson et al., 2016: Bullen & Love 2011a; Mazzetto & Vanini, 2023)
Use of recycled materials	Use of recycled/existing materials and eco-friendly technologies	(Torrieri et al., 2019; Vardopoulos et al., 2021; Elsorady, 2014; Guo et al., 2021; Bullen & Love, 2009)
Energy and water efficiency	Self-generation of energy/water sources for the operational phase through renewables/ water capture, filtering and reuse systems	(Bosone et al., 2021; Guo et al., 2021; Bullen & Love, 2009; Conejos et al., 2017; Foster et al., 2020; Karakök et al., 2023)

alongside the deployment of eco-friendly technologies, encapsulating a holistic ethos of environmental responsibility and resource optimization (Torrieri et al., 2019; Vardopoulos et al., 2021; Elsorady, 2014; Guo et al., 2021; Bullen & Love, 2009). Furthermore, the necessity of improving energy and water self-sufficiency during the operating stage highlights a strategic shift towards renewable energy sources and cutting-edge water management techniques. (Bosone et al., 2021; Guo et al., 2021; Bullen & Love, 2009; Conejos et al., 2017; Foster et al., 2020; Karakök et al., 2023).

In this perspective, central is the role AR can have in the achievement of a circular economy model, both for the city and territory as a whole. Foster (2020) indeed, illustrating the concept of circularity in the realm of AR, states that a greater level of circularity implies that materials are utilized more frequently, therefore they stay in the product value chain for longer periods of time, and, even in the event that resources are rejected, they never enter the value chain at all.

By eliminating or reducing the wastage of cultural resources (including knowledge and physical and intangible legacy) and environmental resources such as materials, energy, and soils, the waste can be transformed into new economic, environmental, cultural, and social resources (Della Spina, 2020).

4.5. Economic factors

Since the financial feasibility is one of the main aspects to be analyzed and discussed one the current research, it is necessary to provide an overview of critical factors that the literature has regarded as crucial during the phases of assessment of AR projects concerning the economic sphere. Many researches have shown, both on behalf of stakeholders as well as scholars, the high level of importance that AR incorporates in terms of economic sustainability (Aigwi et al., 2019, Amato et al., 2021; Vardopoulos et al., 2021; Othman & Elsaay, 2018).

This latter can be evaluated in two different manners, on one hand is seen as required to guarantee the preservation of this unique historic structure for future generations, while generating revenue streams sufficient to cover expenses for maintenance (Amato et al., 2021). On the other hand, it is necessary to create a self-sustaining society that can meet people's needs without depending on assistance from others by making effective use of the resources that are available (Othman & Elsaay, 2018).

Achieving economic sustainability means that, if the building heritage's value is not in jeopardy, functional variation should be encouraged in accordance with the district's needs (Mısırlısoy & Günçe, 2016). Thus, the decision about the functional adaptation is made also considering the

commercial purposes of the structure. In this way, the diversity of the multiple-uses (i.e., commercial, residential, planning cultural activities) functions poses a lesser economic risk for investors and maximizes potential financial incomes (Aigwi et al., 2019; Shipley & Parsons, 2006; Bullen & Love, 2011a; Bottero et al., 2019; Langston et al., 2008; Tu, 2020). To support the entire decision-making process, from the phase of problem definition to the study of the financial feasibility of the selected project function, Torrieri et al. (2019) have proposed a methodology that integrates various evaluation methods. The challenging process sees financial boundaries but is also a matter of engagement for the different stakeholders as well as the local community. Indeed, it is widely known how the lack of public resources makes difficult the finances of redevelopment initiatives. Therefore, to ensure economic sustainability over the course of a project, public administrations have to evaluate public spending. This promotes the collaboration of all parties involved and establishes a "shared solution" that can satisfy community needs while maintaining long-term economic viability.

