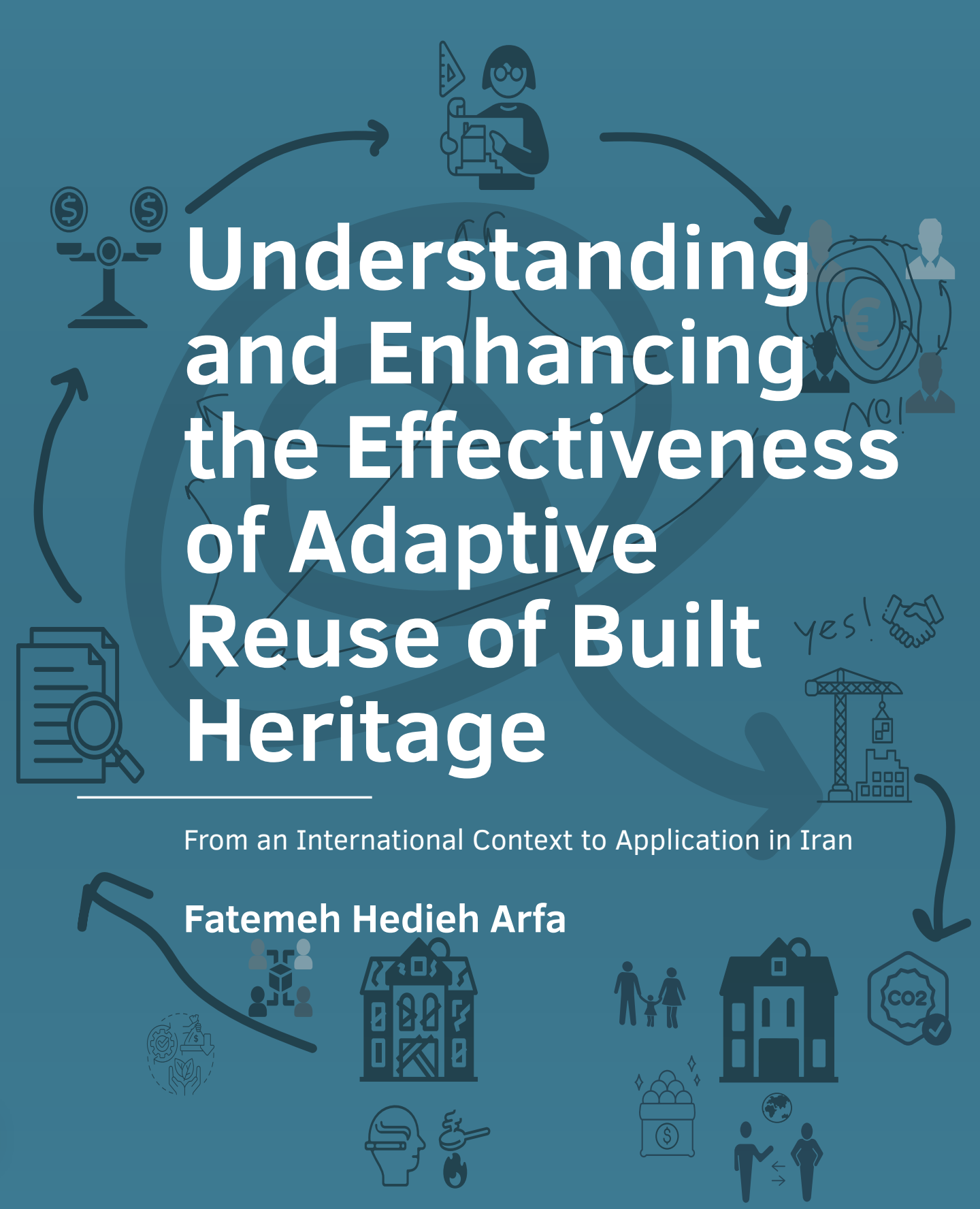

Understanding and Enhancing the Effectiveness of Adaptive Reuse of Built Heritage

From an International Context to Application in Iran

Fatemeh Hedieh Arfa

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Design | Sirene Ontwerpers, Véro Crickx

Cover photo | The cover photo, sketched by Fatemeh Hedieh Arfa, illustrates the complexity of the adaptive reuse process for heritage buildings and serves as an abstract representation of the model developed in this dissertation.

Keywords | Adaptive Reuse; Heritage Buildings; Process Model; Effectiveness; The Netherlands; Iran; Built Heritage; Built Environment

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Understanding and Enhancing the Effectiveness of Adaptive Reuse of Built Heritage

From an International Context to Application in Iran

Dissertation

for the purpose of obtaining the degree of doctor
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by the authority of the Rector Magnificus, prof.dr.ir. T.H.J.J. van der Hagen
chair of the Board for Doctorates
to be defended publicly on
Wednesday, 16 October 2024 at 17:30 o'clock

by

Fatemeh ARFA
Master of Science in Restoration and Revitalization of Historical Buildings and Urban Fabrics-Conservation and Restoration of Architectural Heritage,
Iran University of Science and Technology, Iran
Born in Shahrood, Iran

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This dissertation has been approved by the promotors.

Composition of the doctoral committee:

Rector Magnificus,	chairperson
Dr. B.A. Lubelli	Delft University of Technology, promotor
Dr.ir. W.J. Quist	Delft University of Technology, copromotor

Independent members:

Prof.ir. P.E.L.J.C. Vermeulen	Delft University of Technology
Dr. H.T. Remøy	Delft University of Technology
Prof.dr. K.C. van Cleempoel	Hasselt University, Belgium
Prof.dr. P. Hanachi	University of Tehran, Iran
Prof.dr.ing. U. Pottgiesser	Delft University of Technology, reserve member

Other members:

Dr.ir. H. Zijlstra	Delft University of Technology

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To Alireza, the love and coach of my life,
To my lifelong supporters, my parents,
To my caring parents-in-law,
And to my hometown, Shahrood, where my journey began.

Fatemeh Hedieh Arfa

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The motivation behind doing this dissertation lies not only in doing a PhD research but also in being impactful in this world. My mother's grandfather, Haj Mehdi HEIDARIAN, was a well-known architect who came from Yazd to Shahrood to construct buildings that are now all the heritage of my hometown, Shahrood. My motivation started when I saw those heritage buildings were not fully effective; while some were abandoned, some were restored and in use but not that active! When I started studying for my Bachelor's degree in Architecture and Urbanism at Shahrood University of Technology, I was not aware of the value and potential of those buildings and even my own potential. I was a hardworking student throughout my academic life but felt a bit lost at the beginning of my Bachelor's studies. The first person I should thank is Dr. Saeid KHAGHANI, who believed in me, and just then, I started believing in my own capacity. Two times, he highlighted to me, *"You are exceptional; just go and never stop following your dreams"*. Thanks for those moments. Thanks to Dr. Elham SARKARDEHEE, who always supported me during my Bachelor's studies and my next career steps as a lecturer at Shahrood University of Technology.

As I mentioned in Proposition 9, attached to my PhD dissertation, *"Being impactful is not only about being intelligent and capable; it also requires having people around you who believe in you, support you, and provide space for growth"*. Success or being impactful is mainly about the people you meet, support you and give you chances to grow; I was the lucky one. This luck did not end there; I was fortunate to work with Dr. Seyed Abbas Agha YAZDANFAR, who supported me during my master's studies at Iran University of Science and Technology. Whenever I was lost, he was like a father to me. Thanks for believing in me! Dr. Fatemeh MEHDIZADEH SARADJ inspired me to follow a similar journey and pursue a PhD somewhere abroad. Thanks for being inspirational!

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Fatemeh Hedieh Arfa

August 2024
Delft

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Glossary

Terms	Definition
Adaptive reuse	The process of converting a building to a function that is significantly different from the original function (Douglas, 2006).
Conservation	Heritage building conservation encompasses various aspects. The Venice Charter (1964) describes conservation as maintaining a historical monument's setting in scale, preserving traditional elements, and prohibiting alterations that would affect mass and colour relationships. According to Harun (2011), conservation involves technical activities aimed at preserving the fabric and construction materials of heritage buildings. This process includes physical actions to prevent decay and extend the life of the buildings.
Effectiveness	*"The ability to be successful and produce the intended results"* ("Cambridge Dictionary," n.d.). In this dissertation, the regulations of the Nationaal Renovatie Platform (Gulden Fenix Prijs) for winners are used to investigate "effectiveness" of AR projects. Chapter 3 of the dissertation concludes that "effectiveness" in AR projects involves six criteria, 34 groups of aspects and 108 aspects.
Heritage buildings	Feilden (2007), in his book *"Conservation of Historic Buildings"*, defines heritage buildings as those that evoke admiration and spark curiosity about the people who inhabited them, their culture, and their historical, archaeological, economic, social, and political significance.
Heritage values	Riegl categorizes heritage values as age, historical period, commemorative value, use, and newness (Riegl, 1996). In her PhD dissertation, Pereira Roders broadened the traditional approach to include values in the built heritage by highlighting a categorization that included the ecological, social, economic, scientific, age, aesthetical, historical, political, and (other) primary values (Pereira Roders, 2007).
Method	*"A particular way of doing something"* ("Cambridge Dictionary," n.d.). In this dissertation, this term is used to mention the specific way that architects act in the steps of the AR process.
Methodology	*"A set of methods used in a particular area of study or activity"* ("Cambridge Dictionary," n.d.-a).
Model	"*A simple representation of a system or process, especially one that can be used in calculations or predictions of what might happen*" ("Cambridge Dictionary," n.d.-a).
Preservation	Preservation aims to halt deterioration, decay, or dilapidation, ensuring structural safety without obscuring evidence of the building's construction or historical use (Harun, 2011). In the current dissertation "preservation" is used interchangeably with the term "conservation" and includes adaptive reuse of heritage buildings as well.
Phase	*"Any stage in a series of events or in a process of development"* ("Cambridge Dictionary," n.d.-b). In this dissertation, the adaptive reuse process is divided into four phases: "pre-project," "preparation," "implementation," and "post-project".
Restoration	According to the Venice Charter (1964), restoration is a highly specialized operation aimed at preserving and revealing the aesthetic and historic value of a monument, with a primary focus on respecting original materials and authentic documents. Restoration involves returning a building to its original condition at a specific time period, working from actual evidence.
Reconstruction	Reconstruction involves building a historic structure using replicated design and/or materials. Reconstruction also entails returning a place to a known earlier state differs from restoration as it includes the introduction of new material into the fabric (ICOMOS, 1999).

>>>

Terms	Definition
Stakeholders	*"A person such as an employee, customer, or citizen who is involved with an organization, society, etc. and therefore has responsibilities toward it and an interest in its success"* ("Cambridge Dictionary," n.d.-b). In the present dissertation the following terms are used for referring to different groups of stakeholders (Aigwi, Phipps, Ingham, & Filippova, 2021): • **Users**: The "user" stakeholder group has been divided into three sub-groups: – Original users, i.e., former tenants of a heritage building – End-users, i.e., potential or future tenants of a reused heritage building – Members of the community and passers-by • **Producers**: The group of "producers" includes all participants in the preparation of an AR process, composed of different construction experts (e.g., cultural history experts, environmental sustainability experts, etc.). These may be different for different projects • **Investors**: The "investors" in an AR process can be private owners of historical buildings, funding organizations, government, tenants, etc. • **Regulators**: the "regulators" are typically government officials at the local and national levels whose role is to promulgate regulations and ensure that "producers" strictly adhere to relevant regulatory procedures during the AR process. These regulations include building codes, health and safety regulations, heritage protection regulations, planning and zoning regulations, etc.
Step	*"A stage in a process"* ("Cambridge Dictionary," n.d.-c). In this dissertation, "step" refers to different stages within the adaptive reuse process.
Tool	*"Something that helps for doing a particular activity"* ("Cambridge dictionary," n.d.). In this dissertation, this term is used to indicate specific tools which the architects employ in different methods in the steps of the AR process.

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Summary

Adaptive Reuse (AR) of heritage buildings has gained significance in contemporary society as a sustainable approach to preserving heritage buildings while accommodating new functions. Although repurposing heritage buildings is not new, the term "Adaptive Reuse" emerged in the 21st century, focusing on changing buildings' functions to serve purposes different from their original use. This approach not only benefits heritage preservation but also addresses challenges such as vacancy and contributes to a CO_2-neutral world.

However, despite the growing recognition of AR, a lack of cohesive methodologies still remains, particularly when AR addresses heritage buildings. While international charters acknowledge AR as a means of conserving heritage while enhancing functionality, they often lack specificity regarding implementation at the building scale. This research identifies a gap in AR methodologies, and aims to develop an improved model to guide architects in the AR process, drawing from international literature and Dutch AR practice. More specifically, this research aims to analyze existing knowledge about AR processes, identify criteria for the effectiveness of AR projects, examine methods and tools employed in effective cases in the Netherlands and Iran, and propose an adapted AR model for application in the Iranian context.

A systematic review of international literature highlighted a lack of an overarching model covering the entire AR process of heritage buildings (Chapter 2). This review provided a basis for developing a conceptual model of the AR process. This model includes steps such as “initiative”, “analysis of the building and surroundings”, “value assessment”, “mapping the level of significance (of elements)”, “adaptive reuse potential (function)”, “defining the design strategy”, “final decision-making”, “execution”, “maintenance”, and “evaluation after years”. This model is used as the dissertation's theoretical framework and is used in other chapters.

The review of the jury reports of 48 AR projects, which were winners of the NRP Gulden Fenix Prijs or Europa Nostra Award, served as a foundation for establishing effectiveness criteria for AR projects of heritage buildings (Chapter 3). This research identified 108 aspects that expert juries considered important to indicate the quality of AR projects, highlighting their relevance to the project's overall effectiveness. These aspects have been categorized into 34 groups of aspects and six criteria, which are “sublimation-architectural aspects”, “sublimation-cultural aspects”, “social value creation”, “environmental sustainability”, “economic value creation”, and “innovation”.

AR projects in the Netherlands for further study were selected from the winners of the NRP prize (Chapter 4). Investigating those cases revealed diverse methods and tools architects employ in effective AR projects. This part of the research modified the literature-based AR model proposed in Chapter 1 and enriched it with several methods and tools. AR projects in Iran for further study were selected from the winners/nominees of the Memar and Aga Khan awards (Chapter 5). These case studies led to an understanding of the status of AR processes. Discrepancies between Dutch and Iranian practices highlighted gaps in the AR process in Iran, underscoring the need for a tailored methodology.

Through interviews with architects working on AR in Iran, the proposed AR model, methods, and tools (abbreviated as EARHB framework) were evaluated for their applicability within the Iranian context, addressing the main research question (Chapter 6). While some methods and tools aligned well with the current practice in Iran, many were mentioned as challenging due to cultural, regulatory, and practical constraints (e.g., involving end-users, local communities, and considering the environmental sustainability of projects). The other limitations included a lack of data sharing and bureaucratic hurdles that hindered the implementation of some methods, such as data collection. Despite the limitations, architects clearly recognized the need for a more systematic and innovative approach to AR projects. According to most of them, the EARHB framework can offer a comprehensive model, methods, and tools for enhancing the effectiveness and sustainability of AR practices in Iran.

The EARHB framework can be a valuable set of process model, methods, and tools for architects, practitioners, and policymakers worldwide facing similar challenges in balancing heritage preservation with contemporary needs. Its versatility comes from providing systematic approaches and practical tools that can be tailored and adapted to various cultural, legal, and socio-economic contexts.

Samenvatting

Adaptieve herbestemming (AR) van erfgoedgebouwen heeft aan belang gewonnen in de hedendaagse samenleving als een duurzame benadering om erfgoedgebouwen te behouden en tegelijkertijd nieuwe functies te huisvesten. Hoewel het herbestemmen van erfgoedgebouwen niet nieuw is, is de term "Adaptieve Herbestemming" in de 21e eeuw ontstaan en richt zich op het veranderen van de functies van gebouwen om doelen te dienen die verschillen van hun oorspronkelijke gebruik. Deze aanpak komt niet alleen het behoud van erfgoed ten goede, maar pakt ook leegstand aan en draagt bij aan een CO_2-neutrale wereld.

Ondanks de toenemende erkenning van AR, blijft er echter een gebrek aan samenhangende methodologieën bestaan, vooral wanneer het AR zich richt op erfgoedgebouwen. Hoewel internationale charters AR erkennen als een middel om erfgoed te behouden en tegelijkertijd de functionaliteit te verbeteren, zijn ze vaak niet specifiek met betrekking tot de implementatie op gebouwschaal. Dit onderzoek identificeert een lacune in AR-methodologieën, en heeft tot doel een verbeterd model te ontwikkelen om architecten te begeleiden in het AR-proces, gebaseerd op internationale literatuur en de Nederlandse AR-praktijk. Meer specifiek richt dit onderzoek zich op het analyseren van bestaande kennis over AR-processen, het identificeren van criteria voor de effectiviteit van AR-projecten, het onderzoeken van methoden en tools die worden toegepast in succesvolle projecten in Nederland en Iran, en het voorstellen van een aangepast AR-model voor gebruik in de Iraanse context.

Een systematische review van internationale literatuur benadrukte het gebrek aan een overkoepelend model dat het volledige AR-proces van erfgoedgebouwen bestrijkt (Hoofdstuk 2). Deze review vormde de basis voor de ontwikkeling van een conceptueel model van het AR-proces. Dit model omvat stappen zoals "initiatief", "analyse van het gebouw en de omgeving", "waardering", "in kaart brengen van de mate van belang (van elementen)", "adaptieve herbestemmingspotentieel (functie)", "het definiëren van de ontwerpstrategie", "eindbesluitvorming", "uitvoering", "onderhoud", en "evaluatie na jaren". Dit model is gebruikt als het theoretische kader van de dissertatie en wordt ook in andere hoofdstukken toegepast.

De beoordeling van de juryrapporten van 48 AR-projecten, winnaars de NRP Gulden Fenix Prijs of Europa Nostra Award, diende als basis voor het vaststellen van effectiviteitscriteria voor AR-projecten van erfgoedgebouwen (Hoofdstuk 3).

Dit onderzoek identificeerde 108 aspecten die door deskundige jury's belangrijk werden geacht om de kwaliteit van AR-projecten aan te geven, waarbij hun relevantie voor de algehele effectiviteit van het project werd benadrukt. Deze aspecten zijn gecategoriseerd in 34 groepen van aspecten en zes criteria, namelijk "sublimatie-architecturale aspecten", "sublimatie-culturele aspecten", "sociale waardecreatie", "milieuduurzaamheid", "economische waardecreatie", en "innovatie".

AR-projecten in Nederland voor verder onderzoek werden geselecteerd uit de winnaars van de NRP-prijs (Hoofdstuk 4). Onderzoek van deze casussen onthulde verschillende methoden en tools die architecten toepassen in succesvolle AR-projecten. Dit deel van het onderzoek heeft het op literatuur gebaseerde AR-model, voorgesteld in Hoofdstuk 1, aangepast en verrijkt met meerdere methoden en tools. AR-projecten in Iran voor verdere bestudering werden geselecteerd uit de winnaars/genomineerden van de Memar- en Aga Khan-prijzen (Hoofdstuk 5). Deze case studies gaven inzicht in de stand van zaken van AR-processen. Verschillen tussen Nederlandse en Iraanse praktijken brachten hiaten in het AR-proces in Iran aan het licht, wat de potentie voor een op maat gemaakte methodologie benadrukte.

Door middel van interviews met architecten die werken aan AR in Iran, werden het voorgestelde AR-model, de methoden en tools (afgekort als EARHB raamwerk) geëvalueerd op hun toepasbaarheid binnen de Iraanse context, waarbij de hoofdonderzoeksvraag werd behandeld (Hoofdstuk 6). Hoewel sommige methoden en tools goed aansloten bij de huidige praktijk in Iran, werden vele als uitdagend ervaren vanwege culturele, wettelijke en praktische beperkingen (bijvoorbeeld het betrekken van eindgebruikers, lokale gemeenschappen en het meenemen van milieuduurzaamheid van projecten). Andere beperkingen waren onder meer een gebrek aan gegevensuitwisseling en bureaucratische obstakels die de implementatie van sommige methoden, zoals gegevensverzameling, bemoeilijken. Ondanks deze beperkingen erkenden architecten duidelijk de behoefte aan een meer systematische en innovatieve benadering van AR-projecten. Volgens de meesten van hen biedt het EARHB raamwerk een model, methoden en tools dat de effectiviteit en duurzaamheid van AR-praktijken in Iran kan verbeteren.

Het EARHB raamwerk kan een waardevolle set van procesmodel, methoden en tools zijn voor architecten, praktijkmensen en beleidsmakers wereldwijd die vergelijkbare uitdagingen ondervinden bij het balanceren van erfgoedbehoud met hedendaagse behoeften. De veelzijdigheid ligt in het bieden van systematische benaderingen en praktische tools die kunnen worden aangepast aan en toegepast op verschillende culturele, juridische en sociaaleconomische contexten.

چکیده

"استفاده ی مجدد سازگار" (AR) از ساختمان‌های میراثی در جامعه معاصر به عنوان رویکردی پایدار، برای حفظ ساختمان‌های میراثی، در حالی که عملکردهای جدید را در خود جای می‌دهد، اهمیت پیدا کرده است. اگرچه تغییر کاربری ساختمان‌های میراثی جدید نیست، اصطلاح "استفاده ی مجدد سازگار" در قرن بیست و یکم پدیدار شده و بر تغییر عملکرد ساختمان‌ها برای خدمت به اهدافی متفاوت از کاربرد اصلی آنها تمرکز داشته است. این رویکرد نه تنها به نفع حفاظت از میراث است، بلکه به چالش‌هایی مانند رهاشدگی ساختمان های ساخته شده نیز می‌پردازد و به جهانی عاری از کربن دی اکسید کمک می‌کند.

با این حال، علیرغم شناخت روزافزون استفاده مجدد سازگار، فقدان روش‌شناسی منسجم و جامع همچنان وجود دارد، به‌ویژه زمانی که این رویکرد به ساختمان‌های میراثی می‌پردازد. در حالی که منشورهای بین‌المللی "استفاده مجدد سازگار" را به عنوان وسیله‌ای برای حفظ میراث و در عین حال افزایش عملکرد می‌شناسند، اما اغلب فاقد ویژگی‌ها و دستورالعمل های خاص در مورد اجرا در مقیاس ساختمان هستند. این تحقیق، شکافی را در روش‌های استفاده مجدد سازگار شناسایی می‌کند و نتیجتا، هدفش توسعه ی یک مدل جامع برای هدایت معماران در فرآیند استفاده ی مجدد سازگار است که از ادبیات بین‌المللی و پروژه های مؤثر استفاده ی مجدد سازگار در کشور هلند استخراج می‌شود. به طور خاص، هدف این تحقیق، تجزیه و تحلیل دانش موجود در مورد فرآیندهای استفاده ی مجدد سازگار، شناسایی معیارهای اثربخشی پروژه‌های استفاده ی مجدد سازگار، بررسی روش‌ها و ابزارهای مورد استفاده در موارد مؤثر در هلند و ایران و پیشنهاد یک مدل استفاده ی مجدد سازگار اقتباس شده، برای کاربرد در زمینه ایران است.

یک بررسی سیستماتیک از ادبیات بین‌المللی، فقدان یک مدل فراگیر را که کل فرآیند استفاده ی مجدد سازگار ساختمان‌های میراثی را پوشش دهد، برجسته کرده است (فصل 2). این بررسی مبنایی برای توسعه ی یک مدل مفهومی از فرآیند استفاده ی مجدد سازگار فراهم کرده است. این مدل شامل مراحلی مانند "شروع"، "تحلیل ساختمان و محیط اطراف"، "ارزیابی ارزش ها"، "تعیین سطح اهمیت (عناصر ساختمان)"، "پتانسیل استفاده مجدد سازگار (عملکرد)"، "تعریف استراتژی طراحی"، "تصمیم گیری نهایی"، "اجرا"، "نگهداری" و "ارزیابی پس از سالها" است. این مدل به عنوان چارچوب نظری این پایان نامه عمل می کند و در فصل های دیگر نیز مورد استفاده قرار می گیرد.

بررسی گزارش‌های هیئت داوران 48 پروژه ی استفاده ی مجدد سازگار، که برنده جایزه ی NRP Golden Phoenix و یا Europa Nostra بوده اند، به عنوان پایه‌ای برای شناسایی معیارهای اثربخشی برای پروژه‌های استفاده ی مجدد سازگار ساختمان‌های میراثی (فصل 3) عمل کرده است. این تحقیق، 108 بعد را شناسایی کرده که هیئت داوران متخصص برای نشان دادن کیفیت پروژه های استفاده ی مجدد سازگار در نظر گرفته اند و ارتباط آنها با اثربخشی کلی پروژه را برجسته کرده است. این ابعاد در 34 گروه و شش معیار طبقه‌بندی شده‌اند که عبارت‌اند از "جنبه‌های تعالی معماری"، "جنبه‌های تعالی فرهنگی"، "ایجاد ارزش اجتماعی"، "پایداری زیست‌محیطی"، "ارزش‌آفرینی اقتصادی" و "نوآوری".

برای مطالعه بیشتر، چهار پروژه ی استفاده مجدد سازگار در هلند از برندگان جایزه NRP انتخاب شده اند (فصل 4). بررسی این موارد نشان داد که معماران از روش‌ها و ابزارهای مختلفی در پروژه‌های مؤثر استفاده ی مجدد

سازگار استفاده می‌کنند. این بخش از تحقیق، مدل استفاده ی مجدد سازگار مبتنی بر ادبیات ارائه شده در فصل 1 را اصلاح کرده و آن را با چندین روش و ابزار غنی کرده است. پروژه های استفاده ی مجدد سازگار در ایران برای مطالعه بیشتر از بین برندگان/نامزدهای جوایز معمار و آقاخان انتخاب شده اند (فصل 5). این مطالعات موردی منجر به درک وضعیت فرآیندهای استفاده مجدد سازگار شده است. اختلاف بین رویه‌های هلندی و ایرانی، شکاف‌های موجود در فرآیند استفاده مجدد سازگار در ایران را برجسته کرده و بر نیاز به روش‌شناسی و مدل مناسب و جامع تأکید کرده است.

از طریق مصاحبه با معمارانی که بر روی استفاده مجدد سازگار در ایران کار می‌کنند، مدل، روش‌ها و ابزارهای استفاده مجدد سازگار پیشنهادی (به اختصار چارچوب EARHB) برای کاربرد آن‌ها در زمینه ی ایرانی مورد ارزیابی قرار گرفته و به سؤال اصلی تحقیق پرداخته شده است (فصل 6). در حالی که برخی از روش‌ها و ابزارها به خوبی با رویه ی فعلی در ایران همسو بودند، بسیاری از آنها به دلیل محدودیت‌های فرهنگی، نظارتی و عملی (مانند مشارکت کاربران نهایی، جوامع محلی و در نظر گرفتن پایداری زیست‌محیطی پروژه‌ها) چالش برانگیز ذکر شده است. محدودیت های دیگر شامل عدم اشتراک گذاری داده ها و موانع بوروکراتیک بوده که مانع اجرای برخی روش ها مانند جمع آوری داده ها شده است. با وجود محدودیت‌ها، معماران به وضوح نیاز به یک رویکرد سیستماتیک و نوآورانه تر برای پروژه‌های استفاده ی مجدد سازگار را تشخیص داده اند. به گفته بسیاری از آنها، چارچوب EARHB می تواند یک مدل جامع به همراه روش ها و ابزارهای بسیار، برای افزایش اثربخشی و پایداری شیوه های استفاده ی مجدد سازگار در ایران ارائه دهد.

چارچوب EARHB می‌تواند مجموعه‌ای ارزشمند از مدل‌ها، روش‌ها و ابزارهای فرآیندی برای معماران، متخصصان و سیاست‌گذاران در سراسر جهان باشد که با چالش‌های مشابهی در ایجاد تعادل بین حفظ میراث با نیازهای معاصر روبرو هستند. تطبیق پذیری آن ناشی از ارائه رویکردهای سیستماتیک و ابزارهای عملی است که می توانند با زمینه های مختلف فرهنگی، قانونی، اجتماعی و اقتصادی تطبیق داده شوند.

1 Introduction

1.1 Background

Contemporary society increasingly emphasizes the reuse of buildings, particularly those with historical significance. Adaptive reuse, while supporting the preservation of the historic value of built heritage, offers a sustainable solution to the challenge of vacancy of (heritage) buildings, a phenomenon common in Europe (European Commission, 2014, 2015) and worldwide. Rethinking what already exists and reusing it, either in parts or whole, is a positive step toward the circular economy (Kyrö, 2020) and a CO_2 neutral world (Djebbour & Biara, 2020).

Many buildings, despite having lost their original function, still hold potential for accommodating new functions. While the reuse of heritage buildings is not new, the scientific debate on the concept of "Adaptive Reuse" (AR) emerged in the 21st century (Cohen, 2011; Douglas, 2006). The concept of AR centers around the idea of changing a building's function, involving the conversion of a building for a purpose different from its initial intent (Brebbia & Clark, 2014; Condello & Lehmann, 2016).

The AR process is intricate, encompassing several stages, from initiation to assessment (Kurul, 2007; Langston & Shen, 2007). This complexity even increases in the case of AR of heritage buildings, due to their cultural significance and the involvement of numerous stakeholders with diverse aspirations (Roos, 2007). Several authors advocate for a structured AR process, considering specific steps; they believe that such a structured process might help to conserve a heritage building's essential qualities while improving its functionality for both current and future use (DEH, n.d.; Kuipers & Jonge, 2017). However, although some studies have attempted to structure the AR process and thus explored the steps across its different phases (Misirlisoy & Günçe, 2016a; Van Hout, 2021), a comprehensive model of the AR process remains elusive. Further investigation and analysis are necessary, which need to take into account the perspectives of various stakeholders (BOEi, 2009; Van Hout, 2021). Internationally recognized charters, such as the

ICOMOS Burra Charter (ICOMOS, 1999) and the UNESCO Recommendation on the Historic Urban Landscape (UNESCO, 2011), acknowledge AR as a strategy for conserving heritage buildings. These documents highlight the importance of sustaining the heritage values while improving the functionality and usefulness of the building (ICOMOS, 2013). However, while providing guidance at the urban scale and underlining the importance of engaging local communities, they lack specificity regarding the stages of the AR process at the building scale.

This PhD research started from the recognition of the lack of methodologies for AR of heritage buildings in Iran. During the initial phase of the PhD research, it became evident that this gap extends beyond the context of Iran. There is a need at the international level for a comprehensive AR process model to serve as a guideline for architects dealing with the reuse of heritage buildings. Despite this need, a reuse process that can provide a balance between different values (originality, use, social, economic, etc.) is still a challenge (Roos, 2007).

This PhD research aims to contribute to filling this gap and enhancing the AR process of heritage buildings by understanding and improving the AR process of heritage buildings.

1.2 Research Problem Definition

Iran is well-known for its heritage buildings; however, the lack of updated legislation and efficient management of heritage buildings, the absence of methodologies for conserving them, and the inadequate public participation, have contributed to a considerable number of heritage buildings being abandoned (Taleghani, 2018). In Iran, due to the changes in people's way of living, some buildings with traditional functions (e.g., caravanserais, bathhouses, etc.) have lost their original use. However, in most cases, these buildings have the potential to meet the new demands posed by present times. In the few cases where these buildings have taken on new functions, the lack of specific AR methodologies has often resulted in a rudimentary approach to their restoration and reuse (Masoud, 2020). A similar gap has been identified at the urban scale in Iran by Kermani-van der Hoop (2016). According to this researcher, the dilemma between preserving historic urban cores and the need for urban development in countries like Iran poses challenges to maintaining historical environments.

When considering the literature, several studies have been published, both in English and Persian, focusing on heritage buildings in Iran and their AR. However, most of these publications deal with documentation of the reuse of industrial heritage and/or historic houses; they do not offer a critical evaluation of the interventions nor propose a methodology to be applied in future AR interventions on similar buildings (Akhtarkavan, Alikhani, Ghiasvand, and Akhtarkavan, 2008; Mofidi, Moradi, and Akhtarkavan, n.d.; Salehi Mourkani, 2015; Samadzadehyazdi, Ansari, Mahdavinejad, & Bemaninan, 2018). The lack and need of such a methodology is underlined by several researchers (Saberi, Talib, Motamedi, & Kariminia, 2016; Salehi Mourkani, 2015; Samadzadehyazdi et al., 2018); yet, no research has satisfied this demand.

It is important to mention that the approach to historic buildings in Iran varies depending on their status. Iranian heritage buildings are either listed as national monuments, or unlisted. In most cases, the listed heritage buildings are highly monumental buildings with historical values. The AR approach in dealing with the listed buildings is mainly based on the reconstruction of all the lost elements on the basis of historical documents, if available. Applying this approach to all listed buildings and paying attention exclusively to their "historic values" has often caused other values to be neglected (Masoud, 2020). On the other hand, many unlisted heritage buildings are vacant and abandoned. Recently, some of these unlisted buildings were objects of AR projects, most often by Iranian architects who had studied in Europe (Lotfi & Sholeh, 2020). However, the general and common process of dealing with heritage buildings (listed/unlisted) still suffers from rudimentary methods (Ramezani, 2024).

Nowadays, in Iran, the reuse projects of listed heritage buildings are generally assigned to the private sector via auction. The main reason for this choice is the considerable number of vacant heritage buildings and the relevant costs for their reuse. In other words, it is economically hardly affordable for the Ministry of Cultural Heritage, Tourism, and Handicraft Organization in Iran (MCTH) to restore and reuse these heritage buildings, and this task is thus handed over to the private sector. However, until now the private sector has shown not to be able to fulfil its obligations to restore and reuse heritage buildings properly ("The revitalization fund organization", 2019). During the past few decades, some heritage buildings have been restored and adaptively reused, but academics and professionals are critical of the results of these projects. An overall methodology for the process of AR of heritage buildings is needed ("Caravansaries of Hamedan and the neglect of officials," 2019; Ramezani, 2024).

1.3 Aim of the Research and Research Questions

The main goal of this PhD research is to support the preservation of heritage buildings in Iran by proposing a comprehensive methodology for their adaptive reuse.

This aim is achieved by analyzing effective AR processes and related methods and tools used by architects in the Netherlands and by examining the AR process of effective cases in Iran. The differences and gaps are identified and it is investigated how the process model, including methods and tools, developed in the context of the Netherlands can be adapted to be applied in the Iranian context.

This study considers all stakeholders, including producers (architects and construction engineers), users, regulators, and investors (Aigwi et al., 2021) involved in the AR process, but it focuses on the perspective of the architect, being this the most influential stakeholder (Kuipers & de Jonge, 2017; Roos, 2007).

The main research question that this project aims to answer is:

How can the adaptive reuse process of heritage buildings in the Netherlands, and the methods and tools employed by architects in this process, be further developed to be used by architects in Iran for adaptive reuse projects of heritage buildings?

To answer this main question, the research is designed around six research questions:

- **Research Question 1:** What is the available knowledge, including scientific and practice-based literature, on the adaptive reuse process of heritage buildings at the international level, and in particular in the Netherlands?
- **Research Question 2:** According to which criteria can effectiveness of adaptive reuse projects be evaluated?
- **Research Question 3:** What are the steps in the adaptive reuse process, and the methods and tools used by architects in effective cases of adaptive reuse of heritage buildings in the Netherlands?

— **Research Question 4:** What are the steps in the adaptive reuse process, and the methods and tools used by architects in effective cases of adaptive reuse of heritage buildings in Iran?

— **Research Question 5:** What are the main gaps in the current adaptive reuse process of heritage buildings in Iran, compared to the process model, methods, and tools observed in Dutch adaptive reuse cases?

— **Research Question 6:** Which process model, methods, and tools used in the adaptive reuse process in the Netherlands can be applied to the adaptive reuse of heritage buildings in Iran?

As the final result, a process model, including steps, methods, and tools, for the AR of heritage buildings in Iran will be proposed. This process model aims to assist architects in the AR of heritage buildings in Iran, with the scope to increase the effectiveness of projects and maximize the opportunities associated with the reuse of heritage buildings.

1.4 Research Context

Initially, this research focused on the AR process in Iran, specifically on cases such as caravanserais. This focus arose from the numerous vacant caravanserais in Iran and the potential of AR to improve their utilization. With this in mind, reused forts of the Dutch Waterline were selected as the case studies in the Netherlands, providing insights into the practice of caravanserais reuse in Iran. After conducting an extensive literature review (see Chapter 2), it became evident that gaps in the understanding of the AR process exist to some extent also at the international level. Consequently, the research questions were modified to include an international perspective. Iran, a country with a large volume of vacant heritage buildings that could benefit highly from effective adaptive reuse, still remains the main focus of this dissertation. The Netherlands serves as a point of departure for the study of AR of heritage buildings. The rationale for selecting the Netherlands is based on the country's approach to dealing with AR of heritage buildings, as documented by Meurs et al. (2021). In the Netherlands, there is a broad and long-term experience in addressing the challenge of vacancy in the built environment. The evolution from a focus on "conservation" to "conservation through transformation" in the

Netherlands makes this country a leader in the AR field (Janssen, Luiten, Renes, & Stegmeijer, 2017). This leading position is also shown by several scientific contributions to the systematic analysis of AR of heritage buildings over the past decades, such as the doctoral research by Chatzi Rodopoulou (2020), Clarke (2021), Pereira Roders (2007), and Zijlstra (2009).

1.5 Research Framework, Structure of the Dissertation, and Overall Methodology

A research framework has been developed to address the research questions listed in section 1.3. This comprises five parts, answering the different research questions, which, along with the introduction and the conclusions, shape this dissertation (Figure 1.1).

This PhD dissertation follows a paper-based format. All chapters, except the introduction (Chapter 1) and conclusions (Chapter 7), have been submitted or published as journal articles.

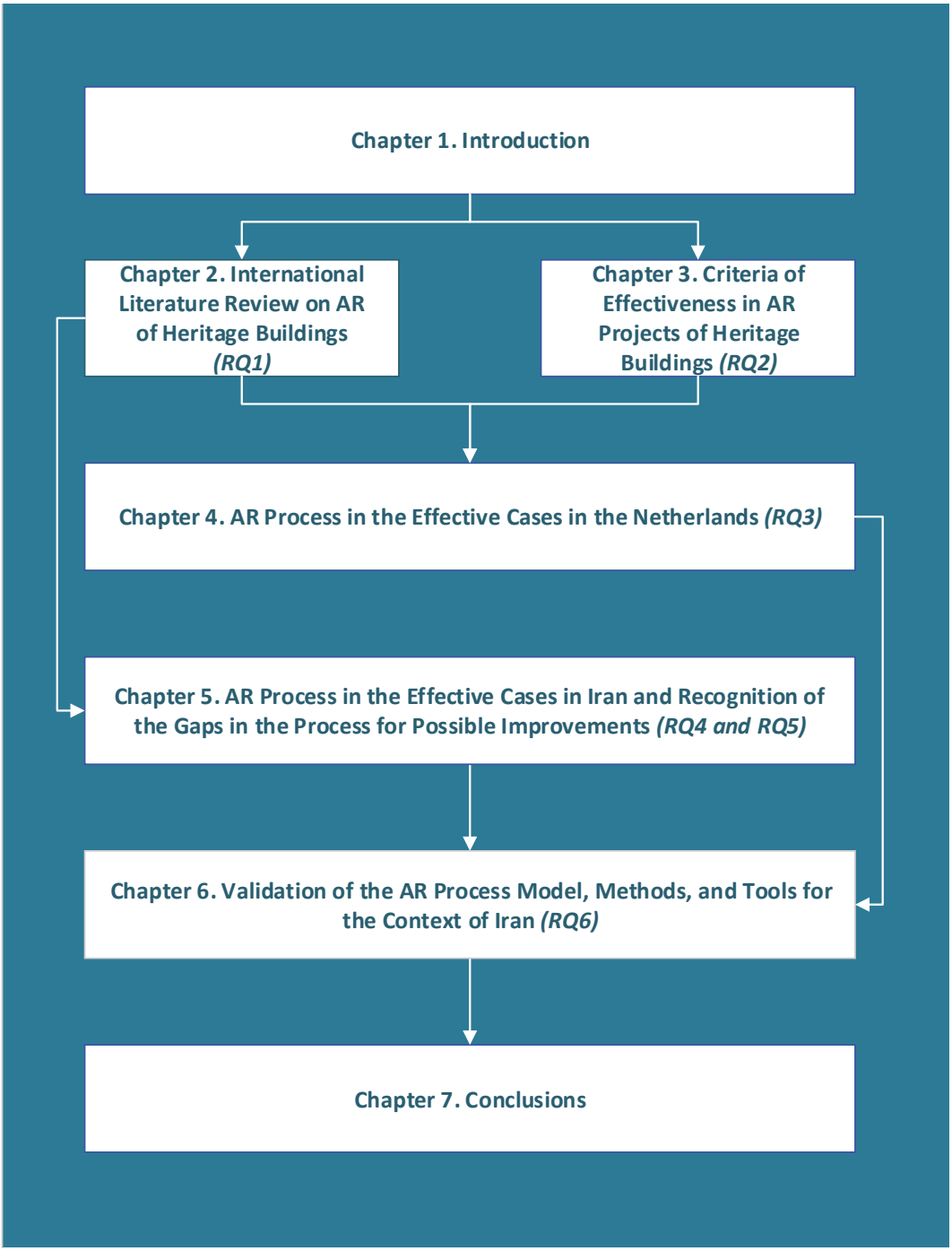

FIG. 1.1 Scheme of the PhD research, including reference to research questions and chapters of this dissertation

TOC

Chapter 1

This chapter introduces the research, providing research background, research problem, research aims, and research questions. Besides, it deals with data management and research ethics. Finally, it gives an outline of the structure of the dissertation.

Chapter 2

In this part of the research, a systematic review of international literature in the field of AR is reported. The steps of the AR process and AR models proposed by previous researchers are analyzed. Based on this review, a new conceptual model of the AR process is proposed, which then serves as the theoretical framework and backbone of the PhD research.

Chapter 3

This chapter includes a review of jury reports of one prestigious prize in the Netherlands for AR of buildings (Het Nationaal Renovatie Platform, Gulden Fenix ("NRP Golden Phoenix," n.d.)) and one European award for the conservation of heritage buildings (Europa Nostra ("Europa Nostra Awards," n.d.)). The reports are retrieved, translated (in the case of Dutch reports), reviewed, analyzed, and coded using the criteria of the jury of the NRP prize in the evaluation of AR projects. This review results into the categorization of "criteria of effectiveness in AR projects" into six criteria, 34 groups of aspects, and 108 aspects.

Chapter 4

In this chapter, four AR cases in the Netherlands, winners of the NRP Golden Phoenix Prize, are studied to identify the AR processes, and the relative methods and tools used by their architects to achieve effective results. This investigation refers to the conceptual model of the research developed and presented in Chapter 2 and to the criteria of effectiveness outlined in Chapter 3. The research methodology used includes reviewing written documents relevant to the cases and conducting semi-structured interviews with their architects and other stakeholders.

Chapter 5

In this chapter, four effective cases in Iran, winners or nominees for the Aga Khan award ("The Aga Khan Award for Architecture," n.d.) and Memar award ("Memar Award," n.d.), are studied. The AR process in these effective cases and the methods and tools used by their architects are analyzed by using the conceptual model

developed in Chapter 2. The applied research methods include cross-referencing of the collected data (analysis and synthesis). This chapter results into understanding the AR process in effective cases in Iran, also in relation to the conceptual model developed in this research.

Chapter 6
This chapter includes the validation of the proposed AR model, including methods and tools (Chapter 4), with a group of Iranian architects who are experts in heritage AR, and active in academia and/or practice. A serious game is developed, with the assistance of the TPM faculty of TU Delft, to engage the Iranian architects in the validation (see Appendix 7.1). However, due to circumstances, the method could not be fully applied; instead, semi-structured one-to-one interviews were used. Based on the results of these interviews and of the previous research on AR in Iran (Chapter 5), the current use, possibilities, and limitations of the proposed conceptual model of AR, including its methods and tools, are identified, and specific aspects for improvement of AR process in Iran are highlighted.

Chapter 7
Chapter 7 of the dissertation provides the key findings and conclusions by answering the research questions. Additionally, the chapter discusses the scientific and societal impact of the research. Finally, the chapter addresses research limitations and suggests directions for future research.

1.6 Data Management and Research Ethics

As this dissertation deals with semi-structured interviews, it has been made sure that the research respected and followed the data privacy principles as defined by European regulations ("REGULATION (EU) 2018/1725 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL," 2018). The compliance of this research with this normative has been checked and confirmed by the Human Research Ethics Committee (HREC) of the TU Delft. The data management plan of this research has been verified and approved by the data steward of the Faculty Architecture and Built Environment of the TU Delft.

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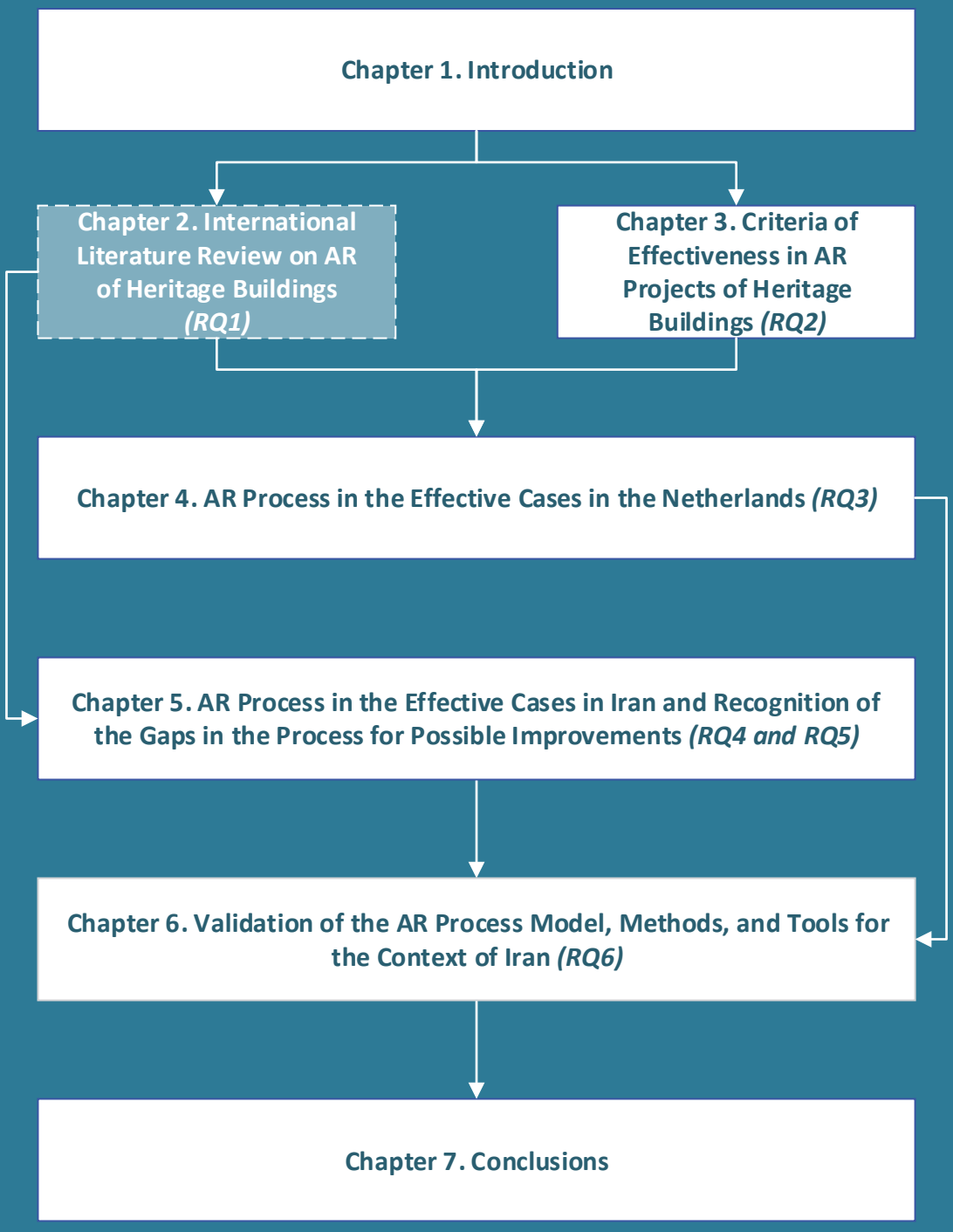
Chapter 1. Introduction
Chapter 2. International Literature Review on AR of Heritage Buildings (RQ1)
Chapter 3. Criteria of Effectiveness in AR Projects of Heritage Buildings (RQ2)
Chapter 4. AR Process in the Effective Cases in the Netherlands (RQ3)
Chapter 5. AR Process in the Effective Cases in Iran and Recognition of the Gaps in the Process for Possible Improvements (RQ4 and RQ5)
Chapter 6. Validation of the AR Process Model, Methods, and Tools for the Context of Iran (RQ6)
Chapter 7. Conclusions

TOC

2 International Literature Review on AR of Heritage Buildings

This chapter has been published as a journal paper:
Arfa, F. H., Zijlstra, H., Lubelli, B., & Quist, W. J. (2022). Adaptive Reuse of Heritage Buildings: From a Literature Review to a Model of Practice. *Historic Environment: Policy and Practice*, *13*(2), 148-170. https://doi.org/10.1080/17567505.2022.2058551
The initial results of this research have been presented at the 27th Annual European Real Estate Society Conference. The presentation document is available on the ERES Digital Archive:
Arfa, F. H., Zijlstra, H., Lubelli, B. & Quist, W. J. (2021) "*Looking for a Model to Structure the Process for Adaptive Reuse (AR) of Heritage Buildings Based on a Literature Review.*" In 27th Annual European Real Estate Society Conference. ERES: Conference. Kaiserslautern, Germany. https://dx.doi.org/10.15396/eres2021_212

ABSTRACT

The Adaptive Reuse (AR) of heritage buildings is a complex process, which aims to preserve the values of heritage buildings while adapting them for use in the present and transferring them to the future. This paper aims to identify steps in this process and develop a structured model. The model is an "ideal", it needs validation in practice; however, it is expected that following this model can help to preserve and conserve the values of heritage buildings. To come to an overview of the process and to identify its main steps, a literature review at an international level has been conducted. The analysis of the literature revealed that the AR process as a whole in relation to heritage buildings has not been widely studied. Based on the results of this review, a conceptual model representing the AR process of heritage buildings has been defined. This model consists of 10 steps: "initiative", "analysis of heritage buildings", "value assessment", "mapping level of significance", "definition of adaptive reuse potential", "definition of design strategy", "final decision-making", "execution", "maintenance", and "evaluation after years". This model can act as a comprehensive theoretical basis for further studies on the AR process of heritage buildings.

KEYWORDS

Adaptive Reuse; Process; Heritage Buildings; Built Environment; Built Heritage; Conservation; Sustainable Development; Literature Review; Model

2.1 Introduction

In today's world, more and more attention is being paid to the adaptive reuse of buildings in general and heritage buildings in particular. There are many buildings, which have lost their main function and which could be adapted to accommodate new functions. Adaptation has its roots in a combination of "ad" (to) and "aptare" (fit) and means action or the process of fitting (Douglas, 2006). Although implementing new uses in old structures is not new, the term "Adaptive Reuse" (AR) emerged in the 21st century (Cohen, 2011). In its classic definition, it refers to change in use. Therefore, many of its definitions revolve around the "performance change" concept, i.e., a process of converting a building for a new use, different from the initial aim of its construction (Austin, 1988; Brebbia & Clark, 2014).

The process of adaptive reuse (AR), from initiative to evaluation, is complex (Kurul, 2003; Langston & Shen, 2007). This complexity is even greater in relation to heritage buildings, because of their cultural significance, the large number of involved stakeholders, and their varied ambitions (Roos, 2007). Different authors have argued that several steps should be considered in the AR process to preserve the essential qualities and values of a heritage building while improving it to be used in the present and transferring it to the future (DEH, n.d.; Kuipers & de Jonge, 2017). Some studies have investigated the steps to be taken during the different phases of the overall process (e.g., Misirlisoy & Günçe, 2016; Van Hout, 2021). However, none of the studies has outlined the stages in this complex process in a comprehensive model. Several studies have noted that this process needs further investigation and analysis from the perspective of different stakeholders (BOEi, 2009).

