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# A MODEL FOR ASSESSING ADAPTABILITY IN HERITAGE BUILDINGS

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***Abstract***

*The various aspects of the diversity within communities can be highlighted by heritage buildings and the traditions they represent. Adaptive reuse of heritage buildings can be seen as a strategy to protect these buildings and their associated values. However, in practice, adaptability assessment of heritage buildings and making informed decisions related to adaptive reuse remains a challenge amongst stakeholders. A comprehensive review of published works on adaptive reuse shows existing models to assess adaptive reuse are mainly focused on commercial and office buildings, and are only partially applicable to heritage buildings. As such, the development of a new, simple model is proposed to assess the adaptability of heritage buildings, at different stages of buildings lifecycle, would benefit all parties engaged with heritage buildings and their ongoing use. By reviewing previous adaptive reuse assessment and decision-making models, as well as identifying the challenges to adaptive reuse, a new model applicable to heritage buildings is developed. The model is applied to two heritage listed city halls in Queensland, Australia, as illustrative case studies. Application of this model in practice over time may result in its further extension and strengthen its validity.*

***Keywords****: Adaptive reuse; Assessment model; Decision-making; Heritage buildings; Queensland heritage listed city halls; Australia*

## Introduction

Globally, heritage makes communities and countries distinctive. Heritage buildings signify cultural history. The New South Wales Heritage Office [1] states: “The best way to conserve a heritage building, structure or site is to use it ….adaptation links the past to the present and projects into the future”. As such, where the original use is redundant, adaptive reuse is the best way of conserving heritage buildings which can preserve heritage values, and thus connect past to the present and future. With this appreciation of adaptive reuse, national and international authorities have developed regulations, guidelines, methodologies, standards and measures to define, as well as preserve heritage buildings [2-4]. A review of existing literature on current assessment and decision-making models shows they are mainly focused on existing office and commercial buildings regardless their heritage values [5-9]; and thus, are only partially applicable to heritage buildings. Considering the importance of heritage buildings, the question that arises is; how can adaptive reuse be assessed in heritage buildings?

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Although the theory and practice relating adaptive reuse started in the 1970s [10], assessment of robust decision-making criterion in the adaptive reuse process remains a challenge [11]. To propose a model for assessing adaptive reuse in heritage buildings, the challenges which impact decision-making related to adaptive reuse need to be identified. The identification of challenges is important in determining whether adaptive reuse is applicable to all heritage buildings, as these challenges may result in a level of obsolescence and consequently the demolition of a building [10, 11]. Decision making challenges in building adaptation and adaptive reuse are grouped by various authors into eight categories: environmental, social, economic, legal, political, locational, functional and technical [2, 9, 12-16]. Considering the variety of challenges in adaptive reuse of heritage buildings, the lack of a relevant, reliable model poses difficulties for stakeholders when assessing adaptive reuse and making informed, appropriate decisions.

Having identified that adaptive reuse assessment and decision-making tools for heritage buildings are scarce and identified the challenges, the first step in developing a model is to identify the most important categories of challenges. The aim of this paper is to propose a new model based on the identification of challenges to adaptive reuse of heritage buildings and the critical analysis of existing assessment and decision-making models. The proposed model, the Adaptive Reuse Assessment Model (ARAM) for heritage buildings, is based in theory and tested in practice. The ARAM can be used easily for assessing adaptability in heritage buildings. All parties engaged with heritage buildings would be enabled to assess adaptive reuse potential of heritage buildings at different stages of a building lifecycle, regardless of their level of expertise.

## Research methods

Content analysis is a research method which provides replicable and valid inferences from information with the aim of providing new insights, knowledge, representation of facts, and a useful guide to action [17, 18].

In this paper, a critical review of secondary sources is undertaken to reveal the challenges to the adaptive reuse of heritage buildings. The analysis of the secondary sources and existing adaptive reuse models lead to the development of a new model which can be used for adaptability assessment of heritage buildings.

As, case study research enables researchers to assess real world examples of a phenomena under study [19, 20], the new model (ARAM) is tested on selected heritage listed city halls in Queensland to examine its validity. Case studies are selected based on two categories: adaptation and adaptive reuse. Adaptation is defined renovation and rehabilitation in which the general function of a building will be retained, whilst in adaptive reuse the function of a building will change to another land use [8, 13, 16, 21, 22]. Therefore, selected case studies have experienced different levels of changes during their lifecycle, from maintenance and refurbishment to a change of function. Secondary data is collected in the form of documents outlining the changes made, which comprised plans and reports and council records, and primary data is collected through a combination of visual inspections of the sites and in semi structured interviews with council stakeholders. *S. Taylor and R. Bogdan* [23] stated that interviews are a method that helps the researcher to achieve a deeper understanding of issues, which cannot be achieved directly [24]. In this research, on-site observation was conducted for two case studies in order to achieve useful information in relation to the current condition of each case study. The sources are then analysed to identify the relevant decision-making assessment criteria. This research demonstrates application to Australia in respect to adaptive reuse of heritage listed city halls.

The internal validity (credibility) of this paper is achieved through applying different methods and sources of data in order to collect information related to the adaptive reuse of heritage listed city halls in Queensland. For this paper, two heritage listed city halls are selected. The same methods can be used for other heritage listed city halls in Queensland and other states with the same heritage legislatives, and thus the external validity of the thesis is addressed.

Reliability is achieved through the consistency of the interview questions, which are repeated for each case study. The interview content was further crosschecked wherever possible with professionally appropriate documents such as the Conservation Management Plans to address both potential bias and the reliability of findings.

