**The Adaptive Reuse of Built Cultural
Heritage: the design
of a cultural toolkit based on
sustainability**

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Abstract

In this research, a consultation toolkit for decision makers of cultural heritage is developed, so that sustainability can contribute to the current societal challenges. To do so, theoretical and empirical evidence are compared and combined. First, the concepts of adaptive reuse, sustainability and circular economy are reviewed, from which it can be concluded that their intrinsic correlation justifies the development of the cultural toolkit. Additionally, a conceptual model, which classifies the adaptive reuses under the four pillars of sustainability, is developed. Following, a multi-criteria evaluation of past projects of adaptive reuse is presented, in order to gather empirical evidence. The application of the toolkit takes place for a specific case study and leads to the appropriate suggestions of sustainable adaptive reuse. The overall result of this thesis is a comprehensive and objective toolkit which leads decision-makers into autonomous, well-founded, efficient and effective conservation interventions.

Keywords: Built Heritage, Sustainability, Adaptive Reuse, Decision-Makers, Cultural Toolkit

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1.

Introduction

"The city of Zaira consists of relationships between the measurements of its space and the events of its past. As this wave from memories flows in, the city soaks it up like a sponge and expands. A description of Zaira as it is today should contain all Zaira's past."

As Italo Calvino reflects while describing the City of Zaira, cities are landscapes of history. Be it major or minor events, cities' architecture is a witness of the past civilizations. Historical buildings, sites and other physical evidence of the past constitute a cultural legacy which is deeply woven into the social fabric of the local, regional, national and international settlements of people. Through this heritage and its varied functions, cities attain their unique social, economic and cultural capital.

Today, all of these types of settlements are being threatened by the ecological crisis. In addition, this Master thesis comes at the height of the crisis due to the Coronavirus pandemic, which already has and is expected to have a severe impact on the economy and the humanity as a whole. The thesis had to be re-framed in this new context in terms of methodology (new plan than the original one) and scope as a whole. Yet, in its essence, the new reality confirmed the thesis's original goal:

> *"To promote the adaptive reuse of cultural heritage through a flexible cultural toolkit in the context of sustainability".*

Should the theoretical concept of cultural heritage be subject to various interpretations, which accordingly refer to various contexts, real heritage assets also confront significant challenges (Rizzo & Throsby, 2006). One of the obstacles is the distinguishing of the complex, intrinsic values that heritage assets represent, along with the decisions on their conservation.

Urban landscapes currently undergo thorough transformations with increasing urbanization and industrialization impacting on populations' spatial distribution and calling

for new centralized amenities. Furthermore, the scarce resources and the high energy consumption of the components of new buildings (e.g. plastic, steel, vinyl, and aluminum etc.), urgently call for sustainable solutions (Rypkema, 2006). Meanwhile, built heritage is an integral part of the urban environment requesting for preservation. Drawing links between the two facts:

> *Is it possible that built heritage responds to the urgent economic and environmental pressures of today with links to sustainability? Could the re-use, repurposing and rehabilitation of built heritage reveal new potentialities? How can decision-makers incorporate the overall societal impact of adaptive reuse?*

In a rapidly-changing society like ours, finding the answer to the previous research questions is rather complicated.

1.1   Rationale

Climate change is the greatest threat of our century, impacting on all the pillars of our existence: environment, economy, society and health. Already, 70% of cities around the world are affected by the adverse impact of climate change while nearly all cities are at risk (C40, 2016). The recently alternate threat of our existence has come to be the global pandemic of Covid 19. Cities being the geographical places where the pandemics has exploded, have been called to play a multi-dimensional role in order to control the pandemic. They have had to come up with back-up plans, implement new practices, invent space while also emptying public/common spaces (Fusco, 2020).

Both Covid 19 and the environmental crisis are systemic, being characterized by a systemic structure of multidimensional interactions. They have come to demonstrate the insufficiency of the governance/management systems. The latter have been focusing on a day-to-day survival, missing out on the long-term picture of societies. Instead, in order to open the horizon to the long-term, future cities' planning needs to not only combat the effects of natural

phenomena, such as climate change, but also the shifting socio-economic circumstances of the urban landscape (Khan et Zaman, 2018).