Adaptive reuse of heritage buildings has also been considered in different internationally recognized charters. For example, the ICOMOS Burra Charter mentions adaptive reuse as a strategy toward the conservation of heritage buildings, which sustains its heritage values while enhancing its functionality and usefulness for the future (ICOMOS, 1999, 2013). The UNESCO Recommendation on the Historic Urban Landscape also mentions the necessity of applying "conservation through transformation", an approach which highlights managing changes in the historic urban area (UNESCO, 2011). However, this recommendation as well as the guidebook which developed from it (Veldpaus et al., 2016) focuses on the engagement of local communities and other stakeholders in the process at the urban scale. Despite proposing six critical steps to be followed in managing the urban historic area, these documents do not specify the steps that should be taken at the building scale level.

The present paper aims to fill the gap by reviewing the literature and to propose a comprehensive model, detailing the steps in the AR process of heritage buildings. In general, four main phases can be identified which form the framework of this review:

- Pre-project phase
- Preparation phase
- Implementation phase
- Post-completion phase

The literature review has been organized according to these four phases, which correspond to the four sections of this paper. Based on the results of this review, a conceptual model including different steps in the adaptive reuse of heritage buildings process is proposed.

2.2 Materials and Methods

In this study, a systematic literature review in accordance with the Preferred Reporting Items for Systematic Reviews (PRISMA) was performed to identify the relevant studies on the topic "adaptive reuse process of heritage buildings" (Moher, Liberati, Tetzlaff, & Altman, 2009). This was complemented by applying the snowball method (Wohlin, 2014) in the selected literature.

This research followed four stages:

1 Formulation of the Research Question and Aim of the Review

This literature review was conducted to respond to the question "what is the available knowledge of adaptive reuse process of heritage buildings at an international level?"

2 Screening of the Available Publications and Selection and Evaluation of the Relevant Studies

To answer the research question, data were searched for on the Scopus database. Firstly, a specific search on "adaptive AND reus*[1] AND process AND heritage" was conducted, which resulted in 92 publications. To increase the reliability of the research, several broad search syntaxes were added, which were "adaptive AND reuse", "adaptive AND reus* AND heritage", and "heritage AND reuse". The researcher applied no limitations during the search process, to have a higher quantity of results to be analyzed in the next stages.

The previous stage resulted in the identification of 1095 publications. After a preliminary screening, 742 publications were removed due to duplication and being irrelevant to the field of architecture and the built environment. Then, the abstracts of the 353 publications left were reviewed. Based on the review of the abstracts, 265 publications were removed as not relevant. Only publications addressing a specific phase of the AR process or the process as a whole and having a methodological approach aiming at the definition of a framework/model for the process, have been considered (e.g., the paper written by Langston & Shen, 2007). Publications on the topic of adaptive reuse of buildings components and disassembly (e.g., Sanchez, Rausch, & Haas, 2019a, 2019b), or on specific technical aspects, such as internal envelop (e.g., Guo & Zhao, 2020) were excluded. Similarly, papers which focused on the specific political, legal administrative situations and the consequent problems in reusing heritage buildings have been disregarded (e.g., Bylemans & Vallet, 2017; Cizler & Soriani, 2019; Elsorady, 2020; Kotval-K, Meitl, & Kotval, 2017; Olivadese, Remøy, Berizzi, & Hobma, 2017; Soewarno, Hidjaz, & Virdianti, 2017). Papers that largely reported the lack of professional education and experience in the process were also excluded (e.g., Tsai, 2017). Similarly, papers discussing the advantages and necessity of integrating adaptive reuse in the built environment suggesting it comply with particular regulations were excluded, (e.g., Fuertes, 2017; Rani, Putri, & Devina, 2017) as were several papers related to designing adaptable (new) buildings in the future (e.g., Chow, 2017; Conejos, Langston, & Smith, 2014; Conejos, Langston, & Teng, 2010).

1 '*' was used to search for variations of the word.

3 Analysis of the Publications

In the next stage after applying the criteria mentioned above, the full-text of 88 publications were reviewed. Among the reviewed literature, 20 publications proposed a clear methodological approach related to the analysis of the adaptive reuse process of existing buildings (covering more than one phase). A further check of the available literature was done by applying the snowball method to the references of these 20 publications. Consequently, eight books, four PhD dissertations, three master theses, and two other non-academic documents were added to the analysis.

4 Organization of the Literature and Development of a Conceptual Model for the AR Process of Heritage Buildings

The literature was screened according to four main phases of the AR process (pre-project, preparation, implementation, and post-completion phases) (see Section 2.3). Based on the results, a conceptual model for the AR process of heritage buildings has been developed. This model and the process of developing it have been explained in the section of "Discussion and conclusions".

The definitions that were followed in this literature review process and throughout the paper are as follows:

- **Adaptive Reuse:** The definition of adaptive reuse which has been used throughout the paper is "the process of converting a building to a function which is significantly different from the original function" (Arfa, Lubelli, Zijlstra, & Quist, 2022; Brooker & Stone, 2004; Douglas, 2006; *Fourth Dimension in Building: Strategies for Avoiding Obsolescence*, 1993). The ICOMOS Burra charter also mentions "adaptive reuse" as the adaptation of a place for a new use (ICOMOS, 2013).

- **Cultural Heritage:** Based on the definition of UNESCO, the term "cultural heritage" includes: "a. monuments: architectural works (e.g., monumental sculpture and painting, elements or structures of an archaeological nature, etc.); b. groups of separate or connected buildings, which have outstanding value from the point of view of history, art, or science; c. sites: areas including archaeological sites or works of man or the combined works of nature and man, which are of outstanding value from the point of view of history, art, ethnology, or anthropology (UNESCO, n.d.).

2.3 Adaptive Reuse Process of Heritage Buildings

In the section which follows, the literature, which forms the evidence base of this review, is discussed and organized according to the four main phases of the AR process. The pattern of the literature reviewed from 2003 to 2021 (Figure 2.1) shows that most publications relate to the preparation phase whilst the fewest are concerned with implementation.[2]

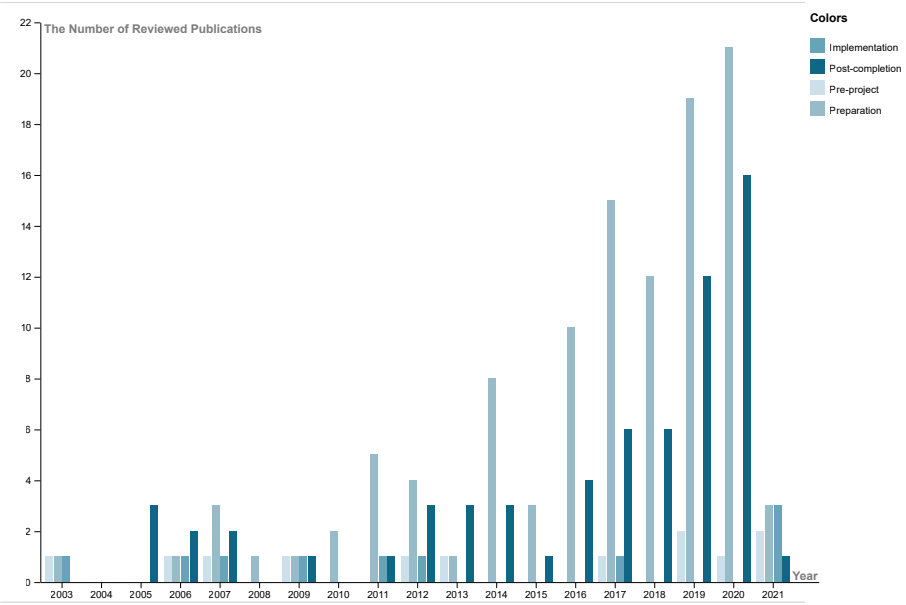

FIG. 2.1 The intensity of the reviewed literature in each phase of the adaptive reuse process (105 reviewed publications)

2 As only two reviewed sources were published before 2003, the starting point of the graph is 2003.

2.3.1 Pre-Project Phase

This initial phase focuses on the decision to preserve, reuse, or demolish a building (Wilkinson, RemØy, & Langston, 2014), at the start of the AR process. Most researchers describe the main aspect of this phase as “initiative”.

The “initiative” may include various actions from different perspectives (Aigwi et al., 2021). This is a phase in the process during which the actors, needed for the following phases, are selected (Misirlisoy & Günçe, 2016b). In this phase, Cultural Heritage officers or agencies are consulted, and the ambitions of different stakeholders are discussed (Pallada, 2017). This is also the phase in which preliminary discussions among the client and the architect about the design brief take place and may include general user requirements, expectations of the client, costs, and the completion date of the project (Giebeler et al., 2012).

In the RCE[3] guideline for building archaeological research, “initiative” has been mentioned from two perspectives, the client and the party conducting the research. From the perspective of the client, this guideline states “initiative” is the part of the process in which the scope is defined, the research plan is requested from the other party, and the tender procedure and commission are requested. From the perspective of the party conducting the research, RCE states “initiative” as a part of the process in which the basis of the research plan and the survey plan is quoted. The research plan is also commissioned (Hendriks & Van der Hoeve, 2009).

In his Spiral-model on the thinking process from the perspective of architects, Roos reports “initiative” as an initial step in which the architect may also play an important role (Roos, 2007). For example, in the adaptive reuse process of the Van Nelle factory, De Jonge explains his key role in promoting the inclusion of the building in the list of protected monuments (Backer, 2005).

Other researchers focused on developing models to identify and rank adaptive reuse potential in existing buildings to ensure that all the heritage values are optimised and attempted to calculate this potential quantitatively. For example, Langston and Shen used the Adaptive Reuse Potential (ARP) model to ensure that buildings with high capacities will be retained to serve their societies (Langston & Shen, 2007). The model was tested on an historic building in Hong Kong to validate the decision not to demolish it. Several researchers have applied this model to heritage buildings

3 Rijksdienst voor het Cultureel Erfgoed (RCE): Cultural Heritage Agency of the Netherlands.

(e.g., Langston, Yung, & Chan, 2013; Sharifi & Farahinia, 2020) while others have used the model to propose design strategies, such as the ADAPT Star model, for the future design of adaptable buildings (Conejos, Langston, & Smith, 2011).

Figure 2.2 represents the most repetitive aspects mentioned by the authors in the reviewed literature in Phase 1.

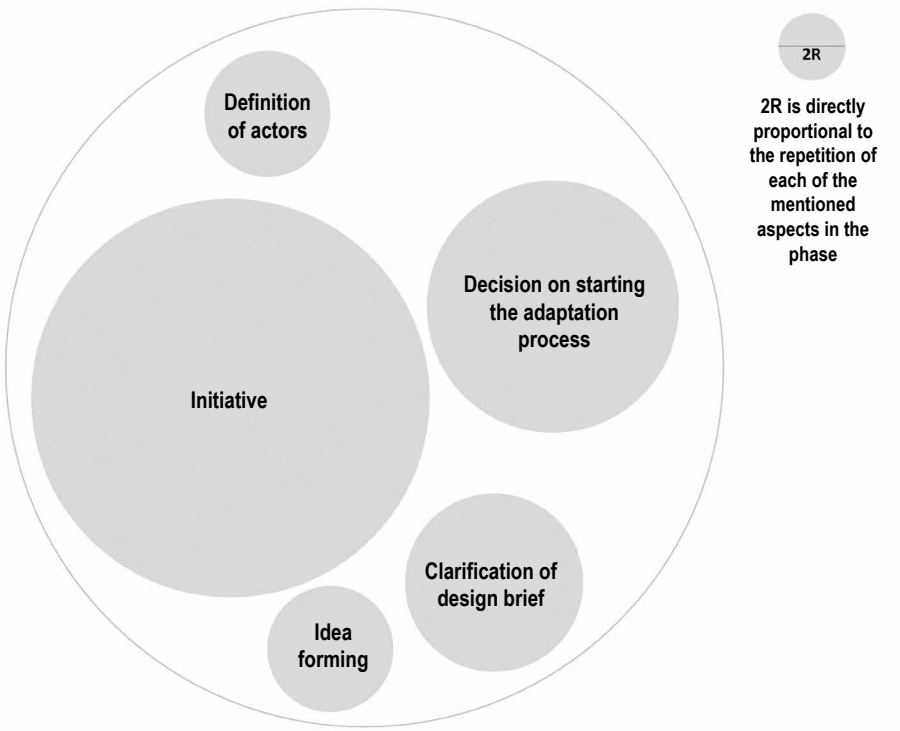

FIG. 2.2 The most repetitive aspects mentioned by the authors in the reviewed literature in Phase 1 (Pre-project); the size of the circles is proportional to the repetition of each of the mentioned aspects.

2.3.2 Preparation Phase

The adaptive reuse of a building differs from new build as the architect's starting point is not so much a blank page, but an existing building (Giebeler et al., 2012). This is especially important in relation to heritage buildings where the process of reuse involves existing attributes which require comprehensive

recognition, analysis, and assessment before becoming embedded in design strategies (Cramer & Breitling, 2007). The majority of reviewed literature in this phase focused on reading, analyzing, valuing, and redesigning the building.

The fact that the AR process starts with an existing building, makes the analysis necessary. This is usually limited to a short history, spatial and technical aspects (Giebeler et al., 2012). However, the analysis of heritage buildings should include mapping the evolution of the building and analysis of its development over time (Misirlisoy & Günçe, 2016a), demonstrating how and when the building has evolved to its current state (Augelli, Rigamonti, Bertò, & Marcone, 2020). It is essential that reliable information should be gathered about the site, its materials, nature of construction, constituent elements, and its surroundings. Information conventionally includes archival and historiographical data such as maps, drawings and photographs, and publications but can also include interviews, and, evidently, the visual observation of the heritage building (Kuipers & de Jonge, 2017). A clear picture of the existing situation is crucial to the AR process to support a value assessment (Cramer & Breitling, 2007). Moreover, as Roos argues analysis, investigation, and research of the existing heritage building is essential to provide the information necessary for the initial designs by the architect. Investigation of the building's history by an independent researcher is not always carried out, though this often depends on the complexity of the building and project. According to Roos, in some cases, the architect's investigations are considered to be enough. However, he underlines that the client should be informed of the importance of this step (Roos, 2007). In some countries, there are specific guidelines (e.g., the RCE guideline (Hendriks & Van der Hoeve, 2009)) or the Historic England Guideline (Lane, 2016)) for building archaeological research that detail which aspects of the historic research on buildings are needed. Categorizing the different types of analysis, Roos identifies architectonic, geographical, urban, and technical analysis (Roos, 2007). Joudifdar et al. consider architectural analysis, value analysis and historical analysis as the basic types (Joudifar & Olgaç Türker, 2020), while Misirlisoy & Günçe, define four types of analysis from original functions, physical character, heritage values, and the needs of the district (Misirlisoy & Günçe, 2016).

In contrast, Zijlstra has developed a research methodology "ABCD in Time", for the analysis of buildings from context to the development over time. She highlights the importance of gathering as much information as possible before starting visual observation of the building and its context to understand why things change over time. The sources of information include published literature, the building itself, interviews with its architects, or those who have dealt with the building and its archives (Zijlstra, 2009).

The assessment of values embedded in a heritage building is crucial to the AR process and can only be conducted when a profound and comprehensive analysis of the building and its context has been undertaken. One of the first publications on this topic is the research conducted by Riegl, in which he categorizes values as age, historical period, commemorative value, use, and newness in an influential study (Riegl, 1996) followed by several others (Lipe, 1984). In her PhD thesis, Roders broadened the traditional approach to include values in the built heritage by highlighting a categorization which included the ecological, social, economic, scientific, age, aesthetical, historic, political, and (other) primary values (Pereira Roders, 2007). However, the question (assignment) here is broader than naming the values. The assignment is to assess the values of different layers of the heritage buildings. In 2008, Van Balen published a tool for assessing the values of heritage buildings based on the Nara document (Van Balen & Vandesande, 2018). Called the Nara-Grid, this refers to six aspects: "form and design, materials and substance, use and function, tradition, techniques, and workmanship, location and setting, spirit and feeling", and four dimensions "artistic, historic, social, scientific" for assessing the values of built heritage. This matrix tries to connect qualities (values) to physical aspects (attributes). In 2017, the Heritage & Architecture section of TU Delft developed a matrix for use by students (Figure 2.3) for the assessment of values (Clarke, Kuipers, & Stroux, 2020) in which the layers of Brand (Brand, 1994) (with the addition of three more layers), and the values proposed by Riegl (Riegl, 1996) (with the addition of two more values), form a value assessment matrix.

BRAND +	RIEGL +	**AGE value**	**HISTORICAL value**	**INTENTINAL COMMEMORATIVE value**	**NON INTENDED COMMEMORATIVE value**	**USE value**	**NEW-NESS value**	**(relative) ART value**	**RARITY value** [+]	**OTHER relevant values** [+]
SURROUNDINGS / SETTING [+]										
SITE										
SKIN (exterior)										
STRUCTURE										
SPACE PLAN										
SURFACES (interior) [+]										
SERVICES										
STUFF										
SPIRIT of PLACE [+]										

FIG. 2.3 The value matrix- Department of Heritage and Architecture, TU Delft (Clarke, Kuipers, & Stroux, 2020)

Roos considers the “value line” in his model as a continuous line during the whole process; in fact, the architect needs to take into account several values and aspects during the different steps in the process (Roos, 2007). Not all the elements of a heritage building, though, have the same ranking in a value assessment. One of the main complexities in the AR process is the determination of the significance of different values, mapping the level of significance (Clarke et al., 2020). In directing the process, it is necessary to distinguish between values that have been recognized and categorized in the value assessment. By doing so, the most significant elements deserving conservation will be determined. This always results in the choice between conservation and change, between blending and contrast, and between continuity and partial renewal. However, it is the role of architects to unite, balance, and strengthen both the historic values and future functionality as well as other values (Roos, 2007). Pre-assumptions about design strategies should not affect the mapping of the level of significance, although consideration of possible interventions can be helpful (Cramer & Breitling, 2007).

Adaptive reuse poses formidable challenges for the architect (Langston & Shen, 2007) identifying a function that preserves the existing values of the building and its site while improving and adding appropriate contemporary layers (DEH, n.d.; Misirlisoy & Günçe, 2016a). Many studies of adaptive reuse consider conceptual models for the prediction of the best function for the building, assessing the adaptive reuse potential of a building (Joudifar & Olgaç Türker, 2020), in developing a framework for the selection of the best option for a new function. In such frameworks, which follow analysis, several options for new functions are often defined. These are proposed to the stakeholders of the building (local community, cultural tourists, end-users, and heritage experts) via a questionnaire and, based on the results, appropriate functions are proposed. Many studies adopt similar approaches: several criteria and possible functions are proposed by the authors while the opinions of experts or the local community are collected via the Delphi method (Crawford & Wright, 2016), or through the distribution of a questionnaire (e.g., Hong & Chen, 2017).

Despite the frameworks and models proposed by researchers to arrive at the selection of an appropriate function for heritage buildings, in real projects, there are many limitations to their actual application. These limitations are often due to the ambitions of different stakeholders (Parsi, 2017; Roos, 2007). Parsi cites the difficulty caused by the discrepancy between the new function proposed by the client at the early steps of the project, and that resulting from the analysis of the building (Parsi, 2017). According to Parsi, it is usually the role of the architect to inform the other stakeholders on the conflicts of their ambitions and the potential of the building. In some cases, the experienced architect can balance the wishes of stakeholders with the potential of the heritage buildings, but this is not always the case. There are several examples where the whole project stops due to such conflicts (Parsi, 2017).

Many frameworks and methods for reaching consensus on the appropriate function for a heritage building have been defined, such as the framework developed by Aigwi et al. and Ribera et al. (Aigwi et al., 2019; Ribera, Nesticò, Cucco, & Maselli, 2020). who proposed MCDM (multiple-criteria decision making) and MCDA (multiple-criteria decision analysis) methods to weight different criteria for new functions. The principal aim of these studies is to define the most appropriate function for heritage buildings based on their values and benefits (e.g., social, economic, environmental, etc.) (Fedorczak-Cisak et al., 2020; Giuliani et al., 2018; Shehada, Ahmad, Yaacob, & Keumala, 2015) or selecting the suitable reuse alternative among several buildings, considering the structural limitations and the need for the building's stability (Della Spina, 2020; Morkūnaitė, Kalibatas, & Kalibatienė, 2019).

Once the appropriate function for the building is determined and agreed, different strategies toward design can be used, and many studies on adaptive reuse focus on this aspect of the design process. In 1989, Robert categorized this approach into seven different strategies when adding new elements to existing buildings: building within, building over, building alongside, building around, adapting to a new function, and building in the style of, and recycling materials of vestiges (Plevoets & Van Cleempoel, 2013). In 2004, Brooker and Stone categorized the strategies with other terms: insertion, intervention, and installation (Brooker & Stone, 2004). Several other studies, including those by Bloszies, Cramer and Breitling, and Plevoets and Van Cleempoel, have addressed the same strategies using alternative terminologies (Bloszies, 2012; Plevoets & van Cleempoel, 2011, 2019). Evidently, researchers have more or less similar ideas about possible strategies but have defined them using different terms, though many have highlighted how such usage can create confusion (Giebeler et al., 2012; Plevoets & van Cleempoel, 2019; Wilkinson et al., 2014). Some researchers have defined strategies for specific functions, such as primary schools (Broekhuizen, Arkesteijn, De Jong, & Van Nieuwamerongen, 2020) where the selection of the appropriate strategy is based on a value assessment, and the approach of different architects when dealing with these values.

Once the possible strategies have been defined, decisions need to be taken to proceed further in the AR process. In several publications, decision-making has been highlighted as the moment when all the stakeholders reach consensus on the design strategy and achieve the design freeze (Roos, 2007; Vervloed, 2013). The design strategy proposed may be presented by the architect to the client or owner and other stakeholders. This is a key moment when negotiation led by the architect may be necessary in order to achieve a final decision (Roos, 2007). The scope of such discussion may be wide-ranging and include the contract, costs, time management, and selection of the appropriate stakeholder (contractors) to execute the plan (Giebeler et al., 2012; Van Hout, 2021).

Figure 2.4 represents the most repetitive aspects mentioned by the authors in the reviewed literature in Phase 2.

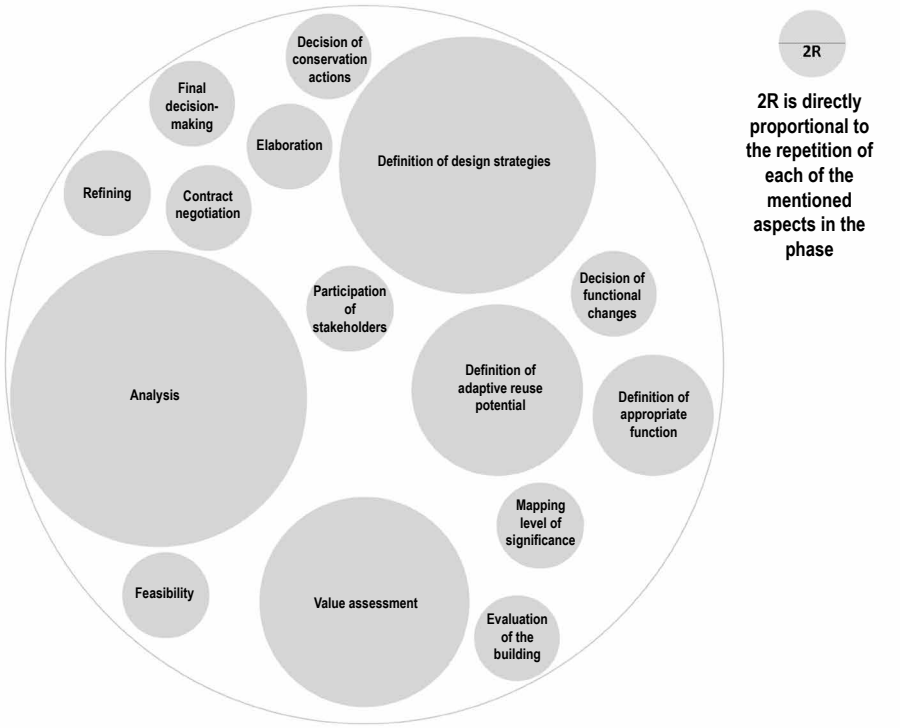

FIG. 2.4 The most repetitive aspects mentioned by the authors in the reviewed literature in Phase 2 (Preparation); the size of the circles is proportional to the repetition of each of the mentioned aspects.

2.3.3 Implementation Phase

The third phase of the AR process consists of implementing the agreed design strategies, which may involve the removal, preservation, or addition of a specific part to an existing building. In this phase, several factors such as time management, costs, and expertise of the executive team, need to be considered. Most publications report this phase, which is often defined as “execution” and the final phase of the reuse process (Bond, 2011; Pallada, 2017; Roos, 2007; Van Hout, 2021; Vervloed, 2013).

In her analysis of three reuse projects, Kurul argues that the complexity of execution is higher in projects where there is higher variance in the types of activities to be undertaken (Kurul, 2007). Comparing the duration of the preparation and implementation phases in three projects to highlight the influence of the preparation phase on implementation, her analysis showed that the longer and the more detailed the preparation phase, the shorter and less complex the implementation. In contrast, Gieleber et al., underline the need for architects to be more involved in site supervision during reuse projects than for new projects, due to the prevalence of less precise planning inherent in AR projects. As on-site work progresses, the uncertainties decrease and the degree of supervision becomes similar to that needed for new constructions (Giebeler et al., 2012). It is also evident that architects should have a continuous presence and supervision in reuse projects where issues can only be resolved satisfactorily by their insight and expertise (Cramer & Breitling, 2007).

In general, longer construction times impose higher costs. In the case of existing buildings, extra costs may occur due to the uncertainties inherent in heritage buildings (Giebeler et al., 2012). In some cases extra costs may be partially covered by the extra governmental tax incentives, which are provided to reuse existing buildings, for example by Tax Reform Act in the U.S. (Bond, 2011) or by tax write-offs such as those available in Germany (Veldpaus, Fava, & Brodowicz, 2019). Similar incentives and funding may be available in other contexts; for example the Dutch policy programme (2018-2021) “Heritage Counts”, in which financial support is given by the government for adaptive reuse of heritage buildings (Veldpaus et al., 2019).

Figure 2.5 represents the most repetitive aspects mentioned by the authors in the reviewed literature in Phase 3.

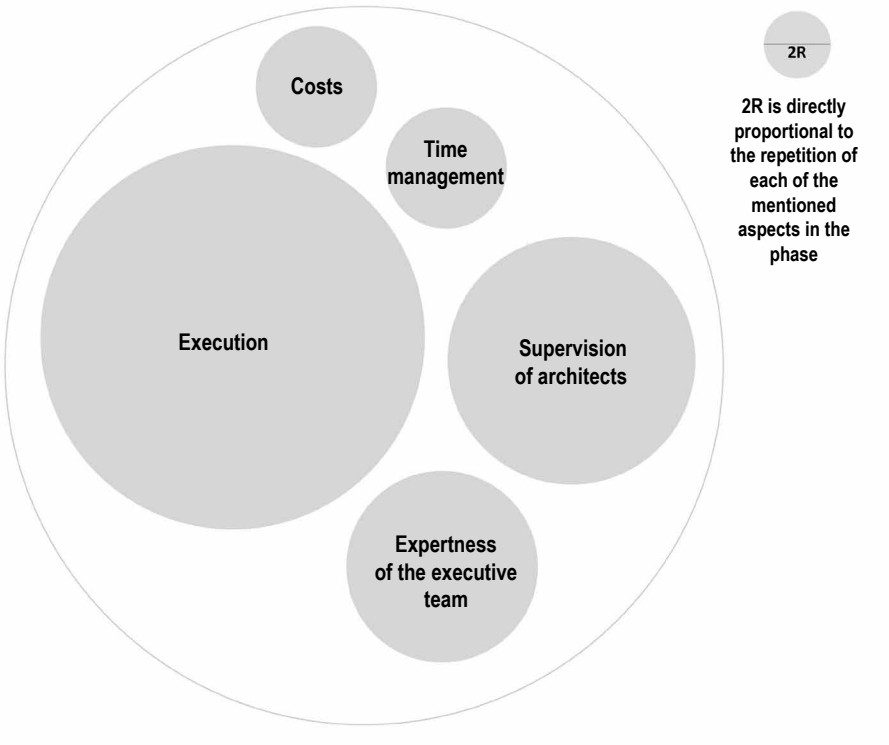

FIG. 2.5 The most repetitive aspects mentioned by the authors in the reviewed literature in Phase 3 (Implementation); the size of the circles is proportional to the repetition of each of the mentioned aspects.

2.3.4 Post-Completion Phase

After completion of the project, in order to ensure the long-term quality of the outcome (Cramer & Breitling, 2007), further action is necessary. Whether these actions are considered in the development process, depends on the approach of the stakeholders and their contract with the producers (Parsi, 2017).

First of all, maintenance is important. Despite its relevance, maintenance has been explicitly mentioned as part of the adaptive reuse process of heritage buildings by very few researchers such as Cramer and Breitling, Hendriks and van der Hoeve, and Misirlisoy and Günçe (Cramer & Breitling, 2007; Hendriks & Van der Hoeve, 2009; Misirlisoy & Günçe, 2016a). Vervloed sees this part of the process, as "aftercare" and considers it important as it prolongs the service life of the building (Vervloed, 2013). According to Parsi, maintenance should be considered an integral part of the process. He proposes that some instructions need to be defined for the building and the users should refer to them and if needed to the architect (Parsi, 2017). The importance of maintenance is shown for example by the conservation management plans published by the Getty Conservation Institute (GCI), for some of the most significant US heritage buildings (Sheridan, Somerville, Ostergren, Matarese, & McCoy, 2018). Moreover, GCI financially supports the development of conservation management plans of outstanding heritage buildings all over the world ("Keep it modern," n.d.).

Finally, the evaluation of an AR project years after its execution can be considered as the final part of the AR process. According to the Royal Institute of British Architects (RIBA) Plan of Work (Douglas, 2006) this evaluation is usually conducted six months after completion of the planned design, and an architect should carry out a post-occupancy evaluation (POE) on the building.

Evaluation in this final stage aims to identify successes and failures and to provide feedback for future projects. It will also provide the maintenance manager with information for preparing an aftercare strategy for the heritage building. In the publications related to the adaptive reuse process, this part of the process has been mentioned as the post-occupancy evaluation (POE) and various methods from different perspectives have been proposed. For example, some studies analyzed the socio-cultural sustainability of some reused heritage buildings through the distribution of questionnaires to the users (Abdullah, Basha, & Soomro, 2017; Aydin, Yaldiz, & Siramkaya, 2015; Naimeh Rezaei & Azhdari, 2018). For evaluation of environmental aspects, some studies focused on the user satisfaction and energy performance of reused heritage buildings (Boschmann & Gabriel, 2013; Lisitano et al., 2018; Sharpe & Shearer, 2013) whilst others focused on the economic impact

of reused heritage buildings on the surrounding environment (Hoxha, 2019; Kee & Chau, 2020). Rodopoulou analyzed the process, program, architecture, cultural values, finance, and social dimensions of several reused heritage buildings which provide a comprehensive framework of guidelines for future projects (Chatzi Rodopoulou, 2020). Lastly, it should be emphasized that "evaluation" may bring up the need for further intervention of the building and consequently, the start of a new "process" (Van Balen & Vandesande, 2018).

Figure 2.6 represents the most repetitive aspects mentioned by the authors in the reviewed literature in Phase 4.

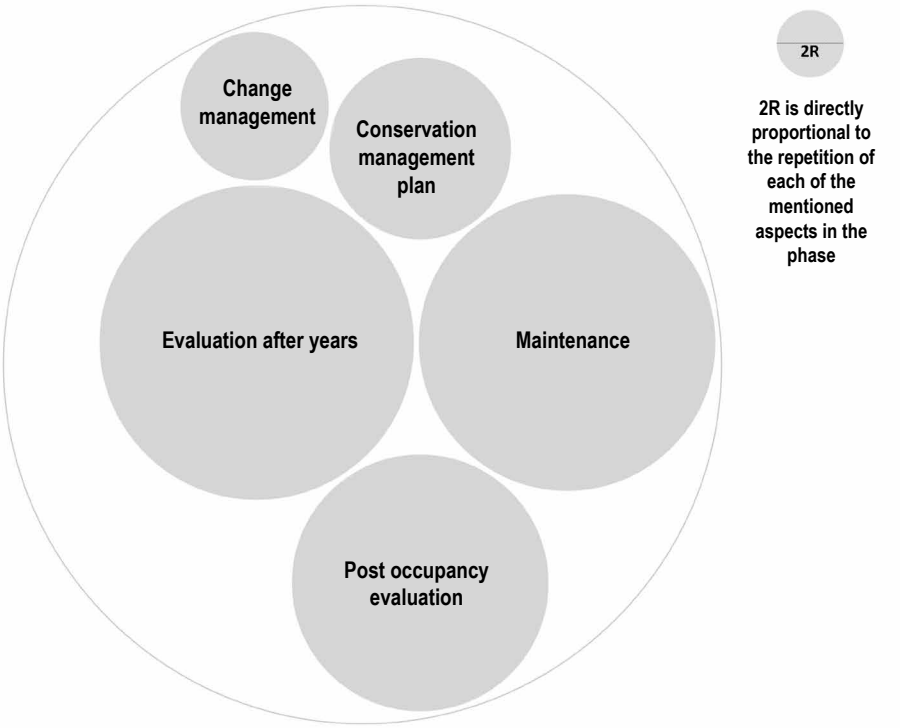

FIG. 2.6 The most repetitive aspects mentioned by the authors in the reviewed literature in Phase 4 (Post-completion); the size of the circles is proportional to the repetition of each of the mentioned aspects.

2.4 Discussion and Conclusions

The analysis of the literature in this study has revealed that the adaptive reuse (AR) process of heritage buildings, as a whole, has not been widely studied. Many publications have focus on different aspects or phases of the process, such as analysis, value assessment, or design strategies, but few consider the full adaptive reuse process. Several sources and charters highlight the need to change the approach to heritage from conservation to "conservation through transformation". However, no specific guideline or model has been proposed and this review shows that research into AR is still sporadic and mainly focused on different parts of this complex process. To develop a comprehensive model for the AR process, this literature review has been organized according to the four main phases of the reuse process: pre-project, preparation, implementation, and post-completion. This categorization helped to group and analyze better published research and to identify overlaps or repetitions.

The review indicates that despite the wide range of research conducted on AR no overarching model of the process which may assist the preservation and conservation of cultural and historic values of heritage buildings has been proposed. Several studies which have guided the development of the comprehensive model for AR of heritage buildings have been identified and are presented in Figure 2.7.

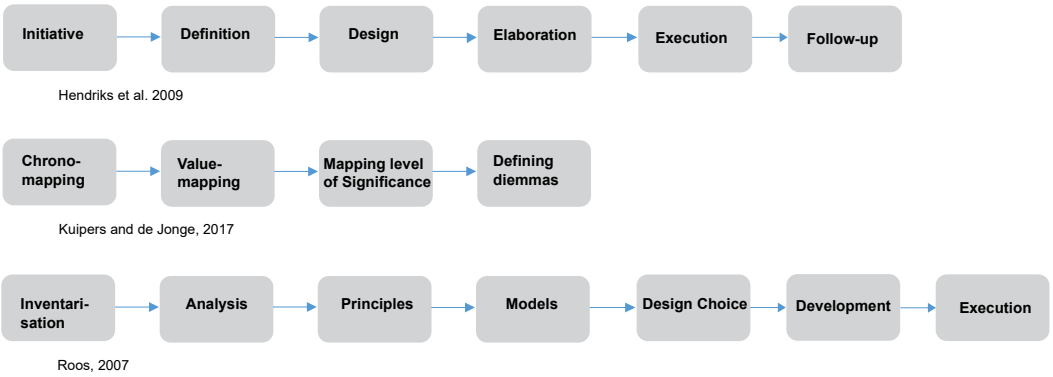

FIG. 2.7 Some of the published models (covering more than one phase) in the AR process.

Figure 2.8 combines the information shown in Figures 2.2, 2.4, 2.5, and 2.6 to identify the most mentioned and highlighted aspects in each phase of the AR process. Analysing and comparing these aspects with three of the most relevant reviewed studies (Hendriks & Van der Hoeve, 2009; Kuipers & de Jonge, 2017; Roos, 2007- see Figure 2.7) led to the selection of the relevant sub-phases, here called "steps", in the AR process. While these models have been proposed with different aims rather than the current research, they have had a substantial role in guiding this research and developing the model. This has resulted in a comprehensive model for the adaptive reuse of heritage buildings.

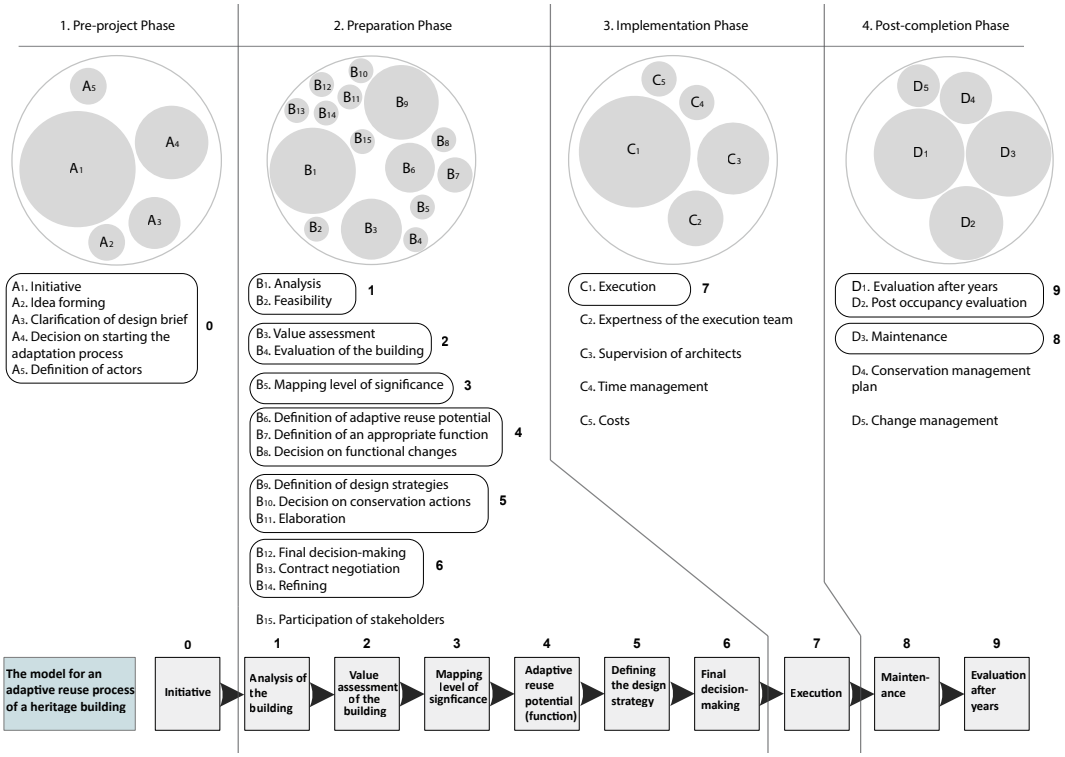

FIG. 2.8 The procedure toward the definition of the sub-phases, the so-called "10 steps" of the adaptive reuse process of heritage buildings.

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In the pre-project phase, the “initiative” was highlighted as the first step of AR. In this step, actors are selected, and the design brief of the project is discussed. Review of the literature, based on either the architects' experience or that of other stakeholders, indicates that while this step may seem straightforward, it requires considerable input from all stakeholder groups.

It is this step in which differences in profitability or an interested party’s stake in a building, may lead to proposals to demolish a heritage building despite its outstanding values, rather than its reuse. This review makes it clear that the outcome of this step is directly related to the policies and established practice of reuse in specific contexts. Where researchers visibly struggle to prove the advantage and benefits of reusing heritage buildings, even when quantifying the values of heritage buildings, this review demonstrates the wide range of stakeholder perspectives and their influence on the decision to initiate the reuse process.

In the preparation phase, “analysis”, “value assessment”, and “mapping the level of significance” are the relevant steps in identifying “adaptive reuse potential”. The object of this phase is to recognize an appropriate function for the heritage building. Based on the reviewed literature, in the initiative step, the owner or other stakeholders (involved in the project) may have certain expectations and ambitions. In the “adaptive reuse potential” step, architects consider whether the requested function is possible and propose their suggestions.

The literature reviewed in relation to this phase consists mostly of publications based on educational projects or written by architects. The objective of these groups is the preservation and conservation of the historic, cultural, and other values of heritage buildings. Accordingly, the steps in the preparation phase are those which form the basis of an effective reuse scheme. In the literature, emphasis is placed on the significance of these steps and the methodology employed, whether achieved through analog or digital tools in analysis, value assessment, or mapping the level of significance in heritage buildings.

This review demonstrates that from the perspective of many researchers, selecting an appropriate function and predicting its effectiveness for the future is a considerable and significant issue. Such views are largely restricted to the scientific literature rather than that based on the experience of architects or other stakeholders. The implication of the review is that the influence of local organizations in determining the ultimate role for the heritage buildings is limited when faced by the systematic and structured models which the researchers have proposed.

The next step is the “definition of the design strategy” to deal with a heritage building. From reviewing the literature, it is clear that the researchers used a wide range of terms to discuss these strategies, though they are essentially the same. This review also shows that researchers on AR have had a significant interest in labeling the strategies and preparing different lists as strategies to deal with heritage buildings. These are often based on their cultural-heritage values rather than critically analyzing their possible effects on the other values of heritage buildings. However, according to some publications based on the practical experience of architects, the selection of the design strategy in practice is dependent on many other factors in addition to cultural-heritage values.

Once the architect has reached a decision on a design strategy, it is reviewed with the other stakeholders involved in the AR process. In the literature, this aspect is often referred to as “final decision-making”, in which both design strategies and the necessary contracts or permits are negotiated. The review shows that while this is one of the most significant steps before the implementation phase, little interest has been expressed in the process. Most of the reviewed publications have been written by architects who see this step as intrinsically connected to the experience of architectural practice. It requires architects to manage and balance their proposals and suggestions, whilst persuading other stakeholders to their view.

In the reviewed literature, the preparation phase highlights steps such as “analysis”, “value assessment”, “adaptive reuse potential”, and “definition of the design strategy”. Although “mapping level of significance” was not constantly highlighted, this has been added to this phase because of its importance in influencing the steps which follow and because of the emphasis placed on it in the material written by architects.

In the implementation phase, which is often defined as “execution”, many challenges need to be tackled. This is seen as one of the principal steps of the AR process, having a significant influence on the final quality of the project. However, few of the studies which covered several phases of the AR process have mentioned and discussed this step. Evidently, investigation of the implementation phase of AR of heritage buildings in practice and more specifically the execution step, need greater attention in research.

In the post-completion phase, two steps, “maintenance” and “evaluation after years”, have been identified and are considered necessary to guarantee the long life of a heritage building. This step has also received little attention from the researchers. “Maintenance” has usually been considered only as a technical intervention to heritage buildings. The specific issue of strategic planning to prolong the life of the heritage building and the varied aspects related to change management, although considered at the process level, have not been sufficiently investigated.

Evaluation sometime after completion is consistently recommended, as it provides insights for the maintenance and management of the buildings and for future AR projects. The attention of researchers in the scientific literature to this step is considerable; especially in relation to the analysis and assessment of the different dimensions of sustainability in the reused building. However, in the practice-based literature, this step has not been significantly highlighted. This difference between approaches and the relationship between the possible impacts and the process should be investigated more in future research.

In conclusion, the conceptual 10-step-model (Figure 2.8) developed in this paper can act as a basis for the AR process of heritage buildings. Although the model requires validation in real-world AR projects, it is comprehensive and sets out a means which has the potential to contribute to the preservation and conservation of the values of heritage buildings while preparing them for a significant role in enhancing the qualities of current and future cities and societies.

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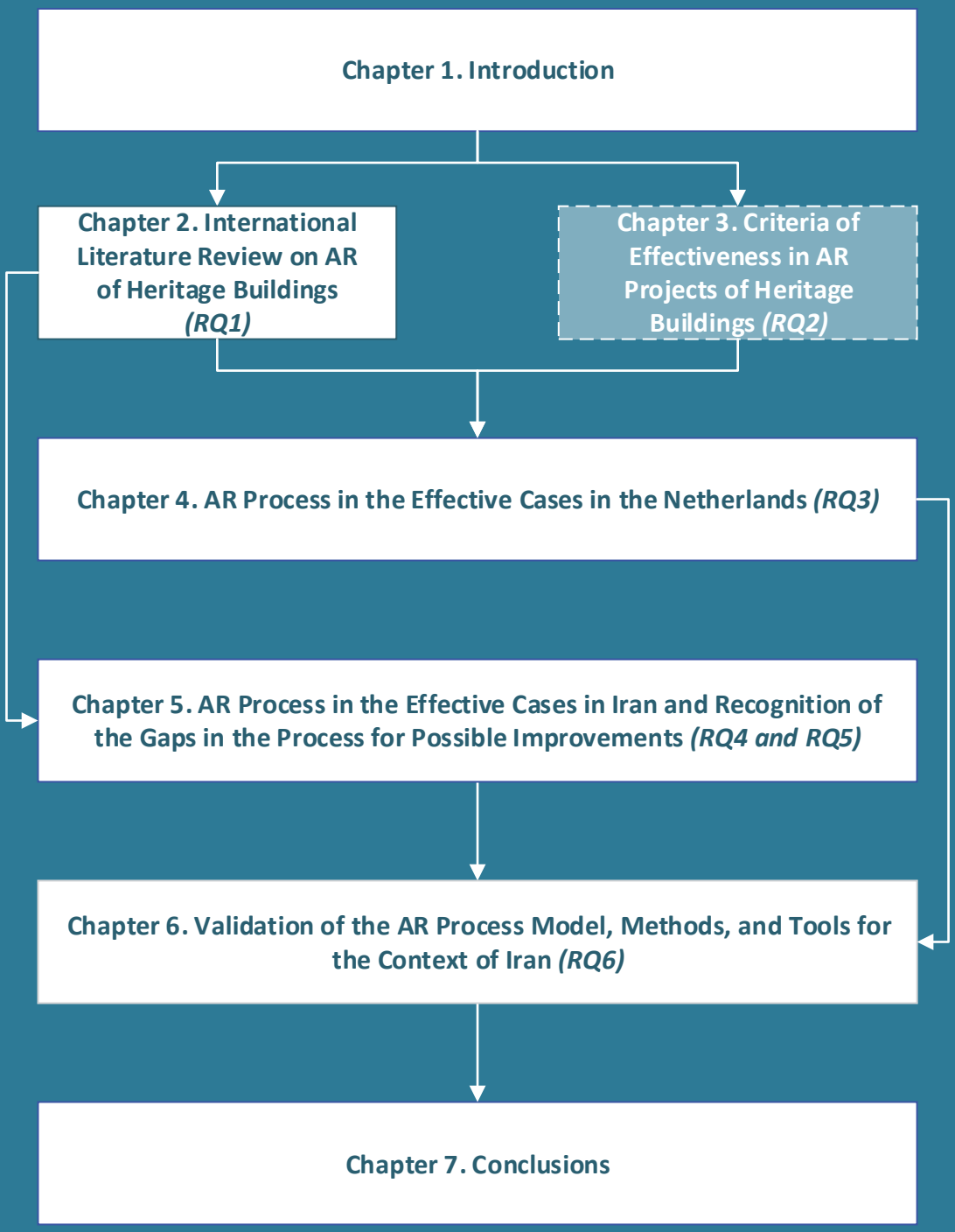
Chapter 1. Introduction
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3 Criteria of Effectiveness in AR Projects of Heritage Buildings

This chapter has been published as a journal paper:
Arfa, F. H., Lubelli, B., Zijlstra, H., & Quist, W. J. (2022). Criteria of "Effectiveness" and Related Aspects in Adaptive Reuse Projects of Heritage Buildings. *Sustainability*, *14*(3), Article 1251. https://doi.org/10.3390/su14031251
Parts of the data of this research have been used in the following conference paper:
Arfa, F. H., Quist, W. J., Lubelli, B., & Zijlstra, H. (2022). "Effectiveness" in Adaptive Reuse of Modern Heritage Buildings. In C. J. Such, M. P. Figueres, A. Tostões, & U. Pottgiesser (Eds.), *Modern Design: Social Commitment & Quality of Life: Proceedings 17th International Docomomo Conference* (pp. 1094–1103). Tirant lo Blanch.

ABSTRACT Adaptive reuse (AR) of heritage buildings is a complex process due to the involvement of many actions and actors, which influence the results of the projects. The effectiveness of AR projects can be described by various criteria. This paper aims to provide a comprehensive overview of the criteria of effectiveness in AR projects with the final scope to guide and improve the AR process. A review of the jury reports of two highly prestigious awards in the Netherlands (NRP Golden Phoenix Prize) and Europe (Europa Nostra Award) has been conducted. In total, the reports of 48 cases have been reviewed. The five criteria mentioned in the regulations of the NRP award have been used to categorize the aspects mentioned in the jury reports of both awards. These criteria are: "social value creation", "sublimation (both architectural and cultural aspects)", "environmental sustainability", "economic value creation", and "innovation". This review reveals that "social value creation" and "sublimation" are among the most highlighted criteria that the juries considered for the effectiveness of AR projects. Often aspects mentioned for these criteria overlap partially with those aspects mentioned in the criterion of "economic value creation". This indicates that enhancement of the qualities of heritage buildings and their surroundings and improvement of the social values and the resulting positive economic effects are strictly interrelated. The overview of the criteria of effectiveness, as defined in this work, will serve as a basis for the investigation of the tools and methods which can be used in the AR process to achieve these criteria.

KEYWORDS Adaptive Reuse; Effectiveness; Heritage Buildings; Built Environment; Sustainable Development

3.1 Introduction

In today's world, restoring and repairing existing and heritage buildings to be used again has become a prevalent and yet challenging action in the field of architecture and heritage (Plevoets & van Cleempoel, 2011; Powell, 1999; Schittich, 2003). The process of converting a building to a function which is significantly different from the original function is often described as "adaptive reuse". This definition has been used throughout the current chapter (Brooker & Stone, 2004; Douglas, 2006; *Fourth Dimension in Building: Strategies for Avoiding Obsolescence*, 1993). Adaptive reuse (AR) of heritage buildings is not a new phenomenon. Despite entry of the term "adaptive reuse" in the terminology of the conservation field only in the 1970s, AR has a long history (Plevoets & Van Cleempoel, 2013). This concept has also been known as "adaptation", "rehabilitation", "retrofitting", "remodelling", and so on (Brooker & Stone, 2004; Giebeler et al., 2012), and many researchers have highlighted how the use of different terms for it can create confusion (e.g., Giebeler et al., 2012; Plevoets, Vande Keere, & Van Cleempoel, 2019; Wilkinson, RemØy, & Langston, 2014).

AR projects can bring many advantages for societies; for example, they can revitalize abandoned buildings and neglected areas and thus enhance the quality of life for local communities (Mohamed, Boyle, Yang, & Tangari, 2017). AR is a complex process (Giebeler et al., 2012), involving many actions and actors (Kurul, 2003), which influence the results of the projects. Research has been done with the goal of improving this process. On one hand, researchers have investigated the "success factors" (e.g., social, economic, environmental, governmental, etc.) influencing the AR process and contributing to reaching an effective result (e.g., Abastante, Lami, & Mecca, 2021; Laprise, Lufkin, & Rey, 2015; Wilkinson et al., 2014). On the other hand, researchers have studied the criteria based on which an executed AR project can be defined as effective. In the paper authored by Djebbour and Biara (2019), sustainability is highlighted as a criterion of effectiveness and the different dimensions of it (including social, environmental, and economic) showing the achievement of sustainability are identified and described. In contrast, in other publications (e.g., Martinez-Molina, Boarin, Tort-Ausina, & Vivancos, 2018), the focus is laid on one single dimension of sustainability, either social, environmental, or economic.

