

The 4res Procedure for Preserving the Built Heritage Of Old Mosul A Sustainable Conservation Policy

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Abstract

The built heritage of Mosul old city suffers from many types of destructing factors which necessitate urgent involvement. At the international scale, many experiments have been successfully performed in employing adaptive reuse of heritage properties. This paper aims to explore and analyse a number of these practices in order to present a procedure based on deriving adequate standards and requirements useful in selecting the most appropriate alternative for the historic building- the paper assumes the necessity to adopt criteria that potentially affect the efficiency and convenience of the new type of use of a historic building and its values- and to use them in implementing conservation of architectural heritage buildings and built environment of Mosul Old City. The 4REs procedure (Reduce, Reuse, Rehabilitate, Recycle) is proposed here for determining a set of criteria needed for making decision of prolonging the useful age of historic and traditional buildings. Reducing the influence harmful causes; rehabilitating and adaptive reusing of the heritage buildings and historic sites; as well building recycling by giving it a new life or by reusing its sustainable materials and methods of traditional construction are essential interventions for exploiting and saving such irreplaceable resources.

Keywords: Preservation, Architectural Heritage, Sustainability, Reuse, Rehabilitation, Recycling, Sustainable material, Old City of Mosul.

كمنهجية للحفاظ على التراث العمراني لمدينة الموصل القديمة نحو سياسة الحفاظ المستدام

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المستخلص

يعاني التراث العمراني لمدينة الموصل القديمة من عوامل متعددة تعمل على اندثاره والتي تستوجب تدخلا مستعجلا للحد منها أو آثارها. على الصعيد العالمي، تم انجاز العديد من التجارب الناجعة في توظيف إعادة الاستخدام المتكيف للمباني التراثية والتاريخية. من خلال استكشاف وتحليل عدد من هذه التجارب، يحاول البحث الحالي تقديم منهجية تعتمد على اشتقاق مجموعة المعايير الكفوءة والمتطلبات الضرورية لعملية انتخاب الاستخدام الأفضل للمبنى التاريخي - إذ يفترض البحث ضرورة اعتماد معايير تؤثر مستقبلا في كفاءة وملائمة نوع الاستخدام الجديد للمبنى التاريخي وقيمته المختلفة- ومن ثم توظيفها في حماية والحفاظ على المباني التراثية والبيئة العمرانية لمدينة الموصل القديمة. تم في هذا البحث اقتراح منهجية 4REs والتي تضمنت آليات (Reduce, Reuse, Rehabilitate, Recycle) لمثل هذه العمليات من خلال تحديد مجموعة المعايير الضرورية لانتخاب البديل للاستخدام الأفضل للمبنى التاريخي أو التراثي. إن عملية تقليل والحد من تأثير العوامل الهادمة أو الضارة بعد تعيينها، وإعادة الاستخدام الأمثل والملائم لنوع المبنى التراثي، وإعادة تأهيل النسيج الحضري ومبانيه التراثية، وإعادة إحياء المبنى التراثي وظيفيا من خلال ما سبق أو على مستوى إعادة تدوير مواده الإنشائية في عمليات ترميم المباني الأخرى في حال القرار بإزالته، هي عمليات أساسية وحيوية لغرض استثمار التراث الموصل غير القابل للاستبدال وحمايته من الزوال والضياع .

الكلمات الدالة: الحفاظ ، التراث المعماري، الاستدامة، إعادة الاستخدام، إعادة التأهيل، إعادة التدوير، المواد المستدامة، مدينة الموصل القديمة.

1. Introduction:

Culture and history of a society and its local characteristics can be maintained by historic buildings and old constructions, which are considered as witnesses to people life progress. Traditional architecture is a manifestation and physical representation of the culture of a people. This research seeks to develop a theoretical plan for evaluating potential preserving building projects and discusses how this potential can be authorized derived from a multi-criteria methodology including economic, environmental and social aspects. The paper contribution lies with its practical application, offering to the specialists, in upcoming days, an opportunity to perform more targeted actions and obtain more effective achievements, rather than facing numerous alternatives that need to assess. It discusses the approaches experts can employ to exploit the cultural significance for future sustainability. It seeks to identifying the major factors of the sustainability framework for rehabilitating and adaptive reuse of built heritage. It presents recommendations on the conversion to new use of historic buildings, used by local authorities when advising on proposals for reuse, and it aims principally to offer guidelines to new or probable new owners or users of a heritage building. The study methodology is based on detailing the preserving challenges encountered by heritage built environments with the target of developing a clear design standards for future uses.

2. The Necessity Of 4res Procedure

All forms of traditional architecture are built to meet specific needs, accommodating values and economies[1]. However, preserving historic buildings can be very capital intensive and risky[2]. Older buildings may have a character that can significantly contribute to the culture of a society and conserve aspects of its history. Buildings can become obsolete long before their physical life has come to an end. Investing in long-lived buildings may be sub-optimal if their useful life falls well short of their physical life[3]. Conservation procedures utilize existing built resources and promote reinvestment in older societies, so, it is broadly considered sustainable. Reduce, reuse, rehabilitate, and recycle are themes that show the relationship between sustainability and preservation. Such topics highlight embodied energy that is considered as one of its most critical issue in the field of conservation[4]. Worldwide, when a building or a site loses its original function, it can be rescued from abandonment or demolition by adapting it to a new use, especially if its architecture is remarkable and remains in good condition, the areas are flexible and/or the settlement is of special interest[5].