## Identification of challenges to adaptive reuse of heritage buildings

Various factors present different challenges to the adaptive reuse of buildings. Challenges play a vital role in decision-making because although these factors do not hinder the adaptive reuse in terms of being a barrier, they need to be addressed to reduce the risk a building being impacted by obsolescence. Challenges to the adaptive reuse of heritage buildings vary from achieving compatibility between old and new demands to the contemporary technical and legal expectations of users [25]. Various factors were identified in the literature that can pose a challenge to adaptive reuse of heritage buildings. One, or a combination of challenges may to some extent hinder the adaptive reuse of buildings. Regarding the adaptive reuse of heritage buildings, most authors focused on economic, legal and technical challenges, with the fewest focusing on locational, physical and environmental challenges. Table 1 illustrates the categories of challenges identified in the adaptive reuse of heritage buildings.

**Table 1.** Challenges to adaptive reuse of heritage buildings (Source: Authors, 2020)

| Categories of challenges | Identified factors in each category | Number of factors |
|---|---|---|
| **Environmental** | – Attaining desired standards [14, 26]<br>– Adaptation based on green standards [27] | 2 |
| **Social** | – High number of stakeholders [2, 13, 28]<br>– Awareness of adaptive reuse in the community [14]<br>– Being on a heritage list [2, 29, 30] | 3 |
| **Economic** | – Risks and uncertainties in adaptive reuse projects [27, 31, 32]<br>– Lack of financial support<br>– Lack of accurate estimation of required budget [14, 33]<br>– Lower possibility of securing loans for reused buildings [27]<br>– Incorrect timing of incentives [27]<br>– High costs of adaptation [2, 21, 32, 34]<br>– Required adaptation work and proposed use<br>– Decline in public sector budget [34]<br>– Finding new elements through an adaptive reuse project | 9 |
| **Legal** | – Receiving approvals for any work [13, 14]<br>– Planning restrictions [2, 12, 14]<br>– Compliance with building codes and regulations [15]<br>– Compliance with heritage guidelines [14]<br>– Being on a heritage list [2, 29, 30]<br>– Land use features [2, 12, 34] | 6 |
| **Political** | – Political mandates [35]<br>– Local government support [36, 37] | 2 |
| **Physical** | – Complex process [2, 38]<br>– Finding new elements or components | 2 |
| **Locational** | – Being on heritage precinct<br>– Locating on city centers and/or valuable land [34] | 2 |
| **Technical** | – Providing disability access [32]<br>– Proving required performance standard and preserving visual quality [32]<br>– Installation and upgrade of mechanical and electrical systems [39]<br>– Lack of experience and knowledge [27, 32]<br>– Sourcing original materials and components [13, 15, 21]<br>– Inflexible building [14] | 6 |

There may be an overlap between the challenges summarised in Figure 1. For example, attaining the desired level of quality in an existing building can be an environmental and technical challenge to adaptive reuse. The frequency of challenges in each category does not reflect the actual importance of the categories, but implies the type of professional engagement in the adaptive reuse of heritage buildings.

***Economic challenges***

One challenge to adaptive reuse is related to risks and uncertainties, such as from matching materials or design limitations, which makes contractors and developed apprehensive about the adaptive reuse process since these additional or unforeseen expenses may affect profit [27, 31, 32]. Finding new components throughout an adaptive reuse project increases the time and, consequently the cost of the project, since each new discovery in a heritage building requires a new heritage application to be submitted.

An economic challenge is an accurate estimation of the costs of adaptive reuse, so there is a perception that demolition and construction of new buildings is cheaper than the adaptive reuse of an existing building [14, 33]. Also, lower possibilities of borrowing to reuse buildings and poor timing of incentives, present economic challenges [27]. The Productivity Commission Inquiry Report [34] notes declines in public sector budgeting resulted in economic challenge and pressure on the conservation of heritage buildings. Although, government policies in terms of granting financial incentives or tax reduction, may address these economic challenges to some extent.

Adaptive reuse of heritage buildings may be costly due to the use of traditional materials and techniques employed by highly skilled workers [21]. According to the Productivity Commission Inquiry Report [34], the costs of conservation of heritage buildings is high, and presents the most significant challenge, especially for private individuals. Lack of skilled tradespeople is one reason for increased adaptive reuse costs [34]. Economic factors may present issues for adaptive reuse of buildings; however, where possible economic challenges need to be resolved for heritage buildings because of their distinctive characteristics and importance for communities. *R. Ball* [29] contends that the high costs of adaptive reuse can be offset when measured against the environmental and social advantages of adaptive reuse. This is the case with adaptive reuse of heritage buildings, where preservation of social values can be more important than the costs. So, even though economic factors may be the biggest challenge for an adaptive reuse project, this issue needs to be addressed to preserve heritage buildings and their cultural values. However, high costs of adaptive reuse, without financial incentives or funds, may lead to buildings being left vacant for long periods, especially privately owned buildings.

***Legal challenges***

Planning restrictions and building regulations in terms of classification is a legal challenge to adaptive reuse [2, 12, 15]. Land use features are important in making decisions related to adaptive reuse because planning zones define permissible developments in a specific area. Different planning zones have specific requirements and purposes [2, 12, 34]. For example, a building sited on land with a residential land use may not have the potential to be reused for a commercial function.