Despite the existence of several scientific publications on the criteria of effectiveness in AR projects, these do not provide a comprehensive overview of the criteria (and of the specific aspects of each criterion) based on which an AR can be described as effective. For example, Bosone, De Toro, Girard, Gravagnuolo, & Iodice (2021) proposed valuable criteria for the ex-post evaluation of AR of heritage buildings; however, these are assessed only from the perspective of the circular economy, whereas criteria related to architectural qualities are mostly missing.

This research aims to provide an overview of the criteria, and specific aspects for each criterion, which have been used in describing the effectiveness of the adaptive reuse of heritage buildings. The identified criteria and aspects can then be used to guide the AR process toward an effective result.

Jury reports of winning AR projects in a selection of Dutch (NRP Golden Phoenix ("Het Nationaal Renovatie Platform Gulden Feniks" in Dutch)) and European (Europa Nostra) awards have been reviewed; criteria have been identified, and for each criterion, aspects showing that a criterion has been achieved have been distilled.

The starting point of this research is the Dutch context. The Netherlands is one of the prominent countries for AR in Europe (Veldpaus, Fava, & Brodowicz, 2019). In the Netherlands, reuse of heritage and existing buildings is a usual practice, especially after the financial crisis in 2008; AR is directly connected with solving the problem of vacancy (Janssen, Luiten, Renes, & Stegmeijer, 2017). The most relevant award for AR projects is the "Golden Phoenix". This award was set up in 2011 by Het Nationaal Renovatie Platform (NRP), a Dutch organization initiated in 2008 with the scope of guiding different groups of stakeholders in the AR process of existing buildings. Recent AR projects can be submitted yearly to this award. A group of experts in different domains of architecture visit the projects and select the winners ("NRP Golden Phoenix," n.d.). The jury report, as well as the criteria used by the jury for the assessment, are published online. These documents are considered to provide, for the Dutch context, the most comprehensive overview of criteria based on which an executed AR project is judged as effective. Because of this reason, this paper is structured according to the five criteria mentioned in the regulations of the NRP award ("Reglement NRP Gulden Feniks," 2020; *Reglement NRP Gulden Feniks*, 2021):

- Social value creation; Sublimation;
- Environmental sustainability;
- Economic value creation; Innovation.

3.2 Materials and Methods

This paper is based on a comprehensive review of the jury reports of two awards in AR of heritage buildings at two different levels (Dutch and European). As previously mentioned, the reason for selecting the Netherlands is because it is among the top countries in AR of existing and more specifically heritage buildings. The jury reports of the NRP Golden Phoenix award (2011 to 2020) were selected as the main source to be reviewed for the Dutch context.

To support the findings, a review of one relevant award at the European level has been conducted, which is the Europa Nostra Award (2015 to 2021). The reasons for this selection are:

- Availability of the jury reports;
- Being among the most well-known awards in the Netherlands and at the European level for designers;
- Including at least one AR project among the winners.

It should be mentioned that in addition to the NRP and Europa Nostra awards, the reports of two global awards (Knoll modernism award and Architizer A + Awards) were also reviewed, but both awards have been excluded from this research. The reason for excluding the Knoll modernism award is that based on Douglas's definition of AR (Douglas, 2006), the Knoll award included only one AR project, and it was not reasonable to consider it in this review. Regarding the Architizer award, while it included many AR projects, the publications about the winners were mainly based on the description provided by their architects instead of the jury.

Additionally, "Docomomo" (Documentation and Conservation of Buildings and Sites of the Modern Movement), "Aga Khan", and "AHI" (Architectural Heritage Intervention) awards were considered. However, a first screening showed that these awards are not appropriate to be included in this review. Though Docomomo is a well-known organization in stimulating the conservation of modern heritage, there is only one edition of the award (2021), for which no publication is available at the time of writing this paper. The reason for excluding the Aga Khan award was that it has a specific focus on Islamic societies. The AHI award was also not considered in this review because the publications were mainly based on the description provided by the architects, and the comments by the jury were not published.

The jury reports of nine winners of the NRP award in the category of transformation and 39 winners of the Europa Nostra award in the category of conservation have been reviewed (See Appendix 3.1 for the list of the selected cases). It should be mentioned that two projects were common in both awards (LocHal in Tilburg and The Halls in Amsterdam). Using the definition of Douglas (2006) for AR, only projects with a change in their original function have been considered in this review.

This review followed seven steps:

1. Collection of the data (online access to the regulations and jury reports of the awards).
2. Translation of the Dutch reports in English.
3. Analysis and coding of the texts.
4. Grouping the coded texts in the relevant criteria.
5. Refining and clustering according to a common terminology and further grouping the coded texts.
6. Analysis of the grouped coded texts and reporting the results of the review.
7. Formulation of some general conclusions and recommendations.

It should be mentioned that, in step four, some aspects were included in more than one criterion (e.g., “generation of new employment opportunities”, which shows both social and economic effectiveness).

In the results section, three terms have been frequently mentioned; these are used in the present paper with the following meanings:

- **Criterion:** “Criterion” is a standard by which the final results of AR projects are judged. In this research, the mentioned criteria in the regulations of the NRP award have been used.

- **Aspect:** “Aspects” show the evidence of achieving a specific “criterion”. In this paper, aspects were distilled out of the descriptions provided by the jury in the selected awards.

- **Groups of aspects:** Aspects have been further clustered in groups, in order to improve their clarity for the analysis and for the possible applicability in the AR process.

3.3 Effectiveness in Adaptive Reuse of Heritage Buildings

The criteria of effectiveness in AR of heritage buildings have been categorized in five groups based on the NRP award: social value creation, sublimation, environmental sustainability, economic value creation, and innovation. Hereafter, these criteria and the aspects showing them are discussed.

3.3.1 Social Value Creation

AR of heritage buildings can provide new social dynamics within their surroundings and facilitate the regeneration of urban areas (Arfa, 2017). Moreover, by involving citizens in the process, their sense of attachment to and pride in their living environment is enhanced ("Leeuwarden declaration," 2018). AR of heritage buildings, if conducted properly, can contribute to well-being, amenity, safety, and equity in societies (Li, Zhao, Huang, & Law, 2021; Faro & Miceli, 2019; Rodríguez-Espinosa et al., 2021; Savvides, 2013, 2015).

In the scientific literature, many authors have highlighted the social value creation in AR projects from a wide range of different perspectives. Some authors highlight the necessity of improving this criterion via different methods, such as public engagement during the process (Balest, Lucchi, Haas, Grazia, & Exner, 2021) or gaining insights into the preferences and interests of people via social media analysis (Roszczyńska-Kurasińska, Domaradzka, Ślosarski, & Żbikowska, 2021; van der Hoeven, 2019). They believe that these methods can enhance the sense of attachment of the local communities to the place. Several authors have provided design solutions in AR projects with the final goal of enhancing social values; for example, Fenollosa, Fausto, & Lanzarote, (2020) have investigated the AR process and more specifically the new addition to an existing building to highlight the collective memories of people.

Other researchers have proposed tools for assessing the impacts of AR projects in contributing to the sustainable development goals, especially social value creation. Vardopoulos et al., (2021) have the idea that holistic assessments and analysis of impacts can help and improve future AR projects to comply with the sustainable development goals. However, in the social dimension of sustainable development, they have not thoroughly specified the aspects and have just mentioned four aspects within it.

In the regulations of the NRP award, social value creation has been described with several aspects. These are: improving the liveability of the area via the AR of buildings, the appreciation of the users and/or residents, and the connecting effect of the project for the community ("Reglement NRP Guden Feniks," 2019; "Reglement NRP Gulden Feniks," 2020; "Reglement NRP Guden Feniks,", 2021). To make these aspects clearer and more specific, the jury reports of this award have been reviewed, and the mentioned aspects related to social value creation have been coded and distilled. These aspects have then been analyzed, refined, and clustered according to a common terminology.

A similar procedure was used in reviewing the jury reports of the Europa Nostra award. In the regulations of the Europa Nostra award, the only aspect which has been mentioned in the criterion of social value creation is the accessibility of the project to the public ("Call for Entries, Europa Nostra Awards," 2021).

The aspects mentioned in the jury reports have then been clustered into several groups. The names of these groups and their definitions are based on the evaluation framework of AR projects by Bosone, De Toro, Girard, Gravagnuolo, & Iodice (2021). However, not all the criteria used by these authors have been mentioned in the jury reports of NRP and Europa Nostra awards. The criteria reported below are those relevant to the aspects distilled from the NRP and Europa Nostra awards.

- **Local community:** Improvement of the local community via providing education and learning opportunities for them.
- **Landscape quality and atmosphere:** Improvement of beauty, harmony, and aesthetic values of the landscape, enhancement of the atmosphere of the place, and place-making.
- **Safety of public spaces:** Improvement of safety and accessibility of public spaces for all.
- **Health and well-being:** Improvement of mental and physical health of citizens and users related to the AR project (via utilization of green and natural materials, enhancing indoor air quality, natural lighting, etc.).

In the groups of Bosone et al. (2021), no specific attention to the "wider community" has been paid. As both the NRP and Europa Nostra awards have considered many aspects related to the wider community, this term has been used to group these aspects.

Table 3.1 shows the aspects and their grouping in the criterion of social value creation in the NRP and Europa Nostra awards.

TABLE 3.1 Social value creation and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Continuation of the city dynamics and becoming a vibrant environment	●[1]	●	Landscape quality and atmosphere*
Development of the relationship between people and natural landscape	-	●	
Integration of the heritage building and its surrounding natural landscape	-	●	
Having a major positive effect on the surrounding area	●	-	
Contribution to the revitalization of the neighborhood	●	●	
Creation of more quality and space for social and cultural entrepreneurship and joint new initiatives	●	-	
Appealing new intervention**	●	-	
Quick acquisition of different target groups to the building	●	-	Wider community
Having an impressive increment in the national/ international visitors	●	●	
Becoming an interesting place for everyone	●	-	
Increment of the accessibility of people to a closed building	●	●	
Becoming a new destination in the city for everyone	●	-	
Attracting wider communities through public and private events	●	●	
Adding a new dimension to the tourism of the area	-	●	
Generation of new employment opportunities**	-	●	
Focusing on knowledge transfer in the field of traditional craftsmanship and other fields for the local community, students and researchers	●	●	
Active use of the place via residents, entrepreneurs, and visitors (living, working, meeting, and relaxing)	●	-	

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TABLE 3.1 Social value creation and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Strengthening the local community's attachment to the place (living, working, meeting, and relaxing)	●	●	Local community*
Keeping the historic stories and memories of the place and people alive	●	-	
Employment of local craftsmen in the process	-	●	
Impressive demonstration of local support	-	●	
Becoming the pride of the residents	●		
Enrichment of the quality of life for residents and citizens	●	●	
High involvement of the citizens in the process	●	●	
Provision of space for public amenities to benefit the neighborhood	-	●	
Contribution to providing a safe place for visitors	-	●	Safety of public spaces*
Acoustic comfort and visual peace**	●	-	Well-being & Health*
Provision of a vibrant cultural, educational, and social center for residents and others responding to their needs	●	●	

** Laurates: "A'DAM Toren," 2017; "Blokhuispoort," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2019; "Lichttoren," 2011; "LocHal," 2019; "Metaforum," 2013; "Timmerfabriek," 2016; "Conservatorium Hotel," 2012; "Cultuurcentrum Energiehuis," 2014; "De Hallen," 2015; "Europa Nostra Awards Magazine (Laureates)," n.d.; "JURYRAPPORT NRP GULDEN FENIKS," 2014; "JURYRAPPORT NRP GULDEN FENIKS," 2015; "JURYRAPPORT NRP GULDEN FENIKS," 2016; "JURYRAPPORT NRP GULDEN FENIKS," 2017.*

1 "●" indicates that the award includes the aspect. [2] The groups of aspects which are based on Bosone et al. (2021) have been marked with an asterisk (""). 3 Two asterisks ("**") indicate that this aspect has been mentioned in other criterion/criteria as well.*

Table 3.1 shows that there are many aspects mentioned in the NRP and Europa Nostra reports in both the "wider community" and the "local community" groups of aspects. In general, the aspects in Table 3.1 indicate the reciprocal relationship between people, reused heritage buildings, and the surrounding environment (Figure 3.1). For example, appealing new interventions attract different groups of people to the building, and this attraction triggers reused heritage buildings being recognized as interesting destinations in the surrounding environment, city, and country. Consequently, more and more visitors come, and by providing the necessary comfort levels for different groups of people (e.g., visitors), the reused heritage buildings contribute to the increment of social values at different scales.

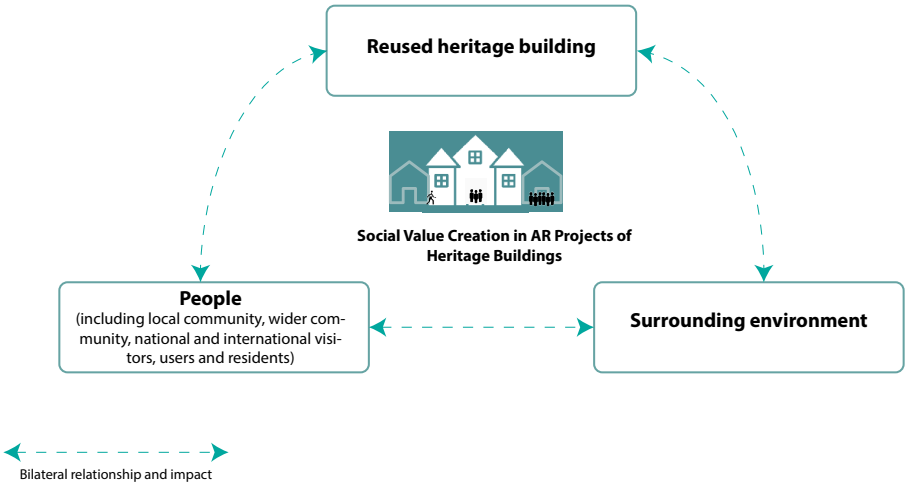

FIG. 3.1 The bilateral relationship and impact between people, reused heritage building, and the surrounding environment.

The similar attention paid to attracting a local as well as a wider community suggests that an effective AR project should be able to keep the balance between these two groups of aspects. When the balance is broken, touristification or isolation of the AR project may occur, both of which could lead to the failure of the project.

3.3.2 Sublimation

Heritage buildings are characteristic, and often landmarks, that create or enhance the identity of the environment. The preservation and reuse of these buildings contribute to strengthening the culture and histories of societies while responding to the needs in their environment ("Leeuwarden declaration," 2018). Although "sublimation" is not a frequently used term for defining effectiveness in AR projects, some researchers have used it as a term to describe protecting the historic environment and its authenticity while improving the qualities of heritage buildings (Peng, Jia, & Jiao, 2012). Similarly, in the regulations of the NRP Golden Phoenix award, sublimation has been mentioned as valuable preservation, restoration, or additions that highlight or reveal the hidden qualities in the project. In other words, the preservation activities make the intrinsic qualities come into bloom ("Reglement NRP Guden Feniks," 2019; "Reglement NRP Gulden Feniks," 2020; "Reglement NRP Gulden Feniks," 2021).

Though it may seem that sublimation of heritage buildings focuses mainly on preserving the materiality of the buildings, it concerns preserving the culture and authenticity through preservation of specific historic features (Guidetti & Robiglio, 2021; Saifi, Yüceer, & Hürol, 2021; Torrieri, Fumo, Sarnataro, & Ausiello, 2019). Reviewing the NRP jury reports supported this belief and led to a division of this criterion into two groups of aspects: “cultural aspects” and “architectural aspects”.

The boundary between these two groups is not always visible; in order to make this clearer in this research, the cultural aspects have been defined as aspects related to preserving the culture, history, and authenticity of the heritage buildings, whereas the architectural aspects are more about spatial interventions or assigning suitable functions to improve the qualities of heritage buildings.

Following the same procedure, the jury reports of the Europa Nostra award have been analyzed. Table 3.2 shows the aspects and their grouping in the criterion of sublimation- cultural aspects in the NRP and Europa Nostra awards. In Table 3.2 some of the terms by Bosone et al. (2021) have been used to group the aspects mentioned in the awards. These terms and their definition are as follows:

- **Authenticity and integrity:** Recreation of cultural capital, tangible and intangible, through the preservation of the authenticity and integrity of heritage as defined by UNESCO and ICOMOS.

- **Intrinsic value:** Recreation and transmission of heritage values and qualities through the AR project (intervention) and hybridization between historic and contemporary values integrated with the cultural landscape and coherent with the intrinsic value of cultural heritage.

- **Traditional skills:** Improvement of traditional skills through the AR project via providing training opportunities for the local community.

- **Local identity:** Enhancement of recognition of the local identity through the AR project via the educational function of cultural heritage.

- **Mutual cooperation:** Improvement of the attitude of stakeholders to mutual cooperation and enhancement of collaboration between public, private, and people.

- **Cultural and knowledge capital production:** Stimulation of the production of knowledge through the AR project.

- **Cultural vibrancy:** Increment of cultural activities and events as a result of the AR project.

TABLE 3.2 Sublimation (cultural aspects) and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Respect for the history, authenticity, and materials of the heritage building	●[1]	●	Authenticity and integrity*
Preservation of the unity of the heritage building	●	–	
Telling the history of the heritage building	●	–	
Keeping and restoring the original design as much as possible	●	●	
Preservation of the characteristics of the heritage building	●	●	
High-quality restoration of the building and landscape conservation	–	●	
Non-invasive and effective protection of the cultural values of the heritage building	–	●	
Realization of a heritage building with future value	●	–	Intrinsic value*
Proper recognition of the heritage values and restoration to the original shape	–	●	
An excellent recuperation of the heritage building	–	●	
Presentation of the history of the site for public viewing	–	●	Local identity*
Presentation of the long-term and sustained effort to ensure the preservation of the heritage building	–	●	
Proper narration of the history of the building	●	–	Cultural and knowledge capital production*
Effective recovering of the history of the heritage building and its the wider context	–	●	
Well-integrated into the wider context of the heritage building	–	●	
Demonstration the inter-ethnic links of the heritage buildings for the history and providing material for comparative evaluation	–	●	
Comprehensive archaeological, structural, and historical research with rich documentation	–	●	
Clear and distinguishable presentation of different phases of the development to visitors	–	●	
Presentation of the historical and contemporary functions and the cultural and artistic aspects of the building	–	●	
Provision of educational programs for the permanent users and others to raise their awareness of its history and important characteristics	–	●	
Restoration with the use of traditional techniques and crafts	–	●	Traditional skills*
Exceptional application of an interdisciplinary approach applied to the project	●	●	Mutual cooperation*

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TABLE 3.2 Sublimation (cultural aspects) and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Addition of a new cultural dimension to the area	●	●	Cultural vibrancy*

** Laurates: "A'DAM Toren," 2017; "Blokhuispoort," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2019; "Lichttoren," 2011; "LocHal," 2019; "Metaforum," 2013; "Timmerfabriek," 2016; "Conservatorium Hotel," 2012; "Cultuurcentrum Energiehuis," 2014; "De Hallen," 2015; "Europa Nostra Awards Magazine (Laureates)," n.d.; "JURYRAPPORT NRP GULDEN FENIKS," 2014; "JURYRAPPORT NRP GULDEN FENIKS," 2015; "JURYRAPPORT NRP GULDEN FENIKS," 2016; "JURYRAPPORT NRP GULDEN FENIKS," 2017.*

1 "●" indicates that the award includes the aspect. [2] The groups of aspects which are based on Bosone et al. (2021) have been marked with an asterisk ("").*

Dividing the aspects into seven groups indicates the relation between the cultural aspects of the criterion of sublimation and people (local community, wider community, residents, and users). The relationship between people, their stories and memories, and the culture is inevitable. In Table 3.2, it can be observed that all the groups of aspects are correlated to people. This can be either the case of "authenticity and integrity", which is indirectly related to people, or "cultural and knowledge capital production", which directly emphasize the importance of educating people and their cultural engagement in improving this criterion. Thus, it can be concluded that the essence of many aspects in sublimation within the cultural aspects is related to the local/wider community and preserving their culture and histories.

Moreover, this table shows that many aspects have been mentioned in "authenticity and integrity" and "cultural and knowledge capital production" groups; this underlines the attention of the juries to these groups of aspects. The analysis underlines that in dealing with heritage buildings, the heritage values and authenticity of the building need to be preserved. Appraising the values and adding to them should also be significantly considered to guarantee the future of the building. It is also necessary to inform and educate different groups of people (e.g., the local community) about the cultural and historic values of the building. Moreover, conducting and compiling comprehensive research with rich documentation is crucial, as this can provide insightful lessons for the building in the future, as well as similar heritage buildings within the wider context.

While in the scientific literature, cultural aspects of sublimation in AR projects have been highlighted significantly, the architectural aspects have received poor attention. Even the publication by Bosone et al. (2021), one of the most thorough sources for the criteria of effectiveness, did not mention any points about architectural aspects in AR projects. Thus, for considering the criteria of sublimation referring to architectural aspects, reference is made to the terms used by Schmidt III and

Austin (2016) for the description of adaptable architecture. Although these authors proposed these terms as "characteristics" to be considered when designing adaptable buildings, the terms still seem to be appropriate for grouping the architectural aspects distilled from the awards. These terms and their definitions are as follows:

- **Joinable/divisible spaces:** Provision of spaces that can support multiple spatial arrangements because of being flexible.
- **Physical and visual linkage:** Enhancement of physical and visual connections between interior and exterior spaces.
- **Spatial quality and zones:** Accommodation of a variety of spacious and open rooms through spatial separation suitable for different uses and groups of users.
- **Multi-functional spaces:** Provision of spaces that can be used for multiple users and can service more than a single demographic.
- **Reversibility:** Provision of the capacity for the interventions within the AR project to be separated from the building (with minimum damage).
- **Multiple access points:** Provision of multiple entry-points to serve different uses or users.

The terms "quality of design, material, and execution" and "complementary redesigns" have been used to group the aspects in the NRP and Europa Nostra awards, which are related to the description of effectiveness in redesigns. They define the qualities that have been considered during the preparation and implementation phases and the qualities provided by the intervention.

Table 3.3 shows the aspects and their grouping in the criterion of sublimation-architectural aspects in the NRP and Europa Nostra awards.

TABLE 3.3 Sublimation (architectural aspects) and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Bringing the structure of the building to a human scale	●[1]	-	Joinable/ divisible spaces*
Flexibility in the layout of the larger areas via adjustable, delicate, and transparent design	●	●	
Improvement of the building through the high quality of the new design and materials	●	●	Quality of design, material, and execution
Excellent execution of the design	●	●	
Appropriate attention to details in the recuperation of the heritage building	●	●	
Securing the structural elements of the building as well as installing essential protective elements	-	●	
Revitalization with a combination of expertise in design and craftsmanship	-	●	
Connection of the heritage building and the new design in a new story	●	-	Physical and visual linkage*
Improvement of the connection of the spaces via the new additions	-	●	
Improvement of the interaction of the heritage building with the surrounding natural landscape	-	●	
Highlighting the values of the heritage building via the new design	●	●	Complementary redesigns
Appropriate balance between the original and new function	●	●	
Helping to increase the understanding of the heritage building	-	●	
Respectful interventions to the architectural essence of the building and its surroundings	-	●	
Innovative design solutions to meet the needs of the users and to preserve the architectural integrity and history of the space	-	●	
Effective preservation via the new contemporary additions	-	●	
Complementation of the original design via the addition of new design in a contemporary style with new multi-purpose facilities	-	●	
Clear presentation of the original function of the building in the new design	-	●	
Finding an appropriate use to ensure the future of the heritage building	-	●	
Successful evoking of a dramatic meeting of the old and new parts of the heritage building	-	●	

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TABLE 3.3 Sublimation (architectural aspects) and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
High-quality preservation and design without any attempt to replicate anything which has come before	-	●	
Well-integrated and respectful new modern additions to the heritage building	-	●	
Complementation of the original design via using imaginative techniques	-	●	
Creation of a diversity of atmospheres	●	-	Spatial quality and zones*
Creation of a pleasant atmosphere	●	-	
Peaceful and structured spatial organization	●	-	
Acoustic comfort and visual peace**	●	-	
Appealing new intervention**	●	●	
Openness	●	-	
Simplicity and tranquillity	●	-	
Clear orientation in the new design	●	-	
Bringing an abandoned building back to life with true imaginative use of the spaces	●	●	Multi-functional spaces*
Having multi-functional spaces for hosting different functions for a wider range of visitors and locals	●	●	
Increment in the functionality of the heritage building	●	-	
Reversibility of the new additions and easily distinguishable from the original fabric	-	●	Reversibility*
Offering accessibility to the visitors with disabilities	-	●	Multiple access points*

** Laurates: "A'DAM Toren," 2017; "Blokhuispoort," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2019; "Lichttoren," 2011; "LocHal," 2019; "Metaforum," 2013; "Timmerfabriek," 2016; "Conservatorium Hotel," 2012; "Cultuurcentrum Energiehuis," 2014; "De Hallen," 2015; "Europa Nostra Awards Magazine (Laureates)," n.d.; "JURYRAPPORT NRP GULDEN FENIKS," 2014; "JURYRAPPORT NRP GULDEN FENIKS," 2015; "JURYRAPPORT NRP GULDEN FENIKS," 2016; "JURYRAPPORT NRP GULDEN FENIKS," 2017.*

1 "●" indicates that the award includes the aspect. [2] The groups of aspects which are based on Bosone et al. (2021) have been marked with an asterisk (""). 3 Two asterisks ("**") indicate that this aspect has been mentioned in other criterion/criteria as well.*

The eight groups of aspects in Table 3.3 present many aspects within the architectural aspects of the criterion of sublimation. The essence of some aspects is again surprisingly related to people (local/wider community) and how they experience being in the reused building. For example, in the group of "spatial quality and zones", there are several aspects that explain the comfort and well-being of users in the AR project at the building scale; all these terms are expressing the human needs within a place, which is, in this case, a reused heritage building. In the NRP award, many specific terms were used to describe these aspects (e.g., openness, visual peace, simplicity, etc.).

Even though the group of “complementary redesigns” focuses on the physical and design aspects of the new addition, these aspects are closely related to improving the understanding of the heritage values by different groups of people. Both groups of “complementary redesigns” and “spatial quality and zones” contain many aspects about the effects of new interventions on heritage buildings, such as assisting heritage buildings to reveal their values and qualities and to make them more visible. It can be observed that having “multi-functional spaces” (adaptability for changes in functions of the spaces) is considered an aspect of the effectiveness of AR projects. Moreover, “joinable/dividable spaces” (having flexibility) is considered as evidence of effectiveness.

Analysis of the aspects in the criterion of sublimation reveals that, again, the core identifier of the effectiveness in both cultural and architectural aspects are people, their stories, and their experiences within the space. The reused building itself, the improvement of the physical and design aspects, and preserving the historic and cultural aspects play a parallel role in improving the effectiveness of the reused heritage building (Figure 3.2). It should be mentioned that the relationship, impact, and influence between the core identifiers are bilateral.

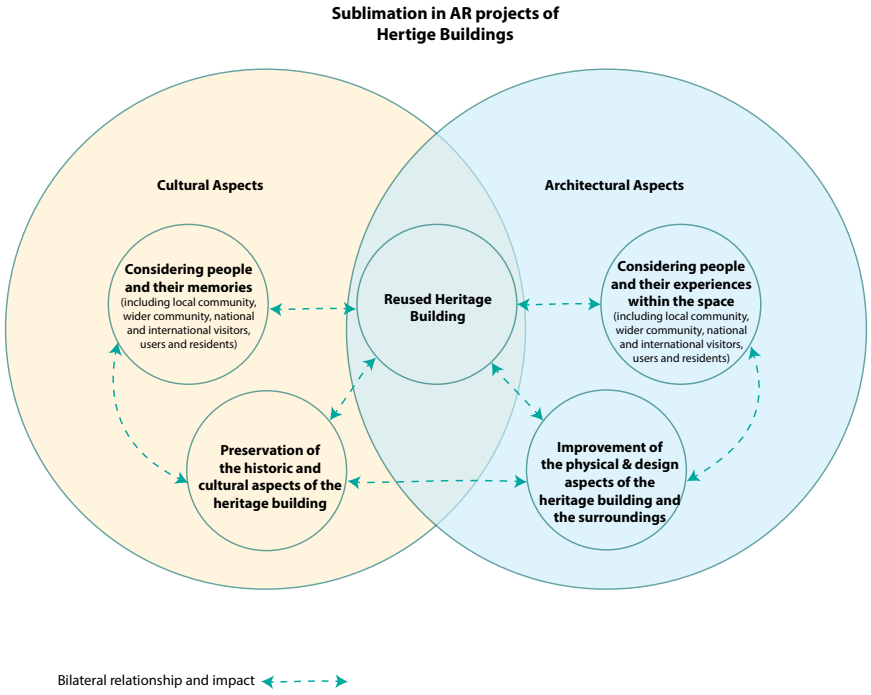

FIG. 3.2 The bilateral relationship and impact between the core identifiers of effectiveness in AR projects.

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3.3.3 Environmental Sustainability

AR of heritage buildings has a direct positive effect on environmental sustainability, as it reduces the amount of new construction materials needed and contributes to saving embodied energy (Stanojević, Milošević, Milošević, Turnšek, & Jevremović, 2021). Moreover, during the AR process, many activities are usually conducted to make heritage buildings energy efficient, climate-proof, and healthier ("Leeuwarden declaration," 2018).

Environmental sustainability is among the hot topics in the restoration and adaptive reuse of heritage buildings. Extensive research has been conducted to bridge the gap between cultural heritage and climate protection, either at the broader levels or by providing solutions for a particular building. For example, in the publication by Williamson, Martinez-Molina, and Dupont (2021), the authors have conducted a comprehensive analysis of the indoor environment of the heritage building to enhance it in line with the heritage values and characteristics of the building. Similarly, in the publication by Elnagar, Munde, and Lemort (2021), the focus is laid on optimizing the energy consumption of the building by providing lessons for similar heritage buildings.

In the regulations of the NRP award, the environmental dimension of sustainability has been frequently mentioned. The explanations in the regulation are about promoting sustainable use of existing built environments, technical measures in the field of materials, water, and energy, and the extent to which the project sets an example in the field of energy transition, climate adaptation, and circularity ("Reglement NRP Guden Feniks," 2019; "Reglement NRP Gulden Feniks," 2020; "Reglement NRP Gulden Feniks," 2021). To make these aspects more explicit, the jury reports of the NRP award have been reviewed.

A similar procedure was conducted in the jury reports of the Europa Nostra award. The generalized aspects resulting from the analysis of the jury reports of both awards are presented in Table 3.4.

The terms proposed by Bosone et al. (2021) as the criteria for evaluating the environmental sustainability of AR projects have been used for grouping the aspects distilled out of the NRP and Europa Nostra awards. However, only two of the criteria proposed by Bosone et al. are relevant to the aspects mentioned in the awards and have been selected. These are the following:

- **Energy efficiency:** Reduction of energy consumption through compatible technologies with heritage buildings and self-production of energy sources.
- **GHG emissions reduction:** Contribution to reduce GHG emissions through various methods.

The aspects and their grouping in the criterion of environmental sustainability in the NRP and Europa Nostra awards are outlined in Table 3.4.

TABLE 3.4 Environmental sustainability and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Making the heritage building comfortable and energy efficient	●[1]	-	Energy efficiency*
Usage of sustainable and local materials with a low carbon footprint	-	●	GHG emissions reduction*
Usage of environmentally sustainable and traditional technologies and design solutions	-	●	
Making the heritage building a circular building	-	●	
Development of innovative and nature-based technologies for the building and also as a model for the sustainable transformation of other heritage buildings	-	●	
Making the heritage building as sustainable as possible (CO2 neutral)	●	-	

** Laurates: "A'DAM Toren," 2017; "Blokhuispoort," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2019; "Lichttoren," 2011; "LocHal," 2019; "Metaforum," 2013; "Timmerfabriek," 2016; "Conservatorium Hotel," 2012; "Cultuurcentrum Energiehuis," 2014; "De Hallen," 2015; "Europa Nostra Awards Magazine (Laureates)," n.d.; "JURYRAPPORT NRP GULDEN FENIKS," 2014; "JURYRAPPORT NRP GULDEN FENIKS," 2015; "JURYRAPPORT NRP GULDEN FENIKS," 2016; "JURYRAPPORT NRP GULDEN FENIKS," 2017.*

1 "●" indicates that the award includes the aspect. [2] The groups of aspects which are based on Bosone et al. (2021) have been marked with an asterisk ("").*

Circularity, comfort, utilization of local materials, and employment of innovative and nature-based technologies in the heritage buildings are among the mentioned aspects. Though this criterion is focused on the building, in Table 3.4 and among the aspects, it can again be observed that providing comfort for the users in effective AR projects causes them to use sustainable solutions. Providing this necessity via unsustainable solutions can lead to a loss of the values of the heritage buildings (Williamson et al., 2021).

While in the scientific literature (e.g., Bosone et al. (2021)) many aspects for achieving "environmental sustainability" have been mentioned, Table 3.2 only covers a few aspects. For example, freshwater efficiency, water quality, and biodiversity are missing. The gap between the aspects in this table as a representative of considering "environmental sustainability" in practice, and the scientific literature on this topic is questionable.

3.3.4 Economic Value Creation

AR of heritage buildings can contribute to providing more attractive urban areas, which can lead to the creation of economic values. For example, via place branding, adaptive reuse of heritage buildings can lead to the increment of tourists (Arfa, Kaboli, Yazdanfar, & Mohammadi, 2016), generation of new jobs (Bosone et al., 2021; "Leeuwarden declaration," 2018), and economic advantages of visiting museums, shops, and the catering industry (Dommelen & Pen, 2013; Haasdonk, 2013; Persoon, 2019)

In the scientific literature, economic value creation is usually mentioned in the research articles, which focus on narrating the advantages of AR of heritage buildings along with other added values, such as social, environmental, and cultural (e.g., Bosone et al., 2021). However, some research focuses on assessing the economic value added by AR projects (e.g., Niemczewska, 2021; Persoon, 2019) or providing methodology or tools for enhancing it in line with the sustainable development goals (e.g., Dell'ovo, Dell'anna, Simonelli, & Sdino, 2021; Rossitti, Oppio, & Torrieri, 2021).

In the regulations of the NRP award, economic value creation has been explained as a demonstrable improvement in the economic structure and value development of real estate. Moreover, it has been mentioned that the business case of the winner projects should be clear, by providing insight into investments and construction costs ("Reglement NRP Guden Feniks," 2019; "Reglement NRP Gulden Feniks," 2020; "Reglement NRP Guden Feniks," 2021). The aspects mentioned in the jury reports of the NRP award have been coded and analyzed.

A similar procedure has been applied to the reports of the Europa Nostra award.

Therefore, in this case, some of the terms used by Bosone et al. (2021) for the criteria and their definition have been used:

- **Financial self-sustainability:** Self-production of financial resources needed for heritage conservation and continuous maintenance independently from the public sector.
- **Jobs creation:** Creation of long-term jobs directly and indirectly linked to the AR project.
- **Economic spillovers:** Having direct and indirect economic impacts in the area (e.g., building construction, tourism, research, education, creative activities, and innovation, etc.).

— **Attractiveness for creative, cultural, and innovative enterprises:** Localization of innovative entrepreneurs, cultural and creative industries, and research and development activities.

— **Attractiveness for circular cultural tourism:** Enhancement of local economic activities related to circular cultural tourism because of the AR project.

Table 3.5 shows the aspects and their grouping in the criterion of economic value creation in the NRP and Europa Nostra awards.

TABLE 3.5 Economic value creation and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Attainment of more economic value through diverse activities	●[1]	-	Attractiveness for creative, cultural and innovative enterprises*
Housing smaller businesses and workshop spaces for creative businesses	●	●	
Improvement of the economic value of a specific industry	●	●	
Provision of national and international branding	●	-	Attractiveness for circular cultural tourism*
Having economic advantages of attracting visitors to the heritage building	●	●	
Generation of new employment opportunities**	-	●	Jobs creation*
Contribution to the economic growth of the area and the local community	-	●	Economic spillovers*
Generation of financial resources for heritage conservation via different economic activities	-	●	Financial self-sustainability*

** Laurates: "A'DAM Toren," 2017; "Blokhuispoort," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2019; "Lichttoren," 2011; "LocHal," 2019; "Metaforum," 2013; "Timmerfabriek," 2016; "Conservatorium Hotel," 2012; "Cultuurcentrum Energiehuis," 2014; "De Hallen," 2015; "Europa Nostra Awards Magazine (Laureates)," n.d.; "JURYRAPPORT NRP GULDEN FENIKS," 2014; "JURYRAPPORT NRP GULDEN FENIKS," 2015; "JURYRAPPORT NRP GULDEN FENIKS," 2016; "JURYRAPPORT NRP GULDEN FENIKS," 2017.*

1 "●" indicates that the award includes the aspect. [2] The groups of aspects which are based on Bosone et al. (2021) have been marked with an asterisk (""). 3 Two asterisks ("**") indicate that this aspect has been mentioned in other criterion/criteria as well.*

While it may be believed that a huge number of subsidies should be provided to have an effective AR project, this review shows that an effective AR project is able to provide the financial resources needed for its life. The ability of AR projects to attract various groups of users and visitors provides financial resources. This attractiveness can make an AR project in a derelict and small city to host thousands of visitors/users (e.g., entrepreneurs) and to bring economic advantages for the whole city.

Here again, the common areas with social value creation can be observed. Attracting various groups of people as tourists lead to providing jobs, which can enhance the social values within the society. Moreover, the initiation of creative, cultural, and innovative enterprises attracts various groups of users to the reused building. However, similar to social value creation, the balance between economic value creation and the heritage values of the buildings should be kept. Incorporating creative and cultural enterprises and industries can usually be in line with the values of the heritage building and can be observed among the functions of winner projects.

3.3.5 Innovation

The definition of the term "innovation" is the use of a new idea or method ("Cambridge dictionary," n.d.). In the scientific literature of AR of heritage buildings, this term is usually used to mention the employment of digital technologies during different phases of the process. This can be either the pre-project, preparation, implementation, or post-completion phases. For example, the research by Jue and Chen (2020) aimed at using VR (virtual reality) technology for analysis of the building with the final goal to restore and reuse it. In the publication by Dela Cruz, Sevilla, San Gabriel, Dela Cruz, and Ella Joyce (2018), the authors worked on using augmented reality mobile applications for enhancing the experience of visiting the reused heritage building and the historic city. With the same goal, in some studies, the focus was placed on comparison between two different devices providing augmented reality and VR (e.g., Petrelli, 2019).

In the regulations of the NRP award, "innovation" has been explained as having resourceful solutions with exemplary value in areas such as organization, process, communication, and technology. It shows the degree to which a project has learning effects for future assignments in the field of AR ("Reglement NRP Guden Feniks," 2019; "Reglement NRP Gulden Feniks," 2020; "Reglement NRP Guden Feniks," 2021). To make the aspects of innovation more specific, the jury reports of NRP and Europa Nostra awards have been reviewed and the coded aspects have been reported in Table 3.6.

Due to the lack of scientific literature on the criterion of innovation in AR projects, the terms used for grouping the aspects in this criterion are defined by the authors as follows:

- **Use of digital and innovative technologies:** Employment of innovative technologies during different phases of AR projects.

— **Cooperation between different stakeholders:** Exemplary and admirable cooperation between different groups of stakeholders with learning effects for other projects.

— **Replicable model in different aspects:** Production of useful models to be implemented by other projects (this group of aspects has been mentioned mainly because of the importance of learning effects of the AR projects in the criterion of innovation).

Table 3.6 outlines the aspects and their grouping in the criterion of innovation in the NRP and Europa Nostra awards.

TABLE 3.6 Innovation and the aspects representing it (NRP Gulden Fenix Rapporten and Europa Nostra Awards*)

Aspects representing the criterion based on the description in the prizes	NRP Prize	Europa Nostra Prize	Groups of aspects within the criterion
Preservation of the stories and narration of them via development of serious games through AR (augmented reality) and VR (virtual reality)	●[1]	-	Using digital and innovative technologies
Having innovative examples of usage of technology (e.g. for foundation repair) in the restoration and adaptive reuse of the heritage building with advantageous lessons for other projects	●	-	
Showing perfect symbiosis and cooperation between client, manager, and architect with useful lessons for other projects	●	-	Cooperation between different stakeholders
Becoming a model in different aspects for the similar heritage buildings, showing that these heritage buildings have value and contribute to a more sustainable development of the city	●	-	Replicable models in different aspects
Provision of a replicable fundraising strategy developed with the goal of being repeated in similar projects	-	●	
Being an example of a private initiative to reuse a heritage building with beneficial lessons for other similar projects	-	●	
Showing perfect involvement of citizens during the process providing lessons for other projects	-	●	

** Laurates: "A'DAM Toren," 2017; "Blokhuispoort," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2018; "JURYRAPPORT NRP GULDEN FENIKS," 2019; "Lichttoren," 2011; "LocHal," 2019; "Metaforum," 2013; "Timmerfabriek," 2016; "Conservatorium Hotel," 2012; "Cultuurcentrum Energiehuis," 2014; "De Hallen," 2015; "Europa Nostra Awards Magazine (Laureates)," n.d.; "JURYRAPPORT NRP GULDEN FENIKS," 2014; "JURYRAPPORT NRP GULDEN FENIKS," 2015; "JURYRAPPORT NRP GULDEN FENIKS," 2016; "JURYRAPPORT NRP GULDEN FENIKS," 2017.*

1 "●" indicates that the award includes the aspect.

An effective AR project (in terms of innovation) should have some insightful lessons for other future projects, that is, other projects can be inspired by the employed innovative concepts. These lessons can vary from technical installations to the methods and tools which have been used to involve people during the AR process.

It may seem that there are some overlaps between the aspects of this criterion and other criteria. For example, "cooperation between different stakeholders" may seem similar to the group of aspects mentioned in the criterion of sublimation-cultural aspects ("mutual cooperation") and the one mentioned in the criterion of social value creation ("high involvement of the citizens in the process"). While the essence of these is similar, and all three target improvement of the social and cultural values, the reasons for including it in this criterion is the emphasis of juries on having useful lessons and mentioning it as a valuable and innovative example for other AR projects within the country and the world.

3.4 Discussion and Conclusions

Reviewing the jury reports of two awards at the Dutch and European levels, the NRP and Europa Nostra awards, provides an overview of the criteria of effectiveness and the aspects considered by the jury (Figure 3.3). Based on the main aim of this research, recognition of the aspects and grouping them provides useful insights for enhancing the AR process. Moreover, the analysis of these criteria and aspects elucidates some points which will be discussed hereafter.

It is necessary to note that as the aim of this research is not to judge the awards or their criteria, the frequency of the mentioned aspects has not been considered as showing the importance of one aspect in comparison to the others; however, as the jury are experts in the field of architecture and heritage, emphasizing some criteria by providing a diverse range of aspects has been considered as showing the priority and relevance of them in dealing with heritage buildings (e.g., social value creation).

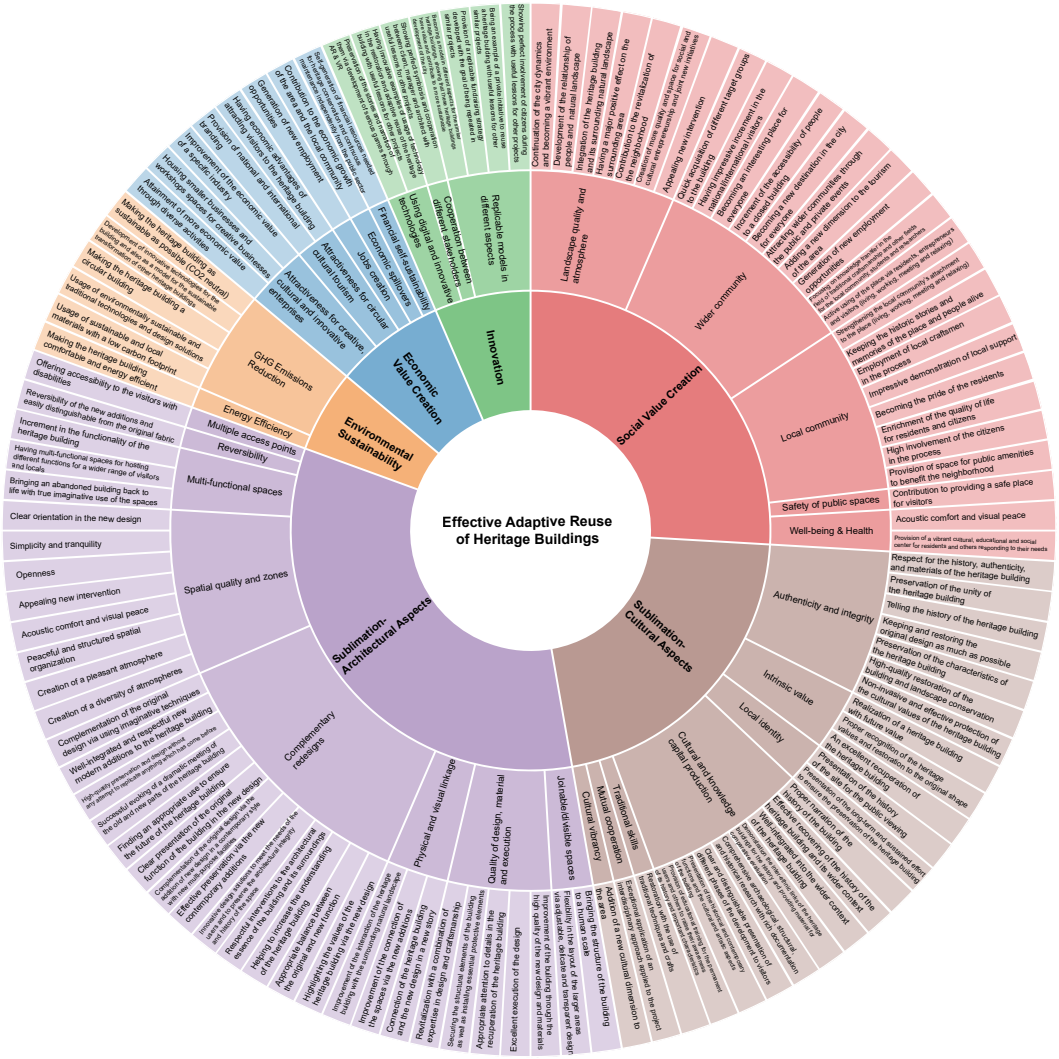

FIG. 3.3 Overview of the criteria (inner ring), groups of aspects (middle ring) and aspects (outer ring) of effectiveness in AR projects of heritage buildings in the NRP and Europa Nostra awards.

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First, it can be observed that in both awards many aspects of sublimation and social value creation are mentioned; this can be explained by the main scope of these awards. In fact, these awards aim to stimulate AR (adaptive reuse) of heritage buildings, firstly, to preserve and enhance their values and, secondly, to encourage people to be more engaged in the process and to increase their sense of attachment to these buildings.

The second point is that the core identifiers of almost all the criteria in effectiveness in AR of heritage buildings are "people" (including local and wider communities, national and international visitors, and users and residences), the "surrounding environment", and the "reused heritage building". The distilled aspects mainly revolve around these core identifiers. It is always the question of their impact and influence on each other and how this can be innovatively enhanced.

In the criterion of social value creation, the core identifier "people" is more visible. In Figure 3.3, it can be observed that a wide range of aspects related to both "local community" and "wider community" are mentioned in the awards. This shows the acknowledgement of the importance of people and considering them in AR projects. In both awards, the other core identifier of "surrounding environment" can be observed as the group of "landscape quality and atmosphere", illustrating the positive social effects provided by the AR projects. "Well-being and health" is also one of the groups of aspects, which re-emphasizes the role of considering "people" and their needs in achieving effectiveness in AR projects; however, despite receiving ample attention from the NRP award, the Europa Nostra award does not explicitly mention it.

In the criterion of sublimation (cultural aspects), "authenticity and integrity" has a wide range of aspects mentioned by the juries, which indicates its relevance in the AR of heritage buildings from the perspective of experts in this field. In addition to this, Europa Nostra pays specific attention to "cultural and knowledge capital production" for considering AR projects to be effective. This attention can also be noticed in the other categories within this award, which are "research", "dedicated service", and "education, training, and awareness-raising". Further evidence of this attention is that the Europa Nostra award includes groups of aspects about "traditional skills" and "local identity" in this criterion. This again highlights the role of the core identifier "people", their stories, and their skills, and its importance to be considered in reusing heritage buildings.

In the criterion of sublimation (architectural aspects), in both awards, the proper recognition of values, preservation, and their incorporation in new designs are appreciated. The balance between original and new designs, hybridization of the heritage and contemporary values, as well as the appropriate meeting of historic and new parts of buildings, are highlighted as positive aspects, especially in the

Europa Nostra award. The presence of "multi-functional spaces" and "joinable/divisible spaces" for having flexibility and hosting a wide range of users is considered significant for showing the effectiveness of the AR projects by both awards. "Reversibility" is also highlighted in several cases of the winners of the Europa Nostra award; however, it is not mentioned in the NRP award. This might be considered as a result of a jury consisting of heritage conservation specialists from different countries within Europe with different approaches from the Dutch approach toward conservation, preservation, and AR of heritage buildings.

Based on analysis of the aspects within the criterion of sublimation, the heritage values or the architectural values cannot enhance the sublimation of the building without considering people (including local and wider communities, national and international visitors, and users and residents), their narratives, and values. The comfort and well-being of them and their interaction with the reused heritage building should be constantly monitored and analyzed. In practice, it is usually observed that the follow-up and maintenance mainly focus on the technical aspects of the building. However, the management plans of the reused heritage buildings should have a specific focus on assessing the relationship of people with the reused heritage buildings.

In the scientific literature, pursuing environmental sustainability is often reported as a necessary criterion for considering AR projects to be effective. However, in the awards, little attention is devoted to environmental sustainability; two groups of aspects are mentioned within this criterion: "energy efficiency" and "GHG emissions reductions". This suggests that the criterion of environmental sustainability should get more attention in awards, and the jury, who are the experts in the field of heritage and architecture, should highlight the necessity of zero-CO_2 emissions heritage buildings and the other aspects mentioned in the scientific literature (e.g., biodiversity). Often, the practice of reusing heritage buildings is considered as an environmentally sustainable action; however, this is not enough, and this criterion needs more attention in practice.

In the criterion of economic value creation, "attractiveness for creative, cultural, and innovative enterprises" and "attractiveness for circular cultural tourism" are among the groups with a wide range of aspects, which underline "national and international branding", and "having economic advantages of attracting visitors". Despite receiving notable attention in the NRP award, these aspects are not explicitly mentioned in the other award. On the other hand, in the Europa Nostra award, the importance of "jobs creation", "economic spillovers", and "financial self-sustainability" are stressed. This shows the focus of the Europa Nostra award on improving the socio-economic aspects at the local scale via AR projects, which can reduce the risks of over-tourism within the reused heritage building by keeping the balance between economic value and social value creation

Both awards encourage the initiation of innovative, cultural, and creative enterprises within the heritage building. This can be either a fixed or temporary function placed at the heritage building which can invite different groups of people to the building.

In the criterion of innovation, which, based on the definition of NRP, focuses on the learning effects of the AR project, the use of possibilities offered by innovative technologies is appreciated. For example, this can include storytelling for enhancing the experience of visiting the reused heritage buildings or the improvement given by laser scanning to the survey of a building. Despite the acknowledgment by the NRP award, the Europa Nostra award has no specific focus on this group of aspects; however, it highlights the importance of "providing replicable models" for other similar heritage buildings, covering different aspects in all the criteria (e.g., fundraising strategies, people engagement models, management plans of the reused heritage buildings, etc.).

In summary, it can be concluded that the attention of the juries in both awards to the criteria of "social value creation" and "sublimation" shows their priority and relevance in AR of heritage buildings for having effective results. This indicates the strong belief that through improving social values, economic values will be created and increased, but by focusing mainly on creating economic values, the social values and sublimation of the heritage building may diminish.