Built heritage is understood as “the contemporary use of the past”[6] which are show-cased and turned into commercial products that are integrated into the fabric of central public spaces[7]. Nowadays, a big raise in claiming for common facilities and services has occurred. Balancing the integration of new structures in a historical setting represents a challenge, and the heritage managers must prioritise the tasks that require their involvement because of the managers’ limited resources[8]. The promotion and economic use of these resources offer a practical opportunity for the diversification and improvement of the economies [9]. Globally, historic buildings compose a considerable part of the total building stock, in the same time, it is not possible to preserve them all intact⁽¹⁾. By social and economical change, new

(1) In the UK, only an additional 1.5% is added to the existing building stock each year, and there are approximately 372,000 listed building entries New South Wales in Australia has 20,000 listed buildings, China has 67,750 county, state and municipal level listed heritage places, and Hong Kong has 94 declared monuments and 1444 proposed graded historic buildings[10].

requirements imposed, demand the reuse of historical buildings, thus, adaptive reuse helps to prolong these structures life by adapting their functions in response to contemporary needs[1]. Generally, planners, designers, building owners and decision makers face a concern of adapting or demolishing existing buildings and constructing new ones to meet changing economic and social requests and themes associated to sustainability. A comparison between the two processes shows some vital aspects². Retrofitting historic buildings with green features can achieve the same low operational costs as new, green-featured construction often with little upfront cost, and nearly always with less waste[4]. Energy efficient design should be focused on retrofitting existing buildings rather than demolition and new construction⁽³⁾[3].

2.14RES of Built Heritage As An Economical Initiatives

Currently, built heritage has transformed to a tool for revitalizing urban fabrics and initiating new industries, after it was previously recognized by a specific conservation expert as a unique form of construction. Historical areas can undergo rapid changes in terms of scientific, aesthetic and architectural values. While many traditions and values have been lost, much has also been invented and revived[1],[11]. The growing interest in cultural resources opens new perspectives for the economy in culturally rich destinations which in turn provide the tourism industry with challenges of managing heritage facilities and attractions, and for public agencies[12]. Such a change is largely a result of the attention being given to tourism as a growing sector of the economy. After major industries have closed down or moved out, cultural and creative businesses have staked their positions in new market niches [8].

2.24RES, Sustainability and Energy Consumption

The concept of sustainable development is often characterized by issues such as the proper use of resources to guarantee generational equity, protection of the natural environment, minimal use of non-renewable resources, economic vitality and diversity, community self-reliance, individual wellbeing, and satisfaction of basic human needs[13]. There are major environmental impacts associated with demolition and new construction. Reusing buildings and reinvesting in older and historic neighborhoods offer a means of avoiding these negative impacts [14]. Unmasking the costs can provide strong incentives for a transition to more sustainable energy use, less profligate use of new materials, and greater use of existing building stock. Traditional constructions already have elements of inherent energy saving characteristics due to the creative and adaptive view of architects and craftsmen in previous time⁴. Actual planning practice reveals that the cultural heritage is handled more as a useful means in the rhetoric of local politics than as an important resource for a sustainable future[8]. The main benefits of traditional building lie in its low embodied energy resulting from the reuse of materials already in place and its relatively high community values[3]. With new constructions producing a disproportionate percentage of the world's greenhouse gas emissions, rethinking housing and commercial development to incorporate the principles of sustainability must be continued[4].

(2) Even if 40% of the new building materials are recycled, it can take up to 65 years for a new office building to recover the energy lost in demolishing an existing building. Conversely, in many cases, historic buildings have already recouped their embodied energy costs through their existence and continued use[4].

(3) To the greenhouse gas reduction targets of the Hong Kong Government, it will take up to a century before the energy efficient strategies of new building construction can make any significant difference[3].

(4) Hence the latter had to take advantage of the environment benefits by adapting the building using site, increasing wall thickness, and controlling the exposure to sunlight.

2.3 The 4REs and prolonging historic buildings age

Generally, reusing redundant buildings results in economic, social, and cultural benefits for the local society. By rehabilitating built heritage, the construction has a new utility for a number of socially supportive purposes, which could be the most valuable approach for a self-financing and sustainable form of conservation. Saving in energy, transport cost and building materials, creation of jobs and new economic activities, promotion of the cultural tourism, preservation of a valuable documental source about countryside culture, recovery of native construction techniques, community encouragement, and a more pleasant appearance of the villages are some of the most significant positive consequences of reusing redundant buildings[15],[16],[17]. In addition, the concept of 'green' adaptive reuse of heritage buildings is an effective strategy, it does not only extend the life's cycle of the buildings, reduce its carbon emissions and improve cost efficiency, but also conserve significant heritage values. Reuse of heritage buildings is a way to create affordable housing and a diversity of housing options etc.[18]. A municipality may meet its goals of heritage conservation and increased affordable housing supply simultaneously. What's more, using existing buildings can lower construction costs by approximately 5% to 10% [19].

3. The Process Of Choosing The New Use Type

Where the traditions of the historical city can be explored, an increasing claim for places of entertainment, leisure and tourism related to locations such as restaurants and hotels occur. Proposals introduce a wide range of adaptive reuse for the historic buildings, including museums, galleries, education centers, training institutes, hostels, restaurants etc.[2]. According to Mucahit[1], new uses should be related to three groups of activities: Cultural Tourism, Lodging And Commerce. Conversely, traditional-house tourism can divert the historical area from its original use. The investigation of the reuse of the traditional houses revealed that the traditional functions of the houses were adapted to commercial and community purposes⁵. Government intervention is essential in this type of community purpose reuse to ensure the attractiveness of a historical site. The next best economic option is retail/tourism. While use as a public market is no longer relevant, the building can be retained for other retail/tourism activities such as arts and crafts and restaurants as ultimately selected. The careful addition of floor space adds to its economic performance without any significant disadvantage [3].