Shipley and Parsons (2006) have revealed some important findings regarding the financial viability of AR projects. The results have shown the complicated financial and economic context that surrounds AR projects in Ontario, bringing to light the obstacles as well as the potential rewards of preserving and repurposing historic structures. Accordingly, some Return On Investment of AR projects have experienced a decrease compared to the expected ones, due to delay issues. Despite that, AR was found to be mostly profitable in the long term, suggesting that while some AR projects may require a major initial investment, they can also yield significant returns in the long run. It has been observed that obtaining funding for adaptive reuse projects can be challenging since banks are reluctant to support them because they are thought to carry greater risks (Shipley et al., 2006).

As shown in Table 5, there are many financial aspects to assess for the success of AR projects. By ensuring financial sustainability, the entrepreneurs develop the ability to generate the funds required for heritage conservation and ongoing upkeep on their own through a variety of reuse-related revenue streams and the absence of public sector funding sources (Bosone et al., 2021). One of the key factors achieved through the reuse intervention is the acknowledgment by the public and potential end users of the cultural demand, laying a robust foundation for heritage-led entrepreneurial activities (Gravagnuolo et al., 2021; Vardopoulos et al., 2021; Danieli & Ghirardi, 2023). This entails recognizing the intrinsic value of historical structures and their potential for economic revitalization. Furthermore, such initiatives aim at increasing job opportunities, offering employment not only through the new functions of the building but also by engaging local restorers

and craftsmen, thereby fostering community involvement and skill preservation (Aigwi et al., 2019; Alavi et al., 2022; Vardopoulos et al., 2021; Vardopoulos et al., 2020; Della Spina, 2021; Niemczewska, 2021; Aigwi et al., 2020; Bosone et al., 2021; Langston et al., 2008). Considering also the tourism industry, these projects can contribute to the financial gains of the area, generating revenue streams and boosting local economies (Aigwi et al., 2019; Vardopoulos et al., 2021;

Table 5

Economic	Descriptions	Literature
Increase of cultural demand	Acknowledgement by the public and possible end users of a cultural demand that might serve as a solid foundation for the growth of heritage-led entrepreneurial activities	(Gravagnuolo et al., 2021; Vardopoulos et al., 2021; Danieli & Ghirardi, 2023)
Job opportunities	Offering employment through the new function	(Aigwi et al., 2019; Alavi et al., 2022; Vardopoulos et al., 2021; Vardopoulos et al., 2020; Della Spina, 2021; Niemczewska, 2021; Aigwi et al., 2020; Bosone et al., 2021; Langston et al., 2008)
Revenue from tourism	Increasing income through earnings from the tourism sector	(Aigwi et al., 2019; Vardopoulos et al., 2021; Niemczewska, 2021; Aigwi et al., 2020; Mazzetto & Vanini, 2023; Karakök et al., 2023)
Property and land value	Value growth for real estate and land after revitalization	(Aigwi et al., 2019; Vardopoulos et al., 2021; Sharifi & Farahinia, 2020; Bullen & Love 2011a; Niemczewska, 2021; Aigwi et al., 2020; Bottero et al, 2019; Kee, 2019)
Local and regional economy	Promoting and encouraging new commercial activities in the neighborhood	(Zhang & Zhang, 2023; Alavi et al., 2022; Amato et al., 2021; Torrieri et al., 2019; Nasr & Khalil, 2022; Elsorady, 2014; Della Spina et al., 2023; Niemczewska, 2021; Bottero et al, 2019; Mazzetto & Vanini, 2023)
Self-sustaining	Creating a self-sustaining society that can meet people's needs without depending on assistance from other by making effective use of the resources that are available.	(Othman & Elsaay, 2018; Vardopoulos et al., 2021; Bullen & Love 2011a; Bosone et al., 2021)
Return on investments	The project's benefits, both material and immaterial, should exceed the rehabilitation's cost.	(Della Spina, 2020; Vardopoulos et al., 2021; Della Spina, 2021b; Shipley & Parsons, 2006)
Attractiveness and financial appeal	Increasing the attraction of the site/location with for tenants, buyers and investors	(Della Spina, 2020; Danieli & Ghirardi, 2023;Vardopoulos et al., 2020; Bullen & Love 2011a; Niemczewska, 2021; Bosone et al., 2021; Bullen & Love, 2009)
Ensure market expansion and competitiveness	Expansion of the market as well as the existence of other similar activities in the municipality	(Torrieri et al., 2019; Vardopoulos et al., 2020; Sharifi & Farahinia, 2020; Niemczewska, 2021; Bosone et al., 2021; Bullen & Love, 2009)
Cost-effectiveness	Increasing the cost-effectiveness due to the removal of the demolition process and re-use of structural elements	(Othman & Elsaay, 2018; Dyson et al., 2016; Aigwi et al., 2020)