Legal factors are important in terms of compliance with current building codes, especially in relation to fire safety and disability access, which usually poses a challenge for adaptive reuse [15]. Heritage listing is a legal and social challenge, since adaptive reuse has to be based on heritage guidelines and permissions [2, 29, 30]. Gaining approvals for any work on heritage listed buildings is a legal challenge to the adaptive reuse of heritage buildings [13, 14].

***Technical challenges***

*R. Shipley et al* [32] believe that adaptive reuse of heritage buildings is challenging in terms of providing required performance standards and preserving the visual quality of building. Overtime minimum standards change and buildings are required to meet

contemporary standards. For example, older buildings may not comply with Part J of the Building Code of Australia (BCA) in respect of energy efficiency. Upgrading the external envelope may require alterations to the building, and it is necessary to find a method that does not affect the appearance or heritage values. *S. Conejos et al* [39] state that the installation and upgrade of mechanical and electrical systems, along with applying green features in adaptive reuse of heritage buildings, are more challenging than for non-heritage buildings due to the limited levels of intervention specified in conservation guidelines.

More broadly, lack of experience and knowledge amongst developers, architects, and engineers about heritage materials, construction techniques, technologies, and software modelling programs presents a challenges to adaptive reuse of buildings and makes professionals reluctant to engage in adaptive reuse [21, 27]. In addition, finding skilled, knowledgeable and experienced people including engineers, architects, and tradespeople, as well as original materials is another technical challenge, making adaptive reuse complex, challenging and costly [13, 15, 32].

Traditional builders used traditional methods and materials in the construction of buildings, which must be fully comprehended by contemporary builders before carrying out adaptive reuse work on buildings. Finding materials and components to match the original is difficult as they may no longer be available. Therefore, new materials need to be replaced, but may have different performance and be expensive [13, 21]. The scope of the technical upgrade, the overall condition of an existing building, and the proposed use are all key-factors related to technical adaptive reuse of existing buildings. However, according to *P.A. Bullen and P.E. Love* [14], some heritage buildings are inflexible in terms of technical innovation and upgrade, and present technical challenges.

**Critical analysis of previous models assessing adaptive reuse**

Among the literature reviewed, a recent model considering categories affecting decision-making in relation to implementing adaptation was presented by *S. Wilkinson* [9]. This model entitled "Preliminary Assessment Adaptation Model (PAAM)", is based on a sequence of conditions which need to be met for an existing building to be considered suitable for adaptation (Fig. 1).

The PAAM design is partly derived from previous adaptation assessment and decision-making tools and models of *C. Langston and L.Y. Shen* [40], *D. Kincaid* [41], *R. Chudley* [42], and *E.B.S.S. Arup* [7]. The PAAM is proposed for assessment of a building at a certain point in time, and thus indicates only the current situation of the building, which may change over time [9]. The PAAM can provide a comprehensive basis for the proposed model; however, other models such as *D. Kincaid* [41] and *E.B.S.S Arup* [7] do not cover all categories identified above, and focus mostly on the levels of adaptation, and consequently are not relevant to this research.

*S. Wilkinson et al* [2] created a large, comprehensive building adaptation database to identify important attributes of adaptation projects to develop the PAAM. According to *S. Wilkinson* [9], the model is mainly based on Chudley's model [42] (Fig. 2); however, there are some differences in the sequencing of stages, which were re-ordered based on previous studies related to each category of challenges.

Chudley's model [42] started with economic consideration of an adaptation project, followed by regulatory requirements, social considerations, aesthetic issues and required time for a project. According to *S. Wilkinson et al* [2], Chudley's model included almost all categories identified by researchers, with the exception of environmental and technical categories. A further weakness *S. Wilkinson* [9] claimed, is that although Chudley's model is easy to follow, it was never tested in practice. *S. Wilkinson* [9] re-ordered the Chudley's model, and considered environmental and technical factors, and then tested the PAAM through case

studies. As such, the PAAM which is based on analysis of the preceding models, covers previously identified challenges, expect the political category.