The criteria of "social value creation", "sublimation", and "economic value creation" have several aspects in common. This underlines their interrelation when coming to an effective AR project, which covers the core identifiers in reusing heritage buildings: "people", "reused heritage building", and "surrounding environment". In other words, creating social values in the heritage building and its surroundings and sublimating their architectural and cultural aspects is more likely to create economic values. This implies that "social value creation" and "sublimation (architectural and cultural aspects)" can be considered as key criteria that highly influence the effectiveness of AR projects of heritage buildings.

The overview of the criteria of effectiveness, as defined in this work, can be useful to guide the ex-post evaluation of the AR of heritage buildings and in defining the management plans of the reused heritage buildings. Moreover, it provides an appropriate basis for the investigation of the tools and methods that can be used in the AR process to achieve an effective AR project. The future research will be a retrospective study on the AR process of several effective cases to further analyze the relationship between the aspects of the effectiveness and the methods and tools used by different stakeholders (e.g., architects) with the final scope to enhance the effectiveness of future AR assignments.

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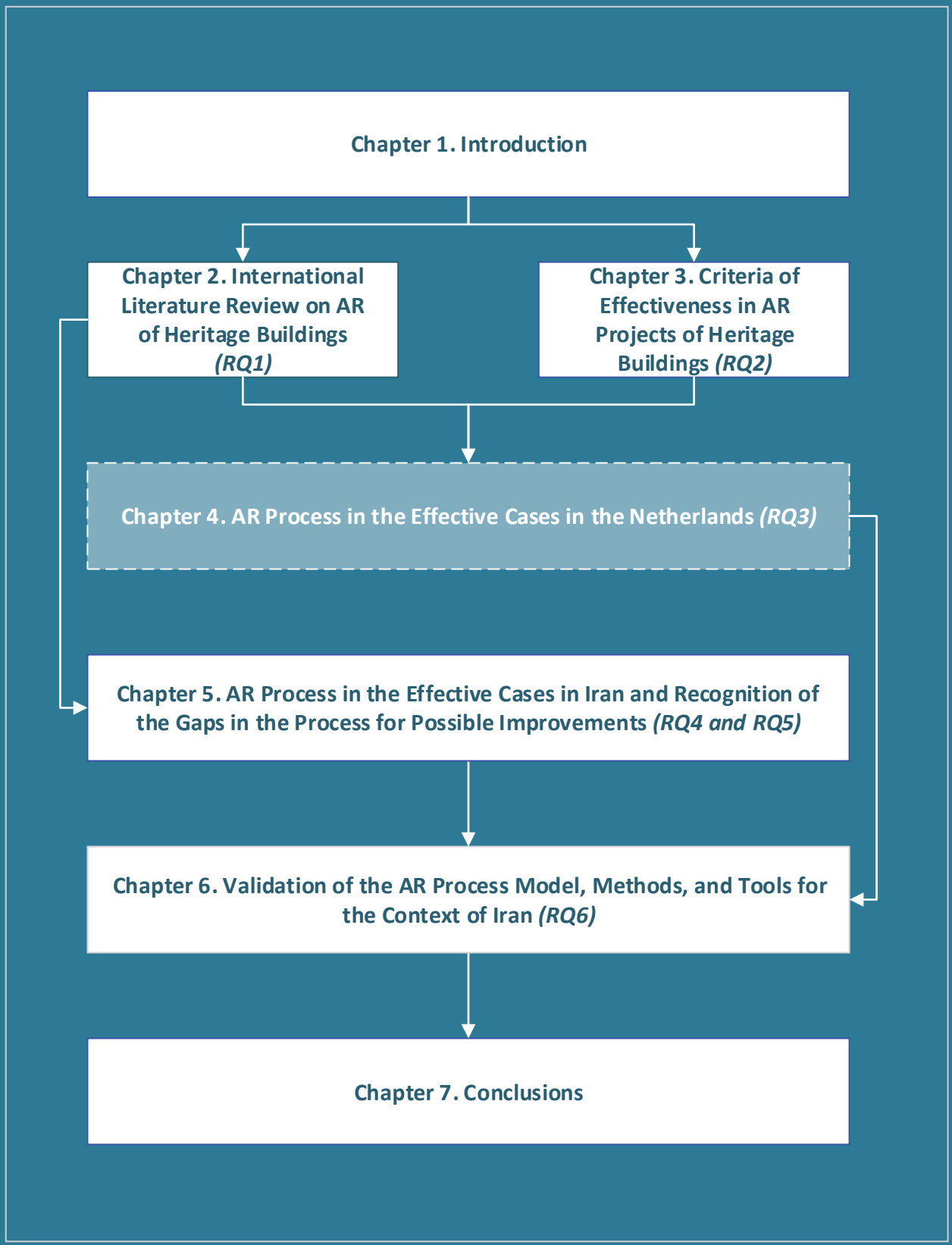
Chapter 1. Introduction
Chapter 2. International Literature Review on AR of Heritage Buildings (RQ1)
Chapter 3. Criteria of Effectiveness in AR Projects of Heritage Buildings (RQ2)
Chapter 4. AR Process in the Effective Cases in the Netherlands (RQ3)
Chapter 5. AR Process in the Effective Cases in Iran and Recognition of the Gaps in the Process for Possible Improvements (RQ4 and RQ5)
Chapter 6. Validation of the AR Process Model, Methods, and Tools for the Context of Iran (RQ6)
Chapter 7. Conclusions

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4 AR Process in Effective Cases in the Netherlands

This chapter has been published as a journal paper:
Arfa, F. H., Lubelli, B., Quist, W., & Zijlstra, H. (2024). A model of the adaptive reuse process of heritage buildings: Validation on four cases in the Netherlands. *Design Studies*, *91-92*, Article 101252. https://doi.org/10.1016/j.destud.2024.101252
Parts of the preliminary results of this research have been presented at the As Found International Colloquium on Adaptive Reuse. The abstract of this research has been published as:
Arfa, F. H., Quist, W. J., Lubelli, B., & Zijlstra, H. (2023). Architects' Methodology in Adaptive Reuse of Heritage Buildings. In N. Augustiniok (Ed.), *As Found International Colloquium on Adaptive Reuse: Book of Abstracts* (pp. 134-135). Hasselt University.

ABSTRACT

Adaptive reuse (AR) of heritage buildings is a complex process involving many stakeholders with different ambitions. Recently, a theoretical model has been proposed to facilitate this process. However, the validation of this model and investigation of the nexus between process steps, methods, and tools used by architects, and the effectiveness of projects are still lacking. This paper aims to validate the model by examining four AR projects in the Netherlands, considered effective as winners of a prestigious architectural prize (NRP Golden Phoenix). The research methods included literature reviews, case visits, and interviews with architects and other stakeholders. The model was refined, and methods/tools used by architects in the process steps were identified, highlighting their link with the effectiveness of results.

KEYWORDS

Adaptive Reuse; Heritage Buildings; Design Model; Design Methods; Built Environment

4.1 Introduction

Adaptive reuse (AR) of existing buildings is becoming increasingly common, partly due to its alignment with sustainable development goals (Lewin & Goodman, 2013). A shift in attention and perception of the term "sustainability" is evident in the scientific literature, moving beyond merely enhancing the energy efficiency of new constructions to reusing the built environment (Abdulameer & Abbas, 2020). Additionally, there has been a rise in the number of papers discussing AR as a sustainable approach to the built environment in recent years (Arfa, Zijlstra, Lubelli, & Quist, 2022). In practice, the reuse of heritage buildings, not only as important relics from the past but also as sources of embodied energy contributing to a more sustainable environment, is increasing (Tam & Hao, 2019).

The AR of an existing building is complex (Kurul, 2007; Langston & Shen, 2007), and this complexity is heightened in the case of heritage buildings due to their cultural significance and the involvement of numerous stakeholders with diverse ambitions (Aigwi, Phipps, Ingham, & Filippova, 2021; Roos, 2007). Extensive research has investigated the role of different stakeholders within the AR process (e.g., Chatzi Rodopoulou, 2020; Misirlisoy & Günçe, 2016). However, despite architects playing a significant role in the AR process (Roos, 2007), there has been insufficient analysis of the process from their perspective.

In exploring the architectural profession, the broader field of design theories and previous research conducted in this area have been examined (e.g., studies by Darke (1979) and Bamford (2002)). According to these researchers, there are two main models for the design process from the perspective of architects: the "analysis-synthesis (A/S) model" and the "conjecture-analysis (C/A) model". The A/S model, developed in response to the tendency to systematize the design process, identifies four steps (Broadbent, 1966; Jones, 1970): a) briefing, b) analysis, c) synthesis, and d) evaluation. Some researchers have opposed this model, stating that *"There is no more rational procedure than the method of trial and error-of conjectures and refutations; of boldly proposing theories; of trying our best to show that these are erroneous; and of accepting them tentatively if our critical efforts are unsuccessful"* (Popper, 1972). This led to the initiation of the conjecture-synthesis model (Hillier, Musgrove, & O'Sullivan, 1972). The initiation of these models led to further research in the field of design processes to critique and propose modifications to the A/S and C/A models, resulting in the proposal that the process can also be a taxonomy of tasks and a combination of analysis, conjecture, and analysis (Bamford, 2002).

Regarding the AR of heritage buildings, which includes (re)design, the literature review reveals two main gaps despite the growing research on the AR process:

- The lack of validation of the existing AR process models from the perspective of architects in practice, to determine if and how the identified steps in the AR process are implemented.
- The lack of investigation into the nexus between the steps of existing AR models and the methods and tools used by architects, and the effectiveness of the AR project.

First Gap in the Process: The Lack of Systematic and Validated Models

Several theoretical models showing the different steps in the AR process are reported in the literature. However, most developed AR process models have not been validated in practice or have been validated considering a few steps of the process or only part of the stakeholders involved. For example, many models have been developed to identify the most appropriate functions for buildings, which is only one step in the AR process of heritage buildings. These models are Multi-Criteria Decision-Making (MCDM) models, and some of them have been validated using AHP (Analytic Hierarchy Process) or ANP (Analytic Network Process) techniques (Balta, 2022; Vizzarri, et al., 2021). A few models addressed more steps of the process and attempted validation of the developed model through the investigation of effective AR projects and interviews with the engaged stakeholders. For example, Misirlisoy and Günçe (2016) developed a five-step model for the AR process, intended for use by all stakeholders involved in the AR process; however, the model does not consider the different groups of stakeholders and their roles and lacks validation in practice. Similarly, Van Hout (2021) developed a model based on a study of several effective cases in the Netherlands and interviews with stakeholders. While this model considers several steps of the AR process, the role of different stakeholders is not highlighted.

Few models and frameworks describing (part of) the AR process have focused on this process mainly from the perspective of architects (see Figure 4.1). Building on these models, the authors conducted a literature review of the field of AR in 2022 and subsequently proposed a theoretical model for the AR process of heritage buildings (Arfa, et al., 2022). This model aims to cover all phases of an AR process, namely, pre-project, preparation, implementation, and post-completion, and seems comprehensive (see Figure 4.2). However, this theoretical model has not yet been validated in practice.

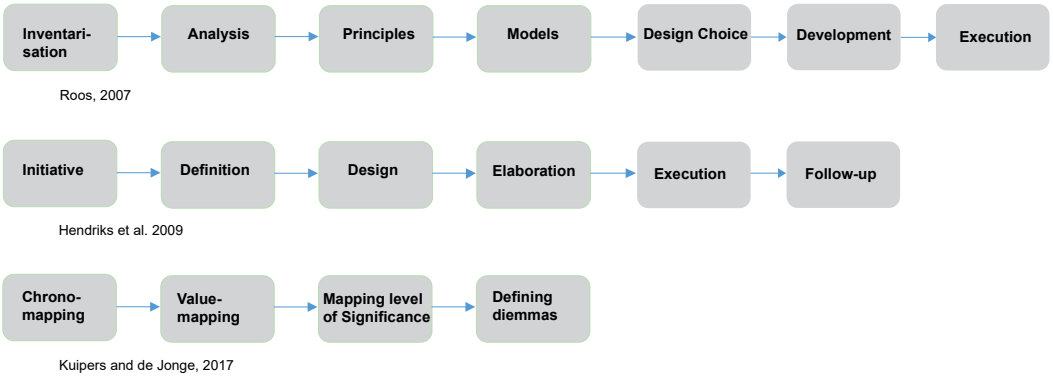

FIG. 4.1 A collection of models and frameworks for AR process from the perspective of architects (Arfa et al., 2022)

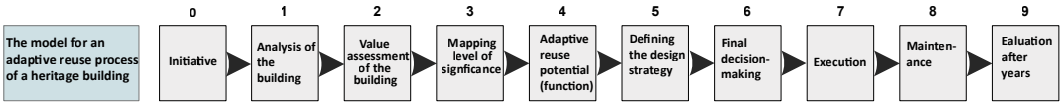

FIG. 4.2 The theoretical model developed by Arfa et al. (2022)

Second Gap: Criteria of Effectiveness and the Process

Next to the lack of validation of AR models, another gap in the literature on AR is the absence of a systematic analysis of the nexus between the AR process, including the methods and tools used by architects in the process, and the effectiveness of reuse projects. In 2018, and later modified in 2020, the European Quality Principles (EQP) were introduced by ICOMOS to guide all stakeholders involved in heritage conservation. One of the criteria for impactful interventions upon cultural heritage, as mentioned in this document, pertains to "Good governance" with a definition of *"The process is part of the success"* and includes points about "Good management, good performance, good stakeholder engagement, and good outcomes" (*European Quality Principles for EU-funded Interventions with potential impact upon Cultural Heritage*, 2020).

Several publications investigated the mentioned criteria in the EQP document from different perspectives to make them applicable in practice. For example, the Leeuwarden Declaration on AR focused on the criteria of effectiveness and the process to ensure high-quality processes ("Leeuwarden Declaration" 2018). Other authors identified the criteria of effectiveness in AR projects (Bosone et al., 2021). In 2022, Arfa et al. proposed a list of criteria based on a review of scientific literature and the jury reports of the NRP prize in the Netherlands (Arfa et al., 2022). However, in all cases, the investigation of the relationship between the process and the actual effectiveness of the AR project is lacking.

When considering the tools and methods used in the AR process, an overview of these methods, covering the entire process and their potential effects on the final result of AR projects, is still missing. Steps in this direction have been taken by Fava (2022), who specifically investigated bottom-up initiatives and citizen involvement in the AR process, aiming to add social values within the AR context.

To address the two gaps mentioned, this paper has two correlated aims:

1 To validate and refine the model proposed by the authors (presented in Figure 4.2) by analyzing the AR process in four effective AR projects, winners of the NRP Golden Phoenix prize in the Netherlands.

2 To identify the nexus between the AR process and its actual effectiveness by analyzing the methods and tools used by architects and linking those to explicit statements in the NRP jury reports of the studied cases.

4.2 Material and Methods

4.2.1 Selection of Case Studies

Various criteria were employed for selecting the AR projects discussed in this research:

- **Location:** The selected projects are situated in the Netherlands for several reasons:
  - The Netherlands is a prominent country in AR of heritage buildings (Veldpaus et al., 2019). Due to its dense population, there is a demand to repurpose existing vacant buildings, leveraging their inherent qualities to serve various community needs (Meurs & Steenhuis, 2017). In addition to this, in the Netherlands, heritage buildings are reused to be preserved in line with the approach of "conservation through transformation" (Janssen et al., 2017).
  - The authors are based in the Netherlands, facilitating easy access to visit the cases and interview relevant stakeholders.

- **Effectiveness of AR projects:** The cases were selected from the winners of the NRP[4] Golden Phoenix prize, a prestigious prize in the Netherlands, thereby ensuring their effectiveness.

- **Change of function (adaptive reuse):** The selected buildings have undergone significant changes in function and now serve public purposes, accommodating diverse groups of people.

- **Monumental status:** The chosen buildings are among the listed heritage buildings. It is recognized that the AR process for national, provincial, or municipal monuments is usually more complex compared to non-listed buildings.

- **Located outside of G4 cities** (Amsterdam, Rotterdam, Utrecht, and The Hague) ("Gemeentegrootte en stedelijkheid," n.d.): It was preferred that the selected cases be situated outside of these cities. This decision stems from the assumption that being located in these cities might positively influence case effectiveness,

4 Het Nationaal Renovatie Platform in Dutch; in English: The National Renovation Platform

independent of the tools and methods employed by architects. Since this research aims to investigate the processes, methods, and tools utilized by architects, potentially leading to higher effectiveness, cases were chosen outside of these cities to mitigate any such positive impact.

- Availability of documents and willingness of the architects and other stakeholders to contribute to the research: The selected cases had ample documentation available, and their architects expressed willingness to contribute to this research.

These criteria led to the selection of four AR projects, which included the LocHal project in Tilburg, Energiehuis in Dordrecht, Blokhuispoort in Leeuwarden, and Fort van Hoofddorp in Hoofddrop.

4.2.2 Methods

A combination of qualitative methods was employed, including literature review, semi-structured interviews, and case visits. Published literature on the selected cases and documents provided by architectural firms were reviewed to gather background information for the case studies. Subsequently, the cases were visited to gain an impression of the project outcomes and their effectiveness.

In preparation for the case study research, a review of the literature focusing on case study research methods (e.g., Ying, 2018) was conducted. Case study research, particularly through interviews with architects, is a prevalent method for understanding (re)design processes (Darke, 1979; Roy, 1993). In this research, alongside visiting each case, architects responsible for the AR were interviewed to collect firsthand data about the process. The interviews were designed to address the following questions:

- Have the architects followed all the steps identified in the proposed theoretical model of AR (Figure 4.2)? If so, in what order?

- Which methods and tools did the architects utilize in the AR process?

Following the methodological approach proposed by Hennink et al. (2020), an interview protocol was developed. Questions were formulated (see Appendix 4.1), tested, and rehearsed in a pilot case. Subsequently, interviewees were selected, contacted, and interviewed.

Interviews carry the risk of bias, potentially reducing the reliability of collected data (Salazar, 1990). To address this risk, several strategies proposed by researchers in qualitative research methods (e.g., Hennink et al., 2020; Salazar, 1990) were implemented. These strategies included using open-ended questions, neutrally summarizing points mentioned by the interviewee, allocating similar timing to different questions, and utilizing probes during interviews.

To gain a comprehensive understanding of the architects' role within the selected projects and mitigate potential biases, interviews were also conducted with other stakeholders. A modified version of the questions (see Appendix 4.2) was used for these interviews. Stakeholders were selected based on either suggestions from architects or the authors' choice regarding the most involved stakeholders in the process.

It should be noted that this research adopted an inductive approach, drawing conclusions from case studies. While inductive reasoning typically lacks predetermined hypotheses, researchers still make implicit assumptions, as highlighted by Creswell (2009). In this research, it was assumed that observations accurately represent the studied phenomenon, implying the reliability and validity of collected data. Additionally, it was presumed that observed patterns are meaningful for theory development and that their interpretations reflect the true nature of the phenomenon. Implicit assumptions also exist regarding the generalizability of findings to other contexts or populations, as well as the relevance of the data collection context.

4.2.3 Analysis of Collected Data

The automatic transcription of recorded interviews was conducted using the Otter.ai tool and subsequently reviewed by the authors. Following this, the Atlas.ti tool was employed to support data analysis. To analyze the transcriptions of the interviews, three distinct groups of codes were created:

- **Process steps codes:** The questions were structured based on the theoretical model presented in Figure 4.2, aligning the content analysis with this model. Initially, all steps in the AR process mentioned by the architects were coded. Additionally, the questions included inquiries about the sequence of steps followed by the architect. Consequently, the order and interconnections between steps were analyzed. Based on the results, the authors drew a scheme for each case, illustrating the steps followed and the connections between them (see Section 4.3).

- **Stakeholders codes:** Segments of responses from interviewed stakeholders and architects, containing information on other stakeholders and their influence on the architects' role, were coded as "stakeholders". This code facilitated the development of conceptual schemes for each case in the results section, depicting the impact of other stakeholders on the architects' role.

- **Methods and tools codes:** At the end of each series of questions concerning a specific step in the AR process, when applicable, information about the methods and tools used by the architects was solicited. Responses to these questions were coded as "methods and tools".

  Furthermore, the relationship between the AR process and the final effectiveness of the projects was further explored. This investigation was based on contextual analysis of the interviews and the effectiveness criteria outlined in the NRP jury reports of the winners, utilizing criteria and aspects identified and investigated by the authors previously (Arfa et al., 2022). Effectiveness in AR projects was defined based on six criteria: "social value creation", "sublimation-architectural aspects", "sublimation-cultural aspects", "environmental sustainability", "economic value creation", and "innovation".

  To ensure objectivity in evaluation, only the effectiveness criteria mentioned in the NRP reports of each case were considered. Consequently, the projects may have had additional positive impacts not mentioned in the NRP reports and thus not considered in this research. In compiling the results section of the paper, data collected from the literature on the cases and case visits were also utilized.

4.2.4 Terminology

Throughout the paper, certain terms are used repeatedly and may have varying interpretations. To maintain consistency, the following definitions have been adopted:

- **Adaptive reuse (AR):** "The process of converting a building to a function that is significantly different from the original function" (Douglas, 2006).

- **Method:** *"A particular way of doing something"* ("Cambridge Dictionary," n.d.). In this paper, the term refers to the specific way that architects act in the steps of the AR process.

- **Tool:** *"Something that helps for doing a particular activity"* ("Cambridge Dictionary," n.d.). In this paper, the term indicates specific tools that architects utilize in various methods during the AR process.

- **Effectiveness:** *"The ability to be successful and produce the intended results"* ("Cambridge dictionary," n.d.-d). In this paper, the criteria of effectiveness in AR projects proposed by Arfa et al. (2022) have been used to examine the relationship between the steps of the AR process and the project's effectiveness.

- **Stakeholders:** The following terms are used to reference different groups of stakeholders (Aigwi et al., 2021):
  - Users: The "user" stakeholder group is subdivided into three sub-groups
    - Original users, i.e., former tenants of a heritage building.
    - End-users, i.e., potential or future tenants of a reused heritage building.
    - Members of the community and passers-by.
  - Producers: This group includes all participants involved in the preparation of an AR process, comprising various construction experts (e.g., architects, cultural history experts, environmental sustainability experts, etc.). These may vary for different projects.
  - Investors: "Investors" in an AR process can be private owners of heritage buildings, funding agencies, governments, tenants, etc.
  - Regulators: "Regulators" typically consist of government officials at the local and national levels whose role is to establish regulations and ensure that "producers" strictly adhere to relevant regulatory procedures during the AR process. These regulations include building codes, health and safety regulations, heritage protection regulations, planning and zoning regulations, etc.

  It should be noted that interviewees were either architects or other stakeholders from the groups of "investors" and "regulators", recognized and considered as the most influential stakeholders in the process. Therefore, whenever the text quotes "according to the interviewed stakeholders", it implies one of these two mentioned groups.

4.3 Results

In this section, the results of the data analysis are provided. The analysis includes a summary of the history of each selected case, followed by an analysis of the role of stakeholders and their influence on the architects' role during the AR process. Subsequently, the analysis provides an overview of the actual steps followed in the AR process, including the tools and methods employed, along with their possible effects mentioned in the NRP jury reports.

4.3.1 The LocHal Project in Tilburg

A Brief History of the LocHal

The LocHal (Locomotive Hall) is a former train workshop in the Spoorzone of the city of Tilburg in the Netherlands. This locomotive shed, dating back to 1932, was originally owned by the Dutch Railways and served as a facility for repairing defective locomotives. In 2010, the municipality of Tilburg acquired the hall from the NS (Dutch Railways). Plans were formulated in 2012 to repurpose the locomotive hall into the new Tilburg city campus. Subsequently, in 2015, the building was officially recognized as a municipal heritage site. The AR of the hall commenced in 2017, with a transformation period spanning two years. Ultimately, the building was repurposed into a center for art, culture, and community gatherings (see Figure 4.3), with the De Bibliotheek Midden-Brabant library being the largest user (Kok, n.d.).

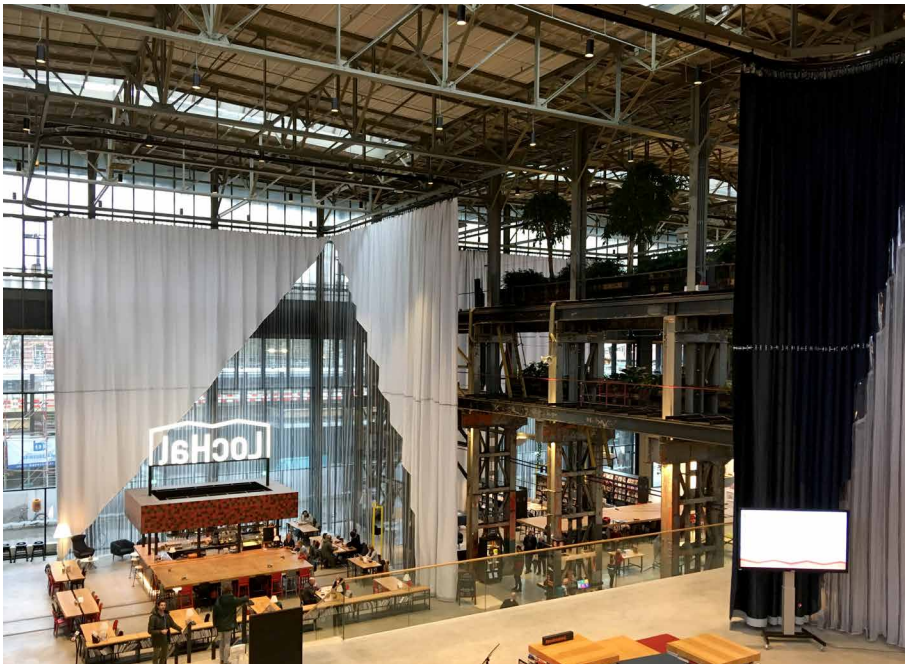

FIG. 4.3 Interior of the main open space (library, café, etc.) of LocHal in Tilburg (Wido Quist, 2020)

Stakeholders in the Adaptive Reuse Process of the Building and Their Influence on the Architects' Role

The AR process of the LocHal was characterized by its complexity, owing to the involvement of various groups of architects, users, and other stakeholders, thus rendering it a participatory AR process. Figure 4.4 illustrates the stakeholders involved in the project and their respective roles, based on the collected data.

The project commenced with a European tender, wherein the architects asserted that their winning design struck a balance between affordability for stakeholders and the added value it would bring to the community. Throughout the AR process, the municipality actively participated in monthly meetings with the architects, spanning from Steps 0 to 1 and Steps 3 to 6. Regulators were engaged in the early steps (Steps 0 to 4) as well as later steps (Steps 5 and 6) and were influential on the architects' strategies (see Figure 4.4). Nevertheless, the architects made concerted efforts to reconcile the demands of investors and regulators with their own design proposals.

Various groups of producers were involved in the project, such as ARUP company for contributing to the improvement of the building's energy efficiency and environmental sustainability. Discussions with the original users played a pivotal role in recognizing the intrinsic values of the building. According to one architect, *"It's not just about the historic values but also the social values related to the space and function"*.

LocHal Project in Tilburg
Role of the architects and the influence of other stakeholders on their role

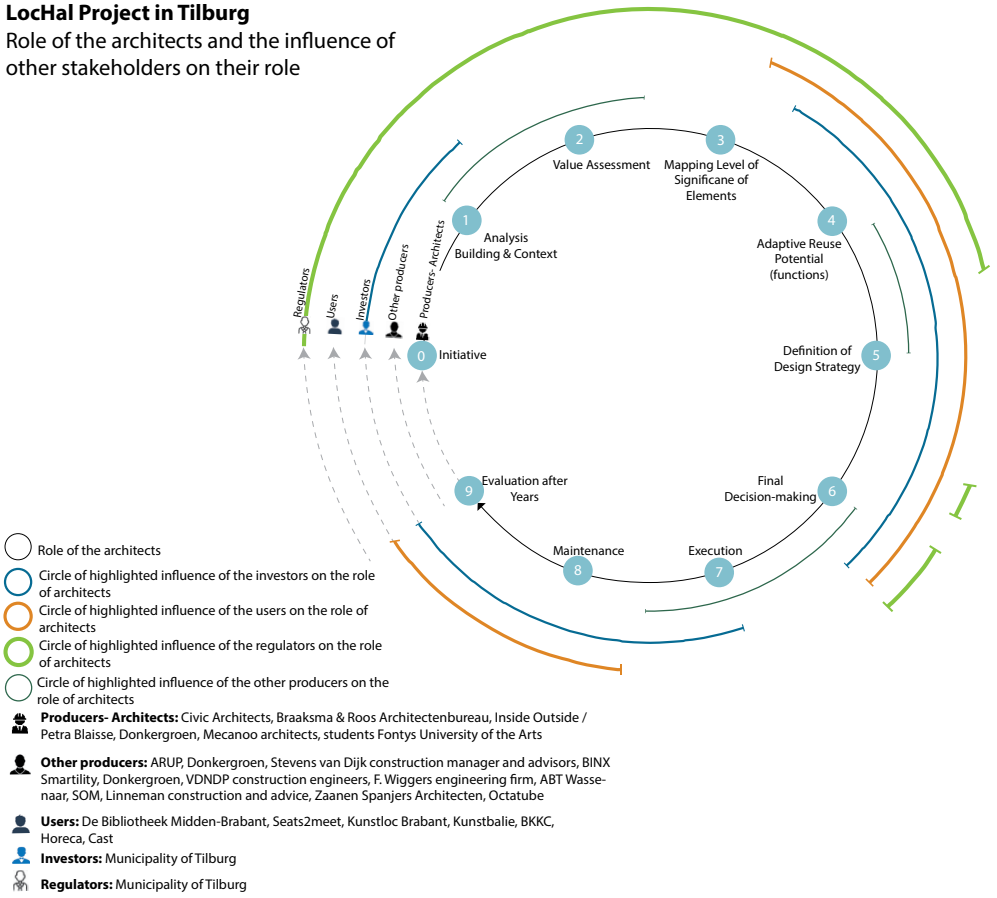

FIG. 4.4 The involvement of the architect and other stakeholders in the AR process

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The AR Process and the Used Methods and Tools in the AR Process of the LocHal Project

The Braaksma & Roos office conducted the heritage analysis, sourcing data from NS archives in Tilburg and Amsterdam. Collaborating with cultural-historical experts, the architects assessed the building's value and mapped the significance of its elements to decide which parts to keep and which to modify.

The AR of the building, as recognized by NRP jury reports, showcased specific cultural sublimation effects. These effects included "respect for history, authenticity, and materials", as well as "preservation of heritage building characteristics" ("LocHal," 2019). The positive outcomes may be attributed to meticulous data collection from various archives, site analysis, and regular building visits during Steps 1 to 5.

Following the preliminary steps, architects engaged end-users in multiple meetings to understand their needs. Involving end-users throughout the process, architects presented diverse sketches, 3D models, and renders for feedback.

In defining the design strategy (Step 5), interviews revealed several key approaches employed by the architects:

- Maintaining the building's originality and spatial qualities while enhancing its attributes
- Upgrading previous technologies used in the heritage building
- Facilitating open dialogues with end-users, to incorporate their input judiciously
- Employing innovative strategies rather than traditional approaches, such as constructing closed boxes within the heritage building
- Enhancing connectivity within the building and prioritizing occupants' well-being and interior climate quality.
- Adopting a continuous and cyclical approach to the reuse process, exemplified by their developed model (Figure 4.5) based on Nota Belvedere ("Nota Belvedere," 1999)

Furthermore, positive impacts noted by the NRP jury included the "creation of multifunctional spaces", "clear orientations in the new design", "creation of a pleasant atmosphere", and "effective preservation through contemporary additions" ("LocHal," 2019). These architectural impacts were influenced not only by methods and tools but also by the design strategy employed. Thorough spatial analysis, multiple visits, and observation of other effective AR projects of industrial heritage buildings contributed to the development of an effective interior landscape focused on users' needs.

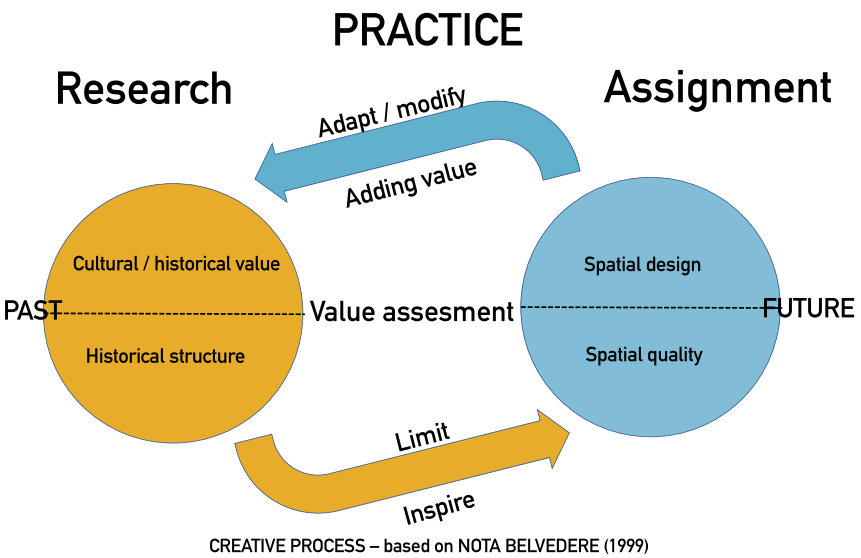

FIG. 4.5 The creative process applied by the architects (Graeven, 2019)

The interviewed architects and stakeholders reported they had regular meetings with various stakeholders. They mentioned that the positive attitude of the stakeholders made the final decision-making (Step 6) rather smoother than what was expected. That being said, according to the architects, "final decision-making" was the point where some new challenges arose and it was the point that a further check on the previous steps was needed. For example, one of the stakeholders was not satisfied with their place entrance design in the LocHal building. Thus, the architects needed to recheck the previous steps and reach to a consensus with the stakeholders before execution.

According to the architect, execution (Step 7) was generally successful, attributed to the contractor's flexibility and eagerness to establish their company's reputation through the project, despite challenges and disagreements. Architects remained involved post-completion to address design modifications if needed (Step 8), such as altering a door design to address indoor climate issues several months after execution.

Architects mentioned the “evaluation after years” (Step 9) as an important step in which architects learn to reflect on their projects and draw lessons for future projects. Systematic analysis by architects involved regular visits to LocHal, brief conversations with end-users and tenants, and gathering feedback. Although interviewees expressed overall satisfaction with the outcome (the interview was conducted in 2022), one critique centered on the interior design, suggesting a desire for a more industrial and contextually connected aesthetic: “*The interior design is fine, but we would have liked something that was really more industrial and more connected to the building. It’s a typical interior design that you see in every library and building*”.

The NRP jury report highlighted a wide range of aspects provided by the AR of this building, including various benefits such as “strengthening community attachment” and “creating an inclusive environment” (“LocHal,” 2019). Original and end-users played crucial roles throughout Steps 1 to 9. Architects involved original users in Steps 1 and 2 to gather their ideas about the building and its potential positive or negative aspects. Subsequently, architects engaged with end-users in Steps 4 to 7 for further discussions regarding their needs. Finally, they monitored the building and community satisfaction in Step 9.

The architects from the Braaksma & Roos office provided positive feedback on the theoretical model (Figure 4.2), acknowledging its insightfulness and accuracy regarding the sequence of steps. However, they highlighted the complexity of certain steps beyond the simplistic depiction of straightforward arrows. They noted that some steps contained inner loops, complicating the process. They emphasized that “final decision-making” introduced new challenges, particularly involving stakeholders, necessitating a revaluation of previous steps (Steps 1, 2, and 3) and impacting subsequent ones (Steps 4 and 5). They advocated for a more participatory approach, involving a wide array of stakeholders, including users, from the outset to mitigate challenges. Nevertheless, they acknowledged that even with increased participation, the steps leading to execution (Step 7) remained non-linear.

The codification of interview transcripts provided insights into the actual steps followed in the AR of the LocHal project (Figure 4.6), reaffirming the complexity and iterative nature of the process described by the architects.

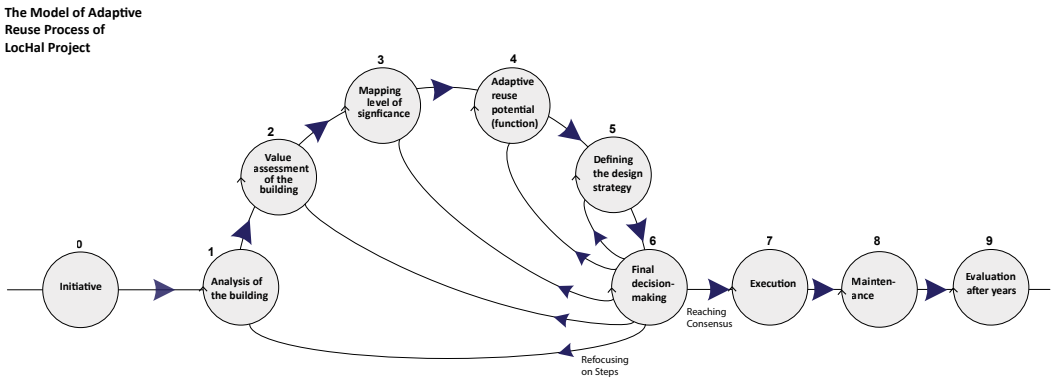

FIG. 4.6 The AR process of the LocHal, based on the analysis of the process and the interviews with stakeholders

4.3.2 Energiehuis Project in Dordrecht

A Brief History of the Energiehuis

The Energiehuis, situated in Dordrecht, the Netherlands, is a former power station dating back to 1910. Originally constructed in three phases, the Energiehuis comprises six machine and boiler halls, making it a significant industrial heritage building. With the inauguration of a modern energy plant in 1960, the Energiehuis ceased to serve its primary function as a power station. In 2011, the AR project of this building commenced. By 2013, the Energiehuis had been transformed into a vibrant cultural center, serving as a stage, production house, rehearsal space, and educational and meeting venue for both amateurs and professionals, including young makers and producers. The municipality of Dordrecht had the vision to swiftly transform the Energiehuis into a prominent regional cultural and recreational attraction. Following its AR, the Energiehuis was officially listed as a municipal monument. According to a stakeholder interviewed, this listing occurred post-project completion to mitigate potential limitations arising from its historical significance (Chatzi Rodopoulou, 2020; "Energiehuis, Dordrecht," n.d.). Figure 4.7 illustrates the building's appearance post-AR.

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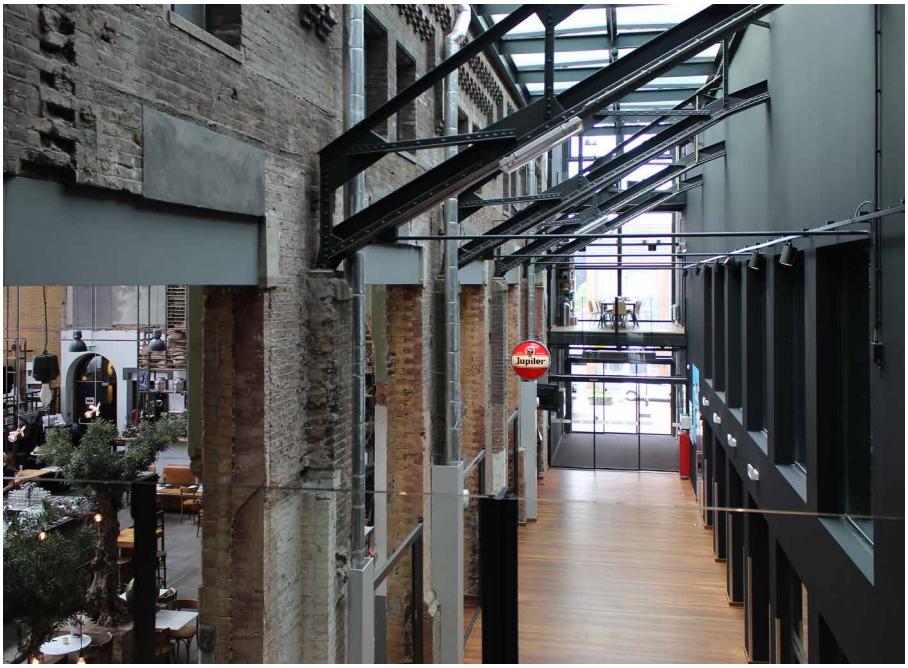

FIG. 4.7 Interior of the main corridor of Energiehuis Project in Dordrecht (2022)

Stakeholders in the Adaptive Reuse Process of the Building and Their Influence on the Architects' Role

Figure 4.8 outlines the stakeholders involved in the project and their respective roles, based on the collected data. The municipality of Dordrecht initially aimed to establish a new theatre for the city but faced opposition from certain political factions regarding the AR of the building. However, through persuasion and consensus-building, the municipality proceeded with a tender process, ultimately selecting the TenBrasWestinga firm to lead the design.

Investors consistently supported the process, playing a facilitative role. The responsible authority within the municipality effectively guided proceedings throughout.

Regulators, instrumental in the project's initiation and decision-making step, demonstrated a commitment to realizing the project as a source of pride for Dordrecht. They actively supported its accomplishment.

Producers, including engineering companies (see Figure 4.8), engaged at various steps of the process, displaying flexibility in adjusting plans to accommodate changes driven by budget constraints. Motivated by the project's scale, they remained committed to its success.

Following their successful bid, architects conducted meetings with end-users to ascertain their requirements. However, subsequent budget cuts necessitated modifications to the design schemes. The architects' adaptability in response to these changes proved pivotal in sustaining the project's momentum.

Energiehuis Project in Dordrecht
Role of the architects and the influence of other stakeholders on their role

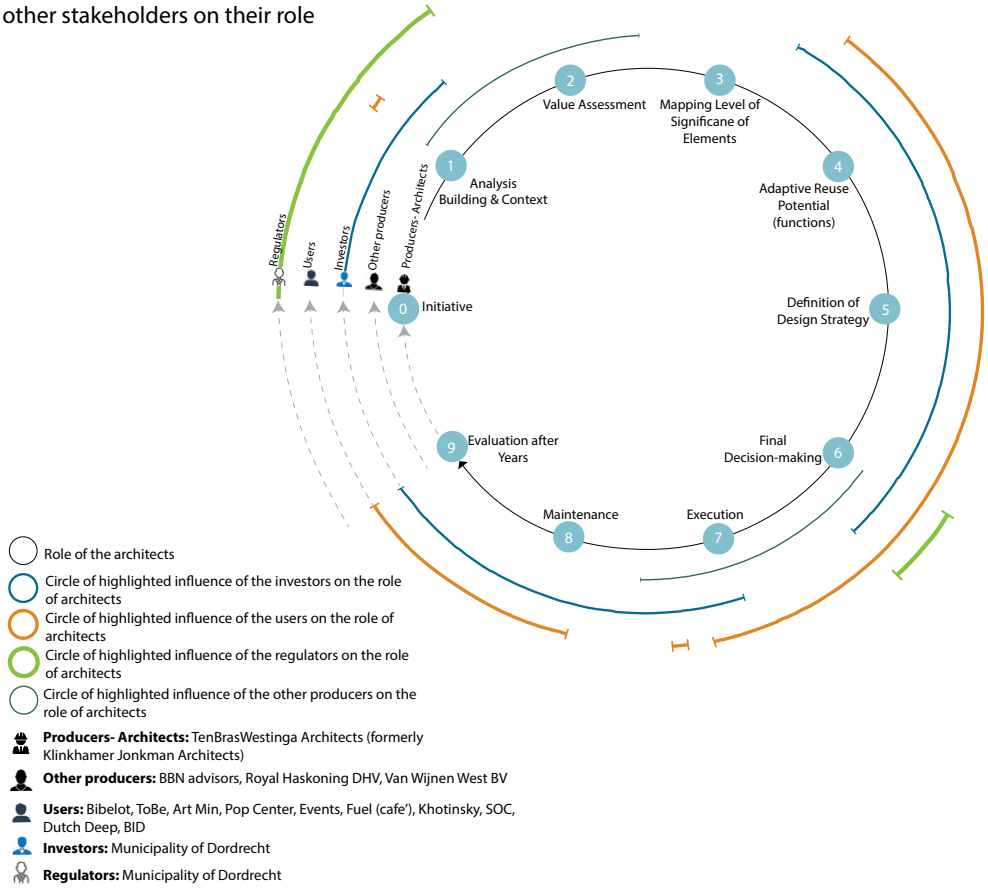

FIG. 4.8 Role of the architects and the influence of other stakeholders on their role based on the analysis of the collected data.

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The AR Process and the Used Methods and Tools in the AR Process of the Energiehuis Project

The selected architecture firm was invited by the municipality of Dordrecht to participate in the tender process. Upon winning the tender, the architects diligently proceeded through each step, including extensive data collection, notably involving original users.

End-users' input regarding their requirements was solicited in Step 4. During the meetings with end-users, the architects employed various tools, such as 3D renders, to articulate ideas effectively.

As highlighted in the NRP jury report, some positive impacts of the AR project included "clear orientations in the new design", "increased functionality of the heritage building", and "effective preservation through contemporary additions" ("Cultuurcentrum Energiehuis," 2014). The architects prioritized recognizing and enhancing the architectural values of the building, employing architectural tools such as sketching and capturing photos for understanding the space and 3D renders to facilitate discussions with producers regarding potential interventions.

Analysis of interviews revealed several design strategies applied by the architects in Step 5:

- Showing the scars of the heritage building instead of fully covering them with plasters
- Making old and new parts of the building visible
- Preserving the authenticity of the building

According to the interviewees, close collaboration between architects, regulators, and investors facilitated smooth decision-making in Step 6. However, issues arose during cost calculation, necessitating a reduction of built area, and prompting architects to revisit previous steps for modifications.

In Step 7, mediation by architects resolved conflicts between regulators (who were investors as well) and one group of producers regarding deadlines. The exemplary cooperation among stakeholders highlighted in the NRP jury report ("Cultuurcentrum Energiehuis," 2014), may have been influenced by their common goal, as was understood during the interviews, to elevate Dordrecht.

The NRP jury report highlighted several positive aspects, including the Energiehuis serving as a "vibrant cultural, educational, and social center that meets the needs

of residents and others". It also noted the "significant positive impact on the surrounding area" ("Cultuurcentrum Energiehuis," 2014). The involvement of original and end-users at various steps raised awareness about the project and its values. Furthermore, the engagement of local producers, such as construction companies, likely increased community attention to the building. Architects remain actively involved in aftercare (Step 8), intervening when changes are necessary. According to the interviewees, they do no visit the project regularly (Step 9), but only if a change is needed.

The main architect evaluated the theoretical model (Figure 4.2) as helpful for future assignments but suggested renaming Step 8 from "maintenance" to "aftercare", emphasizing that maintenance is mainly technical but the architects' responsibilities involve adapting the previous design and providing ongoing care for the project. He found the model too simplified, noting that all steps from analysis (Step 1) to final decision-making (Step 6) involved inner loops. According to him, in Step 6, budget constraints necessitated a reduction in construction areas, requiring a revaluation from Steps 1 to 4. Additionally, issues arose in Step 4 regarding the location of a business within the building, prompting a reconsideration of Steps 1 to 4 to reach a consensus with the end-users. Figure 4.9 outlines the AR process of the Energiehuis based on interviews and collected data.

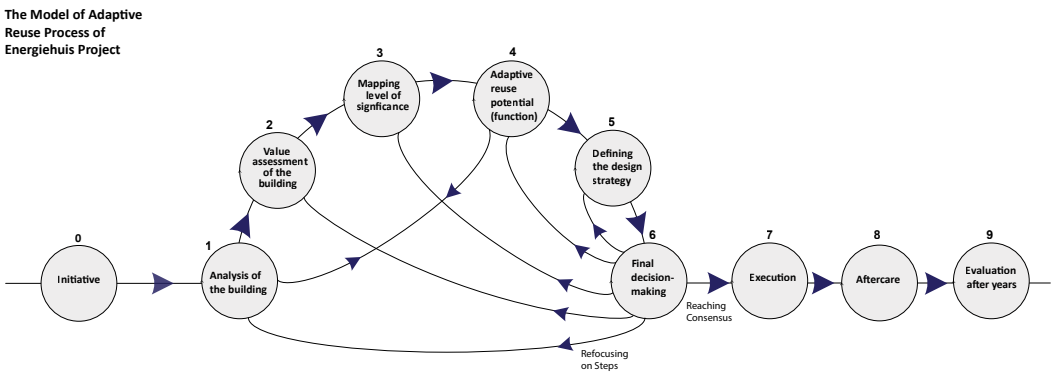

FIG. 4.9 The AR process of the Energiehuis, based on the analysis of the process and the interviews with stakeholders

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4.3.3 Blokhuispoort in Leeuwarden

A Brief History of the Blokhuispoort

The Blokhuispoort is a historic complex in Leeuwarden that formerly served as a detention center until December 2007. Due to its inability to meet modern safety standards, the complex ceased its correctional operations. Built in 1877, the complex sits on a site with a prison history dating back to the 16th century, featuring 180 cells. It holds the status of a listed national monument. Following the closure, the complex underwent AR, acquiring various new functions. Since 2015, ownership has been held by BOEi (Organization for the Restoration and Adaptive Reuse of Cultural Heritage in the Netherlands), with support from the municipality of Leeuwarden and the province of Friesland. In 2018, coinciding with Leeuwarden's designation as the European Capital of Culture, the Blokhuispoort became a focal point for cultural activities, serving as a vibrant hub for the city. Within the complex, visitors can explore the library (Figure 4.10), offices for start-ups, attend concerts, enjoy catering facilities, and even host events.

FIG. 4.10 Interior of the library of the Blokhuispoort Project in Leeuwarden (2021)

Stakeholders in the Adaptive Reuse Process of the Building and Their Influence on the Architects' Role

Figure 4.11 delineates the stakeholders involved in the project and their respective roles, based on the collected data. Investors included BOEi, the Municipality of Leeuwarden, and the Province of Friesland. BOEi was tasked by the municipality to lead the reuse project. The municipality of Leeuwarden, acting as both regulator and investor, aimed to relocate the city's library to the Blokhuispoort. TWA architecture firm joined the AR process between Steps 0 and 1. Different groups of producers were involved in the project. For example, cultural-historian experts influenced the architects' decisions from Steps 1 to 4, offering insights without restricting design strategies. The primary user, the Library of Leeuwarden, initially resisted relocation but eventually agreed after persuasion from regulators and investors. Several meetings were held with tenants, original users, and architects to address concerns and progress with the project.