Niemczewska, 2021; Aigwi et al., 2020; Mazzetto & Vanini, 2023; Karakök et al., 2023). Moreover, the AR of historical buildings often leads to an increase in property and land value, further incentivizing sustainable development practices (Aigwi et al., 2019; Vardopoulos et al., 2021; Sharifi & Farahinia, 2020; Bullen & Love 2011a; Niemczewska, 2021; Aigwi et al., 2020; Bottero et al, 2019; Kee, 2019). This, in turn, promotes and encourages new commercial activities in the neighborhood, fostering economic diversity and resilience (Zhang & Zhang, 2023; Alavi et al., 2022; Amato et al., 2021; Torrieri et al., 2019; Nasr & Khalil, 2022; Elsorady, 2014; Della Spina et al., 2023; Niemczewska, 2021; Bottero et al, 2019; Mazzetto & Vanini, 2023). As mentioned before, such endeavors contribute to creating self-sustaining communities, less reliant on external aid, by effectively utilizing available resources to meet local needs (Othman & Elsaay, 2018; Vardopoulos et al., 2021; Bullen & Love 2011a; Bosone et al., 2021). In this perspective, the benefits, both tangible and intangible, outweigh the costs associated with rehabilitation efforts, ensuring long-term viability (Della Spina, 2020; Vardopoulos et al., 2021; Della Spina, 2021b; Shipley & Parsons, 2006).

AR initiatives enhance the attraction of sites for tenants, buyers, and investors, thereby catalyzing further development and investment (Della Spina, 2020; Danieli & Ghirardi, 2023; Vardopoulos et al., 2020; Bullen & Love 2011a; Niemczewska, 2021; Bosone et al., 2021; Bullen & Love, 2009). In particular, Danieli & Ghirardi (2023) have illustrated interesting insights regarding current cultural development policies. By emphasizing active participation and repurposing existing infrastructure, AR projects can foster innovative strategies for cultural initiatives, thereby attracting private investment and generating two classes of benefits. Globally, the focus on urban regeneration and cultural heritage highlights a market potential for user-oriented technologies that support regenerative processes. Locally, improved curatorial practices for AR can boost long-term audience engagement, sustain participatory initiatives, and offer investors insights into the impact and financial viability of their ventures.

Torrieri et al. (2019), speaking of the economic sustainability of valorization of unused public assets, identified criteria to be accomplished, embracing and relating social issues and the integration of buildings within urban areas. Among these, worth mentioning are: the ability to promote new initiatives, related to private investment in creative projects; competitors' existence, evaluating the presence of additional, comparable activity within the municipality; ability to engage the third sector, evaluating the capacity of nonprofits to engage in activities and stimulate public interest in social concerns. These criteria collectively highlight the potential for identifying and

