Based on our discussions of space and the current research frameworks, in what follows, we suggest that methodology and assessment methods, as an assemblage for sustainable development and a secure foundation for decision-making, are indispensable components of a holistic strategy for adaptive reuse.

Discussions based on the mixed methodology during the research process

Mixed methodologies are very often employed by researchers in adaptive reuse studies. Compared with discrete quantitative and qualitative data collection approaches and analyses, mixed method-based approaches feature highly integrated collaborative analyses for the overall interpretation of quantitative and qualitative data (Wisdom and Creswell 2013). Moreover, the integration of qualitative and quantitative methodologies can occur at any stage of the research process through research models based on mixed methods; furthermore, this integrative approach allows for the construction of a holistic framework that can then be utilised for adaptive reuse assessments and an analysis of architectural heritage (Glogowska 2011). Based on this methodology in the study of adaptive reuse, an assessment would need an objective collection of quantitative data and describable qualitative data, which would then allow data from one source to complement and enhance the other during the analysis and discussion. Hence, at its most basic level, the advantage of complementarity, completeness, and validity means that this mixed-method approach can allow for a detailed exploration of complex phenomena, yielding valid and reliable insights that can guide practice.

Creswell (2010) outlines a mixed-method research framework that is made up of five domains (five MMR: essence, philosophical and theoretical issues, procedures, adoption and use, politicisation); this method particularly deals with key developments, issues, and priorities in the research process. Moreover, Cameron (2011) provides a five-Ps framework for mixed-method research that includes paradigms, pragmatism, praxis, proficiency, and publishing. In discussing the internal logic of the elements within mixed-method research, Morgan (2007, pp. 48â€“76) summarizes an â€˜abductive-intersubjective-transferableâ€™ approach to explain and tease out such relationships; this approach links different kinds of data through data interchange and teamwork to generate cooperative and inclusive research results. Thus, the frameworks of Creswell and Cameron and the â€˜pragmatic approachâ€™ of Morgan each provide rather flexible and scientific starting points for the development and progression of research projects.

Using mixed methodologies is not a new approach. In the last two decades, an increasing number of studies have involved the combination of qualitative and quantitative methodologies in the field of architectural studies, urban planning, landscape architecture, heritage conservation and tourist development. Oppermann (2000) contends that in the research process, different types of data sets and investigators can be brought together through multiple methods (particularly in the study of tourism from interdisciplinary perspectives). Amaratunga et al. (2002) discuss the application of mixed methodologies in the field of the built environment. Likewise, Silva and Mosimane (2012) employ

mixed-methods assessments in conservation-based rural development studies. McGehee and Andereck (2004) adopt this methodology in the study of sustainable tourism. GonzÃ¡lez-Tennant (2013) adopts mixed methods in the study of social justice and the development of new heritage and dark tourism. Chilisa and Tsheko (2014) open the discourse on mixed-methods research on sustainable intervention outcomes relating to indigenous research. Molina-AzorÃ-n and Font (2016) and Khoo-Lattimore et al. (2019) adopt mixed methods in tourism research based on the sustainability and sustainable development perspectives. Berta, Bottero and Ferretti (2016) focus on industrial heritage and urban regeneration with a mixed-methods approach to studying the integration of urban design and economic evaluations. Overall, the above studies represent a broader concern and a scholarly trend that favours mixed methods in that such methods allow for the creation of in-depth information and the mapping of the trajectory of particular research approaches to specific research issues. However, researchers utilising mixed methods in the investigation of the adaptive reuse of architectural heritage are still limited in many respects, and in the next sections, we offer additional ways in which singular projects can be broadened.

Discussions based on the multi-criteria decision model (MCDM)

In responding to the interdisciplinary nature of adaptive reuse, projects need to be assessed in detail and comprehensively (Wang and Zeng 2010); therefore, deciding on new reuse functions for architectural heritage is a difficult problem. Indeed, the decision-making process is complex and diverse since many factors need to be considered (Misirlisoy and Gunce 2016). Some researchers use semi-structured interviews to handle these issues (Elsorady 2020); however, in many cases, researchers often choose a numerical model to quantify problems and propose solutions. According to Mazzanti (2002), analyses of the adaptive reuse of heritage building functions should consider architectural, historical, economic, social, environmental, and/or cultural values. Such an approach, therefore, requires a multi-criteria decision model (MCDM) based on multi-attribute value theory (MAVT), which can then be used to decide the best use and select the best function (Ferretti et al. 2014).