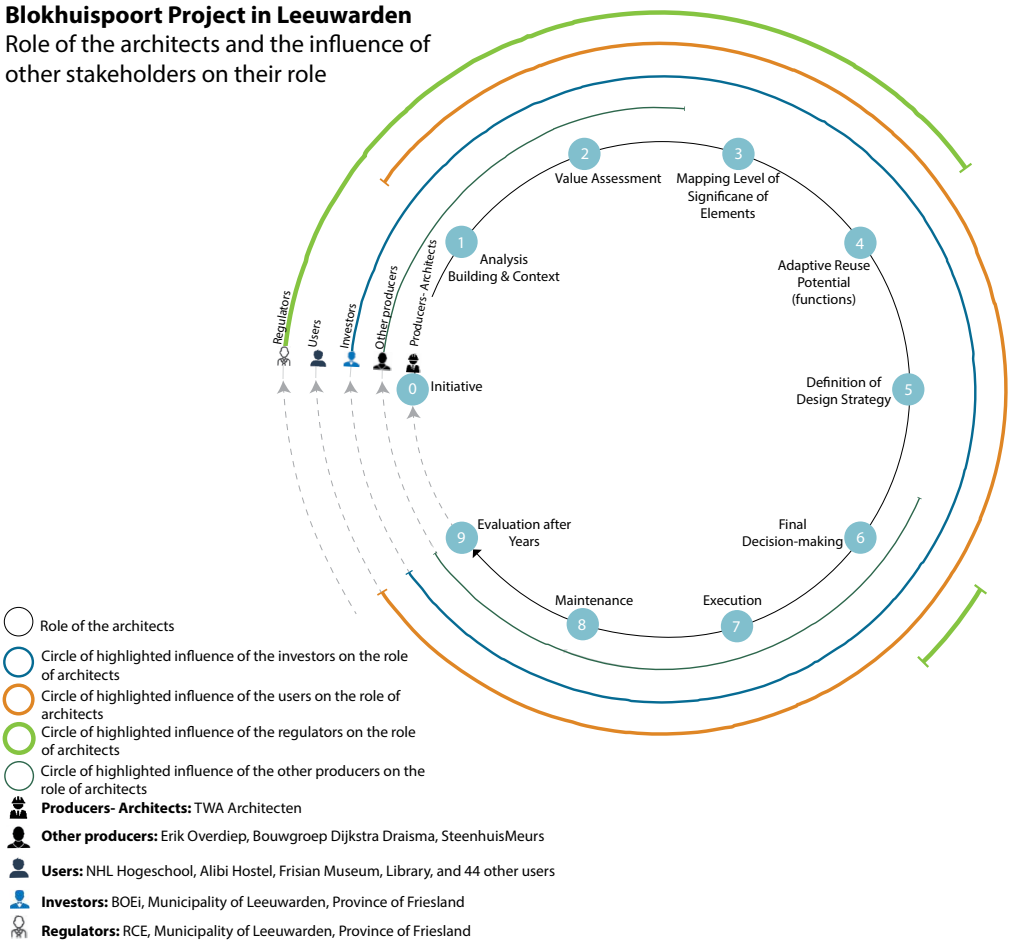

FIG. 4.11 Role of the architects and the influence of other stakeholders on their role based on the analysis of the collected data

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The AR Process and the Used Methods and Tools in the AR Process of the Blokhuispoort Project

The municipality invited the architect to conduct a feasibility study for the complex. Together with stakeholders from RCE[5], they determined that a library and hostel would be suitable for the site. Due to project urgency, many steps were simultaneously undertaken. Step 1 involved analysing the building and its context, leading to a conclusion that maximizing public accessibility was crucial. in the NRP jury report. According to the NRP jury report, increasing accessibility is one of the positive effects of the project ("Blokhuispoort," 2018).

The interviewed architect criticized the tool proposed by RCE (Hendriks, and van der Hoeve, 2009) for mapping the level of significance (Step 3). This tool has three colors, including blue, green, and yellow, for categorizing the historic values of the heritage buildings. According to the architect, *"Green is a little bit important and yellow is not important. If you take care of the blue parts, you can remove the other parts; but I did not use this tool as there are social and collective values in those yellow parts as well".*

According to the interviewed architect and stakeholder, Step 4 (adaptive reuse potential (function)) was not conducted in a systematic order after Step 3. However, the NRP jury report has highlighted "finding an appropriate use to secure the future of the heritage building" as a significant aspect of architectural sublimation in this AR project. Moreover, in the same report, the chosen function has been appreciated for "housing smaller businesses and workshops spaces for creative businesses", which has led to the positive effect of economic value creation. Moreover, a notable outcome mentioned in the NRP jury report was "strengthening the local community's attachment to the site" ("Blokhuispoort," 2018). The data analysis showed that it was achieved through the involvement of original users in Steps 1 and 2 and regular meetings with end-users from Step 4 to the end.

Several design strategies (Step 5) could be identified from the analysis of the interviews:

- Adding a new chapter to the history of the building
- Applying a unified style to the interior and exterior design of the entire complex
- Combining technical solutions with improved functionality and well-being

5 Rijksdienst voor het Cultureel Erfgoed (RCE) in Dutch; in English: Cultural Heritage Agency of the Netherlands

These design strategies might have led to the sublimation-cultural effects highlighted in the NRP jury report as "telling the history of the building by using digital and innovative technologies" and "preservation of the unity of the heritage building" ("Blokhuispoort," 2018).

Triweekly meetings facilitated smooth decision-making (Step 6), with a focus on completing essential parts due to budget constraints.

During the execution of plans (Step 7) the architect played an active role, overseeing quality and accuracy on-site. Despite smooth progress, high costs necessitated prioritizing essential areas like the library, delaying others. According to the architect, BOEi's management of the process, particularly in execution, proved invaluable. The interviewees emphasized the positive effect of the extensive experience of BOEi and their team in managing the execution, contracts, and hiring professional producers in this step.

Monitoring and maintenance (Step 8) are handled by BOEi, with the architect being consulted if a change in function and design is needed.

Evaluation of the project (Step 9) lacks a systematic approach and primarily relies on feedback from various committees (e.g., NRP prize) and stakeholders (such as architects and producers). This feedback is collected through visits to the buildings and unstructured interviews with end-users. Notably, the library within this complex (dbieb) was awarded the best library in the Netherlands in 2019 (Starink, 2019).

The architect interviewed acknowledged the potential utility of the theoretical model (Figure 4.2) for the AR process. However, he underscored that the implementation of the process for Blokhuispoort was not as systematic as depicted in the figure, primarily due to time constraints. He remarked, *"There was no time to go through the process step by step; sometimes we had to do a brief analysis [Step 1] and then immediately develop a design strategy [Step 5]".* Nevertheless, the analysis of the collected data indicated that all the steps were still incorporated into the process. Various steps were concurrently underway in different parts of the complex. For instance, while architects were finalizing design strategies (Step 5) for a part of the complex, other parts were at the analysis step (Step 1). This approach sometimes necessitated adjustments to the architect's strategies for other parts (as indicated by the arrow from Step 6 to Step 5). This highlights the pragmatic nature of the reuse process, with steps occasionally conducted in reverse order (Steps 1 to 6 and sometimes Steps 6 to 5, 4, 3, 2, 1). Analysis of responses from interviewed architects and stakeholders, along with transcript codification, elucidated the steps of the process (Figure 4.12).

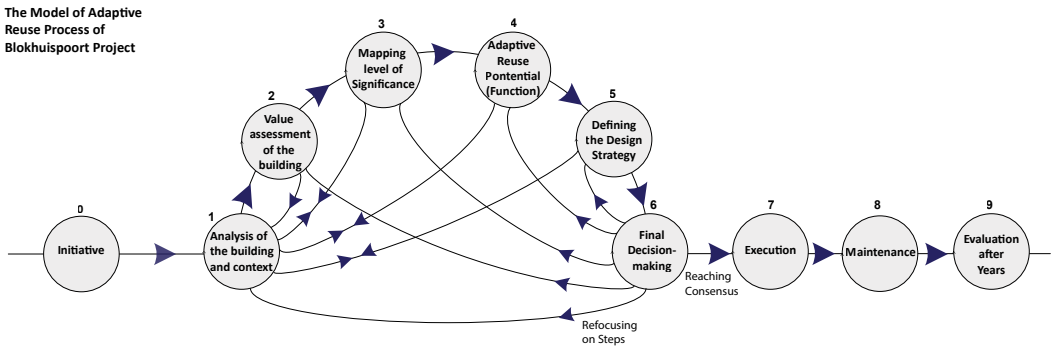

FIG. 4.12 The AR process of Blokhuispoort, based on the analysis of the process and the interviews with stakeholders

4.3.4 Fort van Hoofddorp in Hoofddorp

A Brief History of the Fort van Hoofddorp

Fort van Hoofddorp, situated in the province of North Holland, is a municipal monument dating back to 1904. As a part of Stelling van Amsterdam defence line, it was designated as a UNESCO World Heritage site in 1996. The fort served various functions over the years. Initially utilized as a fortification, it later housed a local shooting club and briefly functioned as a music school. In 2010, two private individuals spearheaded an initiative for its AR, proposing its transformation to the municipality. Securing financial backing for the project proved challenging, resulting in a prolonged process. Finally, in 2020, the building was unveiled to the public as a multifunctional cultural center (Figure 4.13), featuring educational, recreational, and event spaces, alongside a theatre (“Fort van Hoofddorp” n.d.).

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FIG. 4.13 Interior of one of the educational rooms of Fort van Hoofddorp (2022)

Stakeholders in the Adaptive Reuse Process of the Building and Their Influence on the Architects' Role

Figure 4.14 illustrates the key stakeholders involved in the AR process of Fort van Hoofddorp, based on the collected data. The project was initiated by two private individuals, one of whom also served as the project's architect. However, it took eight years to secure adequate financial support for the project's realization.

Regulators played a supportive role by offering initial funding for feasibility studies, which was crucial for initiating the project. Additionally, producers aided architects in construction analysis and historic-cultural value assessments of the building.

Furthermore, engaging with the local community was integral to the process, particularly the fort's neighbors. Regular meetings were held to raise awareness about the project and garner support from the community.

Fort van Hoofddorp Project in Hoofddorp
Role of the architects and the influence of other stakeholders on their role

FIG. 4.14 Role of the architects and the influence of other stakeholders on their role based on the analysis of the collected data

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The AR Process and the Used Methods and Tools in the AR Process of the Fort van Hoofddorp Project

The two private individuals initiated the project, with one of them serving as the project architect. Consequently, they swiftly progressed through Steps 1 to 5. The NRP jury recognized the innovative nature of this private-led initiative, acknowledging its positive impact and potential as a replicable model for similar cases, particularly concerning vacant forts in the Netherlands (*NRP Jury Report*, 2021).

Upon presenting the design to the municipality and seeking a building permit (Step 6), the lack of investors delayed progress for years. Subsequently, upon securing financial support, one of the initiators (the architect) revisited Steps 1 to 5, meticulously preparing detailed drawings and designs. During this period, he considered input from other stakeholders while also adhering to his own approach.

The evaluation by the NRP jury highlighted several positive impacts as sublimation in cultural aspects, including the "realization of a heritage building with future value", "presentation of the site's history for public viewing", and "preservation of the building's unity" (*NRP Jury Report*, 2021). Additionally, aspects such as "creating a pleasant atmosphere", "effective preservation via contemporary additions", and "attention to detail in recuperating the building" were noted as sublimations in architectural aspects. The identification of spatial qualities and values of spaces, identified in Steps 1 to 4, and regular site visits during these steps likely contributed to these outcomes.

Regarding the definition of design strategy (Step 5), analysis of the interviews revealed the following strategies applied by the architects:

- Preserving and enhancing the spatial and aesthetic qualities and atmosphere of the building rather than simply maintaining its original state
- Designing appropriate additions and modifications in the building to make it more functional and comfortable

During final decision-making (Step 6), the architects and the municipality engaged in numerous meetings with residents to address concerns and obtain permits, spanning two years. The project was recognized for its social value creation, but the need for further validation over time was noted by the NRP jury. Increasing involvement from the local community in current activities could enhance this aspect (*NRP Jury Report*, 2021).

As the main architect also serves as the investor, he is actively involved in aftercare (Step 8), regularly visiting the project and evaluating it from various perspectives, particularly architectural aspects and its attraction to visitors (Step 9).

The AR process of the Fort van Hoofddorp project, as confirmed by the architect, aligns with the theoretical model depicted in Figure 4.2. However, the architect emphasized that architects are primarily involved in "aftercare" rather than "maintenance". The process was relatively lengthy, spanning approximately 10 years for the architect. While all steps were followed, the progression between Steps 1 to 6 took a significant amount of time. During the final decision-making phase, where financial support was secured, the architect revisited all steps (from 1 to 6) to conduct a more thorough investigation. This examination of each step contributed to the effectiveness and quality of the project.

The AR process, derived from the data analysis, is illustrated in Figure 4.15.

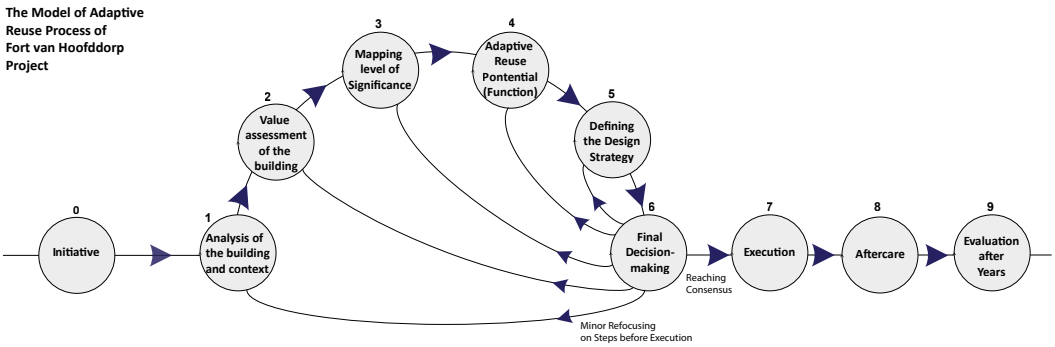

FIG. 4.15 The AR process of Fort van Hoofddorp, based on the analysis of the process and the interviews with stakeholders

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4.4 Discussion

4.4.1 Validated and Refined Steps Model for the AR Process of Heritage Buildings Based on the Investigation of the Effective Cases in the Dutch Context

Every architect or architectural firm has its unique approach to the AR of heritage buildings. Nonetheless, an examination of four effective cases in the Netherlands has uncovered a shared framework, which will be discussed in this section.

Regarding the reuse of heritage buildings, several key steps must be taken. Interestingly, all four cases followed similar steps with minor differences. Each project commenced with a comprehensive analysis. Even if this analysis was expedited due to time constraints, a reassessment was conducted before final decision-making. A significant finding from this study is the non-linear nature of the process, with loops occurring between steps preceding execution (Steps 1 to 6). According to insights gathered from the architects, stakeholders, and NRP reports, these loops seem to enhance the effectiveness of AR projects.

Drawing from the analysis of these four effective cases, the initial model (Figure 4.2) has been refined and renamed as the EARHB (Effective Adaptive Reuse of Heritage Buildings) model (Figure 4.16).

It should be noted that there are additional parallel steps focused on the involvement of other stakeholders in the AR process, which are beyond the scope of the current research.

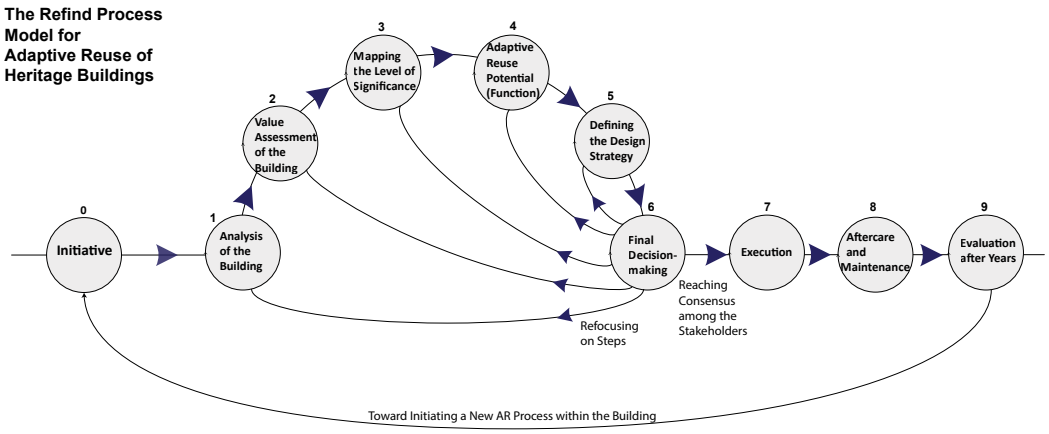

FIG. 4.16 EARHB model, adapted from Arfa et al. (2022) after validation on case studies

4.4.2 Comparative Analysis of the Architects' Role and Influence of Other Stakeholders on This Role

Analysis of the interviews revealed that in effective projects, architects play a broader role beyond design, spanning from Step 1 to Step 9 of the AR process (see Figure 4.17). Three main aspects of the architects' role emerged from the collected data:

- **Importance of professional skills complemented by soft skills:** Stakeholders in the investigated projects highlighted the significance of architects' soft skills, which positively influenced the entire process. Attributes such as openness, responsibility, effective communication, and negotiation skills were highly valued. Architects demonstrated receptiveness to criticism and possessed the ability to persuade other stakeholders with their ideas. Moreover, they exhibited a strong sense of responsibility toward their projects.

- **Adaptability to changes and adjustments in the preliminary design:** Architects acknowledged the inevitability of having initial ideas at the project's outset. However, they emphasized the importance of not being overly influenced by these early concepts before fully assessing the building's values and considering the perspectives of other stakeholders.

— **Impact of a larger number of stakeholders on the project:** This study revealed that despite the notion that a higher number of stakeholders may hinder progress, the study found that a larger stakeholder group can positively contribute to the project's final quality. In the examined projects, the presence of multiple stakeholders facilitated constructive discussions throughout the process. Consequently, if architects can effectively convey and negotiate compromises, diverse stakeholder ambitions can enhance both the process and the overall quality of the project.

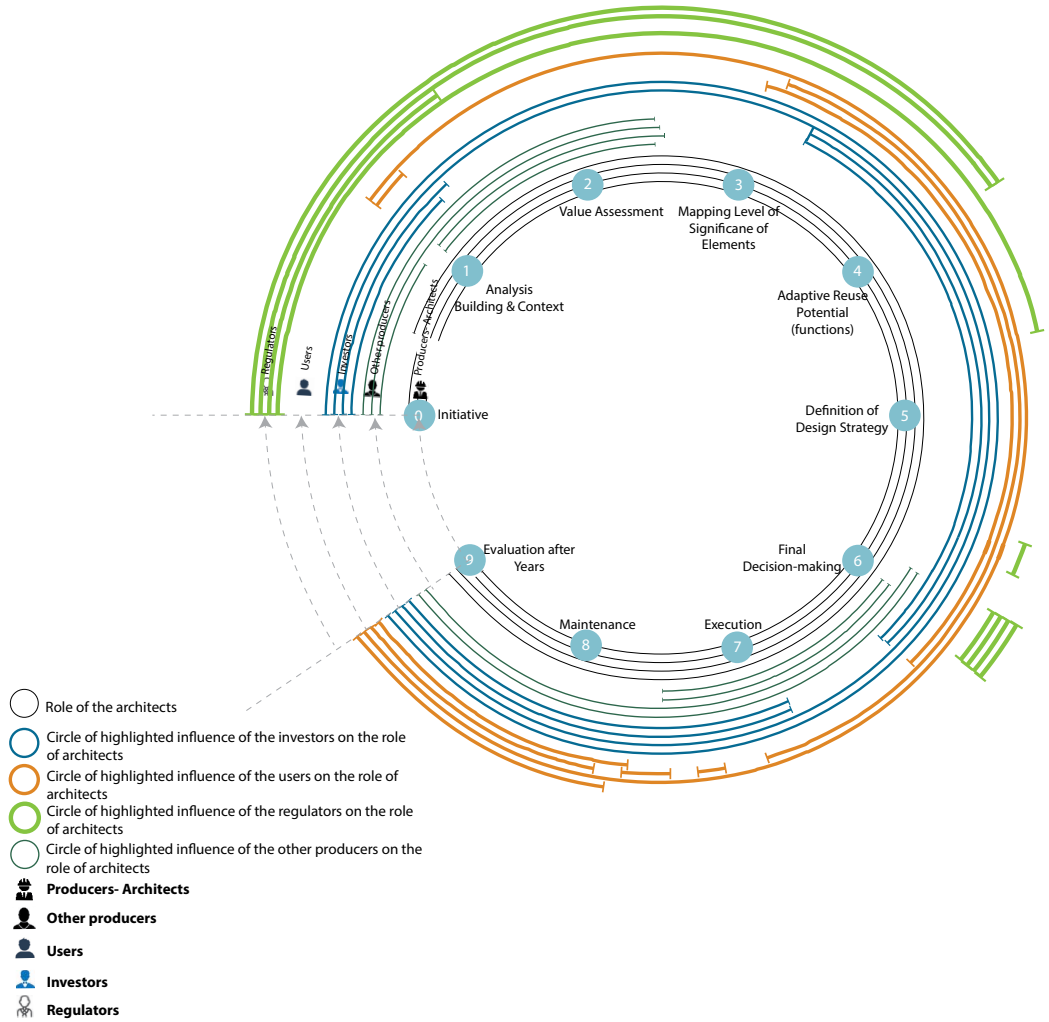

FIG. 4.17 Role of the architects and the influence of other stakeholders on their role based on the analysis of the collected data of the four investigated cases

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While this research primarily focused on the role of architects, insights from interviews with various stakeholders offer additional conclusions:

- **Role of the investors and their influence on the architect's role:** Investors, often municipalities in the studied cases, sought recognition through their involvement in AR projects, which positively impacted the outcomes. For instance, municipalities aimed to showcase their capabilities to other municipalities, fostering a sense of healthy competition and driving the process toward effective results. This trend aligns with findings from the OpenHeritage project report by Veldpaus et al. (2019), indicating a growing interest among developers and municipalities in the Netherlands toward sustainable approaches to the built environment and cultural preservation. However, the actual contribution of these projects to sustainable development goals warrants further investigation.

- **Role of the regulators and their influence on the architect's role:** Regulators played a supportive role in the AR process, ensuring its smooth progression. They valued both the historic significance and functional utility of heritage buildings, reflecting a balanced approach that evolved over time. This positive stance toward preserving heritage while acknowledging its functional value represents a significant achievement in heritage conservation policies in the Netherlands (Janssen et al., 2017).

- **Role of the other producers and their influence on the architect's role:** Various stakeholders, including cultural-heritage experts and sustainability advisors, contributed to the AR projects. Their involvement, particularly in the initial steps (Steps 1 and 2), provided valuable insights for architects to rely on. In the studied cases, local construction companies, driven by a passion to prove themselves in AR projects, were predominantly selected as producers, contributing to the projects' effectiveness.

- **Role of the users and their influence on the architect's role:** Original and end-users were actively engaged throughout the AR process (see Figure 4.17), offering input and insights. In effective cases, original users provided valuable materials such as personal stories (social values), spatial usage patterns (functional values), and technological aspects of the buildings (scientific values), aiding architects in their designs. Managing the high ambitions of end-users effectively is crucial for architects to ensure their contributions enhance, rather than hinder, the AR process's effectiveness.

4.4.3 Used Methods and Tools by the Architects in the AR Process and the Relationship with the Effectiveness of the Project

The methods and tools utilized in the investigated AR projects are outlined in Table 4.1. While there is no conclusive evidence that the project's effectiveness solely relies on these methods and tools, it is probable that their application contributes to project effectiveness. Table 4.2 indicates the potential connection between the employed tools and methods discussed in each case and the effectiveness of the projects, as noted in the NRP jury reports.

Tables 4.1 and 4.2 can serve as a toolkit for architects dealing with heritage buildings. Table 1 outlines the methods and tools employed by architects in the investigated case studies. As highlighted by previous researchers, exploring the past and precedents during the initial steps of the design process not only structures design strategies but also garners support from other stakeholders and engages a more diverse group of stakeholders (Oak, 2006; Otto, 2016; Umney & Lloyd, 2018; Zuljevic & Huybrechts, 2021). Many methods and tools in Table 1 are centered around the concepts of "participatory adaptive reuse" and "comprehensive analysis of the past (building and context)".

In Table 2, the methods and tools used at different steps are presented alongside their potential impact on effectiveness criteria within the selected projects, as reported in the NRP jury reports. It is evident that social value creation has primarily been achieved through the involvement of original and end-users (a participatory design approach (Zuljevic & Huybrechts, 2021)) and local communities. Sublimation, in terms of cultural value and architectural value, has also been considered throughout the entire AR process. However, environmental sustainability has not been significantly addressed in the NRP jury reports, nor was it emphasized by the architects during the interviews. Further investigation into the methods and tools used by architects in AR projects to enhance this criterion is needed.

The broader implications of the EARHB and its methods and tools extend beyond the AR of heritage buildings. AR is not a novel concept and is already being addressed at various urban and building scales. This model can align with the Do-It-Yourself (DIY) movement (Camburn & Wood, 2018) and serve as a guide for end-users seeking to reuse, repurpose, and repair their belongings. Additionally, the steps of "analysis", "value assessment", and "mapping the level of significance" of the model can underscore the importance of considering existing values in the early steps of urban development projects through citizen-designer engagement (Törnroth, Wikberg Nilsson, & Luciani, 2022).

TABLE 4.1 The methods and tools used by the architects in the AR process of the selected cases, as resulting from the interviews (L: LocHal, B: Blokhuispoort, E: Energiehuis, F: Fort van Hoofddorp)

Methods and Tools	Case
M1. Involving a lesser-known but capable architecture firm *[Tool: Participation in matchmaking meetings]*	L
M2. Analysing the building and site (architectural/functional aspects) *[Tool: Analog and digital surveying tools]*	L, B, E, F
M3. Analysing technical aspects of the building (e.g., hazardous chemical materials; acoustical properties) *[Tool: Hiring related specialist for analysis]*	L, E
M4. Collecting data about the buildings from archives	L, B, F
M5. Involving original users during the AR process *[Tool: Holding meetings with them]*	L
M6. Reviewing documents, photographs, drawings, writings, and logbooks of the building and site	L, B, E, F
M7. Digitally storing all collected and produced data *[Tool: Data management tools for documenting the process]*	L, B
M8. Avoiding reliance on personal assessment to limit subjectivity *[Tool: Hiring a company for historic value assessment with predefined code]*	L, B, F
M9. Repeatedly analyzing the building *[Tools: Reviewing all collected and analyzed data; Reinspecting the building to reveal possible hidden aspects]*	L, B, E, F
M10. Involving end-users and the local community during the AR process *[Tools: Holding several meetings with end-users for input; Using renders and 3D models in presenting the project to end-users]*	L, B, E, F
M11. Applying structured design strategies for the AR of the building [Tool: Reviewing the literature on the AR process and accordingly developing specific frameworks and schemes for AR process]	L, B, E, F
M12. Considering the well-being of users within the required functions *[Tool: Hiring experts on sustainability and well-being]*	L
M13. Getting inspired by other effective reuse projects *[Tool: Visiting and analysing the effective reused buildings with similar functions]*	L, B, E
M14. Employing digital and innovative tools to complement the architects' strategies and stories *[Tool: Hiring experts on digital tools in storytelling]*	B
M15. Striking a balance between the existing situation of the building and the requirements *[Tools: Meetings with stakeholders involved in the process and discussing their needs and possible solutions]*	L, B, E, F
M16. Discussions between the (leader) architect and the contractor and being involved in the execution step *[Tools: Meetings with the contractors; Regular visiting of the site during the execution; Hiring of a flexible contractor]*	L, B, E, F
M17. Being open to modifying and adapting the design even after the execution of the project	
M18. Discussions with the end-users after the execution of the project *[Tool: Holding meetings with the end-users]*	
M19. Regular inspecting and visiting of the building after the execution	
M20. Being open to receiving feedback on the project and learning lessons for future projects *[Tool: Following and analysing social media posts about the impact of the project]*	

TABLE 4.2 The nexus between the architects' used methods and tools in the AR process of the selected projects and the criteria of effectiveness, as defined in Arfa et al. (2022)

Identified criteria of effectiveness	Steps in the process									
	Step 0. Initiative	Step 1. Analysis of building	Step 2. Value assessment of building	Step 3. Mapping level of Significance	Step 4. Adaptive reuse potential (function)	Step 5. Defining design strategy	Step 6. Final decision-making	Step 7. Execution	Step 8. Aftercare/ Mainte-nance	Step 9. Evaluation after years
Social value creation	M1				M10	M11, M12, M14	M10, M15	M16	M17, M18	M10, M19, M20
Sublimation-cultural aspects		M2, M3, M4, M5, M6, M7	M8			M9, M11, M13, M14	M15	M16	M17, M18	M19, M20
Sublimation-architectural aspects		M2, M3, M4, M5, M6, M7	M8	M9	M10	M9, M13, M14	M15	M16	M17, M18	M19, M20
Environmental sustainability						M12	M15	M16	M17, M18	M19, M20
Economic value creation					M10		M15	M16	M17, M18	
Innovation	M7	M7	M7	M7	M7	M14	M7	M7	M7	M7

4.5 Conclusions

This research aimed to validate a previously developed model for adaptive reuse (AR) of heritage buildings by investigating AR processes in four cases in the Netherlands. All four cases were recipients of the prestigious NRP prize, denoting their effectiveness. Additionally, the study explored the relationship between architects' methods and tools during the AR process and the ultimate effectiveness of the projects, as reported in the NRP jury reports.

The validation process of the theoretical AR model resulted in a refined version named the EARHB (Effective Adaptive Reuse of Heritage Buildings) model. This model includes the same steps as the theoretical model but incorporates inner loops within and between the steps. The refined model departs from a linear progression, striving to offer a more nuanced depiction of the AR process and its inherent complexities

in practical application. While the EARHB model is based on the perspective of architects, it holds potential for integration with parallel steps to have practical use for all stakeholders in the AR process. It should be noted that it was not the authors' intention to prescribe a singular correct AR process, but rather to explore potential AR processes of effective cases, identifying commonalities that could inform future AR processes.

The validation process highlighted areas warranting further research. While ample research exists on analysis, design strategy definition, and adaptive reuse potential (function), there is a notable gap in understanding execution, maintenance/aftercare, and post-evaluation steps. Furthermore, while the model has been validated in practice across four cases in the Netherlands, it has yet to undergo testing in the actual development of an AR project.

In addition to process-related insights, this study shed light on pertinent stakeholder dynamics. Architects played a pivotal role throughout all steps, with the effectiveness of AR projects significantly influenced by the methods and tools employed in each step. Architects adeptly navigated stakeholder engagement, balancing the needs of producers, regulators, investors, and users. The interviews revealed strong, collaborative relationships among stakeholders, indicative of high-quality professional partnerships.

One notable challenge encountered during the process of effective AR projects pertained to budget constraints and financial issues. In such instances, the commitment of investors proved pivotal in project continuity. Architects demonstrated flexibility by adjusting designs to reduce costs without compromising quality. Notably, architects' attitudes and communication skills were paramount alongside their professional expertise, emphasizing flexibility and minimal emotional attachment to their design ideas.

Addressing the second aim of the paper, it provides an overview of methods, tools, and their potential impact on AR project effectiveness, beneficial for architects working with heritage buildings. The analysis highlighted that involving people, including original and end-users, as well as local communities, throughout the entire AR process is crucial for social value creation.

This research shows that the methods and tools used by architects primarily focused on functional aspects and indirectly related to economic value creation. However, proposing appropriate functions by architects to other stakeholders can significantly impact economic value creation. Regarding environmental sustainability, it seems that architects need to proactively consider diverse aspects beyond energy efficiency

in AR projects. Given the challenges of the 21st century, future research on validating this model in real AR projects and exploring architects' role in sustainable and circular AR processes in heritage buildings is highly encouraged.

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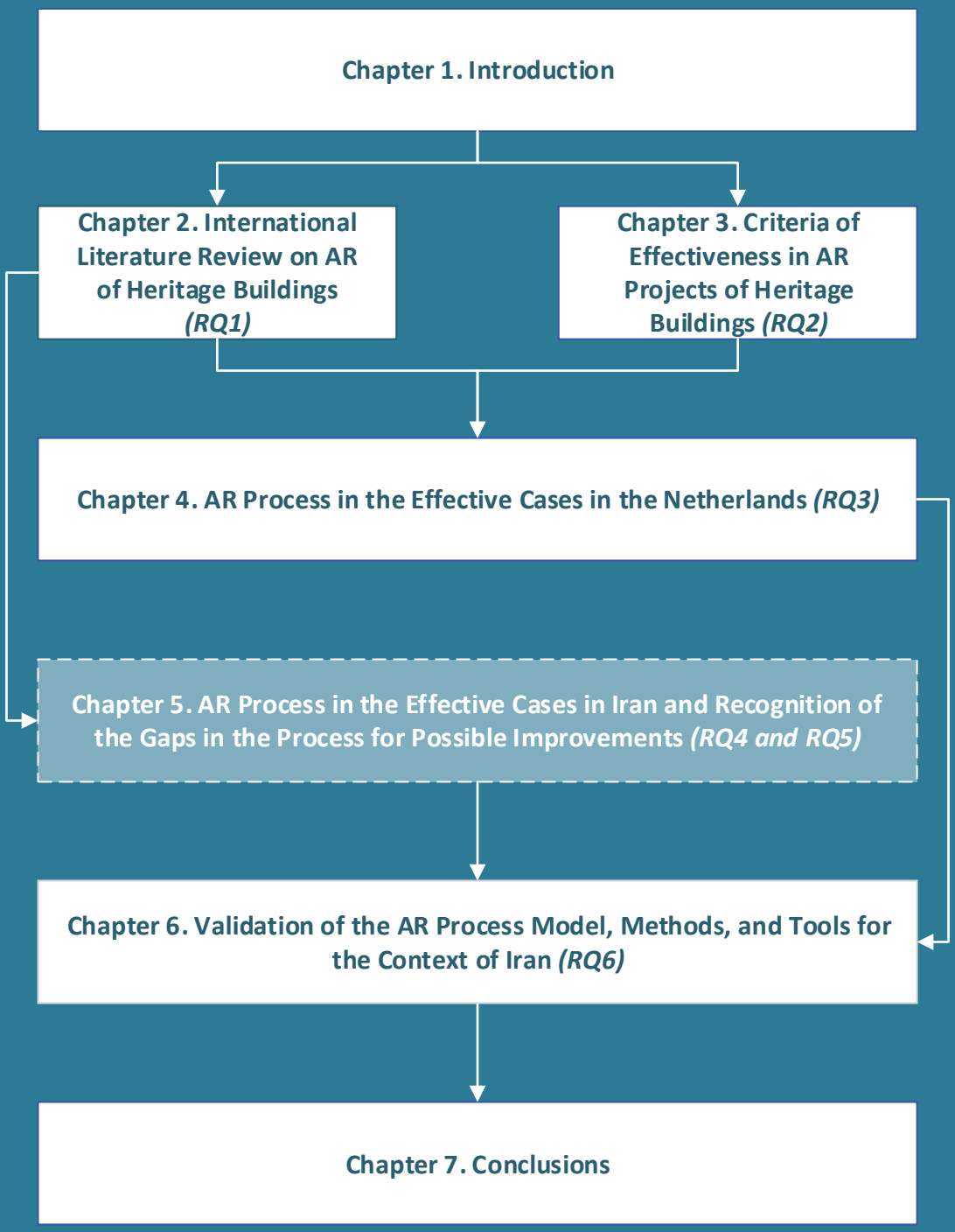
Chapter 1. Introduction
Chapter 2. International Literature Review on AR of Heritage Buildings (RQ1)
Chapter 3. Criteria of Effectiveness in AR Projects of Heritage Buildings (RQ2)
Chapter 4. AR Process in the Effective Cases in the Netherlands (RQ3)
Chapter 5. AR Process in the Effective Cases in Iran and Recognition of the Gaps in the Process for Possible Improvements (RQ4 and RQ5)
Chapter 6. Validation of the AR Process Model, Methods, and Tools for the Context of Iran (RQ6)
Chapter 7. Conclusions

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5 AR Process in Effective Cases in Iran and Recognition of the Gaps in the Process for Possible Improvements

This chapter has been submitted for publication as a journal paper:
Arfa, F. H., Lubelli, B., Quist, W., Zijlstra, H. & Izadi, M. S. (2024). The adaptive reuse process of heritage buildings in Iran from the architects' perspective – investigation of practice and scientific literature. *Journal of Habitat International (Under Review)*

ABSTRACT

Adaptive reuse (AR) serves as a solution to the issue of vacant heritage buildings in cities and countries, particularly in Iran, a country abundant in such buildings. Despite an excess of unoccupied heritage buildings, several buildings in Iran have experienced effective AR, positively impacting their surroundings. The lack of investigation into the current AR process in Iran to further improve it, on the one hand, and the growing number of vacant heritage buildings, on the other hand, make this research necessary.

In this paper, the state of AR of heritage buildings in Iran has been investigated by a systematic review of scientific literature on the AR process within the Iranian context, alongside an analysis of four cases selected among winners and nominees of architecture awards. The analysis of the literature and case studies was made using an international model developed for the AR process of heritage buildings by the authors.

The literature analysis showed the effort made by scholars in investigating different steps of the AR process in Iran, drawing inspiration from the international literature on this topic. The analysis of the cases led to identifying the common steps the architects took during the AR projects in practice. When comparing the outcome of the literature review and that of the analysis of the cases, a gap between academic research and the AR practice in Iran can be observed. Some steps, such as ”value assessment” and “evaluation of AR projects after their completion”, which are extensively discussed in the literature, are not equally developed in the practice of AR. This research serves as a foundational exploration for the development of comprehensive process models for AR of heritage buildings in Iran, holding the potential to yield significant positive outcomes for cities and societies.

KEYWORDS Adaptive reuse; Heritage Buildings; Design Model; Design Methods; Built Environment

5.1 Introduction

Iran boasts many heritage buildings spanning different eras and architectural styles. Evolving lifestyles have left some of these buildings with the challenge of vacancy. However, many of these buildings, if suitably adapted, have the potential to fulfill contemporary societal needs (Taleghani, 2018).

Adaptive reuse (AR) of buildings represents a sustainable approach to urban regeneration, as it prolongs the lifespan of buildings (Langston et al., 2013; Yung & Chan, 2012). AR of historic buildings in Iran is not a novel concept (Lotfi & Sholeh, 2020). According to Hanachi and Shah-Teimouri (2021), heritage preservation was introduced in practice in Iran already during the 1890s, while the concept of “adaptive reuse” emerged around 1965. At that time, the purpose of AR of heritage buildings was to assign them new functions and make them accessible to the public. According to Izadi (2003) and Moradi (2003), the topic of AR has consistently been included in government policies after the Islamic Revolution in 1979 and explicitly mentioned in the third development plan of Iran (2000-2004) (Third Development Plan of Iran, n.d.). Anecdotal accounts and oral tradition recount numerous examples of AR, dating back to the pre-Islamic revolution era (e.g., Shah Abbasi Hotel and Abgineh Museum) and extending into more recent times (like the Hanna Boutique Hotel). The lack of investigation into the current AR process in Iran to further improve it, on the one hand, and the growing number of vacant heritage buildings, on the other hand, make this research necessary.

The primary objective of this paper is to understand the current state of AR practices in Iran, particularly through the lens of architects, who are, according to Roos (2007), pivotal stakeholders in this process.

The study comprises two main components: a literature review (Section 5.3.1) aimed at gathering insights from existing research on the AR process in Iran and case studies (Section 5.3.2) examining the AR process of four award-winning projects from the perspective of architects, serving as illustrative examples of AR in the Iranian context.

Section 5.2 outlines the research methodology and criteria for selecting literature and cases. Results of both literature and case studies are presented in Section 5.3, followed by a cross-case comparison and comparison between case studies and literature in Section 5.4. This facilitates a comprehensive evaluation of the current state of AR in Iran, with a particular emphasis on the architects' perspective. In Section 5.5, the paper is summarized, and recommendations for future research is elaborated.

5.2 Methods

The research process followed in this work included three steps, as shown in Figure 5.1.

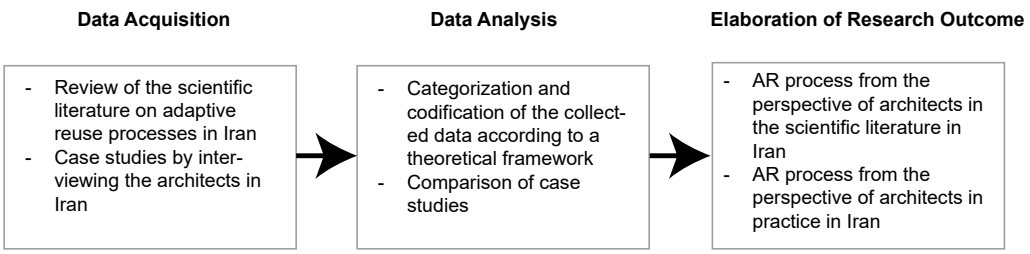

FIG. 5.1 Research process including data aquation, data analysis and reporting the results

5.2.1 Data Acquisition

Systematic Literature Review

A systematic literature review, based on the established PRISMA flow diagram for reference selection (Moher, Liberati, Tetzlaff, & Altman, 2009), was conducted by employing search criteria in both English and Farsi languages within the Scopus and SID databases, respectively. The primary focus of this review was the intersection of “adaptive reuse”, “heritage”, and “Iran” in English and their translation in Farsi, "استفاده ی مجدد سازگار", "بناهای تاریخی", and "ایران". To enhance the comprehensiveness of the search, frequently used alternatives for “adaptive reuse”, such as “renovation”, “remodelling”, and “transformation” in both English and "مرمت", "بازسازی", and "نوسازی" in Farsi, alongside the keywords “heritage” and “Iran” were searched for. The literature research resulted in the identification of 1742 publications (Scopus: 13 and SID: 1729). Due to low accuracy of the SID database search function in finding the most relevant results, after a preliminary screening of the titles, 1622 publications were removed due to duplication and irrelevance to the field of AR of heritage buildings. Then, the abstracts of the 120 remaining publications were reviewed, the full-text of the papers were screened, and 69 were removed as irrelevant to the AR process. Two reports, one PhD dissertation, and five journal papers were added through the snowball method in the references. Only publications addressing a specific step of the AR process, the AR process as a whole, or having a methodological approach aimed at the definition of a framework or model for the process, have been considered. Due to the specific focus on the AR process from architects’ perspective, publications on the evolution of policies in dealing with heritage buildings in Iran have been discarded (e.g., Moradi, 2003). Similarly, papers discussing the advantages and necessity of integrating AR in the built environment have been excluded (e.g., Akhtarkavan, Alikhani, Ghiasvand, and Akhtarkavan, 2008).

Case Studies

The case studies were selected according to the four criteria in Figure 5.2. The first criterion for selecting the cases was a significant “transformation of function” and serving as a public function, being easily accessible to different groups, and potentially making a significant impact in their respective contexts. This already limited the cases to a few. Many interesting AR projects in Iran are adaptive reuses of houses into hotels, hostels, cafes, and restaurants. Although publicly accessible, those do not include specific cultural activities (e.g., theater, etc.). They are not included in the curret paper as they are not “open to the public”, and they have a different impact

on the wider communities. There are limited numbers of AR projects in Iran that have a public function. The next criterion was that they have a monumental status, as this usually adds to the complexity of the projects and might result in a wider range of lessons for future projects. The third criterion was that the selected cases were winners of a prestigious prize in Iran (National Memar Prize) or at the international level (Aga Khan Award), indicating their effectiveness as cases to be selected. This resulted in a shortlist of possible cases. The last criterion was the availability of documents and the willingness of their architects to contribute to this research.

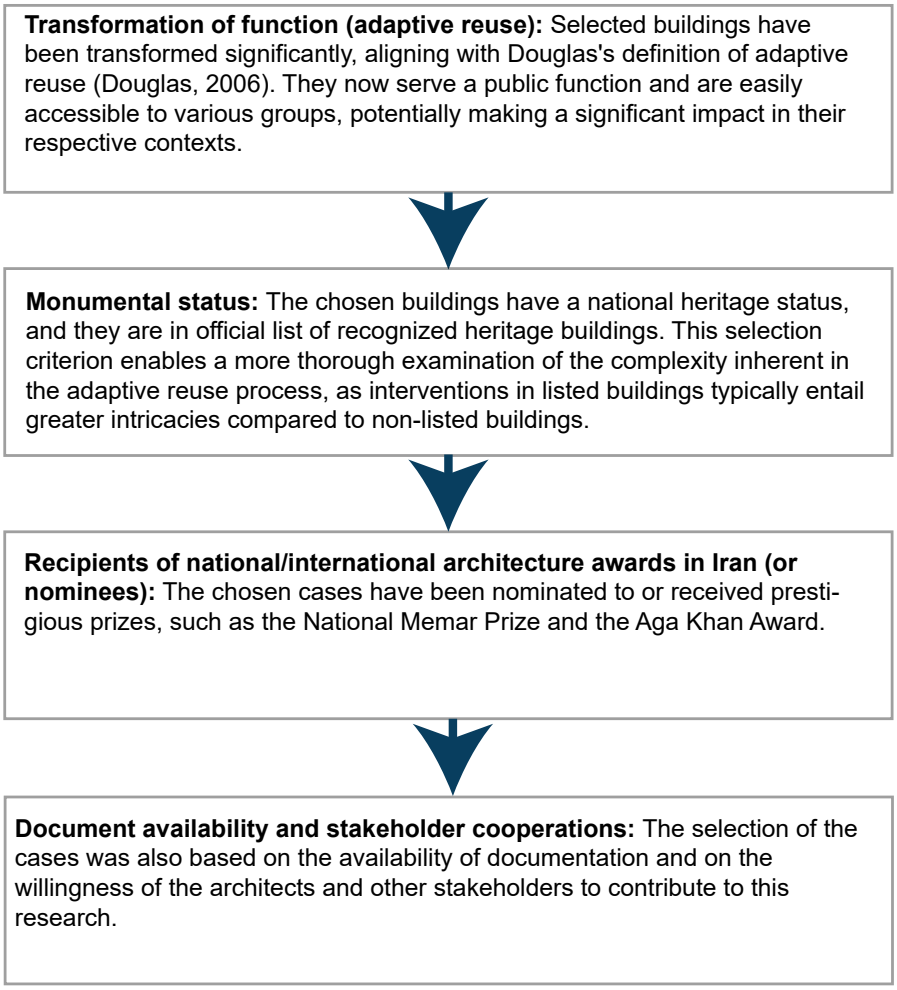

FIG. 5.2 Criteria for selecting the cases

These criteria led to the selection of four cases, which are Textile Museum in Shiraz, Artists' Forum, Qasr Garden Museum, and Argo Factory in Tehran. Figure 5.3 shows the location of the selected cases in Iran.

a. Artists' Forum in Tehran, after adaptive reuse (LIT, n.d.)

b. The extension to the Artists' Forum (B. Shafei Design Studio)

f. Qasr Garden Museum in Tehran ("Qasr Prison Garden-Museum", n.d.)

c. Interior space of Argo factory after the first phase (2016) of adaptive reuse (Nasehi, Razzazi, & Eskandari, 2018)

d. Interior space of Argo factory after the second phase (2021) of adaptive reuse

e. Textile museum in Shiraz, after adaptive reuse (Taropood Gallery, n.d.)

FIG. 5.3 Selected AR cases in Iran

An in-depth examination of four AR cases in Iran was undertaken. This part of the research encompassed interviews with the architects involved in the AR process (for the cases of Artists' forum, Textile museum, and Argo factory (phase 1)) and the use of secondary data published on the process from their architects' perspective.

Interview questions were developed based on the theoretical model of the research, which also served as a data analysis tool (See Section 5.2.2, Figure 5.4) (Appendix 5.5 (in English) and Appendix 5.6 (in Farsi).

To enhance the validity of the results regarding the current AR process in Iran from architects' perspectives, the interviewed architects were asked if they conduct new projects in a similar way to their previous projects (case studies of the paper). This validation method was utilized during interviews with architects in the projects of the Artists' Forum, Argo (phase 1) and the Textile museum.

5.2.2 Data Analysis

Literature Studies

After applying the criteria for selecting the literature studies, the full-texts of 59 publications were reviewed. The literature was categorized according to the 10 steps of the AR process developed by the authors (Figure 5.4).

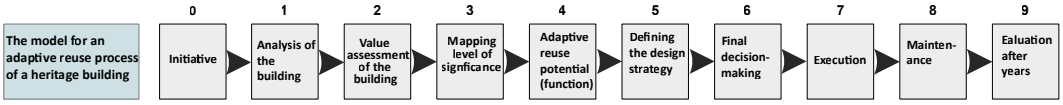

FIG. 5.4 The theoretical model developed by Arfa et al. (2022)

Case Studies

Interviews with the architects, including both interviews conducted by the first author of this paper and previously published interviews by other scholars with the architects, underwent a systematic coding process using the Atlas.ti tool. Similar to the analysis of the literature studies, the 10-step-model (Figure 5.4) was used as an analysis tool to codify the data and sort the information.

5.3 Results

5.3.1 Results from the Literature Studies

This section focuses on reporting the results of the data analysis, based on the steps in Figure 5.4 (the theoretical model), with the goal to explore which steps are investigated in the literature. Figure 5.5 shows the number and focus of each publication on the AR process in Iran.

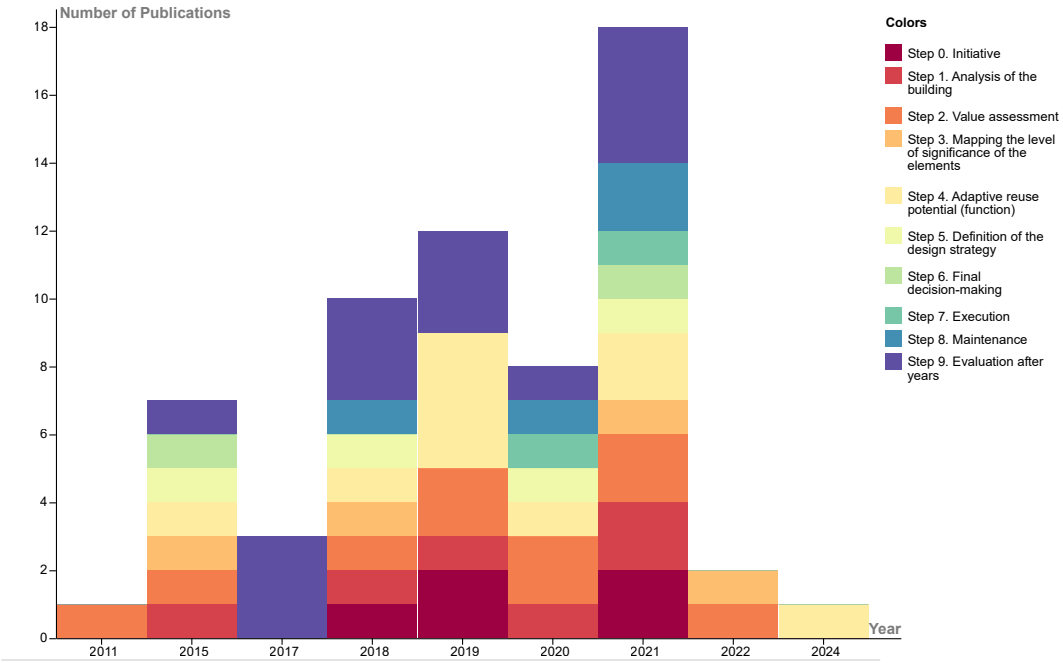

FIG. 5.5 Number of publications per year on different steps of the AR process in Iran

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Step 0. Initiative

Several papers about AR in Iran focus on the initiation of AR projects. Following the international ARP model by Langston and Shen (2007), these publications validate this model on AR cases in Iran (e.g., Eftekhar & Shahraeini, 2020; Eghbali, Fard, & Pourebrahimi, 2018; Naserolmemar & Aminpoor, 2021; Pourebrahimi, Eghbali, Ghafori Fard, Hamedi, & Zolfagharzadeh, 2021; Pourebrahimi, Eghbali, Zolfagharzadeh, & Ghafori Fard, 2019). By using the ARP model and based on the building life cycle, these authors analyzed the potential of specific heritage buildings to start an AR process.

Step 1. Analysis of the Building

Multiple publications focus on aspects of analysis in the AR process. These aspects include energy efficiency and technical aspects (Gholami, Heidari, & Hanachi, 2021; Zeynalpoor Asl, Samadzadegan, Javan, & Talebian, 2022), historical and cultural aspects of the building and its surroundings (Mahdinejad & Bashtani, 2015), analysis of the social and economical aspects (Raoufi & Khajepour, 2018), and understanding the building (Arbab & Alborzi, 2022; Hanachi & Shah-Teimouri, 2021; Naserolmemar & Aminpoor, 2021). One publication focus on the lack of using Building Model Information (BIM) for collecting and managing all the data related to heritage buildings and interviewing architects that how BIM can be used for the case of heritage buildings in Iran (Mohammadzadeh, Mahmoudi Sari, & Barmayevar, 2020). According to one of the publications, BIM can act as a solution for the issue of data management of heritage building in Iran (Andaroodi, 2013).