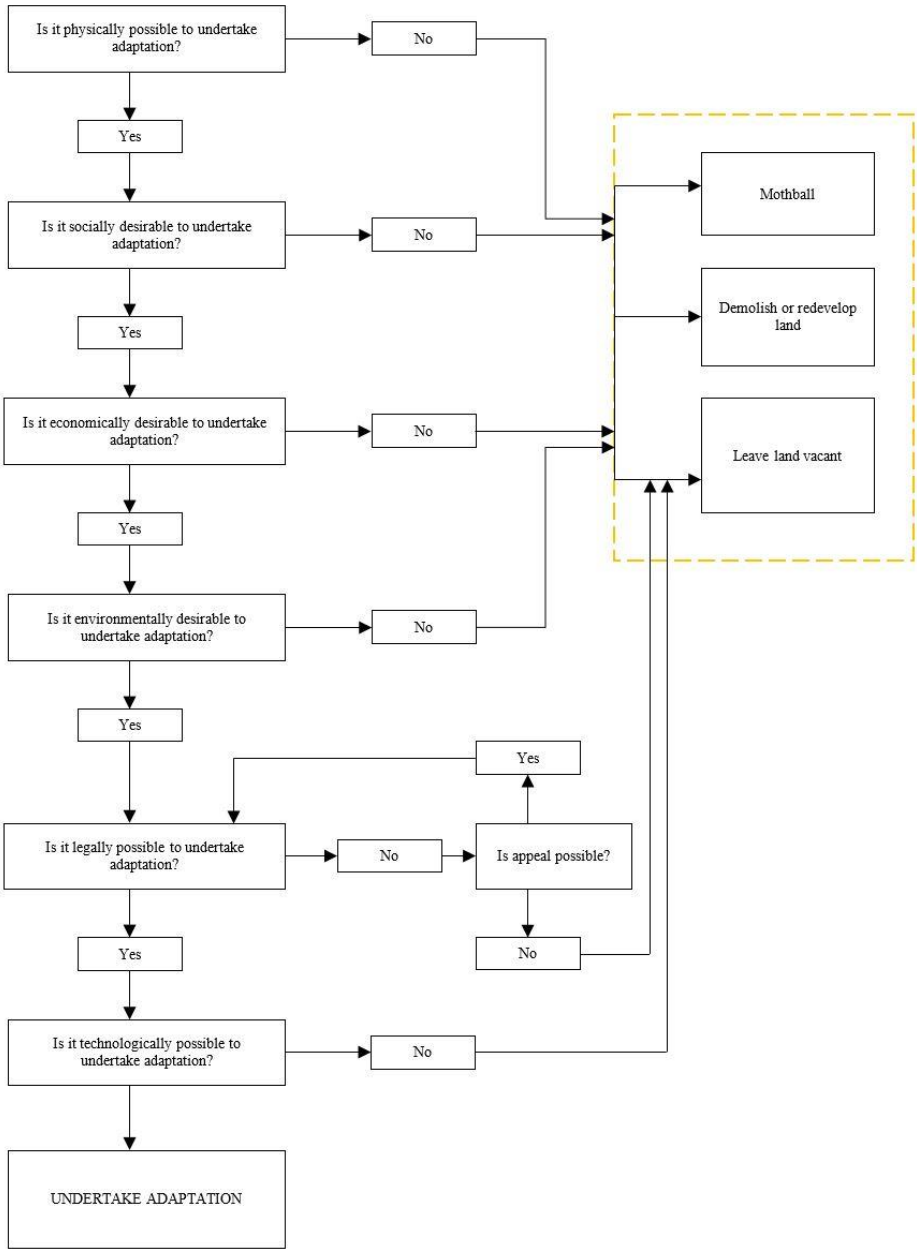


**Fig. 1.** Preliminary Assessment Adaptation Model (PAAM) [9]

Neither *R. Chudley* [42], nor *S. Wilkinson* [9], considered political factors in their models. *R. Chudley* [42] and *S. Wilkinson* [9] did not consider heritage value and authentic features in their models. Thus, their models may not be wholly applicable for the adaptability assessment of heritage buildings.

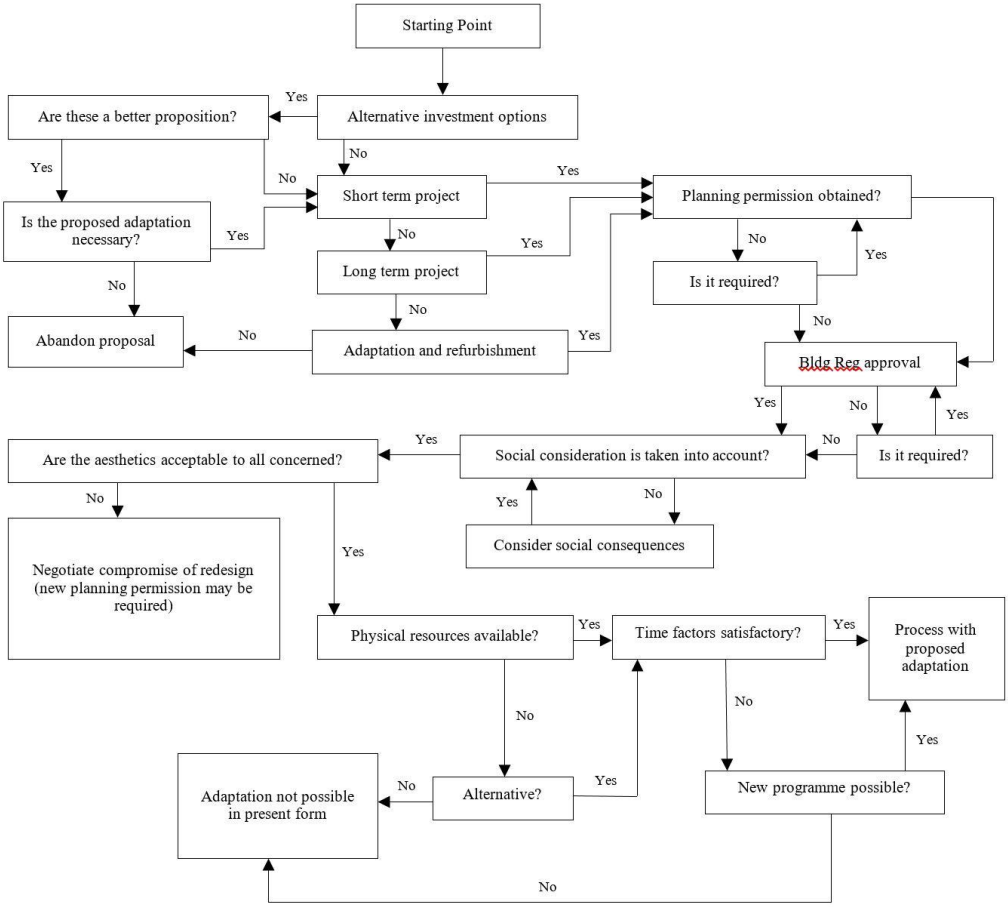


**Fig. 2.** Model of decision-making in building adaptation, Chudley 1981 [9]

*S. Wilkinson et al* [2] stated that PAAM is applicable for non-experts to make a preliminary assessment of a building for minor adaptation. However, this model may not be applicable for all buildings because the sequence and importance of categories may differ, case by case, in terms of specific building features. An important point tested in this study was that heritage building characteristics require a particular sequencing of the identified categories, regardless of use. The focus of the proposed model is on the challenges to the adaptive reuse of heritage buildings which need to be addressed.