3.1 The 4REs Procedure

Preservation in many cases was predicated on reuse, finding a balance between the interests of stakeholder[3]. It encompasses many policies and mechanisms varying in the intervention level, which seek to ensure an acceptable degree to save building durability and sustainability, and to protect and preserve its different values. It has been identified as a process to ameliorate the financial, environmental and social performance of buildings. It is best described as "a process that changes a disused or ineffective item into a new item that can be used for a different purpose" [15].

Sometimes the buildings are in good condition but the services and technology within them are outdated, in which case a retrofit process may be undertaken. If a particular function

(5) For commercial purposes, the houses have been reused as restaurants and lodging, for community purposes, they have been reused as a cultural centre. In the adaptive reuse of a traditional structure such as a cultural centre, spaces for management, handicraft courses, meeting rooms and exhibition halls are needed.

is no longer relevant or desired, buildings may be converted to a new purpose altogether. This is Adaptive Reuse [3] which is applied to development projects in different ways including compatible reuse that will not damage a place or its cultural significance and most appropriate reuse will be not only compatible but will also reinforce and maximise the understanding of the cultural significance of a historical place[1]. The reuse of redundant buildings to accommodate alternative new activities compatible with their character represents an appropriate and long-term sustainable preservation option, as it provides a utility for the owners, guarantees the proper maintenance of the estates and helps to protect the sense of place of rural landscapes [17]. Environmental benefit of adaptive reuse, combined with the energy savings, carbon emissions reduction, and the social and economic advantages of recycling a valued heritage building, make reuse an essential component of sustainable development [13]

As urban ore, a concept described that, existing buildings that are obsolete or rapidly approaching disuse and potential demolition are a ‘mine’ of raw materials for new projects. Even more effective, rather than extracting these raw materials during demolition or deconstruction and assigning them to new applications, is to leave the basic structure and fabric of the building intact, and change its use...Breathing ‘new life’ into existing buildings[3]. The most important aspect of the preservation movement is the Recycling of old buildings by adapting them to uses different from those for which they were originally intended. Creative adaptation contributes to pride in our heritage, creating a link to the past and an opportunity for architectural innovation and problem solving [1].

Based on what is all mentioned, it can be stated that the principal intervention methods which are most appropriate to large number of historic and traditional buildings in the old city of Mosul are those related to reducing damage and its causes to the building, then its rehabilitation and reuse, including giving the building new life consisting permanent process ensures its recycling, and prolonging its physical and useful age. Such process involves many difficulties, assumptions and assessing alternatives, constituting a real obstacle that the wrong decision could produce reverse result and causes incessant irremovable damage for irreplaceable building, or could lead to accelerate its deterioration and destruction. Hence, for the concerned area, several criteria will be set in the next section, so as to facilitate choosing effective alternative for each historic building as an individually case and in isolation from other similar buildings to relatively ensure its better use and mechanism required to its safeguarding, and to extend its useful age, further, to be a positive economically element instead of being depleted object of maintenance and preservation resources.

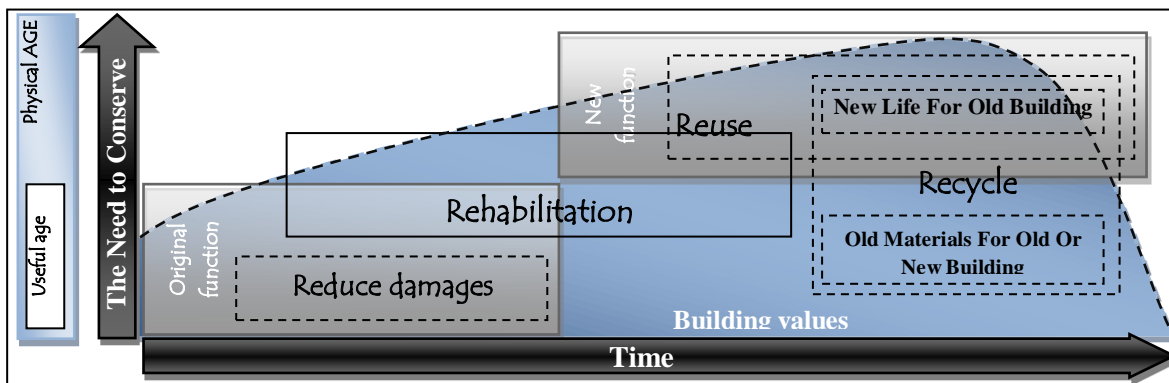


Fig. (1): The 4REs Procedure (The researcher)

3.2 Principals and requirements for adapting 4REs procedure in MOC buildings

To preserve a historic building, various approaches are applicable. Prior to planning, undertaking, or reviewing interventions, such buildings should be understood. Globally, there are successful cases of rehabilitating historic places, where a new use has been intelligently and sensitively matched and alterations have been planned in order to safeguard the construction and its detailed elements. Balancing between project feasibility, environmental impact and social benefit is possible to be objectively evaluated in the light of project-specific constraints and stakeholder interest. Projects with high potential for adaptive reuse can be ranked accordingly[3]. Although for ideal new use in each detail, no conversion may be available, satisfactory results can be obtained through an array of processes, relying on a number of factors and aspects, which can be derived from the successful global experiments. The establishment of selective criteria to guarantee the preservation of the most valuable and significant specimens is needed due to the high number of traditional redundant buildings usually found [15]. The decision-making-process regarding the reuse of historical structures depends on physical, socio-economic and environmental factors[1]. There are many factors that affect the process of selecting an adequate rehabilitation intervention of a historic buildings:

3.2.1 Physical

A. Building Constraints: some aspects related to the physical status of the building, including:

P.1 Respecting the origin: The most appropriate reuse must maximize the cultural significance of the historical pattern. Any alteration of an historic place for new use must be founded on an understanding of the building, its history and its place in the community [10],[20]. The significance and integrity of important historic assets can be threatened by poorly designed adaptations and mitigation responses. Thus, the new use should be a compatible use [21] in which interference with the fabric is minimized.