Among the models applied in the previous literature, the analytic hierarchy process (AHP), proposed by Saaty (1988),

has been widely tested and used to resolve different decision-making problems. Decision situations to which the AHP can be applied include choice, ranking, prioritization, resource allocation, benchmarking, quality management and conflict resolution (Forman and Gass 2001). Ribera et al. (2020) chose the monumental Palazzo Genovese in Italy and used an AHP model to analyse the social, cultural, and economic value of the reuse function of this architectural heritage through multiple dimensions to obtain the highest valuation and best use. Fedorczak-Cisak et al. (2020) believe that many of the criteria used to evaluate reuse are interrelated and have a nonlinear nature, which requires a network-based model. Specifically, they use the FWINGS framework (fuzzy extensions on weighted influence non-linear gauge systems) to rank the uses (including issues relating to society, economics, and energy efficiency) of a heritage building in Poland. Bottero et al. (2019) focus on the issue of the adaptive reuse of heritage with a multi-criteria decision-making framework that supports particular perspectives and presents a novel application of the preference ranking organization method for the enrichment of evaluations (PROMETHEE). This method was also employed by Nadeau and Landry (1986) to design and implement adaptive reuse functions and strategies for heritage buildings in Italy. The model evaluated the performance of nine heritage buildings in seven types of adaptive reuse functions, after which the ranking of the adaptive reuse functions of those heritage buildings was formulated as a reference for decision-making.

However, Pavlovskis et al. (2019) believe that the accuracy of traditional MCDMs needs to be improved, and they particularly suggest the use of BIM (building information modelling) to build a 3D model as a data source. Combining scores from different experts to establish a weighted aggregated sum product assessment (WASPAS) model, Pavlovskis et al. (2019) rank the alternative reuse functions of heritage buildings. Vardopoulos (2019) combines fuzzy theory with DEMATEL (decision making trail and evaluation laboratory) to evaluate the reuse functions of the FIX Brewery in Greece. Importantly, this model was also used to support decision-making based on the criteria of social, cultural, economic, and environmental factors. Considering the hierarchical dependence existing in the traditional AHP method, Chen et al. (2018) use a fuzzy Delphi method to interview experts. In addition to this approach, they also employ a structural modelling method known as an analytic network process (ANP), which was developed by Saaty and Vargas (2006), to explore the best reuse alternatives and strategies for a heritage building in Taipei. They use ANP to determine the priority of the criteria and cases, and specifically, they clarify the impact of the change through sensitivity analyses. Their results reveal that community activities are the most suitable reuse alternative for heritage buildings, followed by commercial, educational, exhibition-based, and mixed-use functions.

Figure 9 illustrates several comparative MCDM applications involving the adaptive reuse of heritage buildings. MCDM is applied in the adaptive reuse of heritage buildings mainly to deal with complex decisions involving multiple criteria.

These models are based on expert opinion and quantify the specific results obtained from the value analysis mentioned before. In addition to considering a set of possible decision-making alternatives with their defined characteristics, these models can also process data describing the attributes and indicator values of heritage buildings; moreover, these models allow for the ranking of alternatives according to indicators or attribute values corresponding to different reuse functions to obtain an optimal solution. In general, the wide application of MCDM within research on the adaptive reuse of heritage buildings proves the necessity of decision-making when considering the reuse and changing functions of a heritage building. The application of MCDM also demonstrates the possibility of multi-group participation and can solve qualitative decision-making problems by providing quantitative data. Thus, MCDM is an important tool for decision-making institutions, evaluators, and other agents when facing adaptive reuse agendas for a heritage site.

Fig. 9 MCDM applications involving the adaptive reuse of heritage buildings. (Source: The author 2020) Full size image

However, although scholars may have introduced fuzzy set methods to improve the degree of objectivity and the accuracy of the modelsâ€™ evaluation results, MCDMs still rely on expert opinion. Indeed, score determination and the accuracy of the assessment results may be affected by the invited scorers (Mualam and Alterman 2020). Considering the representativeness of the decision-making issues and the expertsâ€™ opinions, MCDM is mostly used to determine the rank of adaptive reuses of heritage buildings or to provide a reference scheme. Advanced researchers have frequently developed five-level models for selecting projects based on ANP, or they have used fuzzy theory to evaluate adaptive reuse projects in the face of uncertainty in the evaluations.