In the PAAM, the first consideration is physical suitability for adaptation, and if the building fails to meet this requirement, it cannot be considered for adaptation no matter whether other conditions are met. In the PAAM, the physical condition of an existing building plays a pivotal role in adaptation, whilst technological condition constitutes the least important category. However, for heritage buildings, prioritisation of Wilkinson's conditions may differ due to the building's specific value-representative characteristics, and the given obligation to their preservation. For heritage buildings, adaptive reuse is a strategy to preserve buildings for present and future generations, and the priorities for adaptive reuse are focused on preservation of heritage values, which makes this prioritisation different from other existing buildings [37, 43, 44].

Figure 2 demonstrates that failure to meet legal and technological requirements leads to leaving the land vacant, whilst for other conditions a building may be mothballed, demolished,

or redeveloped [9]. However, all three decisions (mothball, demolish or redevelop land, leave land vacant) seem applicable to existing buildings which fail to meet suitability in each category. Thus, the dash-line has been added to reflect this new perspective on the model (Fig. 1).

The identification of challenges in the adaptive reuse of heritage buildings (Table 1) along with the critical analysis of existing assessment and decision-making models (Figs 1 and 2) provided a basis for proposing a new model for assessing adaptability in heritage buildings.

## Adaptive reuse assessment model (ARAM) for heritage buildings

Extending Chudley's and Wilkinson's model (Figs. 1 and 2), and based on the identification of challenges to adaptive reuse of heritage buildings (Table 1), the Adaptive Reuse Assessment Model (ARAM) is proposed for adaptability assessment of heritage buildings (Fig. 3), which revise prioritisation of categories in the Chudley's and Wilkinson's model, and includes the political category, as well as, heritage values and authentic features.

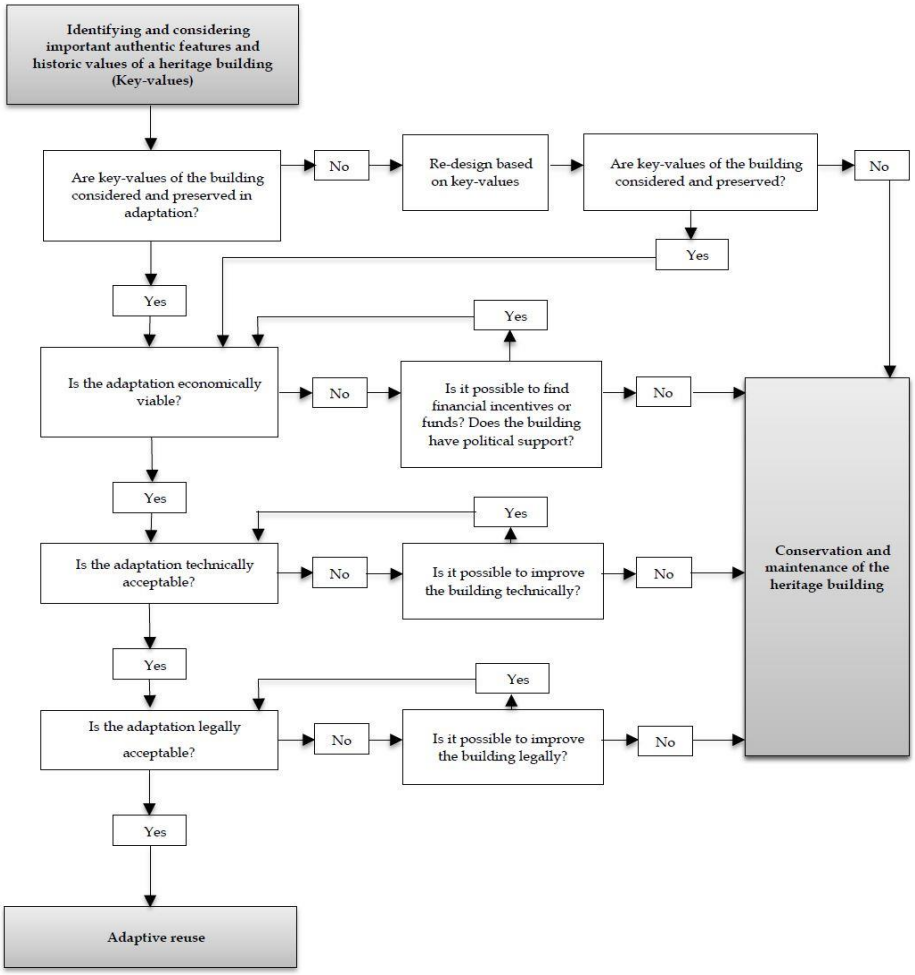


**Fig. 3.** Adaptive Reuse Assessment Model (ARAM) for heritage buildings

Social factors are important in adaptive reuse of heritage buildings since these buildings are typically protected for the long-term community benefit [45]. Thus, a heritage building is usually considered socially desirable, regardless of its reuse worth. Depending on the adaptability assessment of a heritage building in each stage, two outcomes are considered: either conservation or adaptive reuse. All stages have a pathway, along which their applicability for adaptive reuse is assessed, and which may loop back depending on factors on the pathway. The starting point of this model (Fig. 4) is identifying and considering important authentic features and heritage values of a building (key-values). Identifying the key-values of heritage buildings is of paramount importance and simultaneously challenging, due to different stakeholders, perceptions and definitions of values [2, 30, 44, 46]. Following the identification of key-values, the next step is to ascertain whether these values will be preserved through adaptive reuse. Failure of the ability of adaptive reuse to preserve key-values results in conservation or maintenance of a heritage building.