P.2 Determining morphological features, the fabric and evolution of the place: Morphological features of a building, such as its plan size and layout, number of storeys, internal divisions and openings characteristics, among others, determine to a great extent the success of any reuse initiative [10][22]. The fixtures and fittings of a place constitute a large part of its historic character and schemes for conversion should allow for their retention wherever appropriate [10].

P.3 Defining useful and physical life of the buildings: Buildings that have a large time period between useful and physical life would be favoured. By identifying buildings suitable for adaptive reuse, and ranking them according to their real potential to communities, this well helps facilities managers to target their resources better and make more substantial contributions to built worth [3].

P.4 Defining built heritage techniques and typological characteristics: The starting of a local scheme to protect the vernacular architecture requires an appropriate knowledge of the traditional building techniques and typological characteristics of the existing built heritage[15]. Potential negative impacts, such as loss of building identity, use of foreign materials and construction techniques or destruction of material heritage, among others, must also be taken into account in order to minimize their effects [15].

P.5 Specifying the new program type: If the new programme is very similar to the original one, conversion has more chances of success with less intervention. in contrast, if the programme is very different, a more severe intervention on the building's general structure will be needed and the result could then be quite critical for the preservation and enhancement

of its identity [5]. A sustainable use entails finding a use that is appropriate to the historic character and fabric of the building and which is economically viable in its particular location [10].

P.6 Recognizing the function of each space: The first test of any design approach in preservation is determining whether the spatial requirements of the proposed project fit the confines of the existing building [1][23]. Most of historic buildings are, by definition, “specific function-holders”, each space specially designed to host specific machinery, process, activity, etc. Still, when they lose their original function, most of them also prove to be solid, have flexible spatial qualities and be of expressive interest[5].

P.7 Defining building details: The individual elements gain significance from being part of an ensemble and intervention in one part will affect the whole. A proper assessment of significance is vital therefore to come to a realistic idea of what is possible in a particular building [10]. Some parts of the building will contribute more to its heritage values than others. Understanding the development of the building will enable different values to be attached to the various components of it, based on considerations such as survival of historic fabric, quality of design or association with a particular designer or with local or national events. While it is desirable to sustain all the heritage values of a place, this is not always possible, so it is important to consider their relative importance to help decide what should be protected[10].

P.8 Complying with building regulations: Complying with the stringent building regulations is another difficulty encountered in retaining historic settings. Heritage buildings have been spoiled when forced to comply with modern building regulations.

B. Site Constraints: In addition to the architectural value of the building, other factors, related to the Site and ethnographic merits, among others, must be taken into account[15] :

P.9 Location: relationship between the proposed use and the location of the heritage property relative to the surrounding streets and the character of the neighborhood is vital. The type and intensity of a proposed adaptive re-use will be assessed according to which category of roadway will best be able to accommodate that particular use[24]. Attractive, well-located buildings are acquired by developers and renovated for commercial purposes such as hotels and, restaurants and for community purposes such as cultural centres and other similar buildings[1]. In order to be self-sustaining, some form of commercial activities have to be adopted. A quantity surveyor highlighted the location factor. Whether the new use is able to create commercially viable activities highly depends on the location of the building. When it is located in a local district with minimal business activities and consuming capability, it makes the commercial use less feasible [13]

P.10 Infrastructures: Traditional buildings are very influenced by the chronology of the development of infrastructures in the area where they are sited [15]. Adequate infrastructure for the whole area, which minimizes negative traffic impacts, while maintaining the urban pattern of the area and improving the townscape is essential[25]. Since most adaptive reuse projects are in the older, central parts of cities, good access to public transport and major facilities can enhance mixed use, and centralized development [26].

P.11 Site Specific Criteria: An adaptive reuse proposal must be assessed on its own merits as to whether the proposal would be appropriate within the context of the heritage building, the surrounding neighborhood and adjacent property characteristics[24].

P.12 Relationship with the surrounding environment. The surrounding urban fabric contributes to the physical environment and improves the overall liveability and quality of life. The extent to which the historic buildings can contribute to the surrounding townscape is often overlooked [13].

P.13 Neighborhood Resident Concerns: The concerns of neighboring property owners should be considered [24].

P.14 Concentration of Adaptive Reuses: Careful consideration must be given to avoid a concentration of adaptive reuses in any given area [24].

P.15 Design Standards. Any heritage building restorations, renovations or alterations must respect the heritage character of the building and its surrounding area[24].

P.16 Parking/Access. Consideration must be given to on-site parking, access and traffic generation associated with adaptive re-use proposals. In order to limit the impact on adjacent properties, the required number of on-site parking spaces should conform to the Parking Schedule of the Zoning Bylaw[24]

P.17 Hours of Operation: Generally, working hours should be limited to daytime hours [24].

P.18 Other Extrinsic factors. Extrinsic factors like location, landscape quality, accessibility, available services, architectural, historic and ethnographic significance, tenancy, legal status and structural condition must be considered in the evaluation as well [15]. The sorts of services and transportation that are available also directly affect the economic viability of the new use [3].