Discussions based on the preference measurement model (PMM)

Over the past two decades, due to the rise of â€˜bottom-upâ€™ research methods in the field of heritage protection, public participation in the decision-making process has become a new issue for investigators (Yung and Chan 2011). In particular, researchers have been troubled by expert scoring methods, which do not seem to capture the expressions and interests of stakeholders. Moreover, investigators have also noted that the public may lack adequate knowledge about heritage conservation, which can prevent the public from participating in decision-making mechanisms (Coeterier 2002). The European Leader Association for Rural Development (2016) stated that â€˜[the] bottom-up (BU) processing approach means that local actors participate in decision-making about the strategy and in the selection of the priorities to be pursued in their local areaâ€™. This approach is therefore focused on community participation, and it is worth noting

that the bottom-up processing approach is not considered to be an alternative to (or even in opposition to) the top-down (TD) processing approach; rather, the bottom-up processing approach is seen as incorporating the TD approach, with ideas from both of these approaches being combined and interacting. Both approaches are united in that they both seek to identify the coupling mechanisms among adaptive reuse, preservation, sustainability, and architectural heritage.

Khadka and Vacik (2012) compare the top-down and bottom-up approaches in the identification of criteria and indicators; in particular, Khadka and Vacik suggest that some of the content, for example, the involvement of multi-way cooperation and the combination of the TD and BU approaches, can be used in research processes for adaptive reuse, as shown in Table 1. Moreover, these authors suggest that a range of steps are present in the BU process, which encompasses expert-driven and community-driven inputs that can be treated as mutual references. SokoÅ‚owicz and Przygodzki (2020) provide a good example of these new bottom-up methods. They introduce interdisciplinary research methods to supplement the decision-making process related to the adaptive reuse of heritage buildings from an economic perspective. Visitorsâ€™ willingness to pay (WTP) can be measured and used to maximise the value of heritage buildings as supplementary content. Specifically, SokoÅ‚owicz and Przygodzki (2020) take a twentieth-century post-socialist train station in Poland as a case study and use a three-stage assessment method to understand residentsâ€™ and visitorsâ€™ views of these heritage buildings and their preferences for adaptive reuses. Having conducted the study, they propose that research into peopleâ€™s WTP should be the first step for further in-depth research on the adaptive reuse of heritage buildings.

Table 1 The operation of the BU approach to studying the adaptive reuse of architectural heritage based on the preference measurement method Full size table

According to the people-centred (PC) approach, â€˜cultural heritage has been created by people and it has been created for peopleâ€™ (ICCROM 2015). Taking a people-centred approach in adaptive reuse studies not only includes increasing participation in the management, decision-making mechanisms, reuse, and space optimization of architectural heritage but also includes involving individuals or groups that are related to the heritage properties. The inclusion of people forms an integral part of the overall system of sustainable development (ICCROM 2015) and retains the focus on sustainable developmentâ€™s more qualitative and humanistic characteristics. Contextualized within the background of PC development, existing research is very frequently conducted through questionnaires and/or interviews. In addition to common direct scoring methods, there are semantic differential (SD) methods, stated preference (SP) tools, and

means-end chain (MEC) apparatuses.