Step 2. Value Assessment

This step focuses on the recognition of different values associated with the heritage building. Masoud et al. developed a model to quantify the values of heritage buildings, aiding in decision-making in AR processes (Masoud, 2020; Masoud & Gharipour, 2022). According to these authors, value-based redesign can reveal hidden heritage values and highlight them. Other authors highlight values with a specific focus on historic values and authenticity (Aminpoor & Harofteh, 2012; Khakban & Emami, 2020; Pedram et al., 2012; Raoufi & Khajepour, 2021). By reviewing the international literature, Abbaszadeh, et al. (2019) mention thirty different values with many sub-values and their definitions; this is among the first publications in Iran highlighting such a comprehensive list.

Step 3. Mapping the Level of Significance

This step is sporadically addressed in the selected literature; prioritizing the recognized values is mentioned as the primary aim of this step (Mahdinejad & Bashtani, 2015; Masoud & Gharipour, 2022). Abbaszadeh et al. (2019) point out that this step relies on the "needs of the community", "cultural aspects of the target group of building end-users" and "facilities". Arbab and Alborzi (2022) refer to this step as "assessing the significance", involving the clarification of all values (historical and architectural, technical and technological, aesthetic and artistic, cultural and societal).

Step 4. Adaptive Reuse Potential (Function)

As shown in Figure 5.5, AR potential is among the most mentioned topics in the literature and focuses on the recognition of the most appropriate new function for a heritage building. In most of the reviewed papers, a set of criteria and sub-criteria is defined, and then experts and end-users score them. The scores are based on a specific building for a predefined function. The criteria include economic, functional, technical, cultural-social, regulations and rules, and legal (Eftekhar & Shahraeini, 2020; Tootoonchi & Fadaei Nezhad Bahramjerdi, 2021; Tootoonchi, Moradi, & Nezhad, 2022). Several publications highlight the necessity of selecting a new function requiring minimal intervention (e.g., Shafai & Mamarabadi Noori, 2023).

Step 5. Definition of the Design Strategy

In the selected literature, the definition of the design strategy has not been extensively investigated as a step in the AR process. Lotfi and Sholeh (2020) refer to international literature to define different strategies to deal with heritage buildings, such as "addition", "modernization", "replacement". Without further elaboration, Mohammadzadeh et al. (2020) mention this step in the AR process. Abbaszadeh et al. (2019) propose a model of value-based conservation by investigation of the nexus between the values (distilled from the international literature) and the conservation strategies (e.g., renovation, reuse, restoration, reinforcement, etc.).

Step 6. Final Decision-Making

As shown in Figure 5.5, final decision-making receives limited attention. Several authors refer to this step as the "evaluation of all the collected and processed data and multi-criteria decision-making" (Mahdinejad & Bashtani, 2015). Naserolmemar and Aminpour (2021) map the decision-making at different steps of the process, from initiative to evaluation of the project after years. They propose this decision-making model to act as guideline for stakeholders dealing with AR of heritage buildings in Iran.

Step 7. Execution

This step is referred to as "execution" and "implementation" in three reviewed publications, without further elaboration on the details (Arbab & Alborzi, 2022; Mohammadzadeh et al., 2020; Naserolmemar & Aminpoor, 2021). Arbab and Alborzi (2022) mention that active involvement of all the stakeholders during all the steps is necessary.

Step 8. Maintenance

In their publication, Arbab and Alborzi (2022) and Naserolmemar et al. (2021) emphasize the significance of continuous monitoring and management plans following the execution of AR projects, drawing from international literature. However, they do not provide further elaboration on this.

Step 9. Evaluation After Years

As illustrated in Figure 5.5, many publications focus on the evaluation of AR projects (Post-Occupancy Evaluation, POE) in Iran over the years, often referencing Douglas (2006). These evaluations include a wide range of aspects. For example, some studies examine end-user satisfaction (e.g., Razeghi & Hoorandi, 2018) and the local community's attitudes toward the impact of AR projects (e.g., Naimeh Rezaei & Azhdari, 2018). Others adopt a holistic approach, evaluating the cultural significance and economic productivity of projects alongside other aspects (Alavi & Shahbazi, 2022; Ataei Shad, Rafieian, & Ranjbar, 2018; Dehghan Pour Farashah, Aslani, Yadollahi, & Ghaderi, 2021). Meanwhile, some studies focus solely on evaluating authenticity in AR projects (Samadzadehyazdi et al., 2018).

Summarizing, the review of the literature reveals that, apart from the step "evaluation after years" and post-occupancy evaluations, only few publications focus on investigating AR practice in real projects in Iran, particularly from the perspective of architects. To the best of the authors' knowledge, conceptual models based on actual AR practices in Iran, specifically from the architects' perspective, are absent. Most publications draw inspiration from models proposed in the international literature, and are theoretically validated on a case-by-case basis, without delving into the contemporary AR practice in Iran (Figure 5.6). Therefore, a review of case studies, in particular from the point of view of involved architects, is crucial to understand AR in practice.

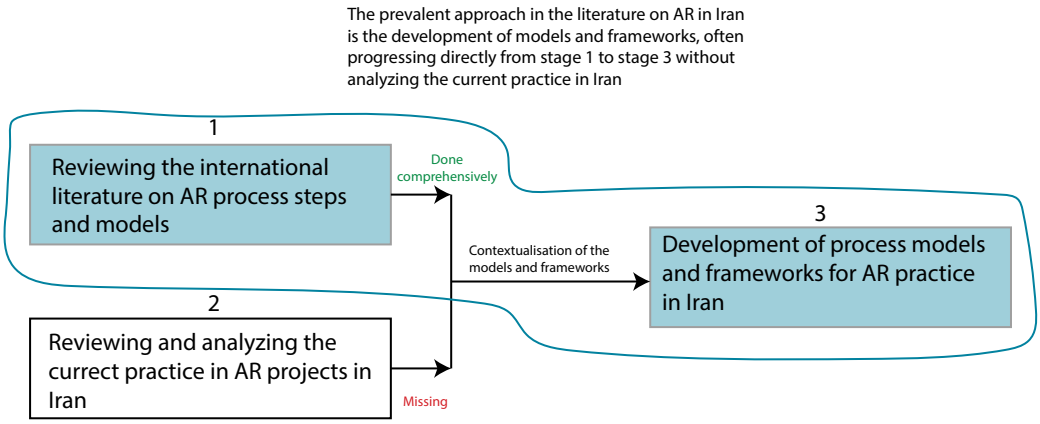

FIG. 5.6 The prevalent approach in the literature on AR, except the literature on step 9, "evaluation after years" and post-occupancy evaluations

5.3.2 Results from the Case Studies

The collected information regarding the selected cases, Textile Museum in Shiraz, Artists' Forum in Tehran, Qasr Garden Museum in Tehran, and Argo Factory in Tehran, are dealt with in two sections: i) general information about the case and ii) the AR process, methods, and tools from the architects' perspective.

5.3.2.1 Textile Museum (Art Gallery) in Shiraz[6]

The AR project of Textile Museum commenced in 2008 and reached its completion in 2009 (see Figure 5.3.e). It was a pivotal part of the comprehensive urban and landscape revitalization plan designed for the area nearby the renowned Iranian poet Hafez's tomb. It was a joint project of the municipality of Shiraz and the Institution of Housing and Urban Development. The building dates back to the late 19th century, and once served as one of the administrative buildings of a textile factory located in this area (CAOI, n.d.-c). Since 2009, the remnants of the factory have been reused as an art gallery and museum.

The AR Process and Used Methods and Tools

In Table 5.1, the main characteristics of each of the steps, with a specific focus on the architect's actions are discussed.

TABLE 5.1 Main characteristics based on the data analysis including the architect's actions per step (M. Iravanian, personal communication, August 18, 2022, CAOI, n.d.-c; "Experience of reuse of modern heritage, meeting 41: Textile Museum Gallery," 2020; "Webinar with the topic 'A narrative of the design and construction of the Textile Museum Gallery,'" 2020)

Main characteristics based on the data analysis including the architect's actions per step	Steps
- The architect's team was invited to collaborate on Textile Museum project in 2008. - Architect proposed preserving and reusing the existing building instead of demolition.	Initiative
- The architect's team conducted a thorough analysis of building and surroundings using historical documents. - The architect's team uncovered information about the four historic layers, garden, cemetery, textile factory, and library.	Analysis of the building and surroundings
- The architect proposed establishment of an open gallery within existing structure, complemented by innovative new interventions.	Adaptive reuse potential (function)
- The architect added elements served dual purposes: integration with remaining part of façade to preserve historical aspects and carrying symbolic meanings, such as the addition of four pillars representing historic layers.	Defining the design strategy
- The architect held meetings with influential stakeholders in Shiraz during AR process to raise awareness and mitigate potential opposition post-project completion. - Negotiated with stakeholders, leveraging negotiation skills to persuade and gain acceptance.	Final decision-making
- The architect was actively involved in project execution, visiting site daily. - The architect made modifications to design as needed (e.g., adding a café to the gallery).	Execution

6 Appendix 5.1 includes more background information about the case.

Synthesizing the data collected, the process of AR of the Textile Museum can be represented by a process model followed by the architect (Figure 5.7).

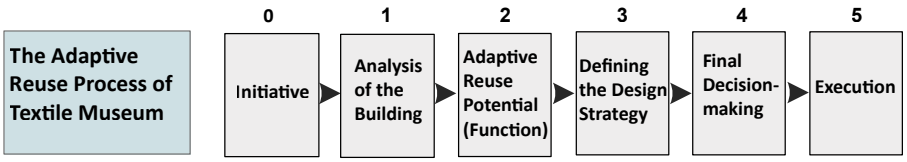

FIG. 5.7 AR process of Textile Museum from the perspective of the architect

Recently, due to some managerial changes, the gallery and its café have been closed. Prior to the closure of the building, the project had created significant social value by hosting various art exhibitions featuring both national and international artists. This had a positive impact, attracting visitors and enhancing the surroundings of the project (M. Iravanian, personal communication, August 18, 2022).

5.3.2.2 The Artists' Forum in Tehran[7]

The Artists' Forum (Figure 5.3.a) is an AR project initiated by the Ministry of Culture and Islamic Guidance of Iran in 2000. This building, dating back to the 1920s, was originally an office building located within the arsenal and military storage of the Iranian army, before becoming vacant for many years. The surrounding Art Park area suffered from criminal activities creating an unsafe environment (CAOI, n.d.-a).

In response to these issues, the AR project started in 1999 when the municipality of Tehran acquired the area and decided to reuse the building as a cultural center. The AR project was entrusted to the Bijan Shafei Design Studio and was successfully completed in 2000 (CAOI, n.d.-a). The success of various activities held at the Artists' Forum in its first decade highlighted the need for additional exhibition and conference spaces. Subsequently, in 2007, another project was initiated to design and implement additions to the building, with the same architecture firm leading the project (CAOI, n.d.-b). This project, aimed at addressing the space shortage, was completed in 2009 (Figure 5.3.b).

7 Appendix 5.2A and 5.2B include more information about the case.

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The AR Process and Used Methods and Tools

In Table 5.2, the main characteristics in each of the steps, with a specific focus on the architect's actions are discussed.

TABLE 5.2 Main characteristics based on the data analysis including the architect's actions per step (B. Shafei, personal communication, April 26, 2023, CAOI, n.d.-a; Moazzezi Mehr Tehran, 2016)

Main characteristics based on the data analysis including the architect's actions per step	Steps
- The architect's team was invited to collaborate in 2000.	Initiative
- The architect's team conducted thorough analysis, including sketching and documenting existing conditions and photographic record.	Analysis of the building and surroundings
- The architect identified primary objective of Artists' Forum and planned functions in consultation with artists. - The architect involved end-users to understand their needs.	Adaptive reuse potential (function)
- The design process of architect reflected his deep understanding of Tehran's history and architectural heritage. - The architect focused on preserving existing qualities while enhancing functionality.	Defining the design strategy
- The architect held regular weekly meetings held with stakeholders for collaborative decision-making. - The architect made collaborative decisions with stakeholders.	Final decision-making
- Design and execution entailed dynamic exchange of ideas among the architect and other producers. - The architect communicated ideas through sketches, held weekly meetings, established temporary office.	Execution
- Evolution of Artists' Forum led to municipality requesting architect's development plan. - The plan developed by the architect included the construction of multipurpose halls and the incorporation of safety measures.	Maintenance and aftercare as a new project

By synthesizing the collected data, the AR process of the Artists' Forum can be illustrated through a process model followed by the architect (Figure 5.8).

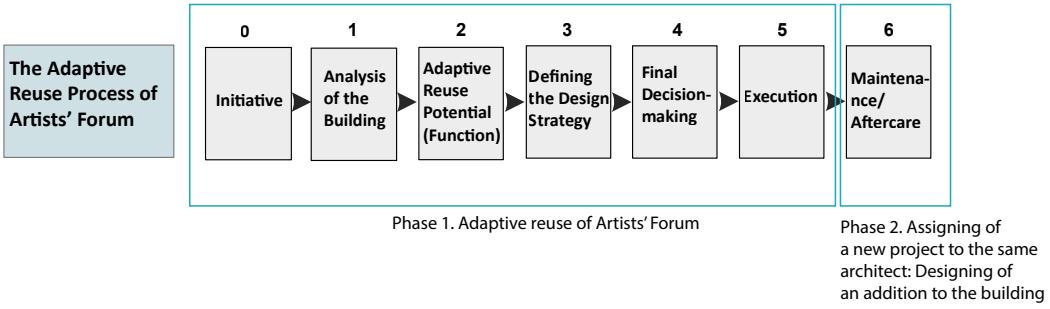

FIG. 5.8 AR process of Artists' Forum from the perspective of the architect

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The architect's evaluation highlighted the enduring positive impact of the project on its surroundings. Revitalization efforts have led to the reuse of numerous historical houses in the vicinity as cafes and art galleries. Despite management changes influencing the direction of the Artists' Forum, the project remains a vibrant cultural hub within Tehran. This underscores its lasting and transformative influence, not only on the building itself but also on the broader cultural landscape of the city (B. Shafei, personal communication, 2023; Moazzezi Mehr Tehran, 2016; *The Fifth Session: Adaptive Reuse of Valuable Buildings*, 2016)

5.3.2.3 The Qasr Garden Museum in Tehran[8]

The Qasr Garden Museum (Figure 5.3.f), located within a 200-year-old historical palace and garden complex, has a diverse history. Originally built in 1790 by Fat'h Ali Shah of the Qajar dynasty, it served various functions, including recreation and military use. During the reign of Pahlavi I (1925–1941), it was converted into Qasr Prison, reflecting a trend of assigning less prestigious functions to Qajarid buildings. As Tehran evolved, the prison became part of the urban landscape. Aligning with urban planning policies to move disruptive functions and increase green spaces, the prison was transferred to Tehran Municipality in 2006, initiating an AR project to covert it into a museum (Moazzezi Mehr Tehran, 2016).

The AR Process and Used Methods and Tools

In Table 5.3, the main characteristics in each of the steps are discussed.

8 Appendix 5.3 includes more information about the case.

TABLE 5.3 Main characteristics based on the data analysis including the architect's actions per step (Masoud, Eshrati, Faizi, & Einifar, 2020; Moazzezi Mehr Tehran, 2016; The Fifth Session: Adaptive Reuse of Valuable Buildings, 2016)

Main characteristics based on the data analysis including the architect's actions per step	Steps
- The contractor's involvement preceded the architect's team in project. - The architect's team joined project in 2006 after initial demolition and inappropriate interventions (Some buildings labelled "low value" were demolished; others underwent inappropriate interventions)	Initiative
- The architect's team leveraged information from various sources to comprehend building's history, structure, and architecture. - The architect's team analyzed challenges such as inappropriate interventions, heavy roofs, and structural problems with load-bearing walls.	Analysis of the building and surroundings
- The architect proposed conversion of Markof prison into "History Museum of Tehran". - The architect curated artworks representing historic moments for museum exhibition.	Adaptive reuse potential (function)
- The architect aimed to showcase building's role in social and political dynamics of Tehran and Iran. - The architect employed integrated design strategies for each part of the complex. - The architect redesigned garden area based on historic patterns. - The architect restored one prison cell to match paintings by political prisoner; transformed remaining cells into museum galleries. - The architect designed new ceiling inspired by historic styles; coloured interventions differently for recognition and potential future removal. - The architect added transparent surfaces/walls for views of interior from outside. - The architect aimed to restore buildings as closely as possible to original state. - The architect established strategy to open complex to nearby residents and establish connections with community.	Defining the design strategy
- The architect maintained regular and daily-based presence for final decision-making. - The architect balanced conflicting interests among stakeholders regarding retention or removal of complex parts.	Final decision-making
- Project execution spanned around six years, completed in 2012. - The architect made regular site visits throughout project duration.	Execution

The AR process of Qasr Garden Museum can be represented by a process model followed by the architect, based on synthesis of the collected data (Figure 5.9).

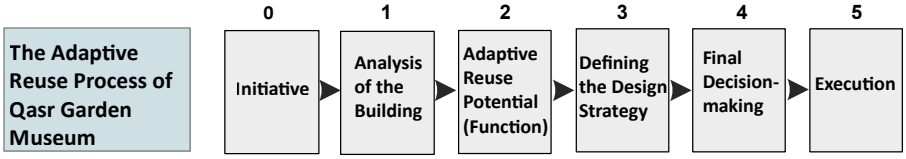

FIG. 5.9 AR process of Qasr Garden Museum from the perspective of the architect

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Regarding the project's impact on the surroundings, the architect reported that the quality of life in the center of Tehran had declined over the years due to the migration of residents to the northern part of the city. Together with other AR projects, such as the Artists' Forum of Tehran (section 5.3.2.2), the AR of the Qasr prison played a crucial role in revitalizing the city center (Izadi & Amiri, 2016).

5.3.2.4 Argo Factory in Tehran[9]

The Argo Company (A.R.G.O), founded in 1930 as an alcoholic beverage manufacturer in Iran, faced challenges as Tehran's population expanded, leading to complaints from nearby residents about unpleasant odours and air pollution. In 1953, a law mandated factory relocation outside city borders, resulting in the closure of the Argo factory five years later, subsequently transformed into the Argo shop (Volner, 2021).

The Argo factory was not registered as listed heritage building before its AR in 2015. After the Islamic revolution in Iran (1979), the building was under governmental ownership and remained vacant for years. In 2016, the building was put up for auction and faced the threat of demolition. However, Pejman Foundation purchased the building with the intention of transforming it into a gallery (Mazhari, 2017).

The AR of the Argo Factory in Tehran was conducted in two separate projects by two different architecture firms: Shiar Design Studio and ASA North Design Studio. The objective of the first project was to quickly prepare the building for an exhibition, while the second project aimed to transform the building into a fully functional art gallery. Figure 5.3.c depicts the building after the completion of the first project. The second project of Argo was assigned to a different architecture firm and they removed all interventions made by the first architect during the first project. Figure 5.3.d shows the building after the second phase of the AR.

9 Appendix 5.4A and 5.4B include more information about the case.

Phase 1 by Shiar Studio; The AR Process and Used Methods and Tools

In Table 5.4, the main characteristics in each of the steps are discussed.

TABLE 5.4 Main characteristics based on the data analysis including the architect's actions per step (A. Shakeri, personal communication, August 16, 2022; Argo Factory; Tehran's Old Storyteller, 2019; Mazhari, 2017)

Main characteristics based on the data analysis including the architect's actions per step	Steps
- The architect's team was invited to join the project in 2015-2016. - The project was not a government-led initiative but supported by influential policymakers.	Initiative
- The architect deferred the detailed analysis of the building to second project due to lack of time. - The architect explored global breweries for insights into Argo factory spaces within time constraints. - The architect aimed at restoration and adaptive reuse of the entire building in the second project. - The architect sought local stories for building reuse, emphasizing preservation of historical characteristics and embedded stories (notable story of General Mohanna halting factory operation due to pollution surfaced). - The architect's vision focused on maintaining integrity of collection and integrating contemporary additions harmoniously. - The architect metaphorically likened the factory to an "old man" supported by "splints." - The architect cleared factory of soil, garbage, and debris within 45 days for official opening as gallery; used metal waste from other projects for structural safety.	Defining the design strategy
- High work intensity demanded simultaneous design and implementation. - The architect spent 8 to 15 hours on-site daily to meet tight schedule. - Eight blacksmiths worked alongside architect in workshop to devise and execute designs.	Execution

Synthesizing the data collected, the process of AR of the Argo (phase 1) can be represented by a process model followed by the architect (Figure 5.10).

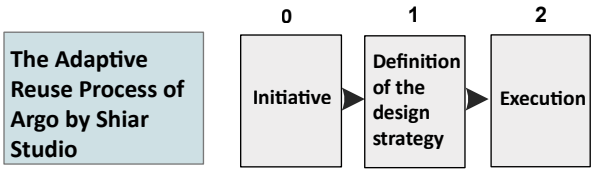

FIG. 5.10 The AR process of Argo factory from the perspective of the architect (Shiar studio)

Phase 2 by ASA North Architectural Firm; The AR Process and Used Methods and Tools

The steps in phase 2 have been elaborated in Table 5.5.

TABLE 5.5 Main characteristics based on the data analysis including the architect's actions per step ("Ahmadreza Schricker's Narration of the Conversion of Argo Factory into an Art Museum," 2018; Crook, 2022; Volner, 2021)

Main characteristics based on the data analysis including the architect's actions per step	Steps
- Phase 2 of the AR project was assigned to ASA North architecture firm and the architect's team was invited to join the project in 2016, immediately after completion of the first phase.	Initiative
- The architect of the second phase removed all interventions done by the previous architect in phase 1.	Demolition of the previous interventions
- The architect's team analyzed building and surroundings,	Analysis of the building and surroundings
- The architect generated four possible functions, including cost-effective options and more profitable ventures like a hotel or apartments. Options included establishing a world-class museum but uncertainties led to a more modest project agreed upon with initiator.	Adaptive reuse potential (function)
- The architect aimed to preserve original form while making necessary changes. - Structural interventions were required, involving a structural engineer to address risk of collapse. - Decision made to place installations, light sources, etc. on roof; roof design consisted of "five hats" for the building. - Approach likened to treating a patient with unknown disease, emphasizing cautious progression and preservation of features.	Defining the design strategy
- The architect's team had presence during project execution.	Execution

Through synthesizing the collected data, the AR process of the Artists' Forum can be depicted via a process model followed by the architect (Figure 5.11).

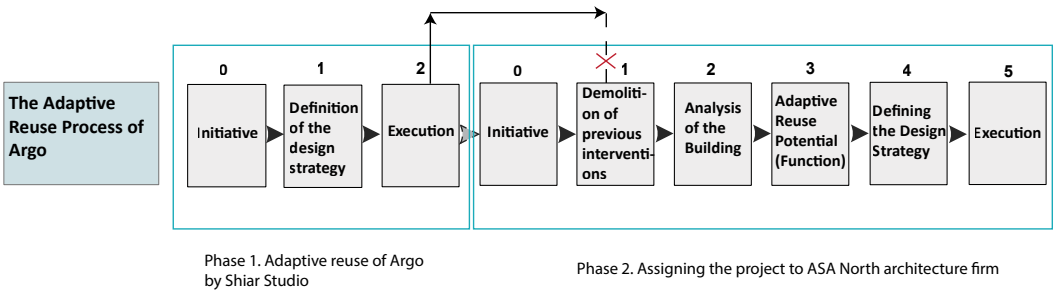

FIG. 5.11 The AR process of Argo factory (phases 1 and 2 with two different architecture firms)

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Regarding the impact of the project after its completion in 2020, the architect mentioned, *"As the wealthy moved up and out from this district, the area around Argo (Tehran downtown) went into decline. Now we hope that with this project, different groups of people come to visit and it influences the neighborhood"* (Volner, 2021). In the words of the initiator (Director of Pejman Foundation), "*Even though, the project started with somewhat muted fanfare due to the Iranian capital's coronavirus epidemic in 2020, it attracted different group of normal visitors who are not necessarily artists but would like to visit the building"* ("AKAA 2022," 2022).

5.4 Discussion

5.4.1 Cross-Case Analysis

When considering the steps taken by architects in AR processes in Iran, there is evident interest in investigating the building's history, context, and state of conservation, even in situations where time constraints limit thorough analysis.

The adopted design strategies demonstrate the architects' capacity to adapt general strategies to suit the specific characteristics and needs of each case. In the case of the Artists' Forum and Qasr Garden Museum, architects considered different scenarios and proposed various design strategies. However, it is notable that in some cases, such as Textile Museum and Argo (phase 1), despite the analysis being carried out, the outcome of the analysis did not translate into the design strategies. This suggests a lack of alignment between the initial analysis and the subsequent design strategies. The research does not provide an explanation for this discrepancy. Further studies, focused on the influence of (international) education of Iranian architects on the adaptive reuse and revitalization of heritage buildings might shed a light on this.

A common element across all studied cases is the active involvement of the architect during the execution of the project. Differently, there seems to be a lack of involvement after completion of the project. Specifically, there is no mention of a maintenance plan or evaluation of the long-term effects and impact of the project. In the case of the Artists' Forum in Tehran, several years after the initial execution, the architect was approached to design an addition to the reused building.

In summary, the most common steps taken by architects, coming from the research, are: initiative, analysis of the building, assessment of the adaptive reuse potential of the building (function), definition of the design strategy, final decision making, execution, and in some cases maintenance/aftercare (Figure 5.12). The depth and precision of each step varied across cases, with some steps being more thoroughly addressed than others.

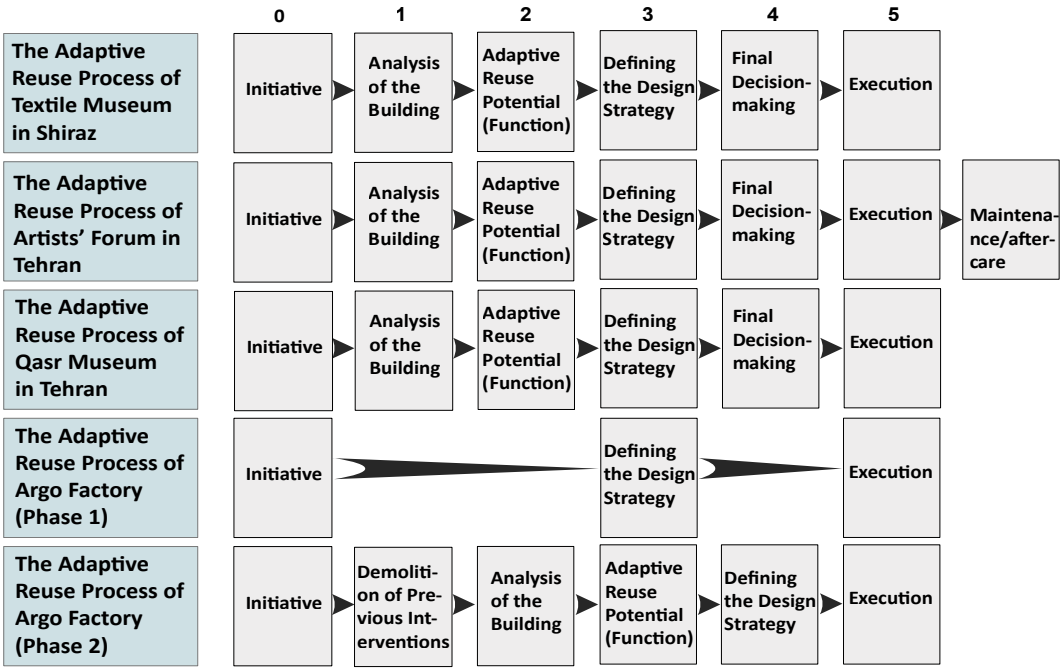

FIG. 5.12 Steps of the AR process in effective cases from the perspective of architects in Iran

The architects employed a variety of tools and methods to facilitate the AR process (Table 5.6). These tools and methods played a crucial role in conducting comprehensive analyses, developing design ideas, and involving stakeholders effectively.

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TABLE 5.6 Summary of the methods and tools employed by architects per step in cases (T: Textile Museum, A: Artists' Forum, Q: Qasr Garden Museum, Ar: Argo Factory)

Step of the process	Methods and tools used by the architects	Case			
		T	Q	A	Ar
Analysis of the building	Using collected data from other companies and supplementing it.		•		
	Creating sketches to detail existing conditions and maintaining a photographic record.	•		•	•
Initiative; analysis of the building; definition of the design strategy	Holding regular weekly meetings.	•		•	•
Initiative; analysis of the building; definition of the design strategy	Involving end-users throughout the process.			•	
Definition of the design strategy	Acquiring knowledge of various redesign strategies and implementing the most suitable one, such as: • Using historic maps for restoration • Redesigning of the new parts with different materials to be distinguished from the original parts	•	•	•	•
Final decision-making	Engaging key figures in the city during the AR process to garner support from other stakeholders.	•			
Execution	Ensuring a continuous presence throughout the execution process.	•	•	•	•
Maintenance and aftercare	Being involved in designing additions to reused buildings.			•	

The table shows that involving end-users throughout the process is among the less used methods and tools in AR practice in Iran. This is also similar to the involvement of architects during maintenance and aftercare, which is only shown in one case.

5.4.2 Comparison Between Literature and Case Studies

The review of the literature and the study of the AR cases highlights a significant gap between the theoretical research and real-world AR practices in Iran. For example, while in the literature a strong emphasis is given to "value assessment", in practice, the explicit focus on "values", seems often less pronounced. Similarly, the attention for the assessment of a AR project over time, which is underlined in the literature, is not observed in the practice. With the exception of the Artists' Forum, in all the investigated cases, "maintenance/aftercare" and "evaluation after years" were not considered. The literature on AR in Iran covers all the steps outlined within the theoretical framework of the research (Figure 5.13).

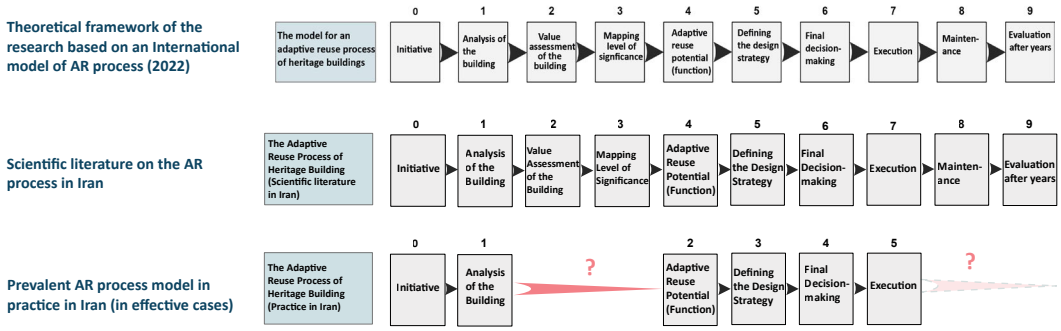

FIG. 5.13 Comparison between the theoretical framework of research with the scientific literature on AR in Iran and the AR practice in Iran, observed in the selected cases

Furthermore, a disparity exists between the theoretical emphasis on community and end-user involvement in AR processes as reviewed in the literature and their actual implementation in investigated AR cases in Iran. While involving end-users and communities during different steps of the AR process is explored in the literature on AR in Iran, such community engagement is absent in the studied AR cases.

One notable observation from the literature on AR in Iran and interviews with architects is the frequent and interchangeable use of the terms "monument", "valuable buildings", and "historic buildings". This suggests that the AR practice in Iran predominantly is focused on "valuable, historic, and monumental buildings" and may not comprehensively address all "heritage buildings". As highlighted by Boodaghi et al. (2022), Iran's policy documents on AR primarily pertain to buildings with "significant artistic and age value". Therefore, it seems that "considering 100% of our built environment as heritage" ("100% Heritage for A More Sustainable Future," 2020) is yet not common in the context of AR in Iran.

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5.5 Conclusions

The aim of this paper was to gain insights into the adaptive reuse (AR) process of heritage buildings in Iran from the architects' perspective. The research involved a literature review and the analysis of four cases.

The literature review revealed that the academic research on AR in Iran has effectively integrated international knowledge. However, the investigated AR cases and the interviews with architects showed that this knowledge is not always translated into the AR practice with a similar level of elaboration. For example, the value assessment of the building, object of several academic publications (e.g., Masoud and Gharipour, 2022), was not explicitly mentioned by the interviewed architects as part of their AR process. Additionally, steps following project execution, such as "maintenance" and "evaluation of the project after years", were neither mentioned as part of their process by the architects. Moreover, the emphasis on end-user and community involvement in the literature was not reflected in the investigated case studies. The analysis of the cases suggests that the support of the government has been crucial for achieving effective AR of heritage buildings in Iran.

This paper represents an initial exploration of the AR process in Iran. It provides preliminary insights for the development of conceptual models for effective AR processes tailored to the Iranian context from the architects' perspective. Further research is necessary to refine, expand and test the AR model, methods, and tools, ensuring their suitability in the Iranian context.

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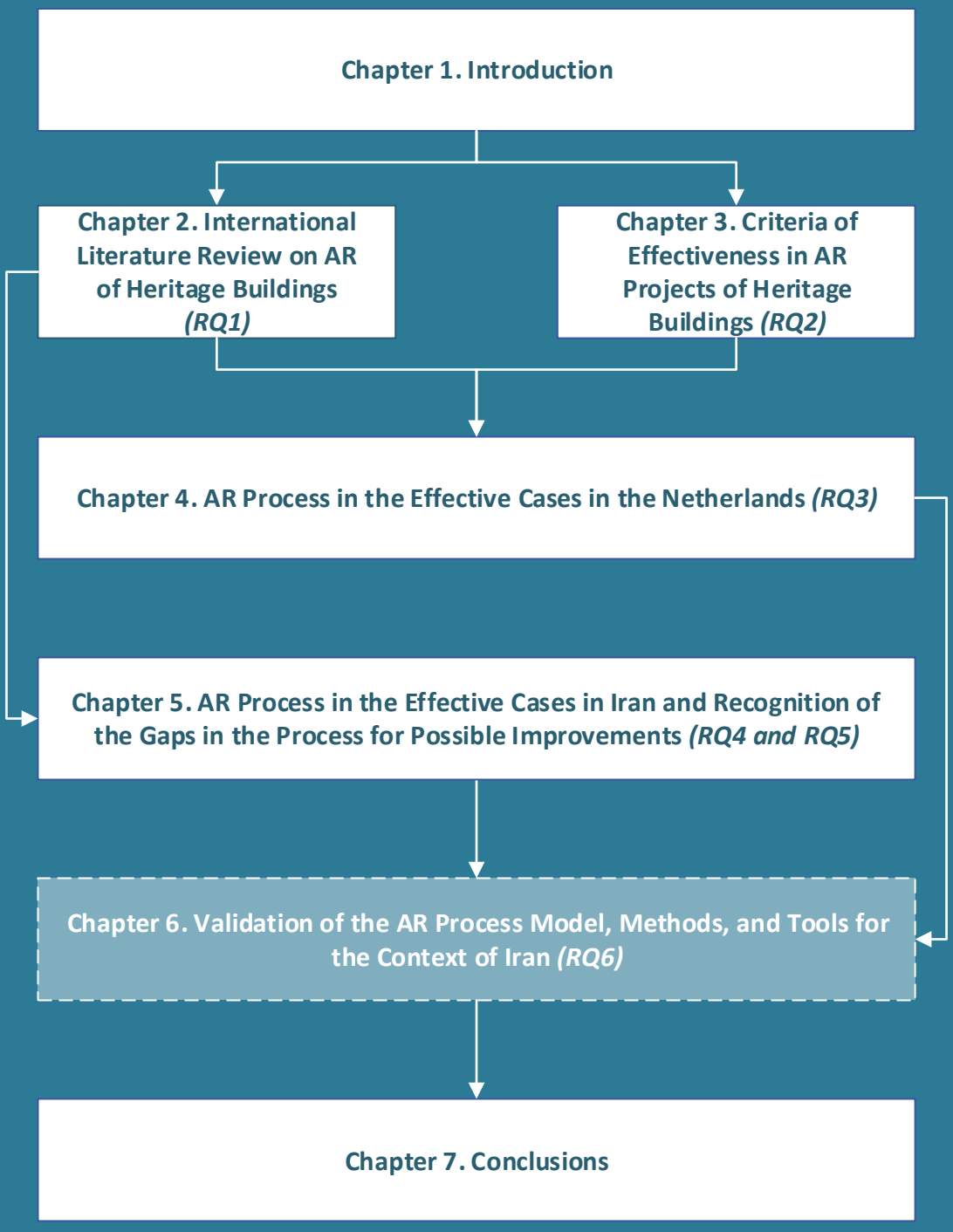
Chapter 1. Introduction
Chapter 2. International Literature Review on AR of Heritage Buildings (RQ1)
Chapter 3. Criteria of Effectiveness in AR Projects of Heritage Buildings (RQ2)
Chapter 4. AR Process in the Effective Cases in the Netherlands (RQ3)
Chapter 5. AR Process in the Effective Cases in Iran and Recognition of the Gaps in the Process for Possible Improvements (RQ4 and RQ5)
Chapter 6. Validation of the AR Process Model, Methods, and Tools for the Context of Iran (RQ6)
Chapter 7. Conclusions

6 Validation of the AR Process, Methods, and Tools for the Context of Iran

This chapter has been submitted for publication as a journal paper:
Arfa, F. H., Quist, W., & Lubelli, B. (2024). Validating an Adaptive Reuse Model, Methods, and Tools. *Journal of Land Use Policy (Submitted)*

ABSTRACT

Adaptive reuse (AR) of heritage buildings is crucial for addressing cultural heritage vacancy, especially in countries such as Iran with rich architectural heritage. The authors previously proposed a model for the AR process, including methods and tools used by architects in the process. This paper validates the use and applicability of such a model in Iran, using semi-structured interviews with architects and reviewing policy documents. The research highlights the need for a systematic approach to AR and identifies cultural, regulatory, and practical challenges when dealing with AR of heritage buildings in Iran. While some methods are already used by Iranian architects, many remain underutilized due to the lack of introduction by heritage organizations or insufficient connection among different entities. By validating global practices with local experiences, this study contributes to heritage preservation and sustainable urban development in Iran and further.

KEYWORDS

Adaptive Reuse; Heritage Buildings; Iran; Cultural Heritage; Built Environment; Process Models

6.1 Introduction

6.1.1 Background and Aim of the Research

Adaptive reuse (AR), i.e., the conversion of a building to accommodate a different use with a focus on the alteration of functionality (Austin, 1988; Douglas, 2006), is a sustainable response to the challenge of vacancy in cultural heritage buildings (Foster, 2020). In contemporary society, there is a growing emphasis on repurposing buildings, particularly those of historical significance, through AR. Many buildings, having outlived their original purpose, present opportunities for adaptation to serve new functions. While the term AR has gained prominence in the 21st century, the practice of repurposing buildings has historical antecedents (Cohen, 2011). AR is acknowledged in international guidelines like the ICOMOS Burra Charter (ICOMOS, 1999, 2013). This charter promotes AR as a conservation approach, striving to maintain heritage significance while enhancing functionality for contemporary needs. Likewise, the UNESCO Recommendation on the Historic Urban Landscape advocates for "conservation through transformation", endorsing the careful management of changes within historic urban settings (UNESCO, 2011).

While AR is an appropriate practice for heritage preservation, not all AR projects lead to effective results. Following a systematic AR process, including different methods and tools to be used by the architect in the process, might enhance the effectiveness of an AR project, in terms of social value creation, environmental sustainability, innovation, and sublimation in architectural and cultural aspects (Arfa, Lubelli, Zijlstra, & Quist, 2022; Arfa, Lubelli, Quist, & Zijlstra, 2024; Bosone, De Toro, Girard, Gravagnuolo, & Iodice, 2021).

This research focuses on AR in Iran, a country renowned for its heritage buildings. Unfortunately, the lack of updated legislation and efficient management of heritage buildings, the absence of methodologies for conserving them, and marginal public participation in preserving them have led to a considerable number of heritage buildings being abandoned (Taleghani, 2018). Due to the changes in people's way of living, many heritage buildings have lost their original use. However, in most cases, these buildings have the potential to meet the new demands posed by the present. In a few cases in which these buildings have acquired a new function, the lack of specific methodologies (Masoud, 2020) has quite often resulted in a rudimentary approach to their restoration and reuse ("Caravansaries of Hamedan and the neglect of officials," 2019).

This lack is not limited to AR in practice in Iran. When considering literature on AR of heritage buildings in Iran (including publications in English and Persian), it is possible to observe that most publications deal with documentation of examples of the reuse of industrial heritage and historic houses (Akhtarkavan, Alikhani, Ghiasvand, and Akhtarkavan, 2008; Mofidi, Moradi, and Akhtarkavan, n.d.; Salehi Mourkani, 2015; Samadzadehyazdi, Ansari, Mahdavinejad, & Bemaninan, 2018). Until now, to the best of the authors' knowledge, no methodology for AR of heritage buildings in Iran has been proposed. This lack and the importance and need for a methodology for AR of heritage buildings have been underlined by several researchers (Saberi, Talib, Motamedi, & Kariminia, 2016; Salehi Mourkani, 2015; Samadzadehyazdi et al., 2018).

This paper aims to assess the applicability of a model for AR of heritage buildings in the Iranian context, including methods and tools previously developed by the authors (Arfa et al., 2024).

In Sections 6.1.2 and 6.1.3, the necessary background information is provided to aid in understanding the paper.

6.1.2 Adaptive Reuse Process Models, Methods, and Tools

The AR process is complex (Kurul, 2003; Langston & Shen, 2007), particularly concerning heritage buildings (Roos, 2007). In fact, the cultural significance of the building and the involvement of numerous stakeholders with diverse aspirations amplify this complexity. Some scholars advocate for a systematic approach to AR to uphold heritage buildings' intrinsic qualities and values while enhancing their relevance for the present and future (e.g., Clarke, Kuipers, & Stroux, 2020; Kuipers & Jonge, 2017). Some studies explore the specific steps within different phases of the AR process. A comprehensive review of the literature and the resulting model for the AR process and methods and tools used by the architect in the process is given in the research by the authors in 2022 (Arfa et al., 2022). Figure 6.1 summarizes the development from the literature review (Arfa et al., 2022) and validation in practice into a comprehensive AR model (the EARHB model) (Arfa et al., 2024), integrating all the phases (van Laar, Greco, Remøy, & Gruis, 2024) and relative steps of the AR process.

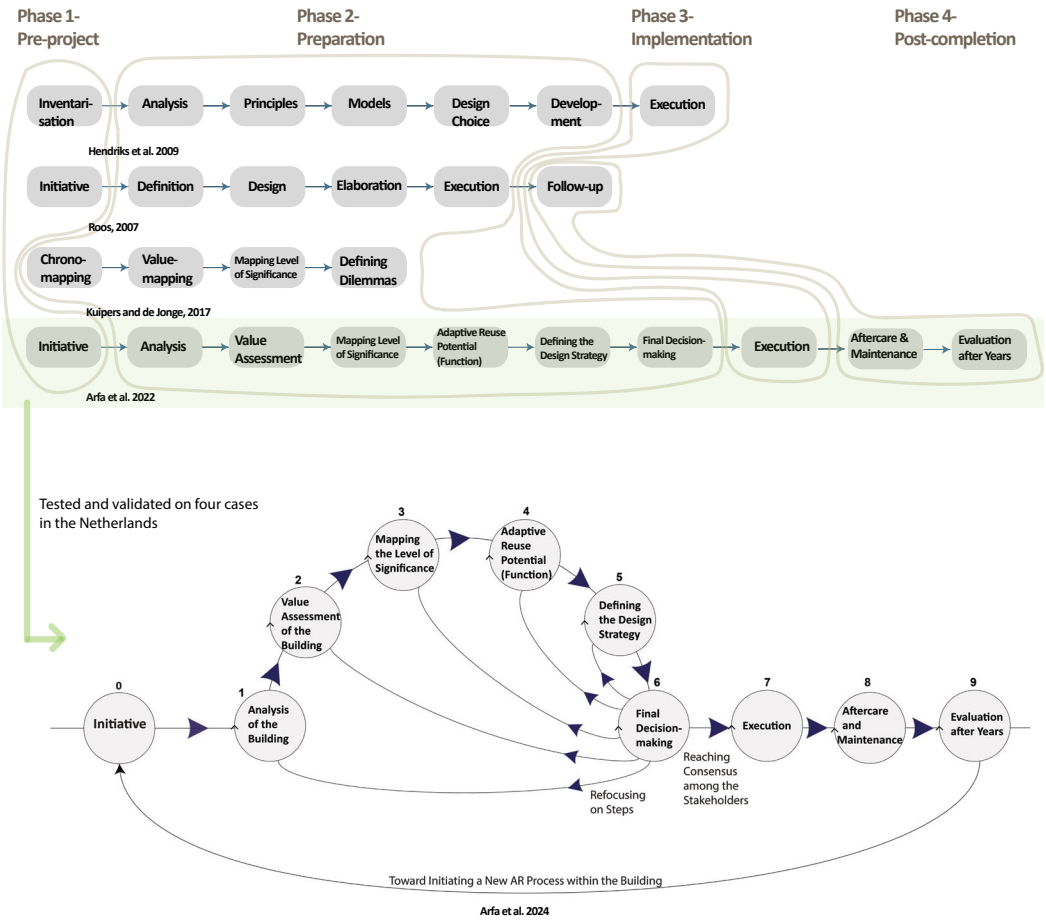

FIG. 6.1 Steps (grey boxes) of the AR process as proposed by Hendriks et al. (2009), Roos (2007), Kuipers and de Jonge (2017), and Arfa et al. (2022) and then tested and validated on four cases in the Netherlands by Arfa et al. (2024).

As shown in Figure 6.1, the preliminary version of their model was linear, and through testing in the Netherlands, it has been refined it into a circular model. However, the steps did not change and include “initiative”, “analysis of the building”, “value assessment of the building”, “mapping the level of significance”, “adaptive reuse potential (function), “defining the design strategy”, “final decision-making”, “execution”, “aftercare and maintenance”, and “evaluation after years”

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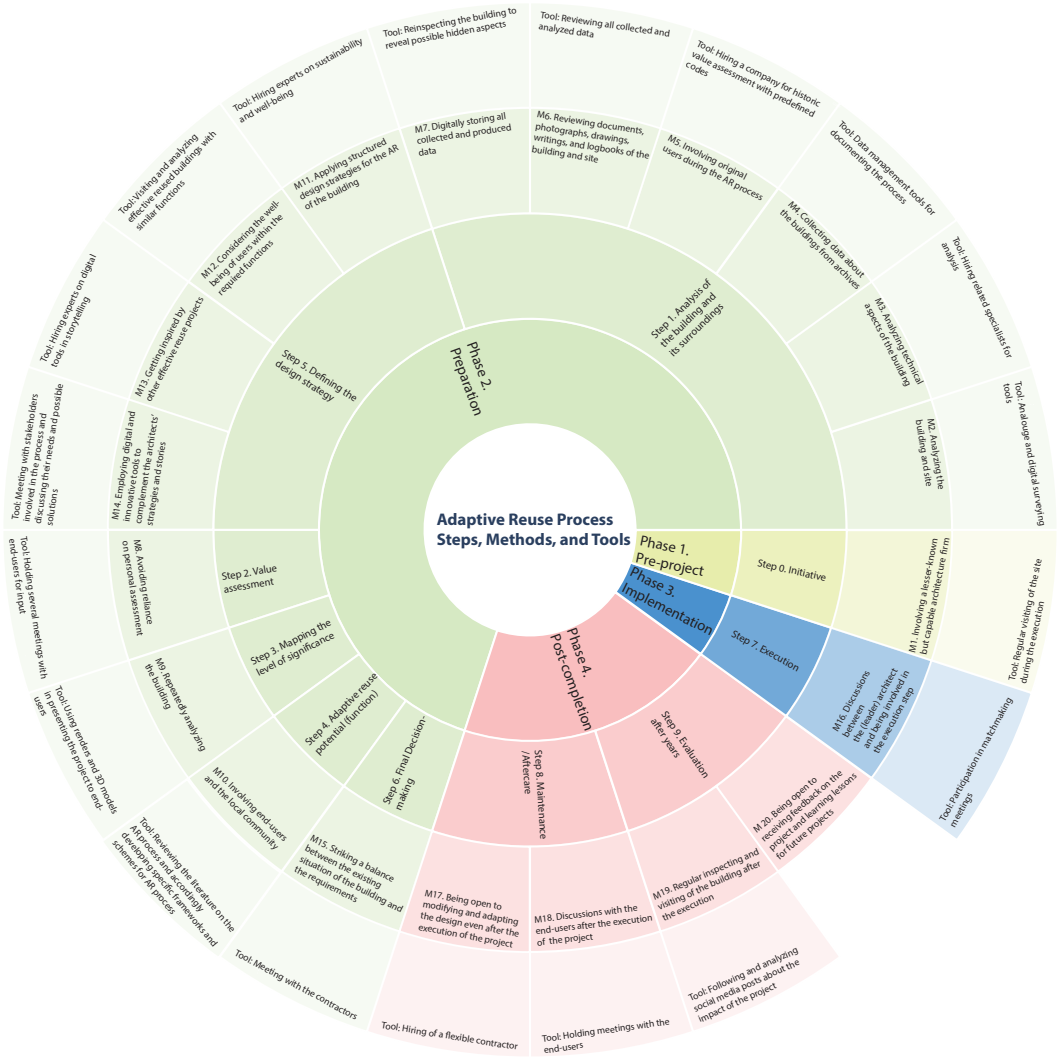

FIG. 6.2 The adaptive reuse process, steps, methods, and tools (adapted from Arfa et al., 2022, and Arfa et al.,2024).

Figure 6.2 shows the steps of the developed AR process model (the EARHB model), as shown in Figure Figure 6.1, and the methods and tools associated with each step that the authors have investigated (Arfa et al., 2024). According to the authors, the model and the methods and tools associated with the steps of this model can be adapted and developed for different contexts to provide impactful results in dealing with AR of existing and heritage buildings (Arfa et al., 2024).

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Although the EARHB model and its relative methods and tools (hereafter referred to as the EARHB framework) have been mainly derived from literature and validated until now only in the practice of AR in the Netherlands, the authors believe that it can potentially be adapted and developed for different contexts (Arfa et al., 2024). The analysis of the current usage and applicability of these methods, tools, and process model within the context of Iran is the aim of this paper. In this paper, the terms proposed in the EARHB framework are used to elaborate and report the results.

6.1.3 Adaptive Reuse Process Models, Methods, and Tools in Iran

To validate the developed EARHB framework within the context of Iran, background information on the current AR process in Iran is essential. To this scope, the authors conducted an investigation based on case studies and interviews with architects (Arfa, Lubelli, Quist, Zijlstra, & Izadi, 2024). This research identified that several steps of the AR process, as defined in Arfa et al. (2022), are often missing in AR projects in Iran, such as "value assessment", "mapping the level of significance (of elements)", "maintenance/aftercare", and "evaluation after years". Moreover, the architects of the studied cases approached each step of the AR process with different depths of investigation, using different methods and tools. Some of these methods and tools include "using collected data from other companies" and "creating sketches to detail existing conditions and maintaining a photographic record" in the analysis step (Arfa et al., 2024).

To gain a better understanding of AR processes in Iran, hereafter, a background is given regarding regulations using the relevant policy documents. From the administrative and legal point of view, the initiation of AR projects of heritage buildings in Iran can occur in three ways: a) Auctions held by Revitalization Fund Organization (RFO)[10], which is an organization related to the Ministry of Cultural Heritage, Tourism, and Handicraft Organization (MCTH) b) Auctions held by municipalities for reusing non-listed and modern heritage[11] c) Individual persons (e.g., artists, architects, etc.) for their own projects or clients[12]. The depth of the

10 RFO mainly focuses on reusing listed heritage buildings in Iran ("About RFO," n.d.).

11 These types of buildings are not listed as heritage buildings in Iran; thus, if not demolished, the municipalities hold auctions for reusing them. This differs per city and municipality and is dependent on the approach of the municipality.

12 It can include abandoned listed or non-listed heritage buildings.

steps taken in the AR process by the architects differs depending on the three above-mentioned situations. The projects initiated by RFO need to follow stricter guidelines, which are reported in the "National Document for Revitalizing of Heritage Buildings" (NDRHB document). This document is not necessarily developed for architects but for everyone who wants to reuse listed heritage buildings that belong to RFO and MCTH.