A successful adaptive reuse project must address all challenges to adaptive reuse appropriately and, simultaneously, preserve heritage values. For the ARAM, the prioritisation is based on the sequence of challenges which received consideration in research. Figure 1 shows most authors focused on economic, technical and legal challenges, whilst political, locational, physical and environmental challenges received least consideration. Although figure 1 does not show the importance of the challenges, it demonstrates that in the adaptive reuse of heritage buildings, stakeholders are mainly engaged with the economic, technical, and legal categories of challenges. This indicates that priority must be given to addressing these challenges in an adaptive reuse project. Consequently, the next step in the proposed ARAM considers economic viability of the adaptive reuse of heritage buildings, following technical and legal considerations. The political category, to some extent, overlaps with the economic category in terms of government support and political ownership, and is thus given equal consideration in the economic category.

Locational, physical and environmental challenges have received least consideration in research (Fig 1), and thus are not considered in the model. The sequence of the ARAM (Fig. 4) does not indicate the importance of categories, except for the first stage which is identifying and considering the important authentic features and heritage values of a heritage building. Prior to carrying out any adaptive reuse work on heritage buildings, all tangible and intangible values must be clearly identified and preserved.

## Applying the ARAM to illustrative case studies

In Australia, city halls present the formal development of towns and cities from the late 1880s onwards. Over time, populations have grown and contracted and the utility of the city hall buildings has fluctuated. There is evidence that many Australian city halls have been altered and adapted over time as user needs changed. This research is focused on heritage listed city halls in Queensland, a state in the north of Australia. The findings are considered useful and relevant to other city hall buildings in Australia and potentially; internationally. Selected heritage listed city halls have experience adaptation and adaptive reuse over time, which make them suitable cases for this research.

***South Brisbane Municipal Chambers (SBMC)***

South Brisbane Municipal Chambers is located in South East Queensland. The building is a two-storey masonry building, designed in the free classical style and was constructed in 1892 (Fig. 4) [47]. In 1978, the building was registered in the National Estate list and in 1992 it was registered in the Queensland heritage list [47]. The building is still used, and has ongoing significance. The building has experienced seven different functions over time including: 1) South Brisbane Municipal Chambers, 2) Council works depot, 3) Headquarters of the American Army, 4) Seven flats, 5) Conservatorium of Music, 6) Technical And Further Education

(TAFE) building, and 7) Somerville School Campus and Café. The building is a good example of adaptive reuse. Although this building has experienced adaptive reuse several times, it appears in good condition externally and internally.

**Fig. 4.** South Brisbane Municipal Chambers

For this case study, data was collected including archival research, document and content analysis, on-site observation, and a semi-structured interview with the archivist. The main works undertaken were necessary to maintain the building as a heritage asset, and to make the building more functional. Numerous challenges were revealed following the adaptive reuse of the building over time (Table 2). These challenges are identified based on an interview, archival research, document analysis, and on-site observation.

The analysis of the building shows the highest number of challenges belonged to the technical category followed by physical and legal categories.

*Technical challenges*

Improvement of technical aspects of the building, as well as installation and upgrade of mechanical systems presented a challenge to adaptive reuse. In 1955, providing ventilation systems resulted in damage to the ceiling of the council chambers for ductworks [48]. Bottger [48] noted in the 1999 adaptation of the building, air conditioning was introduced into a very old building and this was complicated and it was hard to conceal installations and achieve 'invisibility'. Furthermore, the building never had plumbing fixtures, so installing kitchens and toilets was complicated.

For the construction of the building, specific construction techniques and materials were used, requiring skilled tradespeople with experience and knowledge of heritage buildings, which posed challenges [48].

Providing disability access was a technical challenge to the adaptation of the building. The building is heritage listed, and it was difficult to find a place for an internal lift, leading to the construction of the lift externally on the rear façade of the building.

**Table 2.** Identified challenged to adaptive reuse of SBMC (Source: Authors, 2020)

| Challenges to the adaptive reuse of South Brisbane Municipal Chambers | |
|---|---|
| **Environmental** | – Attaining the desired levels of standards<br>– The existence of hazardous materials |
| **Social** | – Being on a heritage list |
| **Economic** | – Lack of financial support<br>– The high cost of adaptation |
| **Legal** | – Receiving approvals for any work on heritage listed buildings<br>– Compliance with building codes and regulations<br>– Compliance with heritage guidelines<br>– Being on a heritage list |
| **Political** | – Local government support |
| **Physical** | – Finding a suitable function<br>– Lack of accurate drawings and information<br>– The poor quality of a building<br>– The poor physical and structural condition of a building |
| **Locational** | – Car parking |
| **Technical** | – Improvement of technical aspects of existing buildings<br>– Providing disability access<br>– Proving required performance standard and preserving the visual quality<br>– Installation and upgrade of mechanical and electrical systems<br>– Lack of experience and knowledge<br>– Specific construction techniques and materials in existing buildings<br>– Lack of skilled tradesmen |

*Physical challenges*

Poor physical and structural condition of the building, such as moisture in the brickwork, breakdown of the ceiling plaster, peeling paintwork, and inadequate roofs, presented physical challenges to adaptive reuse over time [49, 50]. Bottger [48] noted when Somerville House bought the building, it was in very poor condition and needed significant adaptation work to be usable.