3.2.2 Cultural

C.1 Assessment the cultural value: Prior to determine reuse type, performing listing, recording, classifying and documentation of the concerned buildings is essential, since such actions have the impact on selecting the adaptive reuse, and identifying its potential damage level on building original form, and its architectural and historic value. Any intervention needs a previous evaluation, and not only a fitted diagnosis and appraisal but also a well-conceived programme and high-quality design skills are requested to assure a successful result [5]. If a range of compatible uses exists, the ways in which these uses will actively contribute to an understanding of the place's heritage value must be assessed. The management policy should determine whether a particular use is compatible[1]. Understanding the significance of the building, its contents and setting, by which, the likely impact of any changes can be assessed. Each place has its own value and must be assessed on an individual basis [10].

C.2 Intangible value: The Nara Charter declared that “all cultures and societies are rooted in the particular forms and means of tangible and intangible expression which constitute their heritage, and these should be respected”, The majority of historic buildings undergo a renovation derived from constraints that preserve their material values with more or less achievement to facilitate hosting a new function. Still, their intangible aspect is rarely entirely appreciated so that containing it into the “spirit” of the new function. It is not enough to keep part of the original infrastructure or exhibiting old pictures of its active past. Spirit and feeling is what makes the buildings a living part of our environment [5]. An attachment to place and a sense of place are identified as the key motivational forces behind the desire for the conservation of historic buildings as they help us to connect to our roots, underpin our sense of cultural identity and make the city more livable [13] and it states considering to authenticity “form and design, materials and substance, use and function, traditions and techniques, location and setting, and spirit and feeling, and other internal and external factors”[27].

3.2.3 Social

S.1 Staff Constraints: A solid design training, common sense, sensitivity, creativity, and inspiration respect for the old are a must for the professional-individual or team- in charge of the project [5]. Redundant buildings can involve a variety of different types of developers including: private developers, local authorities, voluntary groups, development trusts and the central government[1]. Adaptive reuse of built heritage also requires expertise in planning and renovating historic buildings. As a result, the project cost and time will be increased. Generally, there is a lack of expertise in implementing the adaptive reuse of built heritage, either in planning or in the renovation work on site[13].

S.2 Managers owner requirements: Facility managers are often faced with decisions about whether to rent or buy, to extend or sell, and to refurbish or construct, which are financial decisions, however, environmental and social impacts should bear on the final choice [3]. Advances in technology and commerce, including the growth of industrial and office automation, and user demands for more comfortable environments for work and leisure have led to large numbers of buildings becoming obsolete or redundant and these changes have provided an abundance of buildings suitable for rehabilitation and reuse [3]. If the settlement has some potential for development, there is an attractive conversion business in sight. For the investor, these obvious qualities are enough, and it is the professional's responsibility to make the best of the adapting process for the client, but also for the building and the site, and last but not least, for the community[5].

S.3 Various social meanings of built heritage: built heritage conveys different meanings to different groups of people[28] and may also embody negative feelings towards the place[29]. By identifying the heritage values of the place, i.e. its potential to yield evidence about the past (evidential values); its ability to illustrate aspects of architectural and social history and its associations with people and events of the past (historical values); its design and visual appeal (aesthetic values) and its social, symbolic and spiritual meaning to people (communal values)[10].

S.4 The Continuity Of Social Life: The reuse of the historic buildings should ensure the continuity of social life which contributes to the cultural significance of the place through a strengthening of cultural traditions and forms and by enhancing cultural diversity [30].

S.5 The Social And Demographic Characteristics Of The Local Area: It is important to consider the extent to which the social and demographic characteristics of the local area affect project feasibility [3].

S.6 Community participation: Offering sufficient opportunity for public involvement, allowing the public to articulate their views and participate to the design and decision-making practices. The appropriate project time period for public engagement is very important. In order to allow for project time constraints, make sure representatives from major stakeholder groups are included in any public engagement exercise. A working partnership can be beneficial, especially between the local community and the government. A non-profit organisation, can also play a role in the participation process [13]. Community participation can ensure that the constraints, challenges, interests, and needs, etc. of the affected parties and concerned groups in both public and private sectors are taken into account in the preparation and implementation of the reuse proposals. It can also reduce confrontations between decision makers and local citizens, and any social opposition to the finalized adaptive reuse proposal. Effectiveness and transparency in the policies also affect the extent of political sustainability[30]. Obtaining feedback on the feasibility of new uses can be a good way to evaluate the social impacts of the new use on the existing community In this sense, a bottom-up communication approach would be more acceptable than the top-down approach,

especially for those projects taking place in areas with strong local identities [13]. However, it is impossible to involve the public in every stage of the project because there are many different stakeholders involved and it takes a very long time to obtain a constructive consensus. So far, there is no effective public participation mechanism allowing the public to be involved in the decision-making process for the new use or for the selection of the building operator for the renovated buildings [13]. The new use of the historic building highly depends on the commercial situation and market demand, therefore, it may not be meaningful to ask the public for the preferred new use[13].

S.7 Hindrance of social inclusiveness due to accessibility: In some cases, due to the load bearing and safety constraints, public accessibility is limited, particularly, in residential structures that were not planned for public use. Social inclusiveness can be hard to achieve if public access to the site is inadequate or even prohibited. The operating organisation has the right to determine the degree of accessibility to the public, although the government sometimes requests that the owners allow reasonable access to the buildings as a condition for financial assistance [31].

S.8 The proposed Scale: In a property driven market, profit-making usually outweighs social concerns. The adaptive reuse of historic buildings usually creates a new tourist venue or gentrification of the area in large-scale redevelopment, hence, it is very challenging to maintain the community life. Conversely, a small-scale adaptive reuse project does not affect the social life of the local community. Whether a conservation approach that keeps the original inhabitants in the historic building is an effective way to enhance the continuity of social life still needs to be investigated[13].