In practice, the direct scoring and SD methods ask interviewees to score existing scenarios in order to find their preferences based on different algorithms. Of the two, â€˜the direct scoring method asks decision-makers to specify numerical values for the expected performance of decision alternatives measured against multiple objectivesâ€™ (Suedel, Kim, and Banks 2009, 3). Najd et al. (2015) conduct a study of public perceptions to identify the visual preferences of international tourists for the historic centre of Kuala Lumpur. They use a five-point Likert scale (1 = not preferred and 5 = most preferred) to explore visitorsâ€™ preferences (n = 308) in combination with photo-based questionnaires (objective evaluations) and text-based short descriptions (subjective evaluations) based on a convenience sampling method. The qualitative and quantitative data are analysed through a descriptive analysis, data reduction techniques, principal component analysis with Varimax rotation and Kaiser normalization, and content analysis. From the perspective of an analytical method, their approach is based on the human perspective so as to explore the optimal use and rational protection of architectural heritage. Consequently, the results of their study remind developers that the appearance and legibility of architectural heritage play an important role in demonstrating the characteristics of historic districts. In the historic environment, architectural heritage is the most obvious factor contributing to legibility. Once the adaptive reuse of architectural heritage is carried out, the architectural heritage itself and its surrounding environment must continue to conform to its historical characteristics in order to preserve the legibility of the heritage assets (Najd et al. 2015). Stober et al. (2018) use a Likert scale to investigate the preferences of domestic tourists for visiting pustara settlements. Their approach differs from that of Deghati Najd, Ismail, and Maulan, et al. in that they focus on quantitative data while employing absolute and relative frequencies. Indeed, Stober, BrkaniÄ‡, and LonÄ•ar employ this approach so that they can generate categorical data and use the median and interquartile ranges to calculate numerical data; moreover, this approach allows them to test the normality of the distributions of the numeric variables and the differences between the numeric variables in independent groups. Furthermore, by employing three or more groups of variables, Stober, BrkaniÄ‡, and LonÄ•ar can use the Shapiro-Wilk test, the Mann-Whitney U test, and the Kruskal-Wallis test. With their analysis of the visitorsâ€™ responses, they rank the most interesting heritage content in the area. To some extent, the total score acts as a reference concerning the functional adjustment of architectural heritage and can also be used to guide the restoration of heritage buildings.

According to Osgood et al. (1957), SD analysis mainly includes three factors: evaluation, potency, and activity. In practical applications, the number of factors to be included, including either one or three at the same time, may be

selected on the basis of the research purposes. However, it is customary to use three or more measures for each factor. SD methods allow for the adoption of an auxiliary decision-making effect on the adaptive reuse of different heritage buildings based on real-world experiences. At the core of the SD method is the semantic differential scale, which creates a series of two-way adjective scales based on comparisons of different scenarios. This scale requires respondents to answer a series of pre-set questions to capture their feelings related to their understanding of particular words. It is essentially a method of quantitative subjective evaluation used to obtain respondentsâ€™ preferences for decision-making references. Kang and Zhang (2002) conduct semantic differential analysis on the soundscapes of open urban public spaces, and they conduct their study in three stages. Specifically, Kang and Zhang utilise a pilot study, more detailed interviews, and several soundscape walks to examine the differences between designers and the general public. Ma et al. (2018) conduct a systematic review concerning semantic differential method applications to indoor and outdoor sounds through the use of meta-analysis; specifically, their study analyses the human perceptual dimensions of sound and their corresponding content. Through a systematic review, their study provides suggestions for the use of the SD method in the investigation of specific issues; indeed, in their research, the SD method is adopted to evaluate sounds and their corresponding acoustic indexes within indoor and outdoor environments in combination with the psychological perceptions of the occupants; these methods therefore provide data to support the spatial optimization of an acoustic environment or habitat. This approach also has implications for adaptive reuse in that it provides insights into perception evaluations 1) of individuals and groups for spaces or of individuals and groups for heritage values and 2) of individuals and groups for the historical background of the environment in the assessment process. Shao et al. (2019) use SD methods to conduct a survey with 16 adjectives to identify the views of 84 participants concerning 18 buildings from Asian and European countries. Through participantsâ€™ opinions on comparisons of adaptive reuse designs and through the results of semi-structured interviews, they propose that adaptively reusing old buildings may be better than building new buildings. In addition, according to the SD survey, architects have a responsibility to lead efforts towards sustainable and creative lifestyles in the future.

However, SD methods are based on factual and realistic behaviours, which do not play a role in the evaluation of preferences for the adaptive reuse of heritage buildings that the public has not visited or cannot visit. In contrast, SP methods can be used to design virtual scenarios based on the different levels of different influencing factors to build a discrete choice model for respondents. At the core of the SP method is random utility theory. This theory is based on the idea that researchers can build a discrete choice model by selecting several element items and levels and can then collect visitorsâ€™ behaviour preferences for virtual scenes using conditional logit models or multinomial