entering new a cultural market, especially when there is strong involvement from nonprofit organizations, which enhances community engagement and social impact.
This potential expansion of the market, coupled with the presence of similar activities in the municipality, amplifies the impact of these projects, developing a vibrant socio-economic landscape (Torrieri et al., 2019; Vardopoulos et al., 2020; Sharifi & Farahinia, 2020; Niemczewska, 2021; Bosone et al., 2021; Bullen & Love, 2009). Lastly, the cost-effectiveness of AR represents one of the most debated elements to evaluate in economic terms, underscored by the elimination of demolition expenses and the utilization of existing structural elements, making it a prudent choice for sustainable development practices (Othman & Elsaay, 2018; Dyson et al., 2016; Aigwi et al., 2020).
In this regard, Langston et al. (2008) introduced the concept of economic obsolesce, in order to establish the effective life of a building, thereby the effectiveness of repurposing an historical building instead of reconstruction or demolition. Based on economic criteria, investor interest and obsolescence are determined by the duration of time that ownership or usage of a specific building has been shown to be the least expensive solution for achieving a business purpose. Given that there are no major issues like asbestos or foundation problems, converting a building is generally more cost-effective than new construction, as existing structural elements reduce expenses. However, older buildings may require updates to meet current regulations, especially regarding fire safety. This is the reason why a comprehensive survey, before any refurbishment initiatives, needs to be conducted among professional, designers and architects to ensure the building's structural integrity and compliance.

On the whole, the aspect that encompasses as well as serves as a bridge between all the previously mentioned aspects is the combination of financial resources, financial viability and effective management plan of the initiatives. This could involve leveraging a combination of public and private funding sources, including government grants, tax incentives, philanthropic donations, and private investments (Niemczewska, 2021; Othman & Elsaay, 2018). Establishing a sustainable financial model helps cover upfront costs, ongoing maintenance expenses, and any unforeseen challenges, ensuring the long-term viability and success of the AR project.

4.6 Functional factors

The function of reuse of architectural heritage represents a new role in urban development. Cultural heritage in the form of different historic buildings is a useful resource, maintaining the continuity of

urban historical development while integrating architectural heritage into economic, social and cultural dynamics (Zhang & Zhang, 2023).

Keeping these resources maintained solely with public funding is challenging and frequently unfeasible. As a result, they must be profitable and adjusted for modern needs. On the other hand, modern usage ought to support regional sustainable growth and provide an opportunity to maintain the cultural sustainability of the object itself (Niemczewska, 2021).

However, working with existing buildings sets a challenge based on the function dialectic, which states that an adaptation can only be successful if the new function and the old form complement each other well (See Table 6). Indeed, a conflict between the original and new architectural integrities may arise while trying to identify a new function. In this sense, Elsorady (2014) highlights the concept of compatible reuse, an approach that does not devastate a site or adversely affect its cultural significance. When the form and the function have strong compatibility, buildings tend to create positive feedback that people can relate to through the use of form (Elsorady, 2014). For instance, leveraging innovative design solutions facilitates the seamless integration of historical elements with contemporary functionalities. (Dyson et al., 2016; Langston et al., 2008).

Thus, the sustainable process of AR strategies for historical buildings necessitates a meticulous approach that balances preservation with functionality. Primarily, it entails integrating novel functions into these edifices while safeguarding their intrinsic architectural, artistic, and cultural essence, thereby preserving their identity (Amato et al., 2021; Nasr & Khalil, 2022; Foster, 2020; Aigwi et al., 2020; Conejos et al., 2017). Additionally, the reimagined purpose aims to harmonize with the requisites of end-users and the local community, while meeting the expectations of stakeholders, ensuring a symbiotic relationship between the structure and its surroundings (Mısırlısoy & Günçe, 2016; Torrieri et al., 2019; Alavi et al., 2022; Nasr & Khalil, 2022; Aigwi et al., 2020; Conejos et al., 2017). Considering these different interests, the adaptation should be resilient and reversible, allowing for the reinterpretation of spaces originally intended for different functions, with an openness to future modifications in response to socio-economic dynamics (Della Spina et al., 2023; Bottero et al, 2019; Langston et al., 2008). The incorporation of diverse uses, encompassing commercial, residential, and planning activities, serves to mitigate economic risks for investors while optimizing financial returns (Aigwi et al., 2019; Shipley & Parsons, 2006; Bullen & Love, 2011; Bottero et al, 2019; Langston et al., 2008; Tu, 2020).