3.2.4 Financial

F.1 Balancing cultural significance and economic viability: The new use should ensure the appropriateness of potential uses in the light of the assessment of significance, and take into account the medium and long-term financial (and cultural) viability of the site. Balancing cultural significance and economic viability is one of the major challenges in the reuse of historic buildings [20].

F.2 Required costs: the capital costs of the building works, the future running costs of the proposed use, including maintenance costs, the potential market for the proposed reuse, the location and the financial sources should be taken into account [20][29]. Compliance with statutory regulations while conserving the historic value of the building is challenging in historic buildings and incurs extra costs. The cost of dealing with regulatory agencies adds an additional 30% to the cost of construction and doubles the time needed for project completion[13]

F.3 Supportive government policies and strategies: Government financial assistance becomes vitally important for adaptive reuse projects whose new use is to provide services or businesses in the form of social enterprises. It would be extremely challenging for non-profit organisations to become economically self-sustaining, particularly in a short-term lease period [13]. Appropriate funding sources are also a critical factor in sustaining urban conservation[13].

3.2.5 Economic

E.1 Conservation VS. Redevelopment: In urban cities with immense redevelopment pressure and high land prices, there is always a high opportunity cost for the conservation of the site compared to developing it to its highest development potential. Adaptive reuse is a very

expensive investment, if people only count the economic return and overlook the intangible non-economic values, then the economic efficiency seems to equal to zero[13]

E.2 The economic viability of the heritage place: Successful urban conservation and adaptive reuse should maintain the economic viability of the heritage place [31] while achieving economic efficiency. Economic efficiency is achieved when the tangible and intangible benefits of the project outweigh its costs. However, the intangible values are difficult to assess and measure. Job creation and the revitalisation of the immediate area can be one of the major benefits. The extent to which the reuse project generates tourism is often seen as a measure of economic success[33].

E.3 Use type competition: The types of development taking place locally and the potential competition that may affect the existing businesses is a primary concern [3]. In the other hand, the significance of a place can be understood by comparing it with other places with similar heritage values. Listed buildings have to be identified as being of national importance on the strength of their heritage values [10]

E.4 Building regulations and economic efficiency: Compliance with current building regulations such as means of access and escape, fire safety, planning and environmental regulations affects the ease of adaptive reuse. These factors can reduce the economic efficiency as a result of the increase in cost and time involved in building and planning approvals[3].

E.5 Tourism influences: Tourism also determines the economic viability of the new use. The extent of tourism revenue generated is highly influenced by the local character of the district. Built heritage located in a low-income district mainly comprised of local small business without adequate infrastructure in the proximity is less likely to attract tourists. In contrast, a high-income district with a large shopping precinct and infrastructure is more likely to attract tourists[13].

E.6 Energy costs: Any sustainability appraisal of historic building stock should consider the whole-life energy costs including its lifespan and durability; the residual-life energy costs of the existing stock, allowing for strategies to increase its thermal efficiency; the sustainability in terms of both energy and materials; and the effect of the generous green spaces, connected with the historic buildings, in mitigating some climate change effects[10].

3.2.6 Environmental

En.1 Environmental upgrading of existing buildings is an essential part of in-situ reuse. It helps reduce greenhouse gas emissions and carbon footprints [34] The importance of green adaptive reuse for the built environment is increasingly stressed, emphasizing embedding environmental design and technologies into existing buildings[17],[35]. Conservation principles are the prime concern, and environmental performance criteria are not the most important consideration in the adaptive reuse of built heritage. However, the long-term life-cycle energy efficiency will be substantial in the adapted historic buildings. Architects are aware that adding environmental design features may destroy the cultural significance of the historic building. Any new building structure may not harmonize with the existing building and thus, responsive and innovative design solutions are required[13].

3.2.7 Political

Po.1 Supportive government policies and strategies at the local level play a vital role in sustaining the adaptive reuse of historic buildings [1]. Acquiring approval and authorization from related organizations and bodies involved in the process of rehabilitating the building, in

a legal framework within standards, rules and regulations enacted in concerned and scientific way, both of rental governmental building or the historic building belong to the private sector.

4. The Case Study: Historic Buildings In Mosul Old City (Moc)

Many historic buildings in Mosul old city owned by governmental organizations or by private sector, suffer from deterioration and destruction over time in such a way that necessitates direct and urgent intervention in order to guarantee its protection and preservation. Example of such buildings are those belonging to the Directorate of antiquities and built heritage, and to the Directorate of Waqf in Nineveh. For instance, in Al-Tutanji traditional house (Appendix.1), rehabilitated to be a museum of Mosul traditions, the northern part has been collapsed after a time of its restoration process carried out in two decades ago, caused by neglecting it for this period without efficient and adaptive use that ensure its safeguarding and protecting, thus imposing intervention of the proprietor body to perform new preservation activity presently completed. In absence of an appropriate procedure of rehabilitating and reusing historic buildings for assurance of their protecting and remaining, continuing of graduation level of its deterioration is expected in the next years, which claims permanent specific intervention that depletes the Directorate investments allocated to conserve the built heritage in the entire city. However, in case of finding success, adequate and adaptive reuse for these constructions, such funds could be transformed to other projects.

4.1 The Project

For testing the proposed procedure, a case study has been undertaken according to current suggestions of the Directorate of Antiquities and built heritage of Nineveh. Six historic buildings in the old city of Mosul including AlTutanji house, AlMaqam house, Khan Hammo AlQadou, Khan AlGemreg, ALSharqyia high school, and the Police station center have been elected as part of the case study. Next, for each building, information tables have been created by inserting required data for the criteria derived in the research, accordingly to the priority of those most influential on the election process and the stakeholder objective. Then, the same tables have been created for functional program of a number of required facilities in the city old districts.