Using the terminology proposed by Arfa et al. (2022), Ramezani (2024) categorized the guidelines within the NDRHB document into eight steps of the AR process. The steps include "initiative", "analysis", "adaptive reuse potential (function)", "assigning the building to the private sector (developers)", "preparation of restoration and reuse plans", "execution", "use plans", and "maintenance" (*National Document for Revitalizing of Heritage Buildings*, 2008). Thus, despite the study of the case studies (Arfa et al., 2024) showing that maintenance of the buildings is seldom considered in AR practice in Iran, the NDRHB guideline explicitly mentions the importance of regular maintenance and the necessity of providing reports about each reused heritage building to RFO.

6.2 Research Design and Methods

The research process followed in this work included three steps, as shown in Figure 6.3.

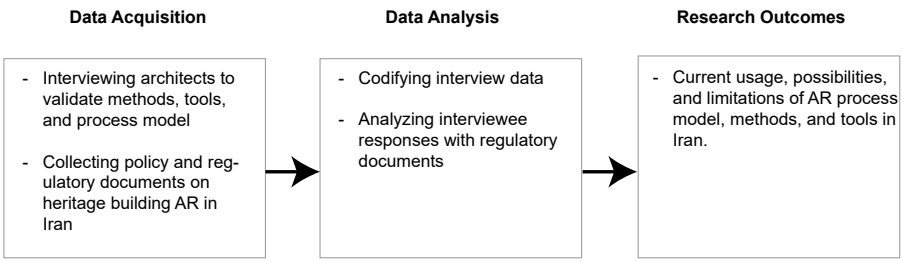

FIG. 6.3 Research process including data acquisition, data analysis, and elaboration of research outcomes

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Data Acquisition

Semi-structured one-to-one interviews (Hennink, Hutter, & Bailey, 2020) were conducted with architects involved in the AR of heritage buildings in the Iranian context. The interviewees were selected based on their experience of dealing with AR in both practice (as architects) and academia (as lecturer or faculty staff), as well as their availability and willingness to contribute to this research. Eight interviewees agreed to participate.

Semi-structured one-to-one interviews allowed for discussion with architects and facilitated the retrieval of more information, including possibilities and limitations of the EARHB framework. The interview protocol and questions were developed, considering the EARHB framework's structure (Appendix 6.1). The interviewees were not asked for preparation in advance and relied solely on their personal background knowledge. For each method and tool, the architects were asked to choose one option among "It is always applied", "It is sporadically applied and can be easily applied to all the projects", and "It cannot be applied due to limitations." They were then asked to elaborate on their responses. At the end of the interview, the EARHB model was presented to the interviewees, and they were asked for feedback on its applicability in the Iranian context.

Regulatory documents, including governmental prescriptions and recommendations for the reuse of heritage buildings in Iran (e.g., the NDRHB document), were collected.

Data Analysis

The responses of the interviewees were analyzed and coded using Atlas.ti tool. Inductive coding of the raw data led to the identification of possibilities and limitations for each step of the AR process, methods, and tool. All relevant policy documents were included in the analysis of interviews to explain the information provided by the architects and to clarify how the regulations affect the practice of AR in Iran.

Elaboration of Research Outcomes

The results of the analysis of the interviews, including the correlation with previous research by the authors, are elaborated per AR phase, step, method, and tool.

6.3 Results

This part is organized into four sub-sections, one for each of the four phases of the AR process (see Figure 6.1). Each sub-section discusses steps and the respective methods and tools, which architects can potentially utilize to improve the effectiveness of the AR process in Iran, as resulting from the interviews. The feedback given by the interviewees is reported, considering the regulations related to the AR process in Iran.

6.3.1 Phase 1, Pre-Project

Step 0. Initiative

The Initiative is about the decision to start an AR project and the involvement of different stakeholders (Aigwi, Phipps, Ingham, & Filippova, 2021). This step explicitly includes deciding to preserve, reuse, or demolish a building (Misirlisoy & Günçe, 2016; Pallada, 2017; Wilkinson, RemØy, & Langston, 2014). In the NRDHB document, the initiative is a step in which it is decided that the heritage buildings will be reused. In Iran, some heritage buildings mentioned as "National Wealth" cannot be reused without the confirmation of the Islamic Consultative Assembly (Article 83 of the Constitution). However, there are no specific guidelines for this decision, which leaves some of these heritage buildings to be abandoned due to not granting reuse permission (Talaie Shokri & Shafia, 2023).

A single method and tool has been identified for this step in the EARHB framework.

Method 1 is "Involving a less well-known but capable architecture firm in the architects group". The identified tool for this method is "Participation in matchmaking meetings". According to the EARHB framework, matchmaking events involve younger or less well-known architects in this first phase of the AR process. This leads to creating social value and updating the knowledge of experienced architects regarding different innovative aspects of the project. Table 6.1 illustrates the interviewees' responses about the application of this method in the context of Iran.

TABLE 6.1 Interviewees' responses to the applicability of methods per step in Phase 1 (Pre-project)

Step	Method	It is always applied	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations	Limitations for applicability in Iran - Remarks by the interviewees
Step 0. Initiative	Method 1. Involving a less well-known but capable architecture firm in the architects group	-	●●●●●*	●●●	Lack of transparency about the collaborations; Limitations of collaborations to internal network; No chance for young architects or misusing them

** The dots represent the number of interviewees who selected each option. Total number of interviewees is 8.*

As shown in Table 6.1, five interviewees stated that this method and its relative tool could be easily applied to all the projects in Iran and mentioned, *"Interesting partnership events, or as you call them, match-making events, have started to be held in Iran"*. Three interviewees found Method 1 hardly applicable in the current context of Iran. One interviewee provided an example of their experience in participating in an architecture competition in Iran, where someone who had never participated in the competition was finally selected. Several interviewees mentioned that well-known architects might involve less well-known or young architects in Iran but without any payment or compensation.

The results of the interviews in Phase 1 (Pre-project) are rather consistent with previous research on case studies conducted by the authors (Arfa et al., 2024), where it was shown that this method was not employed.

6.3.2 Phase 2, Preparation

Step 1. Analysis

The analysis involves examining various aspects of the building and its surroundings (Kuipers & Jonge, 2017; Zijlstra, 2009). In the EARHB framework, six methods and tools have been identified; the applicability of these has been discussed with the interviewed architects. Table 6.2 outlines the feedback from the interviewees on each method across different steps.

TABLE 6.2 Interviewees' responses about the applicability of methods for each step of Phase 2 (Preparation)

Step	Method	It is always applied	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations	Limitations for applicability in Iran - Remarks by the interviewees
Step 1. Analysis	Method 2. Analysis of the building and site (architectural/ functional aspects)	●●●●●*	●●●	-	-
	Method 3. Analysis of technical aspects of the building (e.g., hazardous chemical material, acoustical properties, environmental sustainability.)	●	●●●●	●●●	Not typical in the context of Iran
	Method 4. Collecting data about the buildings in archives	●●	●●	●●●●	Lack of documentation; Time-consuming and expensive; Issues with data sharing
	Method 5. Involving the original users during the AR process	●●●●	●●●●	-	-
	Method 6. Reviewing the documents, photographs, drawings, writings, and logbooks of the building and site	●	●●●	●●●●	Lack of documentation
	Method 7. Digital storing of all the collected and produced data	●	●	●●●●●●	Not typical in the context of Iran
Step 2. Value assessment	Method 8. Avoiding relying on their own assessment to limit subjectivity	●	●●	●●●●●	Not typical in the context of Iran
Step 3. Mapping the level of significance	Method 9. Repeated analysis of the building	●	●	●●●●●●	Not typical in the context of Iran

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TABLE 6.2 Interviewees' responses about the applicability of methods for each step of Phase 2 (Preparation)

Step	Method	It is always applied	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations	Limitations for applicability in Iran - Remarks by the interviewees
Step 4. Adaptive reuse potential (function)	Method 10. Involving the end-users and local community during the AR process (for recognition of their needs and the possibility of placing the required functions within the building)	●	●	●●●●●●	Lack of interest of end-users (partially) and local community to be involved; Limited proposed functions by RFO
Step 5. Defining the design strategy	Method 9. Repeated analysis of the building	●	●●●●●●●	-	-
	Method 11. Applying structured design strategies for the AR of the building	●●	●●●	●●●	Not typical yet
	Method 12. Considering the well-being of users within the required functions	-	●	●●●●●●●	Not typical yet
	Method 13. Getting inspired by the other effective reuse projects	●●●●●●●●	-	-	-
	Method 14. Employing digital and innovative tools to complement the architects' strategies and stories	●	●●●	●●●●	Not typical yet
Step 6. Final decision-making	Method 15. Striking a balance between the existing situation of the building and the requirements	●	●●●	●●●●	The final decision is usually made by the client without flexibility

** The dots represent the number of interviewees who selected each option. Total number of interviewees is 8.*

Method 2 is "Analysis of the building and site (architectural/functional aspects)" and its tools is "Analog and digital surveying tools". According to the interviewees, the analysis of architectural and functional aspects of buildings, in addition to historical analysis, is conducted at most architectural firms when dealing with heritage buildings. This has also been highlighted in the NDRHB document (*National Document for Revitalizing of Heritage Buildings*, 2008).

Method 3 is “Analysis of technical aspects of the building (e.g., hazardous chemical material; acoustical properties, environmental sustainability.)” and its tool is “Hiring the related specialist to conduct the needed analysis”. The interviewees mentioned that these aspects (e.g., environmental sustainability) are not mandatory in the regulations for the AR of heritage and existing buildings in Iran; reviewing the NDRHB document also confirms this. According to the interviewees, as long as something is not mandatory, its implementation will be fully dependent on the interest of the architecture firm. In fact, according to the interviewees, this method and its tool are not used in AR practice in Iran yet. They provided the example of environmental-sustainability analysis of the current status of the building using different tools (e.g., LCA, BREEM, etc.) and mentioned, “*These are not only missing in AR projects of heritage buildings but also new construction projects in Iran*”.

Method 4 is “Collecting data about the buildings in archives”. This method is in use by some architects in the AR process in Iran (Arfa et al., 2024); however, the interviewees mentioned several factors limiting the application of this method: lack of available documentation, time-consuming and expensive process, and issues with data sharing. According to one of the interviewees, this method is not always applied in the Iranian context due to the lack of documentation of the buildings and interventions over time. Other interviewees mentioned that collecting data about the building in different organizations is time-consuming and expensive and is thus often skipped. The interviewees stressed the issue that data about heritage buildings in Iran is not in accordance with FAIR principles, findable, accessible, interoperable, and reusable (“FAIR principles,” n.d.). According to one of the architects, “*During one of our reuse projects, parts of the data about the building was available in the National Archive of Tehran, and parts of that had to be collected in the MCTH; however, the access to parts of the data was denied, due to lack of collaboration of one of these organizations*”. The other interviewee mentioned that *“In Iran, data is approached as wealth and power, so it is not easily shared with other organizations”.*

Method 5 is “Involving the original users during the AR process” and its tool is “Holding meetings with them”. The interviewees mentioned that holding meetings with original users depends on the scale of the project and the interest of the original users. If the original users are interested and available, they will be consulted to attain information regarding the building. No specific point about the original users has been mentioned in the NDRHB document (*National Document for Revitalizing of Heritage Buildings*, 2008).

Method 6 is “Reviewing the documents, photographs, drawings, writings, and logbooks of the building and site”. According to the interviewees, method 6 is currently always applied in Iran, but the quality of its application and implementation depends on the financial resources and time dedicated to the project. Moreover, data should be available and accessible. One interviewee mentioned that, *“In Iran, we have a strong oral history about buildings but not much has been written and documented”*.

Method 7 is “Digital storing of all the collected and produced data” and its tools is “Data management tools for documenting the process”. As shown in Table 2, one of the interviewees mentioned that they store the data on personal hard drives, which poses the risk of data loss. Regarding the application of Heritage Building Information Modelling (HBIM) (López, Lerones, Llamas, Gómez-García-Bermejo, & Zalama, 2018), the interviewees mentioned that it has the potential to be used in Iran, but for these innovations to become common in Iran, they would need to be adopted by numerous organizations. The importance of high-quality data documentation has been highlighted in the NDRHB document (*National Document for Revitalizing of Heritage Buildings*, 2008), but does not include any guidelines regarding digital storage, etc.

Step 2. Value Assessment

This step is about recognizing all the possible values (Van Balen, 2008) and assigning them to different attributes of the building (Kuipers & Jonge, 2017). In the NDRHB document, “value” has been significantly referred to as “authenticity and historic value” and does not include other values, such as use and functionality value.

Method 8 mentioned in the EARHB framework is “Avoiding relying on their own assessment to limit subjectivity” and its tool is “Hiring a company to do the historic value assessment with the predefined code”. Regarding the current use and possible future applicability of Method 8, half of the interviewees emphasized the term “value” is mainly considered as “historic value” and this term, in its broader connotation (e.g., functional value, social value, etc.) is not commonly used by architects or the RFO in Iran. This confirms what reported in the NDRHB document. However, one of the interviewees, who is not only a practicing architect but also a scholar, mentioned that “*We used the NARA grid on value in our project and we know that this is a more updated approach in comparison to other architects in practice in Iran*”.

Step 3. Mapping the Level of Significance

This step is focused on differentiating between the importance of the recognized values about different elements within the heritage buildings. According to Arfa et al. (2024), in effective AR projects, in this step, architects review the results of Steps 1 and 2 to determine the level at which each existing value needs to be considered in the next steps (Arfa et al., 2024). The NDRHB document does not include any guidance in this (*National Document for Revitalizing of Heritage Buildings*, 2008).

Method 9 mentioned in the EARHB framework for this step is "Repeated analysis of the building", and its tools is "Reviewing all the collected and analyzed data; Re-inspecting the building to reveal the possible hidden aspects". Only one interviewee reported to have applied the methods and its relative tool; another interviewee mentioned these would be easily applicable in Iran. One interviewee mentioned, "*We do not approach the process in this way; it is a very structured and interesting way to approach AR processes".* The limitation mentioned for applying Step 3, mapping the level of significance of elements in heritage buildings, is mainly about the lack of familiarity with this approach among architects.

Step 4. Adaptive Reuse Potential (Function)

This step is focused on finding the most appropriate function for the building, using MCDM (Multiple-Criteria Decision-Making) and MCDA (Multiple-Criteria Decision Analysis) methods to weigh different criteria and pros and cons for new possible functions (Aigwi, Ingham, Phipps, & Filippova, 2020; Ribera, Nesticò, Cucco, & Maselli, 2020). According to the EARHB framework, the specification of functions can be proposed based on the architects' suggestion and the recognition of the community needs (Arfa et al., 2024). In the NDRHB document, all the heritage buildings in Iran have been categorized into thirteen groups according to their function (e.g., houses, castles, caravanserais, etc.). For each of the groups, twelve different new functions, such as commercial and educational, have been proposed and scored (*National Document for Revitalizing of Heritage Buildings*, 2008). However, the criteria for scoring the new functions for each group are not clear. Structured methods that include the needs of end-users and communities are required (Ramezani, 2024). According to one of the interviewees, "*The functions are mainly hotels and restaurants predefined by the Cultural Heritage Organizations […] It would be great to approach this systematically by involving end-users and local communities".*

The EARHB framework mentions Method 10, which is "Involving the end-users and local community during the AR process (for recognition of their needs and the possibility of placing the required functions within the building)", and its tools are "Holding several meetings with the end-users for input and using renders and 3D models in presenting the project to end-users" and "Reviewing all the collected and analyzed data; Re-inspecting the building to reveal the possible hidden aspects". One interviewee found that this method and its tools are already applied in Iran and mentioned the involvement of original users: *"It was tough to find the original users, but we could find their grandchildren and historic photo albums of the family. We have used this in the AR process and some of their photos are now used in the building to show its history to the visitors"*.

However, most of the interviewees mentioned that Method 10 can hardly be applied in Iran. According to them, the main limitation to the application of the method is the scale of the project and the interest of end-users to be involved in the project. Several interviewees mentioned that in most historic parts of Iranian cities, the original users have left the zone of heritage buildings, and now the local communities include mostly immigrants from other countries who are not interested in being involved. However, previous research on case studies by the authors (Arfa et al., 2024) showed that this method is sometimes applied.

Step 5. Defining the Design Strategy

According to the EARHB framework, in this step, the architect develops the design strategy to be applied to the project. Strategies for dealing with AR might be based on shapes, such as building within, building over, etc. (Plevoets & Van Cleempoel, 2013) and/or on value assessment (e.g., Broekhuizen, Arkesteijn, De Jong, & Van Nieuwamerongen, 2020; Kuipers & Jonge, 2017). In the NDRHB document, no specific point about "defining the design strategy" is mentioned, but the importance of "preserving the historic values of heritage buildings" and "minimum interventions" is reported several times.

The EARHB framework reports Method 9, which is "Repeated analysis of the building" and its tools "Reviewing all the collected and analyzed data; Re-inspecting the building to reveal the possible hidden aspects". According to the interviewees, this method is often applied in Iran, "*We try to go back to the previous steps to come up with the design strategy for the building"*.

Method 11 is "Applying structured design strategies for the AR of the building" and its tool is "Reviewing the literature on the AR process and accordingly developing specific frameworks and schemes for the AR process". Several interviewees mentioned that

structured design strategies are sporadically applied in the context of Iran. One interviewee stated, *"I used my scientific knowledge to make the process of AR in the case of a historic house to a boutique hotel an informed and structured process".*

Method 12 is "Considering the well-being of users within the required functions" and its tool is "Hiring experts on environmental sustainability, users' comforts, and well-being". Most interviewees mentioned that considering users' well-being is not usual in AR process in Iran. According to one of the interviewees, *"Users' comfort and well-being is just a new topic within the new constructions; in the heritage buildings, it is not more than adding normal air-conditioning and warming/cooling systems to the building without in-depth analysis".*

Method 13 is "Getting inspired by the other effective reuse projects" and its tool is "Visiting and analyzing effective reuse buildings with similar functions". All the interviewees mentioned that they get inspiration for their projects. According to one of them, *"I have visited many cases in Europe (e.g., Dominican church in Maastricht, etc.) and they have been very inspiring but I am not sure how to encourage other architects to do so".*

Method 14 is "Employing digital and innovative tools to complement the architects' strategies and stories" and its tool is "Hiring experts on digital tools in storytelling". While Method 14 was new to half of the interviewees, one of them believed that it is applied in Iran, and three believed that it is sporadically applied but can be easily applied to all projects. According to one of the interviewees, *"We never thought about this. Does this enhance the users' attraction to the building?".*

Step 6: Final Decision-Making

Final decision-making is a crucial step, as it is the moment in which all stakeholders need to agree on the project before execution can start. Architects, by being open and flexible, can play a significant role in this (Roos, 2006; Arfa et al., 2024). In the NDRHB document, no specific guideline can be found related to "decision-making". Table 6.2 shows the methods and tools, as mentioned in the EARHB framework, by which architects can facilitate a shared final decision.

Method 15 is "Striking a balance between the existing situation of the building and the requirements" and its tool is "Meetings with stakeholders involved in the process and discussing their needs and possible solutions". Previous research by the authors highlights an alternative tool that is already used in Iran in this step "Getting influential roles within the city on board with the process".

Half of the interviewees believed that *"We as architects do not have that much influence on the decision made by the client or other stakeholders"*. Thus, it seems that the trade-off between the requests and architects' decisions is not easily applicable in the context of Iran.

When comparing the previous information collected on Phase 2 (Preparation) of the AR process by the authors in the analysis of case studies (Arfa, Lubelli, Quist, Zijlstra, et al., 2024)) with the outcome of the interviews, parts of the results are in line with each other. For example, Method 2 was significantly used by the architect. However, discrepancies are present as well. For example, while according to the interviewees, Method 5 (Involving the original users during the AR process) is also among the prevalent methods used in the context of Iran, the studied cases and architect did not explicitly mention this. It can be assumed that architects in Iran attempt to involve original users in the AR process when possible. Similarly, Method 8 (Getting inspired by other effective reuse projects) is used by all the interviewees in the current research. This method was not explicitly identified in the analysis of the case studies (Arfa et al., 2024).

6.3.3 Phase 3, Implementation

Step 7: Execution

The involvement of architects during the execution step is necessary for an effective AR project (Giebeler et al., 2012). The NDRHB document has specific guidelines for controlling the execution step. Regular reports during the execution step in the AR process to the RFO organization have also been emphasized (*National Document for Revitalizing of Heritage Buildings*, 2008). In the EARHB framework, one method and relative tool have been identified. Table 6.3 shows the feedback of the interviewed architects in Iran.

TABLE 6.3 Interviewees' responses to the applicability of methods per step in Phase 3 (Implementation)

Step	Interviewees	It is always applied in Iran	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations	Limitations for applicability in Iran - Remarks by the interviewees
Step 7	Method 16. Discussions between the (leader) architect and the contractor and being involved in the execution step	●●●●●*	●●●	-	-

** The dots represent the number of interviewees who selected each option. Total number of interviewees is 8.*

Method 16 is "Discussions between the (leader) architect and the contractor and being involved in the execution step" and its tool is "Meetings with the contractors; Regular visiting of the site during the execution; Hiring of a flexible contractor".

According to one of the architects, *"I am always present on the construction site; I even rented an apartment in the city of the project for two years"*. In line with the requirement by RFO, this step seems to be applied in the context of Iran.

The results of the interviews are in line with the previous research conducted by the authors on case studies in Iran (Arfa et al., 2024).

6.3.4 Phase 4, Post-Completion

Step 8: Maintenance/Aftercare

An AR project of heritage buildings is never finished after execution; many scholars and organizations have highlighted the importance of maintenance and aftercare in having effective AR projects (Sheridan, Somerville, Ostergren, Matarese, & McCoy, 2018; Van Balen & Vandesande, 2018). The EARHB framework mentions two methods and tools for this step. Their applicability in Iran has been discussed with the interviewed architects.

Table 6.4 shows the feedback of architects in Iran toward the steps and methods associated with them.

TABLE 6.4 Interviewees' responses to the applicability of methods per step in Phase 4 (Post-completion)

Step	Interviewees	It is always applied in Iran	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations	Limitations for applicability in Iran - Remarks by the interviewees
Step 8	Method 17. Being open to modifying and adapting the design even after the execution of the project	-	-	●●●●●●●●*	Not typical yet
	Method 18. Discussions with the end-users after the execution of the project	-	-	●●●●●●●●	Not typical yet
Step 9	Method 19. Regular inspecting and visiting of the building after the execution	-	-	●●●●●●●●	Not typical yet
	Method 20. Being open to receiving feedback on the project and learning lessons for future projects	-	-	●●●●●●●●	Not typical yet

** The dots represent the number of interviewees who selected each option. Total number of interviewees is 8.*

Method 17 is "Being open to modifying and adapting the design even after the execution of the project" and Method 18 is "Discussions with the end-users after the execution of the project". The tool is "Holding meetings with end-users". The interviewees found these methods to be very important but still missing in the AR practice in Iran. They reported that *"After execution, we are not involved anymore"*. In the NDRHB document, some guidelines regarding the importance of "regular control" of building after execution are mentioned, and some templates for doing inspections are proposed. However, it seems that this is not about controlling the preservation of "qualities" of buildings but mainly "historic values". No point about architects and their role within this step is specified in this document. Moreover, it seems that it is mainly a suggestion and not a prescription (*National Document for Revitalizing of Heritage Buildings*, 2008).

Step 9: Evaluation After Years

Evaluation after years is about assessing the AR project in different aspects (Post-occupancy evaluation-POE), such as the socio-cultural sustainability of AR projects (Aydin, Yaldiz, & Siramkaya, 2015; Rezaei et al., 2018), user satisfaction, and energy efficiency (Boschmann & Gabriel, 2013; Lisitano et al., 2018; Sharpe & Shearer, 2013), and the economic impact of AR projects (Hoxha, 2019).

The EARHB framework mentions two methods. Method 19 is “Regular inspecting and visiting of the building after the execution” and its tool is “Being aware of the project impact and assessment methods and tools”. Method 20 is “Being open to receiving feedback on the project and learning lessons for future projects” and its tool is “Following the social media about the impact of the project”. The interviewees mentioned that this step and both methods 19 and 20 are relevant, but they still need to be applied more regularly in the context of Iran. The review of the NDRHB document confirms this (*National Document for Revitalizing of Heritage Buildings*, 2008).

Similarly, the previous research conducted by the authors on case studies in Iran (Arfa, Lubelli, Quist, Zijlstra, et al., 2024)), confirms that the methods within Phase 4 (Post-completion) are not widely used in AR practice in Iran.

6.3.5 The EARHB Model

After asking about the current usage and applicability of the methods and tools, the EARHB model (Figure 6.1) was shown to the architects, and they were asked for feedback. While they found the model interesting for the AR process in Iran, they highlighted the importance of introducing these models via guidelines through the MCTH and RFO organizations. According to them, applying the EARHB framework and similar innovative and systematic approaches to reuse depends on the managerial levels at organizations dealing with heritage (e.g., MCTH or municipalities). They stated, *“If managers with a passion for improvement join the municipalities and MCTH, these methods and tools can be promoted; otherwise, many prefer to continue using similar methods and tools as they did before”.* Some interviewees mentioned that this model, methods, and tools should be integrated in the education of young architects and the ongoing training of experienced ones. A few interviewees expressed the opinion that *“AR and, in general, the design process is based solely on intuition and cannot be approached systematically”.*

6.4 Discussion

This research delves into assessing the current usage and possible applicability in the context of Iran of a model for the AR process, including methods and tools, previously developed by the authors (Arfa et al., 2024). This section brings together and critically discuss the results from the interviews carried out with architects in Iran, presented in Section 6.3. It also discusses the collected results at the light of the administrative and policy constraints, reflecting on the applicability and limitations of the EARHB Framework in the context of Iran.

Table 6.5 summarizes the methods and the responses of architects regarding their usage and/or future applicability in the four phases of AR projects, as reported in Section 6.3.

TABLE 6.5 Overview of the current use and possibility of applicable of methods and tools in the EARHB framework to the context of Iran.

Step	Method	It is always applied in	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations
Phase 1. Pre-project				
Step 0	Method 1. Involving a less well-known but capable architecture firm in the architects group	-	●●●●●*	●●●
Phase 2. Preparation				
Step 1. Analysis	Method 2. Analysis of the building and åpects)	●●●●●	●●●	-
	Method 3. Analysis of technical aspects of the building (e.g. hazardous chemical material; acoustical properties, environmental sustainability.)	●	●●●●	●●●
	Method 4. Collecting data about the buildings in archives	●●	●●	●●●●
	Method 5. Involving the original users during the AR process	●●●●	●●●●	-
	Method 6. Reviewing the documents, photographs, drawings, writings, and logbooks of the building and site	●	●●●	●●●●
	Method 7. Digital storing of all the collected and produced data	●	●	●●●●●●
Step 2. Value assessment	Method 8. Avoiding relying on their own assessment to limit subjectivity	●	●●	●●●●●
Step 3. Mapping the level of significance	Method 9. Repeated analysis of the building	●	●	●●●●●●
Step 4. Adaptive reuse potential (function)	Method 10. Involving the end-users and local community during the AR process (for recognition of their needs and the possibility of placing the required functions within the building)	●	●	●●●●●●
Step 5. Defining the design strategy	Method 9. Repeated analysis of the building	●	●●●●●●●	-
	Method 11. Applying structured design strategies for the AR of the building	●●	●●●	●●●
	Method 12. Considering the well-being of users within the required functions	-	●	●●●●●●●
	Method 13. Getting inspired by the other effective reuse projects	●●●●●●●●	-	-
	Method 14. Employing digital and innovative tools to complement the architects' strategies and stories	●	●●●	●●●●
Step 6. Final decision-making	Method 15. Striking a balance between the existing situation of the building and the requirements	●	●●●	●●●●

TABLE 6.5 Overview of the current use and possibility of applicable of methods and tools in the EARHB framework to the context of Iran.

Step	Method	It is always applied in	It is sporadically applied and can be easily applied to all the projects	It cannot be applied due to the limitations
Phase 3. Implementation				
Step 7. Execution	Method 16. Discussions between the (leader) architect and the contractor and being involved in the execution step	●●●●●	●●●	-
Phase 4. Post-completion				
Step 8. Maintenance/ Aftercare	Method 17. Being open to modifying and adapting the design even after the execution of the project	-	-	●●●●●●●●
	Method 18. Discussions with the end-users after the execution of the project	-	-	●●●●●●●●
Step 9. Evaluation after years	Method 19. Regular inspecting and visiting of the building after the execution	-	-	●●●●●●●●
	Method 20. Being open to receiving feedback on the project and learning lessons for future projects	-	-	●●●●●●●●

** The dots represent the number of interviewees who selected each option. Total number of interviewees is 8.*

As depicted in Table 6.5, in the Pre-project phase (Phase 1), the involvement of less well-known architecture firms and matchmaking events is identified by the interviewees as a potential method to enhance social value creation and knowledge updating. While some interviewees mentioned this easily applicable in the context of Iran, limitations such as lack of transparency and limited collaboration opportunities seem to pose barriers to the effective application of these methods in the AR practice in Iran. The strong reliance on personal networks and the limited opportunities for young architects were highlighted as key challenges.

In the Preparation phase (Phase 2), Method 8 (Getting inspired by the other effective reuse projects) is always applied in Iran. Next to these, Method 2 (Analysis of the building and site (architectural/functional aspects) and Method 5 (Involving the original users during the AR process) are among the most used methods in Phase 2. The methods with the most limitations in the Preparation phase (Phase 2) are *"Digital storing of all the collected and produced data"*, *"Repeated analysis of the building"*, *"Involving the end-users and local community during the AR process"*, *"Considering the well-being of users within the required functions"*. According to the interviewees, the importance of systematic data storage throughout the AR process and digital representation models (e.g., BIM and digital twin technologies) still need to find their place in Iran. Advocating for the adoption of FAIR (Findable, Accessible,

Interoperable, Reusable) principles for data management within governmental organizations and educational institutions seems necessary. Similarly, the end-users and their well-being, specifically physical well-being, in AR projects are not much considered in the current practice. According to the limitations, it seems that the MCTH, RFO, and municipalities in Iran need to play a more active role in urging the necessity of in-depth and more technical analysis in line with the global challenges (e.g., environmental-sustainability) when educating architects for adaptive reuse of heritage buildings.

All the methods within the Post-completion phase (Phase 4) show no application due to limitations in Iran. It can be concluded that in the current practice of AR in Iran, the life of the building after Phase 3 (Implementation) is not significantly monitored or evaluated.

Table 6.5 shows that the majority of responses (dots per person/response) are in the last column, "It cannot be applied due to the limitations". In response to the question regarding the applicability of the EARHB model in Iran, similar responses were received, indicating that *"These changes need to be introduced at managerial levels within organizations and then will be applied by others".*

The findings of this study underscore the need for tailored approaches to AR in the Iranian context. Future research efforts should focus on addressing the identified limitations and developing strategies to overcome barriers to effective AR practice. However, it should be emphasized that overcoming barriers does not necessarily lead to effective AR practice, but there are possibilities that they might influence the effectiveness of AR projects. Future research could involve initiatives such as:

- **Capacity building:** Integration of systematic AR approaches into ongoing professional training programs can enhance the adoption of innovative methods and tools among practitioners. This would address the issue of limited knowledge about the most current methods and tools which can support an effective AR process.

- **Policy and regulatory reform:** Updated legislation and guidelines by MCTH and RFO can provide a more supportive framework for implementing systematic AR processes. The current regulation document (NDRHB) seems comprehensive. However, the inclusion of clear mandates for technical analysis, energy efficiency, and stakeholder engagement could facilitate more comprehensive and inclusive approaches to AR. These proposals could address some steps which are currently missing, such as value assessment, maintenance and aftercare, and evaluation after years.

- **Community engagement:** Initiatives to foster community participation and awareness-raising campaigns could promote greater involvement of original and end-users and local communities in the AR process. Platforms for dialog and consultation can facilitate collaborative decision-making and ensure that projects align with community needs and aspirations. This could effectively address the observed lack of consideration for the end-users of the buildings object of AR.

While the EARHB framework acts as a promising collection of process model, methods, and tools for AR practice in Iran, their effective implementation requires addressing contextual challenges and fostering a supportive environment for innovation and collaboration. By adopting a multifaceted approach that encompasses policy reform, capacity building and community engagement, stakeholders, including the architects, can work toward realizing the full potential of adaptive reuse as a sustainable conservation strategy for Iran's cultural heritage.

6.5 Conclusions

This study aims to assess the applicability of a model for AR of heritage buildings in the Iranian context, including methods and tools previously developed by the authors. Iran is renowned for its rich heritage, yet facing challenges due to the necessity of updated legislation, more systematic and effective management, and more public participation in preservation efforts.

The research design involved semi-structured interviews with architects engaged in AR projects in Iran, coupled with a review of policy documents governing heritage preservation. Previous publication by the authors on the current status of AR in Iran served as basis to the data analysis of the current research.

The findings revealed that while some methods and tools align well with current practices in Iran, others face challenges due to cultural, regulatory, and practical constraints. For instance, involving end-users and local communities in the AR process proved challenging due to shifting demographics and lack of interest from immigrant populations in heritage zones. Similarly, issues such as limited documentation, lack of data sharing, and bureaucratic hurdles hindered the implementation of some methods, such as data collection.

Despite these limitations, there is a clear recognition among architects of the need for a more systematic and innovative approach to AR projects. According to most, the EARHB framework can enhance the effectiveness and sustainability of AR practices in Iran. However, the successful implementation of the proposed EARHB framework requires not only additional technical expertise but also institutional support and a cultural change within heritage preservation organizations.

The EARHB framework can serve as a valuable resource for architects, practitioners, and policymakers worldwide grappling with similar challenges in preserving heritage while meeting contemporary needs. The EARHB framework versatility lies in its ability to offer systematic approaches and practical tools that can be customized and applied to different cultural, legal, and socio-economic contexts.

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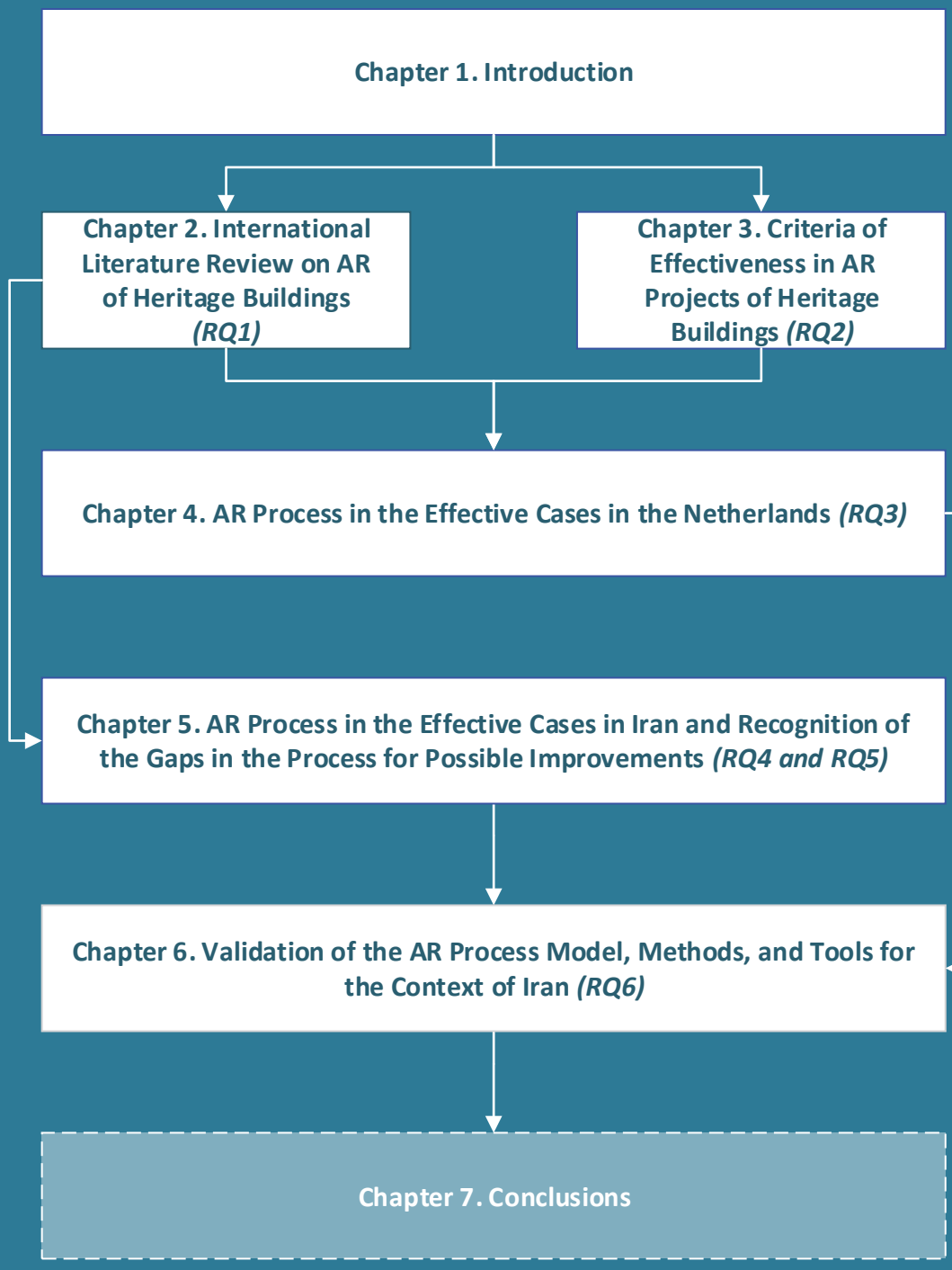
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TOC

7 Conclusions

7.1 Main Outcomes and Revisiting Research Questions

In the introduction of this dissertation (Chapter 1), six research questions were raised to approach the aim of the research. In this section, the answers provided to these questions by the research are summarized.

"What is the available knowledge, including scientific and practice-based literature, on the adaptive reuse process of heritage buildings at the international level, and in particular in the Netherlands?"

The literature review (Chapter 2) provided insights into the available knowledge about the AR process at the international level, and in particular in the Netherlands. It indicated a lack of an overarching model covering the entire AR process of heritage buildings. Research on AR was shown to be scattered across different phases. To address this gap, the literature was categorized into four main phases of the AR process: pre-project, preparation, implementation, and post-completion. It emerged that implementation and post-completion phases received scarce attention in the literature. Through this review, several studies guiding the development of a comprehensive model for AR were identified. Based on this literature, a model for AR of heritage buildings was proposed structured into 10 steps, including initiative, analysis, value assessment, and final decision-making. Challenges in stakeholder alignment, function selection, and design strategy were highlighted. The developed 10-step model is proposed to serve as a guide for AR projects, emphasizing the preservation of heritage values while adapting the heritage building to contemporary needs. In the next phase of the PhD research, the developed AR model was further refined and validated through investigation of the actual AR project in real-life situations.

“According to which criteria can effectiveness of adaptive reuse projects be evaluated?”

The jury reports of the NRP Golden Phoenix prize and Europa Nostra award were used as basis to define effectiveness criteria for AR projects of heritage buildings. The research identified various aspects recognized by expert juries as relevant for the quality of AR projects, classified them and emphasized their significance for the effectiveness of projects.

The research showed that both awards prioritized aspects related to social value creation and sublimation, reflecting their primary objectives to encourage preserving heritage values and fostering community engagement. Core identifiers of the effectiveness across almost all the criteria include “people” (encompassing local and wider communities), their stories, and their experiences within the reused buildings. In the realm of social value creation, attention was placed on enhancing community involvement and well-being, with an emphasis on local narratives and skills. Similarly, the sublimation criterion highlighted the importance of authenticity, integration of heritage values into new designs, and the balance between preservation and functionality.

Although environmental sustainability received limited attention in the awards, it was underscored in the scientific literature as a crucial criterion for effective AR projects, urging greater focus on aspects like energy efficiency and biodiversity preservation. The criterion of economic value creation emphasized the role of heritage buildings in attracting creative enterprises and cultural tourism, with a balance sought between economic benefits and social value creation to mitigate over-tourism risks. Innovation was recognized for its potential to enhance learning effects and visitor experiences through technological advancements.

Overall, the convergence of criteria such as social value creation, sublimation, and economic value creation highlights their interconnectedness and their influence on the effectiveness of AR projects. These findings provided a framework, consisting of six groups of aspects (for a total of 108 aspects), for evaluating AR projects and informed the next parts of this PhD research.

“What are the steps in the adaptive reuse process, and the methods and tools used by architects in effective cases of adaptive reuse of heritage buildings in the Netherlands?”

This part of the research delved into the complexity of adapting heritage buildings for contemporary use, focusing on four effective cases in the Netherlands to refine, enrich, and validate the AR model defined in Chapter 2. Despite each architect or firm having their unique approach, common steps emerged from the data analysis, and the iterative nature of the AR process became evident. In fact, a significant finding was the non-linear progression of steps in the AR process, with feedback loops occurring between them, underscoring the dynamic characteristics of AR process. This insight led to the development of the Effective Adaptive Reuse Model (abbreviated as the EARHB model).

The research cataloged the diverse methods and tools employed by architects, ranging from site analysis to stakeholder engagement techniques. These tools not only facilitated decision-making but also fostered collaboration and consensus-building among stakeholders. The collection of the process model and methods and tools (abbreviated as the EARHB framework) can act as a process guideline for architects with useful insights for other stakeholders in AR processes.

Another key takeaway of this research was the pivotal role architects play throughout the AR process, extending beyond design to encompass stakeholder engagement, negotiation, and problem-solving. Soft skills, such as communication and flexibility, emerged as crucial factors contributing to project effectiveness. Furthermore, the study shed light on the influence of various stakeholders, including investors, regulators, and users. While budget constraints posed challenges, passionate investors often propelled projects forward, showcasing the importance of financial commitment. Regulatory bodies played a supportive role, valuing both historic preservation and functional utility.

While the study highlighted the importance of social and cultural value creation, it also emphasized the need for greater attention to environmental sustainability in AR projects. This study highlighted that architects need to adopt a more proactive and broader approach to sustainability in heritage building preservation, which goes beyond mere energy efficiency considerations.

"What are the steps in the adaptive reuse process, and the methods and tools used by architects in effective cases of adaptive reuse of heritage buildings in Iran?" and "What are the main gaps in the current adaptive reuse process of heritage buildings in Iran, compared to the process model, methods, and tools observed in Dutch adaptive reuse cases?"

To answer these questions, the AR process of heritage buildings in Iran was critically studied, focusing on the perspectives of architects. Through case analysis and interviews with architects, it became evident that architects in Iran display a significant interest in investigating the historical aspects of buildings during the AR process. Despite encountering time constraints, architects adapted general design strategies to accommodate the specific needs of each case. However, there existed a gap between the depth of analysis conducted and the subsequent design strategies, suggesting potential discrepancies in alignment. Besides, while architects exhibited active involvement during project execution, their involvement in the post-completion phase, particularly concerning maintenance and long-term evaluation steps, appears lacking.

Furthermore, a comparative analysis between theoretical literature studies and practical case studies underscored substantial disparities. Theoretical research emphasized critical steps in the AR process, such as value assessment and maintenance, and highlighted aspects such as community involvement, which often received inadequate attention in the studied AR projects in Iran. Although the scientific literature broadly covered necessary procedural AR steps, the implementation of the steps varied significantly across cases, indicating a notable incongruence between theory and practice. The pivotal role of government support in facilitating effective AR projects in Iran emerged as a central finding.

"Which process model, methods, and tools used in the adaptive reuse process in the Netherlands can be applied to the adaptive reuse of heritage buildings in Iran?"

To answer this question, the research explored the applicability of AR model, methods, and tools developed in the previous part of the work (the EARHB framework) to the AR practice of heritage buildings in Iran. Architects working on AR of heritage building in Iran were interviewed. In these interviews the current usage, applicability, and limitations of the EARHB framework in Iran were addressed, in the light of the current administrative and policy constrain.

The research showed that, in the pre-project phase, methods and tools such as involving less-known architecture firms and matchmaking events could enhance social value creation; however, challenges like lack of transparency and limited collaboration opportunities hinder the application of these methods. According to

the interviewees, several methods and tools among those identified in the EARHB framework, (e.g., analysis in the preparation phase) are quite often used in AR projects in Iran. Differently, some other methods and tools are deemed atypical in Iran, and organizational-level changes would be necessary to facilitate their adoption. Certain methods, mainly related to the post-completion phase, are not yet introduced in Iran, indicating a need for greater consideration of project impact after execution.

The study underscored the need for tailored approaches to AR in Iran, suggesting initiatives such as capacity building, policy reform, community engagement, and knowledge exchange. By addressing contextual challenges and fostering collaboration, stakeholders can maximize AR's potential as a sustainable conservation strategy for Iran's cultural heritage. The EARHB framework offers a systematic framework, potentially adaptable to various cultural and regulatory contexts, and provides valuable insights for architects, not only in Iran but also worldwide.

7.2 Research Impact

This section explores the contributions of this PhD research from scientific and societal perspectives.

7.2.1 Scientific Contribution

This dissertation fills a significant gap in the international literature by providing a comprehensive study of the AR process of heritage buildings. It identifies the fragmented nature of the existing research on the AR process and it proposes a structured analysis of the literature according to four main phases of the AR process: pre-project, preparation, implementation, and post-completion. Based on this extensive review, the dissertation proposes a novel process model of the AR process, including key-steps such as analysis, value assessment, and evaluation after years. This theoretical model, enriched by different case studies and validated by semi-structured interviews, can serve as a framework for AR projects, emphasizing the preservation of heritage values while accommodating contemporary and future needs. By highlighting the necessity of analysis and value assessment of heritage buildings, this research contributes to the concept of 100% heritage

("100% Heritage for A More Sustainable Future," 2020). Thus, the applicability of the developed process model is not limited to what is usually defined as "heritage", i.e. historic buildings, but it can be further adapted to any existing building.

By analyzing jury reports from prestigious awards in the field of AR of heritage, the dissertation identifies criteria for evaluating the effectiveness of AR projects. These criteria encompass social value creation, sublimation, environmental sustainability, economic value creation and innovation, providing a comprehensive framework for assessing AR projects. The criteria, groups of aspects, and aspects can be the starting point of further research focusing on each to improve the quality of AR projects in different aspects. This criteria can also act as a systematic evaluation framework for architecture competitions focused on heritage and existing buildings.

Through a study of effective cases in the Netherlands, the dissertation elucidates common steps and methodologies employed by architects in the AR process. It highlights the iterative nature of AR projects, underscores the multifaceted role of architects, and emphasizes the importance of stakeholder engagement and sustainability considerations. Thus, this research can act as a starting point for further research on circularity and life cycle analysis in AR projects of heritage and existing buildings in the Netherlands.

The dissertation critically examines the AR process of heritage buildings in Iran, highlighting disparities between theoretical frameworks and their practical implementation. It identifies gaps in areas such as value assessment, maintenance, and post-project evaluation, emphasizing the need for tailored conceptual models and government support. Building upon insights from the Netherlands, the dissertation highlights the possibilities and limitations of the EARHB framework for the Iranian context, addressing administrative and policy constraints. Overall, the dissertation contributes to the advancement of knowledge in the field of AR by providing a holistic understanding of the process, identifying effectiveness criteria, offering insights into international practices, and proposing a model, methods, and tools (the EARHB framework) that can be adapted for implementation within different regions.

7.2.2 Societal Contribution

This work makes significant societal contributions by advocating a balanced approach to preserving cultural heritage through AR. By emphasizing the AR of heritage buildings, this dissertation promotes sustainable development principles, while accommodating contemporary needs, thus safeguarding cultural diversity and heritage for future generations. Effective AR contributes to resource conservation, reduces urban sprawl, and enhances community resilience, in alignment with global sustainability goals. Furthermore, by prioritizing community involvement and engagement in the AR process, this work empowers local communities, valuing their narratives, skills, and well-being. This participatory approach fosters a sense of ownership and pride among community members, strengthening social cohesion and cultural identity.

The dissertation underscores the importance of stakeholder collaboration in the AR process, including architects, investors, regulators, and community members. By highlighting the role of architects as facilitators of collaboration and problem-solving, the dissertation fosters interdisciplinary dialogue and cooperation, leading to more inclusive and sustainable decision-making processes.

The dissertation contributes to the professional development of architects, practitioners, and policymakers through the adaptation of Dutch methods for the Iranian context and the proposal of initiatives such as capacity building and knowledge exchange. By disseminating best practices, lessons learned, and innovative strategies, the dissertation promotes continuous learning and improvement in the field of AR.

By prioritizing aspects such as social value creation, environmental sustainability, and community well-being in AR projects, the dissertation ultimately aims to enhance the quality of life for inhabitants and users of heritage buildings. This holistic approach considers the broader societal impact of architectural interventions, striving to create built environments that are inclusive, accessible, and conducive to human flourishing.

On the whole, the dissertation's societal contributions extend beyond the academic realm to positively impact communities, promote cultural heritage conservation, enhance stakeholder collaboration, and improve the quality of life for individuals and society as a whole.

7.3 Research Limitations

The dissertation acknowledges several limitations that may affect the depth and applicability of its findings:

- **Limited focus:** While the focus on the AR process of heritage buildings and the exchange between the Netherlands and Iran provides valuable insights, it may overlook aspects specific to other geographical contexts.

- **Generalizability:** The proposed models, criteria, and methodologies may have limited generalizability and applicability to diverse cultural, socio-economic, and regulatory contexts, impacting their applicability and effectiveness in different settings.

- **Cultural and linguistic differences:** Comparative analysis between different cultural and linguistic contexts, such as the Netherlands and Iran, may be influenced by cultural differences and varying interpretations of terms and concepts.

- **Bias and subjectivity:** Despite efforts to maintain objectivity, inherent biases and subjectivities may influence the selection of case studies, criteria for evaluation, and interpretation of results. It should be mentioned that the effectiveness criteria in this research are based on the jury reports of two awards in the Netherlands and Europe. The jury members of these two awards are mostly architects. This might have influenced the assessment of projects in different aspects (e.g., environmental sustainability and economic value creation).

- **Necessity of validation in real-world projects:** To ensure the effectiveness and applicability of proposed frameworks, validation through real-world implementation and empirical testing is crucial. While semi-structured interviews (Chapter 6) were employed to validate the EARHB framework, and attempts were made to complement it with gamification (Appendix 7.1), further validation studies during the actual AR process can enhance the reliability and robustness of the EARHB framework.

- **Limited stakeholder access:** Limited access to key-stakeholders, including architects, policymakers, and community members, may have constrained the depth of insights gathered during interviews or case studies.

— **Temporal Relevance:** This dissertation represents the state of knowledge and practices up to its completion. However, rapid advancements in AR practice, policies, and evolving societal trends may make certain findings outdated or less relevant over time. This highlights the importance of continuous research and updates in the AR field to stay current with developments.

7.4 Recommendations for Future Rresearch

This works contributes to filling the gaps identified in AR research by developing a model for effective AR of heritage buildings. While significant progress has been made, there remains room for further investigation. Future research could focus on validating the proposed models, methods, and tools (the EARHB framework) through empirical testing and real-world application. Collaborative efforts involving architects, policymakers, end-users, and local communities can help assess the applicability and effectiveness of the developed model across diverse contexts and project scenarios. Moreover, exploring game-based processes for efficient decision-making in AR processes (Appendix 7.1) warrants further attention.

Studies tracking the outcomes of AR projects over time, especially during post-completion phases such as maintenance, usage patterns, and community impact, could yield valuable insights into the effectiveness and sustainability of AR interventions. This would provide a more comprehensive understanding of the effectiveness of methods and tools employed throughout the AR process.

While this research primarily focused on developing an AR model and validating it within Dutch and Iranian contexts, future research should strive for broader geographical and cultural inclusivity. Investigating AR practices across different regions, taking into account regulatory frameworks, cultural norms, and socio-economic conditions, will enrich the understanding of AR process dynamics. Additionally, expanding the scope to encompass economic aspects of effective AR projects would contribute significantly to the existing body of knowledge. Similarly, analysing the impact of existing policies and regulations on AR processes, and identifying best practices and policy recommendations, presents promising avenues for further research.