The uses for which the spaces were to be utilised was an issue for the school as this building was physically separated from the school property [48].

Lack of information presents challenges in the adaptive reuse, according to the Conservation Management Plan [51], for any further work to the building, there must be a detailed investigation of the building condition. The most recent document relating the detailed building condition is the outdated 2001 Conservation Management Plan.

*Legal challenges*

The heritage listing brings limitations with regards to work on the building, since all proposed work needs approval of the Queensland Heritage council [48, 51].

Compliance with building codes and regulations in terms of providing disabled access presented a challenge to adaptive reuse. Bottger [48] stated that, providing disabled access was challenging due to the heritage listing, as a lift could not be installed internally due to the interference with the significant building.

*Analysis*

Although the adaptation of the South Brisbane Municipal Chambers was costly, the project was financially supported by Brisbane Council and the local government. The number

of challenges identified is based on the sequence of the stages outlined in the ARAM, demonstrating the validity of the ARAM for this case study.

***Southport Town Hall***

The former Southport Town Hall is located on the Gold Coast (South East) of Queensland. Southport Town Hall is a two-storey brick building with the main façade comprising cement render, constructed in the Art Deco architectural style in 1935 (Fig. 5) [52].


**Fig. 5.** Southport Town Hall

For this case study, data was collected including archival research, document and content analysis, on-site observation, and a semi-structured interview with the executive coordinator facilities manager.

Southport Town Hall has undergone two extensions and several adaptations. The building is still used as a branch of the council, and is a good example of adaptation. These changes were mainly in response to the changing needs of the community, due to the population growth and the advances in technology. The adaptations were necessary to address issues of building obsolescence. Following the building adaptations, several challenges were identified and are shown in Table 3, based on an interview, archival research, document and content analysis, and on-site observations.

**Table 3.** Identified challenges to adaptive reuse of Southport Town Hall (Source: Authors, 2020)

| **Challenges to the adaptive reuse of Southport Town Hall** | |
|---|---|
| **Social** | – Being on a heritage list |
| **Legal** | – Compliance with building codes and regulations<br>– Being on a heritage list |
| **Physical** | – Inflexible buildings<br>– Lack of accurate drawings and information |
| **Technical** | – Improvement of technical aspects of existing buildings<br>– Proving required performance standard and preserving the visual quality<br>– Installation and upgrade of mechanical and electrical systems |

Table 3 shows the highest number of challenges were in the technical, legal, and physical categories respectively.

*Technical challenges*

The installation of electrical and mechanical systems, as well as improvement of technical aspects of the building, presented adaptation challenges. As stated by Bolster [53], integrating of modern technologies such as air-conditioning and electronic locks was challenging as the aim was to make them invisible. During 2018 on-site observations, some of the air-conditioning equipment installed on the Davenport Street façade of the building was interfering negatively with the visual quality of the building. Internally, in some parts of the building, the air-conditioning ducts are exposed. Bolster [53] noted that a false ceiling was not constructed because it would reduce the ceiling height to an acceptably low level. Overall, meeting the required level of building services performance standards whilst preserving the visual quality of the building were key challenges.

*Legal challenges*

Being on the heritage list is a challenge. According to the report of the Gold Coast City council [54], all works which result in deterioration of the fabric of a listed building and cause irreversible damage must be avoided. The legal compliance aspects of the preservation process makes adaptation a delicate complex task that requires an expert team to deliver; which is challenging.

Compliance with building codes and regulations was a legal challenge, especially with regards to the installation of the fire safety system [53]. Furthermore, the building was not constructed with access for people with disabilities. *G. Bolster* [53] stated, and on-site observation confirmed, there was no disabled access to the first floor of the building. This is a negative aspect and needs to be considered for future adaptation of the building.

*Physical challenges*

Although the building had the capacity to be extended, the interior had less flexibility to accommodate different functions. *G. Bolster* [53] believed that, unlike modern buildings, Southport Town Hall has small spans due to the large number of supporting and load-bearing walls and columns, which needed to be retained. The result is, the interior of the building is somewhat inflexible for any use other than offices.

In 1997, the conservation process was challenged by a lack of original plans and drawings of the building. In this situation, the architects and builders were unaware of what had occurred in the past. The only available reference were construction drawings dated 1955 [54]. In 2016, the lack of accurate drawings and information about the building was still an issue as most of works carried out to the building were not recorded [53]. This lack of accurate drawings and information was a challenge to the adaptive reuse.

*Analysis*

With respect to challenges, Table 3 demonstrates the highest number of challenges to building adaptation were technical, legal, and physical. Economic factors could have been a challenge to building adaptation; however, the economic factors were addressed by the financial support of the local government. The number of challenges identified follows the same sequence of the ARAM and the validity of the ARAM for this case study is confirmed. Consequently, the ARAM can be used for future adaptability assessment of the building.

## Analysis of case studies

As stated by interviewees, adaptive reuse and adaptation of the case study buildings has always been costly; however, they have usually been supported by the local government due to their ownership. Without political support at the local or State level, economic factors could present a significant challenge to the adaptive reuse and adaptation in the case study buildings. This statement implies the importance of the economic and political categories, which need to be considered prior to undertake any adaptation work. Although the importance of political

support in the adaptive reuse of heritage buildings received least consideration in the literature [35, 37] and existing models, it is considered in the ARAM.