For best matching, a comparison practice has been performed by utilizing computer software by creating database for relative information of the concerned historic building and functional programs. 70 factors (derived from the gathered criteria) divided to 9 categories have been chosen to evaluate the building characteristics for potentialities and challenges that could be faced in adopting the proposed new use. Some of these factors have been repeated in different categories according to their various impacts.

For identifying the weight of each factor and the most influential ones on the new use type, a semi-structured questionnaire has been distributed. Such tool allows participants to comment and take notes on the subject, in addition to choosing answers (Appen.4). The questionnaire included five questions designed to draw an approximate weight of the level of impact of each factor. 115 form have been distributed to involved specialists and participants in the field of Built Heritage (Architects, Civil Engineers, Archeologists, Historians, and Consultants in the real estate trade sector) with the condition of 5 years experience in their field as minimum (e.g. authorized engineer at least). 92 contributors have been answered most of the questions and 23 contributors declined to participate. By analyzing the answers, percentage of factors impact were calculated in order to represent within the database as an

effected element on the choice of the new use type, which is determined by multiplying the value of detailed factor (V) by the percentage of weight (W%) of that factor. Final values have been gathered to evaluate the accepting level of the concerned building to the proposed new use.

A program has been designed using the Excel Software to help the user to determine the adaptability of the building heritage for the proposed new use, through selecting a set of data which includes classifying the characteristics and standards- obtained within the theoretical framework- to main categories for each one specific page is allocated where the minor percentage of each is determined (Appen.2).

The potential detailed values of each factor were separately identified, starting from the most positive significance, and ending by the least negative ones. For example, five values have been assigned for the factor (Architectural value of the building) ranged between (The building has worth architectural value at the overall and details level) and (The building has weak architectural value).

The work page of the programme was divided into a table that includes a number of fields. In the first column, the importance rate of the assigned item to the rest of the elements within its category (R1) was added (Table.1). This rate was derived in the current paper by analysing answers of the questionnaire form (Appen.3) with the possibility of amending this ratio as necessary by the expert user.

The second column includes the elements details of the category, followed by column of the potential options of the element (Op), the value of each element (V) with the possibility of amending this value as necessary by the expert user, then column of weight of the entire category (W% = R), then the decision box (D), which requires replacing the value (0) of the original copy of the programme by the value (1) in only one cell of them, that represents the elected value by the analyst for each item.

4.2 Discussion

After selecting all possibilities of the detailed elements of each category by the analyst of the building, the program calculates the percentage of new usability of this group by collecting the sum of multiplying the detailed value of each element (V1:Vn) by the element weight (W1:Wn) by the decision cell value (D1:Dn), as shown (Sum1=V1*W1*D1).

The program then calculates the final percentage for the building capability to accommodate the new use for each group by multiplying the percentage of each group (Sum1) by the category weight regarding to the rest of the categories (Rt1) (Fig.2). By the summation of the final results of all groups, the concluding assessment can be obtained. This represents the possibility and suitable degree of new use for the historic building, (SumT= sum1:sum9), as shown in Equation.1:

$$\sum_{j=1}^M \left[\sum_{i=1}^{nj} (R_j * V_{ij} * D_{ij}) \right] * RT_j$$

Where:

R : The weight of the entire category

V : The detailed value of each element

D : The value of the expert decision

RT : The category weight regarding to the rest of the categories

By comparing the analysis results for different buildings, the extent to which appropriateness degree and the success prospects for the proposed reuse of the historic building can be perceived. It is noticeable that, within the program ,when an analyst modifies the (R1) value for any element, for the concerned element options, the (W1) value will be automatically adjusted, in order to provide the possibility of weights adjustment when needed. By changing the weights of the group elements - R1: Rn - (provided that the sum of the weights is 100%), the program calculates the final results over again, immediately, according to the completed updates.

Table (1):. The process of calculating the efficiency percentage of the proposed reuse of the historic building

Site Constraints		(Options)	Value	Weight W%	Decision	
%16 R1	The building location (Group elements details)	Op	V	R	D	Sum
		High value	1	16	0	0
		Medium value	0.6	16	1	9.6
		Low value	0.2	16	0	0
					Final sum of the group (Sum1)	Percentage of the Group (Rt1)
						Final result (SumT)

These standards have been applied on the case study in two ways: the first was to choose a specific new use type for the purpose of proposing it on various buildings, whenever there is a specific use request within the old districts and the need to employ the historic building to meet this need. The possibility of adapting a new specific function and reuse for the elected buildings has been tested ('Hotel' has been chosen).

By filling out the forms of each building, so as to see how the ability and convenience of standards derived from the theoretical framework and its impact on the potentialities and characteristics of the elected buildings (Table2), the analysis process (see Fig.3) indicates that the Old Police station (Sarai building) had a preference to adopt the new use by 76.13/100, followed by Alsharqyia High School by 74.76/100, then the Maqam house by 65.98/100.

The second method is the selection of a new use type for a particular historic building so when exploiting this building is needed and economically investing and preserving through its revival with a new function. Altutanji House has been elected as an example for this method, attempting to calculate its efficiency for different functions including commercial and cultural and service uses (Table2) (Hotel, Museum, Health Center, Administrative Office, and Constrictions Bureau).

The results of the analysis indicate preferential of cultural utilizing for the building as a museum or gallery by 75.58/100 and 74.62/100 respectively, or as service facility managed by the private sector such as offices of the construction companies by 69.53/100, as shown in (Fig.4).