Recapitulating, AR’s primary goal is to modify a space's attributes in response to its altered environment, prolonging the building's life cycle with an eye toward sustainability while requiring as little grafting, integration or removal as possible. It is critical to understand how to adapt

resiliently and reversibly reinterpret space that was intended for different purposes, while also being flexible enough to adapt to potential socio-economic shifts in the future and provide the city with more options for self-reorganization (Della Spina et al., 2023).

Table 6

Functional	Description	Literature
Compatibility	Introducing new functions in historic buildings while minimizing the loss of their architectural, artistic characters as well as cultural and identity values	(Amato et al., 2021; Nasr & Khalil, 2022; Foster, 2020; Aigwi et al., 2020; Conejos et al., 2017)
Social engagement	The new use is aligned with the needs of end-users and local community and expectations of stakeholders	(Mısırlısoy & Günçe, 2016; Torrieri et al., 2019; Alavi et al., 2022; Nasr & Khalil, 2022; Aigwi et al., 2020; Conejos et al., 2017)
Flexibility of changeable functions	Reinterpret space in a reversible manner, keeping it open to future modifications in response to potential changes in the socioeconomic landscape	(Della Spina et al., 2023; Bottero et al, 2019b; Langston et al., 2008)
Diversity of use	The diversity of the multiple-uses (commercial, residential, planning activities, etc.,) functions poses a lesser economic risk for investors and maximise potential financial incomes	(Aigwi et al., 2019; Shipley & Parsons, 2006; Bullen & Love, 2011; Bottero et al, 2019; Langston et al., 2008; Tu, 2020)
Innovative design	Innovative design as a way to match the historical building and the new function	(Dyson et al., 2016; Langston et al., 2008)

5. Conclusion

The current research aimed to identify critical success factors of AR strategies while meeting a sustainable approach and financial feasibility. The central question of the research was as follows: *How can adaptive reuse strategies effectively balance the preservation of cultural heritage with sustainability goals and economic viability?".*

To answer, a Systematic Literature Review methodology has been adopted in order to comprehend and take into consideration the diverse and multiple elements of evaluation as well as objectives of AR projects. The final corpus of the literature resulted in 40 relevant papers, which have been analyzed according to specific taxonomy of sustainable dimensions, provided by the authors themselves or, in other cases, determined by comparing the factors presented in the literature with the already suggested taxonomy. Hence, the dimensions of sustainability encompassed the following success factors: Architectural, Cultural, Social, Environmental, Economic and Functional. Results have shown that the adaptive reuse of cultural heritage is integral to sustainable urban development, blending historical preservation with modern functionality. Evaluating architectural integrity is essential, emphasizing minimal structural changes and thorough pre-project assessments to maintain both structural and aesthetic elements. Community involvement is also a critical success factor, ensuring AR projects align with local aspirations and needs, thereby improving living standards, cultural awareness, and social cohesion. Culturally and socially, AR fosters local development, preserves cultural relevance, and strengthens collective identity. In terms of Environmental benefits, AR supports sustainability by extending the lifecycle of buildings, reducing resource consumption and waste, and promoting urban sustainability through the reuse of existing structures. Economically and financially sustainable AR initiatives drive heritage conservation independently of public funding, creating jobs, increasing property values, and boosting local economies. In essence, AR of cultural heritage addresses contemporary needs while preserving historical significance, fostering sustainable regional growth, and accommodating future socio-economic shifts, thus proving vital for urban regeneration and cultural heritage preservation.

However, limitations can still arise within a broad and widely discussed topic. For instance, this thesis did not present a full review of critical success indicators concerning the technical feasibility and engineering evaluation of AR projects. Aspects such as accessibility and physical conditions of the built heritage and its surroundings can also represent significant factors to assess. In addition, given the complexity of the body of law related to ownership and management of cultural heritage, distinct in every country, a differentiation in this sense is necessary to comprehend the policy context in which AR strategies can or can not occur. Further research could concentrate on this latter topic as well as assessing the theoretical success elements identified in this research in actual

cases. The collected findings can aid in the decision-making process for AR initiatives and assist stakeholders in determining the elements that should be taken into account for more effective adaptive reuse projects.

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