The case studies revealed that the physical category is the third most important challenge to adaptive reuse. This finding contradicts reviewed literature where the physical category received least consideration [2, 38]. This finding results in changes in the initial ARAM by considering the physical category at the last stage, shown in a dashed line (Fig. 6).

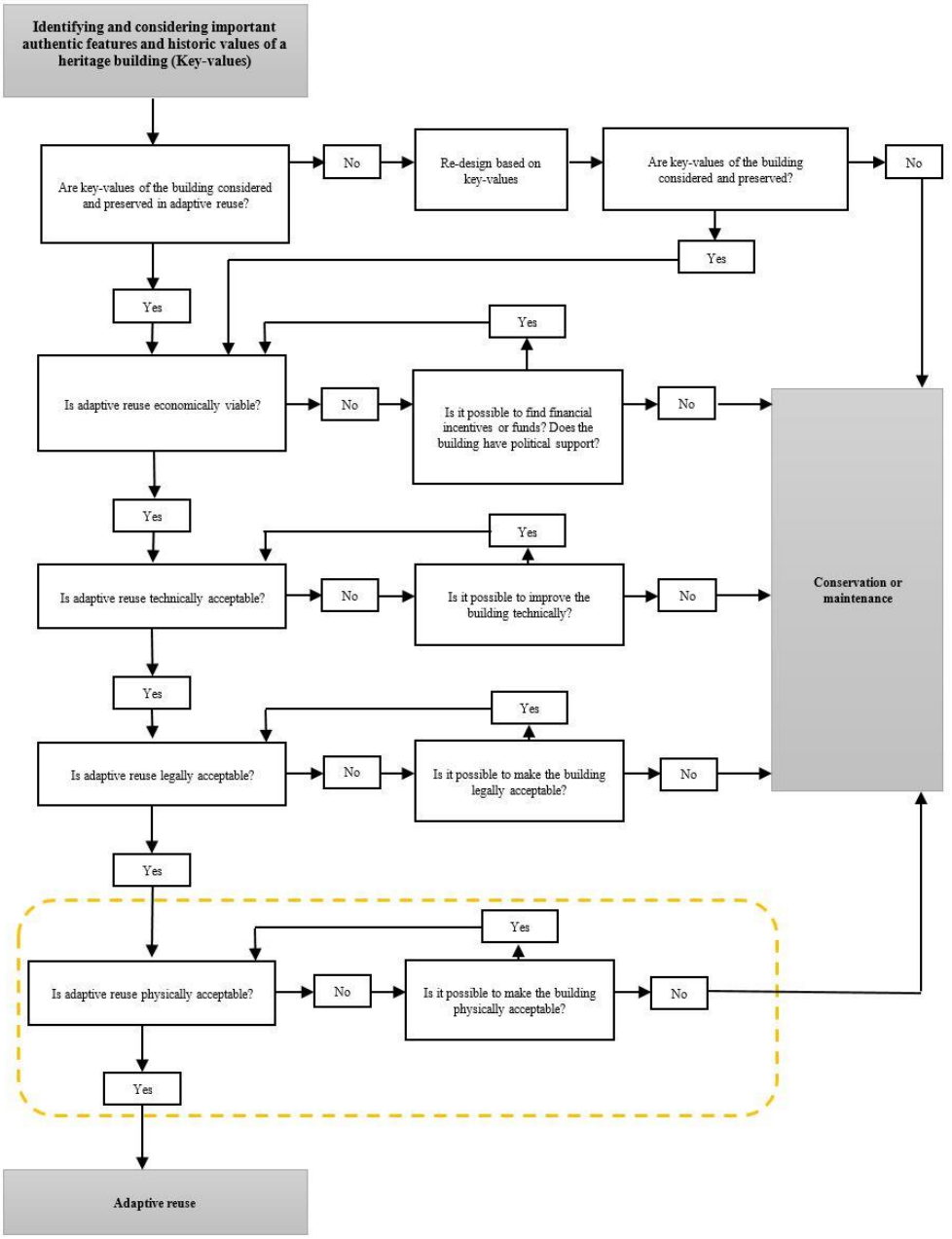


**Fig. 6.** Adaptive Reuse Assessment Model (ARAM) for heritage buildings

The ARAM has the capability to be used for further adaptability assessment of heritage listed city halls in particular, as well as for heritage buildings nationally and internationally. However, applying the ARAM to further case studies would definitely strengthen its validity. A key advantage of the ARAM is its simplicity, as the model can be used by stakeholders in adaptive reuse of heritage buildings regardless of their level of expertise.

## Conclusions

The aim of this paper is achieved through proposing a model, ARAM, which has the capability to be used for further adaptability assessment of heritage buildings. A critical analysis of existing assessment and decision-making models revealed that, political factors, heritage values and authentic features of heritage buildings had not been considered previously. For heritage buildings, a successful adaptive reuse project must address all challenges to adaptation appropriately, whilst preserving the heritage values. Furthermore, previous models considered different options such as demolition, leaving the property vacant, and mothballing the building, which fails to address each category. However, heritage buildings must be safeguarded, no matter whether they address each category or not.

For ARAM, consideration is given mainly to the challenges of the adaptive reuse of heritage buildings, which must be addressed thoroughly to have a successful adaptive reuse project. The validity of the ARAM was tested on two Queensland heritage listed city halls in Australia, and then further developed. However, applying the ARAM to further case studies would strengthen its validity. The ARAM can be applied as a preliminary assessment or a detailed assessment, depending on the level of user expertise.

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