Table (2): Comparing the proposed reuse between historic buildings and different uses for a historic building

	Hotel	Museum	Art Gallery	Health Center	Administrative Office	Constrictions Bureau
Altutanji House	64.62	75.58	74.62	62.44	63.15	69.53
Almaqam House	65.98					
Khan Hammo Alqadou	58.33					
Khan Algemreg	59.12					
Alsharqyia High School	74.76					
The Police Station Center	76.13					

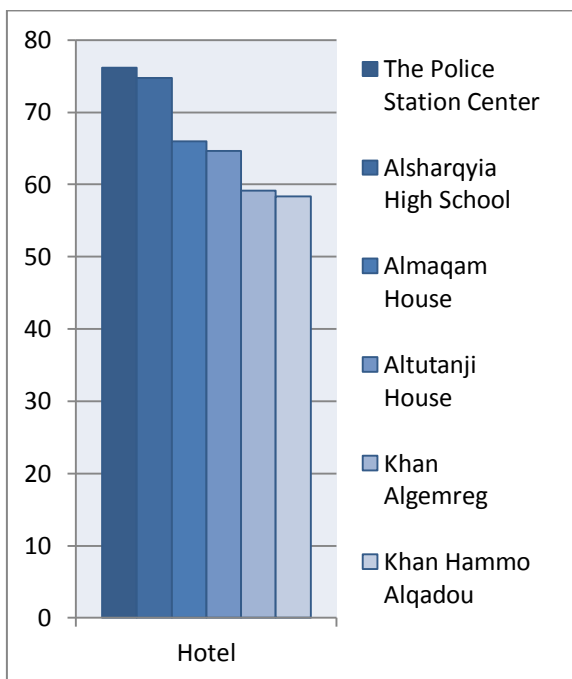


Fig.3 Hotel as a new use for the historic building
- The researcher

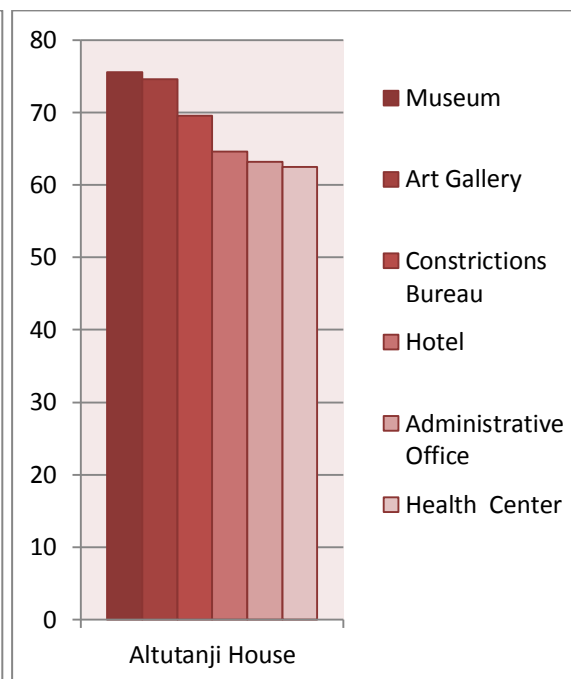


Fig. (4): Altutanji House most favorable reuse according to the study
- The researcher

5. Conclusions and Recommendations

- For Mosul city the transformation of the historic buildings has become a critical action, due to rising demand of regular facilities and lack of services, simultaneously to increasing of population growth of the city, and regarding to the small percentage of preformed required projects last period in city districts.
- When proposing a specific new use type for the old and historic buildings, a number of criteria that determine the best type of use need to take into account, which not negatively influence on the significant architectural and heritage value of the building, and works on the continuity of its functional performance for the longest possible period.
- There are a set of physical, cultural, social, economic, environmental and financial standards affect on the efficiency and convenient of the historic building for the new use. Such standards work on preserving the irreplaceable historic buildings by electing the more suitable use for each building.

- The wrong decision for the new use type of the heritage building may accelerate its deterioration or increase its damage, or possibly, deprive another building that is more suitable and accessible to the new use with less expensive and more benefits.
- The extent to which appropriateness degree and the success prospects for the proposed reuse of the historic building can be perceived by comparing the analysis results for different buildings.
- Within the old districts, whenever there is a particular use demand and the need to employ the historic building to meet this need, the methodology of this paper provides the possibility to prefer a specific new use type for suggesting it on various buildings. Furthermore, it offers the opportunity to select a new use type for a specific historic building, so when exploiting this building is needed and economically investing and preserving through its revival with a new function.
- In the old city of Mosul, instead of creating new administrative and services buildings over the ruins of the old ones after their demolishing, reuse of the heritage buildings offers a viable opportunity to undertake such functions in less budget and time, particularly, in absence or shortage of financial resources.
- The government institutions can purchase a number of these buildings by transforming the capital allocated to construct new facilities in the concerned area. Post offices, health centers, administrative offices, galleries, contractor companies and constrictions bureau are good examples for adequate reuse for a number of historic buildings.
- One of the best procedures in the field of rehabilitating a historic building, that is under the procedure condition, throughout a fixed concession period under an agreement, a private body will build, renovate and operate the building, and finally after the expiry transfer it to the Government.
- In case of needing addition and extension spaces for employing an adaptive reuse for a historic building and preventing harming its original construction, architectural and historical values, by combining it with one of the surrounding buildings or more, the outcomes of the procedure can be achieved, especially, if these buildings have no high significant value.
- In addition, several heritage buildings can be merged in order to provide the required spaces for specific reuse program, as converting a number of traditional houses to hotel, construction company, offices, and administrative building.

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