In terms of technological innovation, exploring the potential of emerging technologies such as building information modelling (BIM) and virtual reality (VR) in enhancing AR processes is imperative. Understanding how digital tools can facilitate decision-making and stakeholder communication throughout the AR process and post-project management stages is essential for advancing the field.

Documenting and disseminating effective AR projects through case studies and critical analyses can provide valuable insights. Leveraging and adapting the AR process model developed in this research as an analysis tool for AR processes can enhance the understanding and replication of effective AR processes across borders.

Finally, exploring the importance of AR of heritage buildings in sustainable urban development requires deeper examination. Involving policymakers, community representatives, and the general public in real-world cases fosters appreciation for cultural heritage and garners support for AR projects. While the prioritization of heritage preservation and AR varies depending on socio-economic factors, launching public awareness campaigns and conducting further research on real-world cases are essential steps toward sustainable urban development.

References

100% Heritage for A More Sustainable Future. (2020). Retrieved April 10, 2023, from Communication BK website: https://www.tudelft.nl/en/2020/bk/100-heritage-for-a-more-sustainable-future

Appendices

Appendix 3.1

TABLE APP 3.1 List of the selected cases included in the review among projects that won the NRP Golden Phoenix and Europa Nostra awards.

Award	Case	Year of Winning the Award	Location
NRP Golden Phoenix	LocHal	2019	The Netherlands
NRP Golden Phoenix	Blokhuispoort	2018	The Netherlands
NRP Golden Phoenix	A'dam Toren (A'dam Tower)	2017	The Netherlands
NRP Golden Phoenix	De timmerfabriek (The carpentry factory)	2016	The Netherlands
NRP Golden Phoenix	De Hallen (The Halls)	2015	The Netherlands
NRP Golden Phoenix	Energiehuis (Energy house)	2014	The Netherlands
NRP Golden Phoenix	MetaForum	2013	The Netherlands
NRP Golden Phoenix	Conservatorium (Conservatory hotel)	2012	The Netherlands
NRP Golden Phoenix	Lichttoren (Light tower)	2011	The Netherlands
Europa Nostra	Gare Maritime	2021	Belgium
Europa Nostra	Haus Am Horn	2021	Germany
Europa Nostra	18 Ormond Quay Upper	2021	Ireland
Europa Nostra	Besòs Water Tower	2021	Spain
Europa Nostra	Mas de Burot	2021	Spain
Europa Nostra	Hvar's Arsenal	2020	Croatia
Europa Nostra	LocHal	2020	The Netherlands
Europa Nostra	Manor Farm of Bois de Chênes	2020	Switzerland
Europa Nostra	Castle of Montreuil Bonnin	2019	France
Europa Nostra	Cathedral of Saint Bavo	2019	The Netherlands
Europa Nostra	The Queen Louise Adit Complex	2019	Poland
Europa Nostra	Lithica Quarry of s'Hostal	2019	Spain
Europa Nostra	Medieval Tithe Barn	2019	Sweden
Europa Nostra	Tarsus-Gözlükule Excavations Research Center	2019	Turkey
Europa Nostra	Yr Ysgwrn	2019	United Kingdom
Europa Nostra	St. Wenceslas Rotunda	2018	Czech Republic
Europa Nostra	Poul Egede's Mission House	2018	Denmark
Europa Nostra	The Bac Fortress	2018	Serbia
Europa Nostra	The Pavilion of Prince Milos	2018	Serbia

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TABLE APP 3.1 List of the selected cases included in the review among projects that won the NRP Golden Phoenix and Europa Nostra awards.

Award	Case	Year of Winning the Award	Location
Europa Nostra	Baroque Complex and Gardens	2017	Czech Republic
Europa Nostra	Bastion of the Grand Master's Palace	2017	Greece
Europa Nostra	The Clerigos' Church and Tower	2017	Portugal
Europa Nostra	Cap Enderrocat Fortress	2017	Spain
Europa Nostra	Roof for the Ruins of the Monastery of San Juan	2017	Spain
Europa Nostra	Kilic Ali Pasa Hamam	2017	Turkey
Europa Nostra	Cromford Mills: Building 17	2017	United Kingdom
Europa Nostra	Conversion of De Hoorn brewery into a creative hub	2016	Belgium
Europa Nostra	The French Hospital	2016	Iceland
Europa Nostra	The Diocletian Baths: charterhouse and open-air pool	2016	Italy
Europa Nostra	Museum Oud Amelisweerd	2016	The Netherlands
Europa Nostra	Fort Kijkuit in Kortenhoef	2016	The Netherlands
Europa Nostra	Knockando Wool mill	2016	United Kingdom
Europa Nostra	Boulingrin Central Market Hall	2015	France
Europa Nostra	Antouaniko Mansion	2015	Greece
Europa Nostra	The Halls: Center for Media, Fashion Culture and Crafts	2015	The Netherlands
Europa Nostra	Manor House in Eidsvoll	2015	Norway
Europa Nostra	Cathedral in Tarazona	2015	Spain
Europa Nostra	Armenian Church of St. Giragos	2015	Turkey
Europa Nostra	Middleport Pottery	2015	United Kingdom

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Appendix 4.1

My name is Fatemeh Hedieh Arfa (f.arfa@tudelft.nl), and I'm a PhD researcher at the Faculty of Architecture and the Built Environment of the TU Delft.
The subject of my PhD research is developing a methodology for adaptive reuse of heritage buildings (from the perspective of architects).
The goal of this research is to assist architects in dealing with heritage buildings, which finally leads to the preservation of these buildings.
Thank you in advance for your time!

Process and methods in the steps

1 How did the project start?
2 Were you involved from the start?
3 What was your first step when you took the commission?
4 Did you analyze the building/site/location?
5 What was your next step?
6 What did you do then?
7 How was the function researched and decided?
8 What were your design strategies for the redesign of the building?
9 How the final decisions for the design strategies were made?
10 Were you involved in the execution step of the process?
11 How far was/is maintenance considered in the process? Were/are you involved in the maintenance step?
12 Did you evaluate the implemented project after years? What about the process? What about the approach?

Effectiveness criteria and groups of aspects

13 What has made your project to be among the successful cases and winners of NRP?
14 Could you please let me know if you have thought about social value creation (e.g. place making, improving the community attachment, etc.) during the process?
15 Do you think that the intervention has improved the architectural aspects (e.g. spatial quality, functionality, etc.) of the building?
16 Do you think that the project has improved the cultural aspects (e.g. authenticity, local identity, etc.) of the building and its surroundings?

THANK YOU!

Appendix 4.2

My name is Fatemeh Hedieh Arfa (f.arfa@tudelft.nl), and I'm a PhD researcher at the Faculty of Architecture and the Built Environment of the TU Delft.
The subject of my PhD research is developing a methodology for adaptive reuse of heritage buildings (from the perspective of architects).
The goal of this research is to assist architects in dealing with heritage buildings, which finally leads to the preservation of these buildings.
Thank you in advance for your time!

Process and methods in the steps

1 How did the project start and what was your role in it?
2 Were you involved from the start? How about the architects?
3 What was the first step when the architects took the commission?
4 Did they analyze the building/site/location?
5 What was their next step?
6 What did they do then?
7 Do you know how was the function researched and decided?
8 What were the architects' design strategies for the redesign of the building?
9 How the final decisions for the design strategies were made? Were there some differences in the ideas of different stakeholders? How did you reach a consensus on the design strategies?
10 Were the architects involved in the execution step of the process?
11 How far was/is maintenance considered in the process? Were/are the architects involved in the maintenance step?
12 Did the architects evaluate the implemented project after years? What about the process? What about the approach?

Effectiveness criteria and groups of aspects

13 What has made your project to be among the successful cases and winners of NRP?
14 Could you please let me know if you and the other stakeholders (e.g. architects) have thought about social value creation (e.g. place making, improving the community attachment, etc.) during the process?
15 Do you think that the intervention has improved the architectural aspects (e.g. spatial quality, functionality, etc.) of the building?
16 ts (e.g. authenticity, local identity, etc.) of the building and its surroundings?

THANK YOU!

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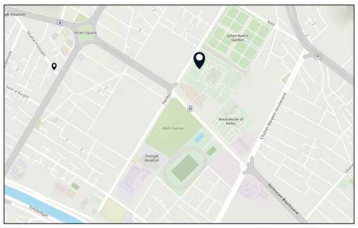
Appendix 5.1

Textile Museum (Art Gallery)

Location: Shiraz, Iran
Original function: Textile factory
New function: Mixed use (Art gallery, cafe)
Reuse architect: Mehrdad Iravanian Architects
Status: National monument
Project start and end dates: 2008-2009

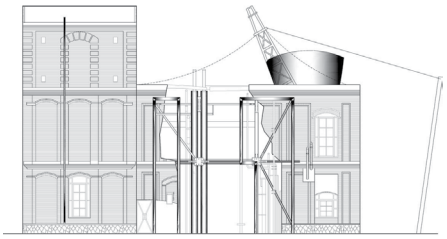


Location of the building and its surroundings

Textile museum, before adaptive reuse (https://rb.gy/rx0y55)

Textile museum, after adaptive reuse (https://rb.gy/q6gcvv)

Textile museum, after adaptive reuse, with the addition of the tensile structure (https://rb.gy/782rnq)



Elevation of one of the facades of the Textile museum, after adaptive reuse, with all the additions (https://rb.gy/fzatpe)

Textile museum, after adaptive reuse; addition of a horn in the center of the building in memory of the horn that existed in this factory according to one of the old employees (https://rb.gy/fzatpe)

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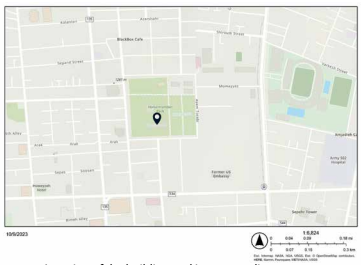
Appendix 5.2A

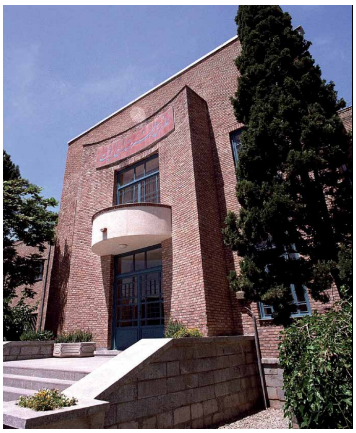
The Artists' Forum (Phase 1)

Location: Tehran, Iran
Original function: Office building of the arsenal
New function: Mixed use (artists' forum, event center, art gallery, restaurant, cafe)
Reuse architect: Bijan Shafei Design Studio
Status: National monument
Project start and end dates: 1999-2000

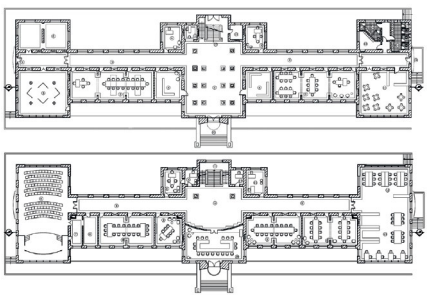


Location of the building and its surroundings

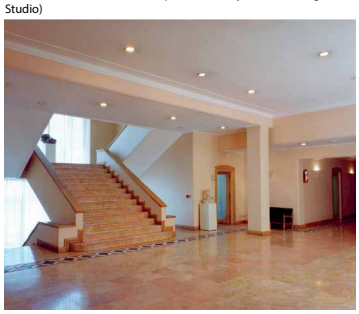
The Artists' Forum, before its adaptive reuse (Bijan Shafei Design Studio)



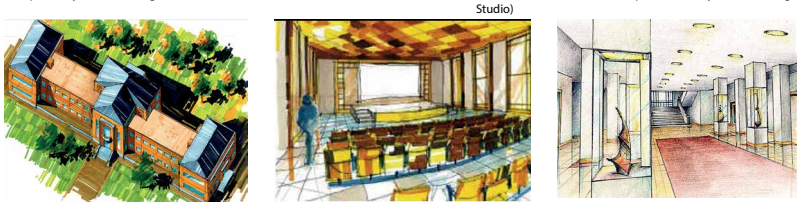
The Artists' Forum, after its adaptive reuse (Bijan Shafei Design Studio)



Floor plans (Bijan Shafei Design Studio)



The Artists' Forum, after its adaptive reuse (Bijan Shafei Design Studio)



Preliminary sketches during the adaptive reuse process (Bijan Shafei Design Studio)

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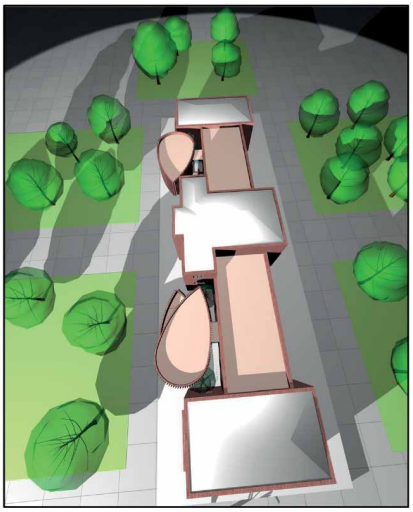
Appendix 5.2B

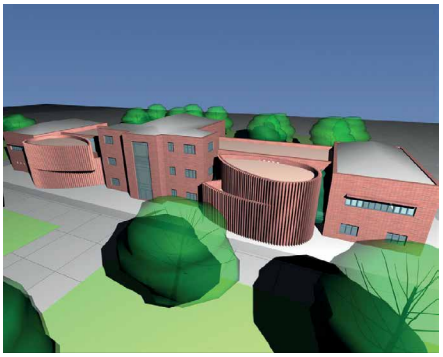
The Artists' Forum (Phase 2)

Location: Tehran, Iran
Original function: Office building of the arsenal
New function: Mixed use (artists' forum, event center, art gallery, restaurant, cafe)
Reuse architect: Bijan Shafei Design Studio
Status: National monument
Project start and end dates: 2007-2009

Location of the building and its surroundings

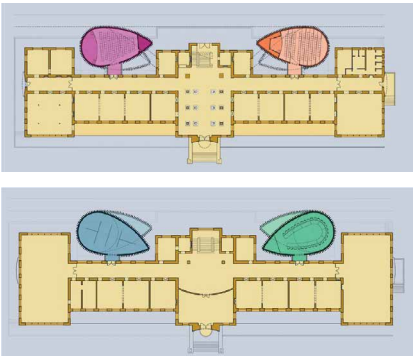


The design of the extension to the Artists' Forum (Bijan Shafei Design Studio)



The design of the extension to the Artists' Forum (Bijan Shafei Design Studio)

The extension to the Artists' Forum (Bijan Shafei Design Studio)



The floor plans of the extensions to the Artists' Forum (Bijan Shafei Design Studio)

The extension to the Artists' Forum (Bijan Shafei Design Studio)

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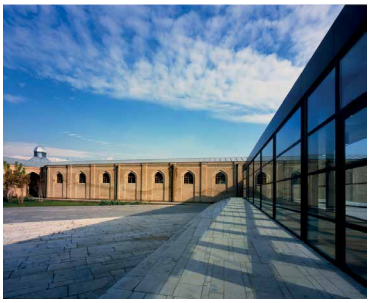
Appendix 5.3

Qasr Garden Museum

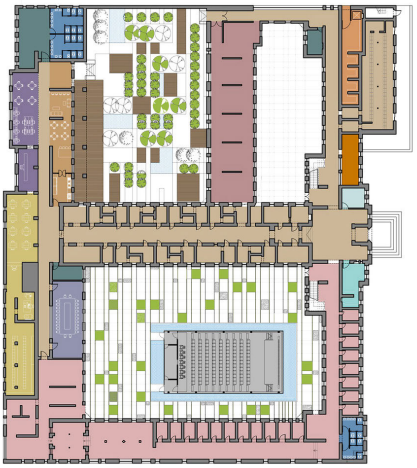
Location: Tehran, Iran
Original function: Palace and later on for different functions (e.g. recreational purposes, etc.)
New function: Mixed use (Art gallery, cafe)
Reuse architect: EBA[M] Architects
Status: National monument
Project start and end dates: 2006-2012

Location of the building and its surroundings

Qasr Garden Museum, before adaptive reuse (https://www.aparat.com/v/tPIoU)



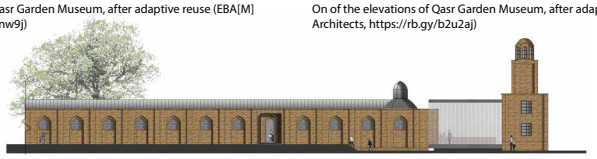
Qasr Garden Museum, after adaptive reuse (Ali Daghigh, https://rb.gy/nnoyvv)



One of the floor plans of Qasr Garden Museum, after adaptive reuse (EBA[M] Architects, https://rb.gy/lhnw9j)

Qasr Garden Museum, after adaptive reuse (Ali Daghigh, https://rb.gy/1ilflx)

On of the elevations of Qasr Garden Museum, after adaptive reuse (EBA[M] Architects, https://rb.gy/b2u2aj)

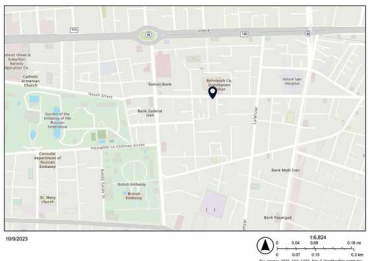


One of the elevations of Qasr Museum Garden, after adaptive reuse (EBA[M] Architects, https://rb.gy/adqiwh)

Appendix 5.4A

Argo Factory in Tehran (Phase 1)

Location: Tehran, Iran
Original function: Brewery factory
New function: Mixed use (Art gallery, cafe)
Reuse architect (first phase): Shiar Studio
Status: National monument
Project start and end dates: 2015-2016

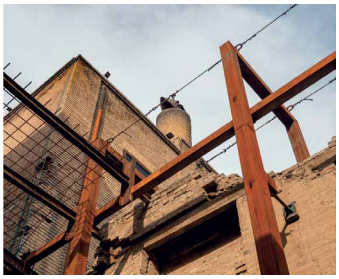


Location of the building and its surroundings

Argo Factory, before adaptive reuse (Shiar Studio, https://rb.gy/504bxi)

Argo Factory, before adaptive reuse (Shiar Studio, https://rb.gy/504bxi)

Argo Factory, after adaptive reuse (first phase-2016)
(Hamid Eskandari, https://rb.gy/504bxi)



Argo Factory, after adaptive reuse (first phase-2016)
(Hamid Eskandari, https://rb.gy/504bxi)

Argo Factory, after adaptive reuse (first phase-2016)
(Shiar Studio, https://rb.gy/2hr6z4)

Argo Factory, after adaptive reuse (first phase-2016)
(Hamid Eskandari, https://rb.gy/504bxi)

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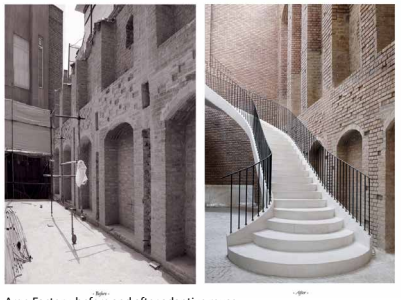
Appendix 5.4B

Argo Factory in Tehran (Phase 2)

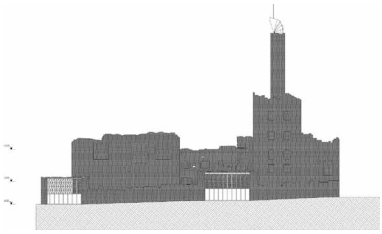
Location: Tehran, Iran
Original function: Brewery factory
New function: Mixed use (Art gallery, cafe)
Reuse architect (second phase): ASA North
Status: National monument
Project start and end dates: 2018-2021

Location of the building and its surroundings

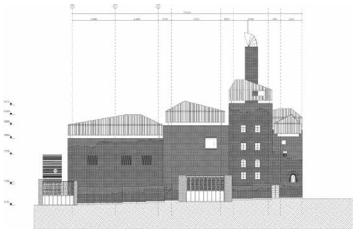
Argo Factory, before and after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/w4nbno)



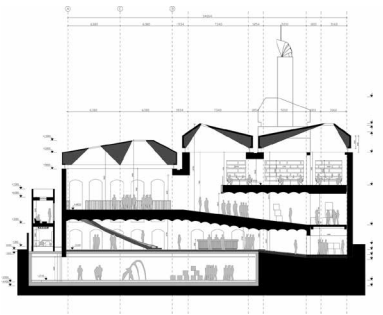
Argo Factory, before and after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/oxanfd)



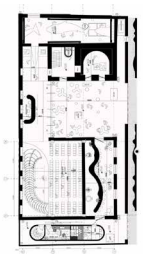
East elevation of the building, before adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/xbzgxt)



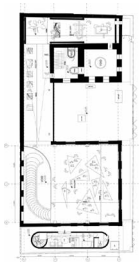
East elevation of the building, after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/iumcs7)



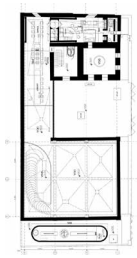
Section of the building, after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/avekrv)



Ground floor plan, after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/45afwt)



First floor plan, after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/9udvfo)



Second floor plan, after adaptive reuse
(ASA North, Archdaily webpage: https://rb.gy/4hy6n2)

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Appendix 5.5

My name is Hedieh Arfa (f.arfa@tudelft.nl), and I'm a PhD researcher at the Faculty of Architecture and the Built Environment of the TU Delft.
The subject of my PhD research is developing a methodology for adaptive reuse of heritage buildings (from the perspective of architects).
The goal of this research is to assist architects in dealing with heritage buildings, which finally leads to the preservation of these buildings.
Thank you in advance for your time!

Process and methods in the steps

1 How did the project start?
2 Were you involved from the start?
3 What was your first step when you took the commission?
4 Did you analyze the building/site/location?
5 What was your next step?
6 What did you do then?
7 How was the function researched and decided?
8 What were your design strategies for the redesign of the building?
9 How the final decisions for the design strategies were made?
10 Were you involved in the execution step of the process?
11 How far was/is maintenance considered in the process? Were/are you involved in the maintenance step?
12 Did you evaluate the implemented project after years? What about the process? What about the approach?

Effectiveness criteria and groups of aspects

13 What has made your project to be among the effective and well-known adaptive reuse projects in Iran?
14 Could you please let me know if you have thought about social value creation (e.g. place making, improving the community attachment, etc.) during the process?
15 Do you think that the intervention has improved the architectural aspects (e.g. spatial quality, functionality, etc.) of the building?
16 Do you think that the project has improved the cultural aspects (e.g. authenticity, local identity, etc.) of the building and its surroundings?

THANK YOU!

Appendix 5.6

اینجانب، هدیه ارفع (f.arfa@tudelft.nl)، محقق دکترا در گروه میراث و معماری در دانشکده ی معماری و محیط ساخته شده دانشگاه صنعتی دلفت در هلند هستم. موضوع پژوهش دکتری اینجانب، توسعه ی متدولوژی برای استفاده ی مجدد سازگار از بناهای میراثی (از دیدگاه معماران) است. هدف این تحقیق، کمک به معماران در برخورد با بناهای میراثی است که نهایتا منجر به حفظ این بناها می شود.
پیشاپیش از زمان شما سپاسگزارم.

فرآیند و روش ها در گام های فرآیند

1. پروژه چگونه آغاز گردید؟
2. آیا شما از ابتدا در پروژه مشارکت داشتید؟
3. اولین گام شما در زمانی که به توافق برای مشارکت در پروژه رسیدید، چه بود؟
4. آیا ساختمان، سایت و زمینه ی پروژه را آنالیز کردید؟
5. گام بعدی شما چه بود؟
6. سپس، گام بعدی تان چه بود؟
7. عملکرد بنا، چگونه مورد تحقیق و تصمیم گیری قرار گرفت؟
8. استراتژی های طراحی شما برای طراحی مجدد بنا چه بود؟
9. تصمیمات نهایی برای استراتژی های طراحی چگونه گرفته شدند؟
10. آیا در مرحله ی اجرای پروژه مشارکت داشتید؟
11. تعمیر و نگهداری تا چه حد در این فرآیند در نظر گرفته شده است؟ آیا در این مرحله، مشارکت دارید؟
12. آیا پروژه ی اجرا شده را پس از سالها ارزیابی کردید؟ در مورد فرآیند چطور؟ در مورد رویکرد/ استراتژی چطور؟

معیارها و زیرمعیارهای اثربخشی پروژه

13. چه چیزی باعث شده است که پروژه ی شما در بین پروژه های موفق و مطرح استفاده ی مجدد سازگار از بناهای تاریخی در ایران باشد؟
14. آیا می‌توانید بیان کنید که آیا در طول این فرآیند، ایجاد ارزش اجتماعی (به عنوان مثال ایجاد حس مکان، بهبود دلبستگی و تعلق جامعه به بنا و غیره) را در نظر گرفته اید؟
15. به نظر شما، آیا این مداخله و طراحی مجدد، جنبه های معماری (به عنوان مثال کیفیت فضایی، عملکرد و غیره) بنا را بهبود بخشیده است؟
16. به نظر شما، آیا این پروژه، جنبه های فرهنگی (به عنوان مثال اصالت، هویت محلی و غیره) بنا و محیط اطراف آن را بهبود بخشیده است؟

با سپاس از شما.

Appendix 6.1

Interview protocol and questions

The validation interviews were based on a previously developed protocol (using the guidelines provided in Hennink et al., 2020) that included 13 questions in a PowerPoint file. During the one-hour interviews, the interviewer (first author of the current paper) introduced her PhD research and the team members. Then, the interviewees were asked to respond to each question, which included the steps, method, and tools; subsequently, the interviewees were asked for feedback. The researcher explained to the interviewees that, by their consent, their voices would be recorded, and the data would be saved following the HREC guidelines. She also mentioned that this research has the approval of the HREC committee at TU Delft (November 2022).

To get the most out of the interviews, the interviewees were asked to think about the way they had conducted their previous projects. First, questions about the steps were presented to the interviewees. For example, “How did you become involved in the project? What was your first step when you took the commission?”. After receiving their response, the method of the step using the EARHB Framework was presented to the architect. For example, “matchmaking events” were immediately presented, and the three choices “It is always applied in Iran”, “It is sporadically applied and can be easily applied to all the projects”, and “It cannot be applied due to the limitations” were shown. The interviewees reported their choices verbally. If a method had more than one tool, the researcher asked for feedback regarding each tool separately, using the “On Click” animation function in PowerPoint. If interviewees opted for “It cannot be applied due to the limitations”, they were asked to elaborate further on these limitations.

The list of questions is as follows:

1 **How did you become involved in the project? What was your first step when you took the commission?**

- Match-making events
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

2 **Did you analyze the building and the context? If yes, how?**

- Analysing of the building and site (architectural/functional aspects) *[Tool: Analog and digital surveying tools]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Analysing of technical aspects of the building (e.g. hazardous chemical material; acoustical properties, LCA) *[Tool: Hiring the related specialist to conduct the needed analysis]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Collecting data about the buildings in archives
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Involving the original users during the AR process *[Tool: Holding meetings with them]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Reviewing the documents, photographs, drawings, writings, and logbooks of the building and site
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

3 **How did you store the data?**

- Digital storing of all the collected and produced data *[Tool: Data management tools for documenting the process]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

4 **Did you value the elements? How? What are the (possible values)?**

- Avoiding relying on their own assessment to limit subjectivity *[Tool: Hiring a company for doing the historic value assessment with the predefined code]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Digital storing of all the collected and produced data *[Tool: Data management tools for documenting the process]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

5 **How did you decide on the significance of elements? Any dilemmas?**

- Repeated analysis of the building *[Tools: Reviewing all the collected and analyzed data; Re-inspecting the building to reveal the possible hidden aspects]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

6 **How did you decide about the function?**

- Involving the end-users and local community during the AR process *[Tools: Holding several meetings with the end-users for input]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Digital storing of all the collected and produced data *[Tool: Data management tools for documenting the process]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

7 **How did you decide about the design strategies?**

- Repeated analysing of the building *[Tools: Reviewing all the collected and analyzed data; Re-inspecting the building to reveal the possible hidden aspects]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Applying structured design strategies for the AR of the building *[Tool: Reviewing the literature on the AR process and accordingly developing specific frameworks and schemes for AR process]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Considering the well-being of users within the required functions *[Tool: Hiring experts on sustainability and well-being]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

8 **How did you decide about the design strategies?**

- Getting inspired by the other effective reuse projects *[Tool: Visiting and analysing the effective reused buildings with similar functions]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Employing digital and innovative tools to complement the architects' strategies and stories *[Tool: Hiring experts on digital tools in storytelling]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

9 **How did you come up with the final decision?**

- Involving the end-users and local community during the AR process *[Tools: Holding several meetings with the end-users for input; Using renders and 3D models in presenting the project to end users]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Striking a balance between the existing situation of the building and the requirements *[Tools: Meetings with stakeholders involved in the process and discussing their needs and possible solutions]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Digital storing of all the collected and produced data *[Tool: Data management tools for documenting the process]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

10 **How did you go through the step execution?**

- Discussions between the (leader) architect and the contractor and being involved in the execution step *[Tools: Meetings with the contractors; Regular visiting of the site during the execution; Hiring of a flexible contractor]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Digital storing of all the collected and produced data *[Tool: Data management tools for documenting the process]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

11 **How did you go through the step maintenance/after-care?**

- Being open to modifying and adapting the design even after the execution of the project
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Discussions with the end-users after the execution of the project *[Tool: Holding meetings with the end-users]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

12 **Did you evaluate your project after years? How? (POE?)**

- (After year) Involving the end-users and local community *[Tools: Holding several meetings with the end-users]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations
- Regular inspecting and visiting of the building after the execution

- It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

- Being open to receiving feedback on the project and learning lessons for future projects *[Tool: Following the social media about the impact of the project]*
  - It is always applied in Iran
  - It is sporadically applied and can be easily applied to all the projects
  - It cannot be applied due to the limitations

13 **This is the EARHB model (**Figure APP.6.1**) that we have developed using the international and Dutch context. Do you see this applicable to the AR processes in Iran?**

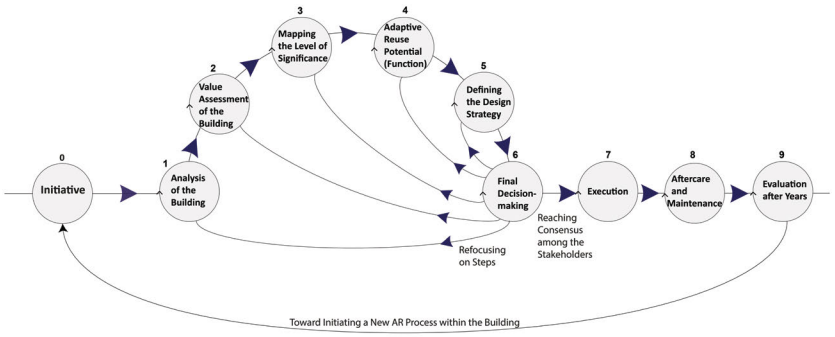

FIG. APP.6.1 The EARHB model (Arfa et al. 2024)

— At the end of the interviews, if the interviewees were willing, a short presentation of the PhD research and how their responses would be helpful to the research were presented to them.

Appendix 7.1

Serious game for validating the EARHB model

In 2023, the PhD researcher, author of this PhD dissertation, was involved in the master's course "SEN9235 Game Design Project" at the Faculty of Technology, Policy, and Management (TPM) at the TU Delft. The main aim of her involvement in the course was explore serious gaming as an attractive approach to be used for validation of the developed AR model with Iranian architects. Despite, due to circumstances, the outcome of this course could not be applied within the timeframe of this PhD research, it was still a useful exercise with relevant outcomes. The process and results of this part of the research are summarized in this appendix.

During the course, a group of students (including Franko Baho, Robin Mueller, Gijs van de Burg, and Pim Groen) designed a game to validate the EARHB model proposed by the author of this dissertation. The PhD researcher played the role of the client. The material used for the game was provided by Alexander de Ridder and was part of a course at the Faculty of Architecture and the Built Environment at the TU Delft.

Objective in and of the game

Objective of the game
The main goal of the game is to simulate the complexities and challenges encountered during the adaptive reuse of heritage buildings. This interactive experience aims to assist architects and experts in gaining a deeper understanding of preservation, modernization, stakeholder management, and other critical aspects of the process. Through immersion in this simulated environment, players can develop insights, strategies, and solutions that are applicable to real-world situations.

Description of the target group
Professionals: Architects and experts actively engaged in the field, potentially with diverse levels of experience in adaptive reuse projects.

Interests and motivations: This group is motivated by a passion for architecture, historic preservation, and blending old and new elements.

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Existing knowledge: With their professional background, they possess a solid understanding of architectural principles, regulatory requirements, and design aesthetics. However, their exposure to the adaptive reuse of heritage buildings may vary.

Expected outcomes: Their aim in playing the game is to gain practical insights, refine their problem-solving skills, and enhance their comprehension of stakeholder dynamics within adaptive reuse projects.

Relevance of the game objective to the target group:
For architects and experts, each project involves striking a balance between preserving a building's authenticity and ensuring its functionality in the modern world. The game's objective is to understand the architects' actions when addressing these challenges and raise their awareness about the necessity of informed actions. The simulated challenges within the game closely resemble real-world scenarios that architects may encounter. By navigating these challenges in the game, players can refine their decision-making skills, explore innovative solutions, and better prepare for actual adaptive reuse projects.

Moreover, the game provides a safe environment for players to experiment, make mistakes, and learn from them without the risks associated with real projects. This aspect further enhances its relevance, serving as both an educational tool and a platform for creative exploration.

Research goal of the game
Apart from serving as a valuable learning tool for architects and experts in the field of adaptive reuse, this game can also function as a validation tool, allowing players to gather insights into the decision-making processes, problem-solving approaches, and strategic thinking of professionals in architecture. After the gameplay, the choices made by the player in the game can be analyzed to gain a deeper understanding of the process and pattern language involved in the adaptive reuse of heritage buildings. Consequently, the game becomes an effective educational and evaluative instrument for professionals seeking to enhance their expertise.

Game concept

At the heart of Delft lies a charming yet significant neighborhood known as the Cable District, a tapestry of history waiting to be unlocked and reinterpreted. “Architect’s Design Challenge” is a board game that enables eight aspiring architects to form four pairs, embarking on a quest of rediscovery and reinvention. Each pair is initially provided with a location map and a blank canvas awaiting their creative touch. The inclusion of certain elements in the board game aims to mirror real-world architectural challenges, offering players an experience that closely aligns with the complexities architects encounter.

Four distinct values, which the architects are confronted to in the real world, are represented by colored Lego pieces (Figure APP.7.1): historical value (blue), economic value (red), community value (yellow), and environmental sustainability (green). The different colors force players to prioritize and make trade-offs, just as architects must do when considering the various facets of a project. The objective is to design in a way that brings out the true identity of heritage.

FIG APP.7.1 Lego blocks and the value that they represent

The journey to architectural eloquence unfolds across six thoroughly designed stations (Figure APP.7.2): Heritage Gateway, Research Hub, Function Forge, Appraisal Agency, Design Studio, and Decision Table. At each station, different options can be selected. The distinct stations represent the multifaceted nature of adaptive reuse projects. Architects navigate through similar stages in their professional practice, from initial research and concept development to decision-making and final design approval. Each station mirrors a critical step in the architectural process, introducing players to the real challenges faced at each step.

FIG. APP.7.2 The game board

As players stroll through these stations, each step involves brainstorming, collecting information, making informed decisions, adjusting models, and planning for the next. The budget looms over them like a ticking collection of coins, reminding them of their financial constraints. Players begin their turn with a starting capital, represented by one purse containing seven coins. They can determine their action plan (selecting the card, Figure APP.7.3) and request additional funds from either the city hall or investors at the Decision Table. However, there are always two sides to a coin. More funds may come with more requirements, leading to greater complexity in the design process.

Limited resources often force architects to make strategic decisions, balancing creativity with economic considerations. The game captures the essence of financial constraints, a common challenge in real-world adaptive reuse projects.

FIG. APP.7.3 Action cards of the game; On the other side of each action card, there are specific requirements

This architectural saga reaches its climax at the Decision Table. Confident in the quality of their projects, teams present them to the facilitator, who evaluates their professional skills. If the project does not meet minimum standards, a clue for modification is provided, exposing vulnerabilities to competitors.

Architects must then present their designs to clients, city planners, or other stakeholders for approval. The possibility of modifications based on professional judgment introduces the element of critique and emphasizes the importance of meeting industry standards, mirroring the challenges architects face in the real world.

The competitive aspect adds pressure, as architects often compete for projects. This dynamic encourages strategic thinking and the development of interpersonal skills, which are crucial for professional success. The team that first develops a design complying with all the criteria wins the game. Nevertheless, regardless of the result, each participant receives a complex set of insights that allow them to understand how contemporary needs should be reconciled with the conservation of the heritage.

Architects often face setbacks, but these experiences contribute to their growth and understanding of the profession. The game reinforces the idea that, even in failure, there are opportunities for learning and improvement.

To keep track of all the thinking steps during the adaptive reuse process, an architect's journal is provided to the players, in which they can write down their steps and actions. This document serves as a tool to remember all the hints given in the game. It resembles real-life situations, as architects use to keep track of their design process and reasoning for their final designs.

By simulating the dilemmas, constraints, and decision-making processes inherent in the field, the game provides a valuable platform for aspiring architects to develop essential skills. "Architect's Design Challenge" is not only a game but also a journey into the annals of architectural thought, celebrating heritage and forging a new frontier in innovations, with deep insight into the multi-faceted world of adaptive reuse.

Game test

The game's designers (master's students) conducted two rounds of testing with different players, including one group of students and one group of architects (experts) (Figures APP.7.4 and APP.7.5). The testing process comprised three phases: introduction and explanation of the game, gameplay, and debriefing. The introduction was crucial to immerse the players in the "magic circle" of the game. The game designers began by explaining that the players would be all in a competition, aiming to get them excited. Next, they engaged the players in the architect role by asking interactive questions like: *"What does an architect do? What do you value in buildings? And how can you apply this as an architect?"* This step was necessary to immerse them in the critical role of an architect, which was essential for the game's success. After this, the game designers elucidated the research goal of the game, followed by explaining the serious game and its connected case (Cable District in Delft).

Next, gameplay commenced. Each session comprised four teams, each consisting of two individuals. With one facilitator and one assessor per game, three games ran simultaneously. Despite the game being intended for individual play, a shortage of Lego pieces necessitated the formation of two-persons teams. However, for real architects, individual play is preferred, in order to allow each participant to undergo their unique design process. Yet, for students, playing in teams of two proved effective, fostering valuable discussions about strategy during the game.

Post-game, a debriefing session ensued. Designers initiated dialogue with simple inquiries such as, *"How was the game? Who won? What was your strategy?"* This prompted a discussion about players' experiences. Subsequently, designers requested feedback about the game itself and the strategy players used during the game: *"Was the game clear? How did you manage your resources? How did your values come into play? And how was it to gather all the information?"* This elicited valuable suggestions for improvement. For instance, the feedback indicated that the gamified names of game parts (AR process steps) caused confusion, prompting game designers to plan more precise naming conventions. Lastly, players' processes were discussed, comparing them to the AR process model as perceived by the author of this dissertation.

FIG. APP.7.4 Testing the game with fellow students at the faculty of TPM

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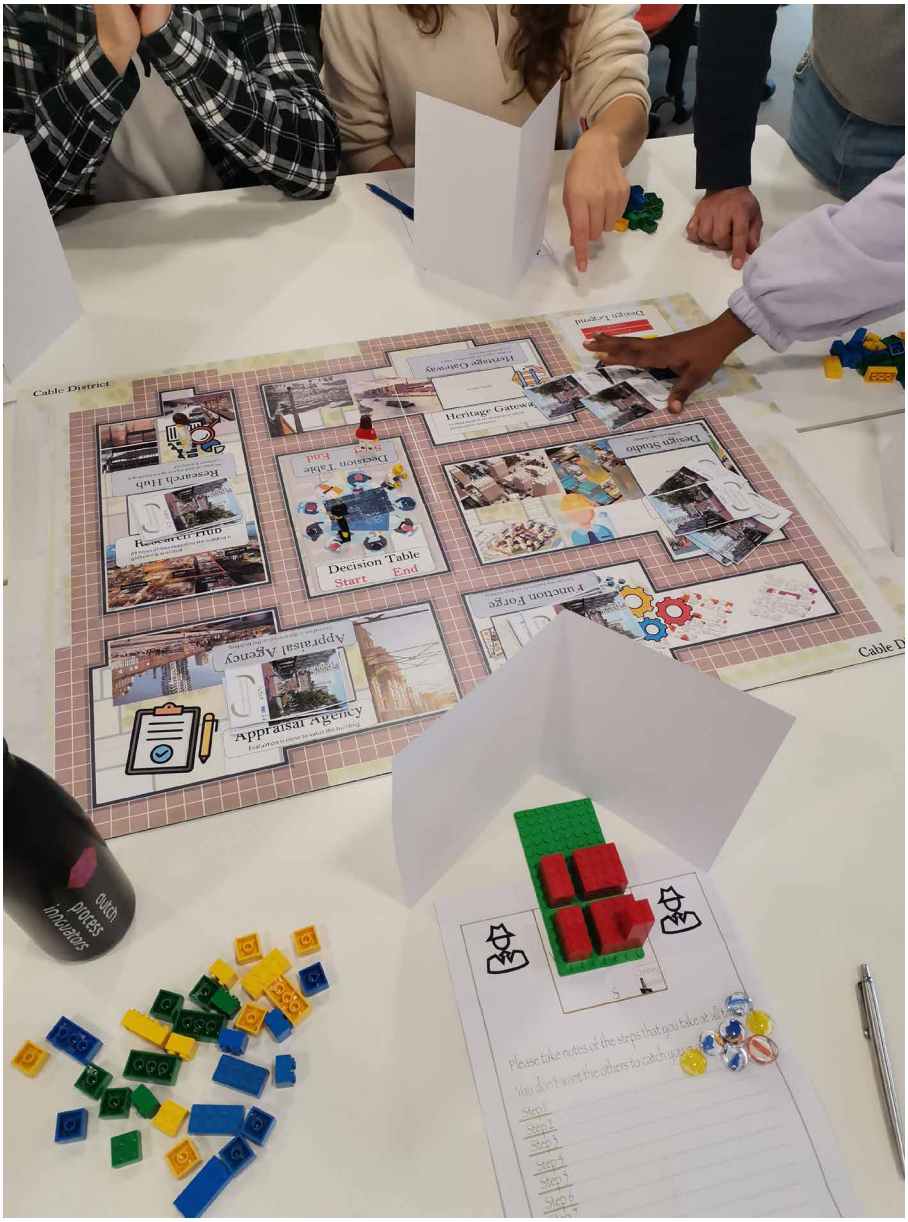

FIG. APP.7.5 Testing the game with architects (experts) at the faculty of Architecture and the Built Environment

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Evaluation of the game by the game designers and PhD researcher and conclusions

During the game test with architects (experts) (Figure APP.7.5), participants praised the game's intricate design steps. However, some confusion arose regarding the game's abstraction, particularly concerning the correlation between values and Lego pieces. Architects tended to prioritize real-life actions over the game's abstract elements. Conversely, in the testing with students (Figure APP.7.4), there was less emphasis on real-world representation of actions. Instead, students focused more on strategic thinking within the game and aimed for victory. Nonetheless, both groups managed to draw parallels between the game and hypothetical real-world scenarios.

The main challenge identified by designers of the game and the client (the PhD researcher, author of this dissertation) during testing concerned a delicate balance: *"Did the game designers successfully achieve a balance between guiding players toward purposeful decision-making while allowing them the freedom to navigate the game world and make choices reflective of real-life scenarios?"* This question remains central to the ongoing development and refinement of the game. With collaboration among researchers, architects, and field experts, the action cards could be fine-tuned and balanced, enabling the game to represent real-world cases better.

Publications

Journal publications and book chapters

Arfa, F. H., Quist, W., & Lubelli, B. (2024). The adaptive reuse process of heritage buildings in Iran from the architects' perspective - investigation of practice and scientific literature. *Land Use Policy* (Submitted)

Arfa, F. H., Lubelli, B., Quist, W. J., Zijlstra, H., & Izadi, M. S. (2024). The adaptive reuse process of heritage buildings in Iran from the architects perspective - investigation of practice and scientific literature. *Habitat International* (Under Review)

Arfa, F. H., Lubelli, B., Quist, W. J., & Zijlstra, H. (2024). A model of the adaptive reuse process of heritage buildings: Validation on four cases in the Netherlands. *Design Studies.* https://doi.org/10.1016/j.destud.2024.101252

Arfa, F. H., Zijlstra, H., Lubelli, B., & Quist, W. J. (2022). Adaptive Reuse of Heritage Buildings: From a Literature Review to a Model of Practice. *Historic Environment: Policy and Practice.* https://doi.org/10.1080/17567505.2022.2058551

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Arfa, F. H., & Pottgiesser, U. (2021). Roundtable VII: Time and Unlisted Heritage. In U. Pottgiesser, S. Fatoric, C. Hein, E. de Maaker, & A. Pereira Roders (Eds.) *LDE Heritage Conference on Heritage and the Sustainable Development Goals: Proceedings* (pp. 537-539). TU Delft Open.

Arfa, F.H., Kaboli, Sh., Yazdanfar S.A. (2016). The Effective Factors on Increasing Visits of International Tourists to a Recognized Cultural or Natural Heritage in UNESCO World Heritage List. *International Journal of Humanities and Cultural Studies*

Conference publications

Arfa, F. H., Quist, W., Lubelli, B., & Zijlstra, H. (2023). Architects' Methodology in Adaptive Reuse of Heritage Buildings, *As Found: International Colloquium on Adaptive Reuse* - Hasselt University & Flanders Architecture Institute, Hasselt, Belgium

Arfa, F. H., Quist, W., Lubelli, B., Zijlstra, H. (2022) 'Effectiveness' in Adaptive Reuse of Modern Heritage Buildings Proceedings 17th International Docomomo Conference, *17th International Docomomo Conference: Modern Design: Social Commitment & Quality of Life* - University Politècnica de València, Valencia, Spain

Arfa, F. H., Zijlstra, H., Lubelli, B., Quist, W. (2021) Looking for a Model to Structure the Process for Adaptive Reuse (AR) of Heritage Buildings Based on a Literature Review, *27th Annual European Real Estate Society Conference*. ERES: Conference. Kaiserslautern, Germany

Arfa, F. H., Mohammad Moradi, A. and Mehdizadeh Seradj, F. (2017) The Criteria for Compatible Architectural Designs in Historical Fabric", May 2017. *The 2nd International Conference on the New Horizons in Architecture and Urbanization and Cities Cultural Management*, Tehran, Iran

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Mohammad Moradi, A., Kazempour H. and Arfa. F. H. (2016). The Study of Historical Evolution, Design, and Implementation of Moaraq and Moaqali Tiles in Iran, *The 2nd International Conference on Urbanism, Urban Management, and Development (ICU2016)*, Shiraz, Iran

Arfa F. H., Kaboli, Sh., Yazdanfar S.A., Mohammadi H. (2015). The Effect of Recognized Heritage in UNESCO World Heritage List on Inducing more International Tourists, (Case Study: Soltanieh Dome, Zanjan), *The 3rd International Congress on Civil Engineering, Architecture and Urban Development*, Shahid Beheshti University, Tehran, Iran

Yazdanfar S.A, Arfa F. H., Kaboli Sh. (2015) Studying the Effective Factors on Increasing the Foreign Tourists Visiting from a Cultural or Natural Site Registered in UNESCO World Heritage List, *The International Conference on Science and Engineering*, Dubai, UAE

Curriculum Vitae

Personal Information

Name Fatemeh Hedieh Arfa
Date/Place of Birth 26 July 1992, Shahrood (Iran)

Professional Experience

2024- Present

Delft University of Technology
Postdoc Researcher at the Department of Management in the Buit Environment (MBE) in collaboration with Police of the Netherlands (PolitieNL)

2019- 2024

Delft University of Technology
PhD Researcher at the Department of Architecture Engineering and Technology (AE+T), Section of Heritage and Architecture (H&A)

PhD Dissertation: "Understanding and Enhancing the effectiveness of Adaptive Reuse Process of Built Heritage: from an International Context to the Application in Iran"
Promoters: Dr. Barbara Lubelli, Dr. Ir. Wido Quist
Advisor: Dr. Ir. Hielkje Zijlstra

2022-2023

Delft University of Technology
Tutor and Teaching Assistant; Different bachelor's and master's courses:
– M.Sc. 3, Redesign of Hofjes
– Minor in Heritage and Design

2017-2018

Shahrood University of Technology
Lecturer; Teaching different courses, such as:
– Adaptive reuse of heritage buildings
– Revitalization of heritage buildings
– Rural heritage buildings

Education

2019- Present
PhD in Architecture and the Built Environment
Delft University of Technology

2014-2017
Master of Revitalization of Heritage Buildings and Historic Urban Landscapes
Iran University of Science and Technology
First Class Honors

2010-2014
Bachelor's degree in Architectural Engineering and Urbanism
Shahrood University of Technology
First Class Honors

Professional Contributions

2022- Present
Elsevier
Research Journal Reviewer
– Review for Journal of Cultural Heritage
– Review for Journal of Building and Environment

2022- Present
Taylor & Francis Group
Research Journal Reviewer
– Review for Journal of Asian Architecture and Building Engineering
– Review for Journal of Cogent Arts & Humanities
– Review for Journal of Cogent Social Sciences

Awards

2022
Research Travel Grant
Catharine van Tussenbroek

2018
PhD Full-Scholarship Award MSRT organization

2014
Exceptional Talents Fellowship in Master of Revitalization of Heritage Buildings and Historic Urban Landscapes

2010
Fellowship in Bachelor of Architecture Engineering Program

Participation in International Organizations

2024- Present	**Future for Religious Heritage: The European Network for Historic Places of Worship** Member of young professionals and researchers working group
2023- Present	**Europa Nostra;** Young member
2022- Present	Graduate Women International Netherlands “GWI-NL” Member
2020- 2021	Ki Culture; International Non-profit Organization (Culture & Sustainability) Member

Languages

Persian: Native
English: Fluent
Dutch: B2

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Understanding and Enhancing the Effectiveness of Adaptive Reuse of Built Heritage

From an International Context to Application in Iran

Fatemeh Hedieh Arfa

Adaptive Reuse (AR) of heritage buildings is a sustainable approach to preserving cultural heritage while accommodating new functions. Despite the growing importance of AR in the last decades, a lack of comprehensive models for AR, particularly concerning heritage buildings, persists. This research addresses this gap by developing a model that guides architects in the AR process, drawing on international literature and Dutch AR practices, with a focus on its adaptation and possible application in the Iranian context.

A systematic review of the literature revealed a lack of overarching models for AR, and led to the development of a conceptual model. This model includes 10 steps, which are: “initiative”, “analysis of the building and its surroundings”, “value assessment”, “mapping the level of significance”, “adaptive reuse potential (function)”, “defining the design strategy”, “final decision-making”, “execution”, “aftercare and maintenance”, and “evaluation after years”. In addition, based on the analysis of 48 award-winning AR projects in the Netherlands and Europe, six key criteria for effectiveness were identified: sublimation-architectural aspects, sublimation-cultural aspects, social value creation, environmental sustainability, economic value creation, and innovation aspects.

Testing the initial model in the Dutch context, led to further development into the EARHB model, enriched with methods and tools used by the architect in the different steps of the AR process. In this dissertation, the EARHB model, including its methods and tools, is referred to as the EARHB framework.

Research on Iranian AR projects and interviews with architects demonstrate the EARHB framework’s potential, confirming that some of its process steps, methods, and tools are in use. Some limitations, due to cultural, regulatory, and practical constraints, might affect full implementation of the framework in Iran. Nevertheless, the potentialities of the proposed EARHB framework, offering a comprehensive and adaptable approach for enhancing the effectiveness of AR projects in different context worldwide, are confirmed.

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