logit models to fit respondentsâ€™ preferences for different scenarios. These models obtain utility values corresponding to different element levels and assist decision-making by calculating the utility values of different adaptive reuse schemes for heritage buildings (Kroes and Sheldon 1988). Glumac and Islam (2020) use Eindhoven as a case study and use SP methods to generate a model (including six attributes of housing preferences) to measure usersâ€™ preferences for adaptive reuses of heritage buildings. The research results show the occupantsâ€™ preferences for space and experiences after renovations. Additionally, the researchers verify their results for the usersâ€™ preferences. Based on their research and verification results, the researchers explore adaptive reuse frameworks to be able to promote an efficient and economically sustainable framework. The reuse of architectural heritage provides references for evaluation methods, utilisation intensity, and occupantsâ€™ acceptance. Oppio et al. (2017) establish an SP model to support the design of adaptive reuse strategies for threeâ€”mostly unusedâ€”castles in northern Italy by carrying out choice experiments. These experiments use the attributes of multi-functionality, conservation, exclusivity, interaction, and the costs of inhabitants and tourists in order to understand the preferences of residents and tourists and their willingness to pay for different adaptive reuse functions.

In contrast to the SD method mentioned above, the MEC method uses interviews as the main tool in the research process. Means-end chain theory predominantly represents three cognitive levels of abstraction that are hierarchical in nature: attributes (means), consequences, and values (ends) (McIntosh and Thyne 2005). This method is based on the idea that personal value is the ultimate outcome that motivates goal-seeking behaviour in people. This method uses a series of pre-set questions to obtain the intervieweeâ€™s preferences for product attributes and the resulting product benefits. This forms a chain of means and ends, and as a result, the researcher can learn how interviewees are attracted to different attributes in order to understand their preferences. The application of means-end chain theory is also related to the adaptive reuse of architectural heritage within a heritage preservation context in that this theory is often used to examine and investigate tourist perceptions and preferences (Katahenggam 2020; Lin and Fu 2020), visitor meanings and motivations (Wassenberg et al. 2015; Ho et al. 2015; Jiang et al. 2015; Esfandiar and Bapiri 2016), and heritage tourism experiences (Willson and McIntosh 2010; Abascal 2019; Bapiri et al. 2020; Tu 2020). Wassenberg, Goldenberg, and Soule employ the MEC method to investigate the links visitors make between sites (such as botanical gardens) in terms of their attributes, consequences, and values by conducting in-person interviews. Based on means-end theory, they form a means-end content code list, which they then apply to the participantsâ€™ responses to create hierarchical value maps (HVMs) (Klenosky 2002; Jiang et al. 2015; Abascal 2019). As McIntosh and Thyne (2005) state, the MEC method is employed by researchers to evaluate personal values related to tourism activities and experiences. These values are derived from the subjective evaluations of tourists. Through discourse and textual analysis, the

influence of touristsâ€™ individual values on their behaviour can be inferred to provide a further reference for spatial optimization. To some extent, such an application is similar to the adaptive reuse of architectural heritage in that both approaches use the MEC method to achieve their aims or obtain benefits; the MEC method can therefore be used by preservationists, architects, and planners to justify technical means and methods for adaptive reuse. Abascal (2019) employs the MEC method and convergent mixed-method approaches to identify the link between visitorsâ€™ perceptions and their intentions towards participation; as was done in Wassenbergâ€™s research, an HVM is also created in Abascalâ€™s study to interpret the perceptions and understand the motivations of individuals. Bapiri et al. (2020) combine visitor-employed photography (VEP) and the MEC method to identify chains of attributes, consequences, and values. Finally, based on the impact factors of visitor behaviour, Bapiri, Esfandiar, and Seyfi address issues around the fostering of heritage properties by extracting the personal meanings attributed to such cultural heritage sites.

Studies of human preferences also include further research on their decision-making preferences and heritage buildings. The comparison of preference measurement methods in Table 2 shows the differences between current investigations in studies of the adaptive reuse of heritage buildings. Of these methods, the SP method investigates the characteristics of preferences in the virtual environment (Abdullah et al. 2011). This method can accurately measure the influence of the different adaptive reuses of heritage buildings on visitorsâ€™ preferences and has good predictive power. In contrast, the SD method and the MEC method adopt different perspectives. The SD method is easier to discuss given its use of opposite adjectives in pairwise comparisons, while the MEC method involves the analysis of personal values and behaviour through interviews.

Reference

Introduction to Nursing Research: Incorporating Evidence-Based Practice: Incorporating Evidence-Based Practice

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