Built heritage holds a crucial part in the previous city planning and is subject to a variety of stakeholders. Following Edward Freeman, by stakeholders we refer to *"any group or person who can affect or is affected by the achievement of the objectives of the organization"* (Freeman et al, p. 54). Furthermore, stakeholders can be divided into internal, as in people/institutions with a straight influence on cultural heritage management, and external, as in people/ institutions which testify the impact of cultural heritage. For the needs of this thesis, we focus on the internal stakeholders considering that they have the power to participate in the decision -making process and actively implement their decisions. Examples of such stakeholders are the following:

- the public policy-makers on an EU, national, regional or local level

- the owners of privately-owned heritage houses and their sector support organisations (such as the European Historic Houses Association)

- the various Cultural Heritage Network Associations (such as Europa Nostra, European Heritage Alliance 3.3, ICOMOS, Future for Religious Heritage (FRH), national and regional cultural heritage network organisations)

- business support organisations which assist the decision-making processes

- the academia (universities and research institutes).

As previously mentioned, deciding on the future of heritage assets is rather complicated. Decision makers need to make efficient and effective decisions, divide properly the available resources between the different projects, and prioritize actions (Caniels & Bakens, 2011). In order for a project to be successfully managed, it needs to be completed on time, on budget, meeting the specification, stem from efficient management effort and satisfy the project members (Collins and Baccarini, 2004). The latter prerequisites of success can lead to an overwhelming amount of information and an overlooking of the essential information. Adding up the lack of adequate resources at disposal, built heritage ends up obsolete, underused of misused.

Yet, cultural heritage decisions require a more structured approach due to their

significance. Decision makers need to thoughtfully analyze built heritage assets and use multiple source of information. This way of deciding is called "evidence-based management" (Briner et al, 2009). Indeed, more and more managers, in every field and industry, rely less on their instincts for decisions but instead more on data-based analytics (Brynjolfsson, Hitt, & Kim, 2011). Therefore, a sub-research question is formulated:

Could a decision-making toolkit facilitate projects related to built cultural heritage ?

1.2   Aim of research

The overarching goal of the current thesis is to suggest ways of achieving resilience in the economic, social, cultural and environmental sphere, through built heritage. In order to do so, we focus on the decision-making process, in hopes of strengthening the relationship between decisions and built heritage's conservation. The research is based on the affirmation that technological improvements can help the decision making process, by decreasing the amount of irrelevant data and categorizing the information, thus establishing better understanding and useful insights (Brynjolfsson et al., 2011).

The intention was to find a way to fuse data of past projects of conservation interventions and look at it from different perspectives. These interventions belong to the category of adaptive reuse, as in the alterations of buildings and/ or their surrounding areas in order to serve new needs. By designing a cultural toolkit based on the principles of sustainability, we aspire to help decision makers gain better insights into sustainability and cultural heritage. The toolkit aims at allowing decision-makers interact with the data, interpret the different variables, be aware of the alternatives and, finally, be guided into successful decisions.

Finally, during the process of the toolkit design, the thesis aims at contributing to the existing debate on the correlation between adaptive reuse and the four pillars of sustainability: environment, culture, society and economy.

1.3   Structure

Since the aim of the thesis is to design a toolkit based on the aggregated knowledge on past projects of adaptive reuse, the structure of the thesis follows the process of designing a database. The recognized and approved schemas, as in levels, of designing a database are (Deen, 1984):
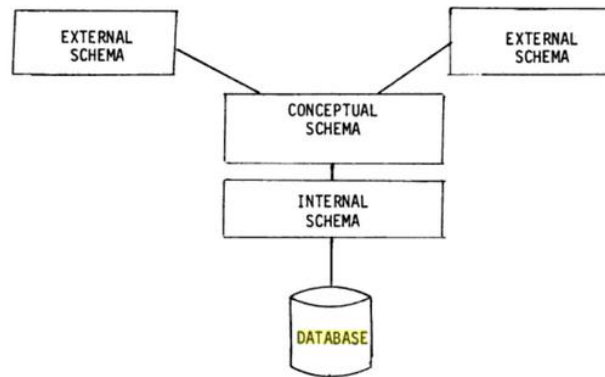
Figure 1: ANSI/ SPARC Architecture (Deen, 1984)

Starting from the bottom, the internal schema of a database is the physical storage of it. In our case, the internal schema of the toolkit will be the data on past projects of adaptive reuse such as type of built heritage, country, funding source, managing body and so on. Following, the conceptual schema contains the logical description and evaluation of the data, according to specific criteria. In this stage, we will explore the relationship between sustainability and adaptive reuse, set the appropriate frameworks and present a multicriteria evaluation of past projects. Lastly, the external schema, is what the user, the decision-maker in our case, will view upon interacting with our toolkit. This schema describes the way data are presented to decision-makers and is the closest to them.

Our research consists of five chapters. Chapter two sets the theoretical framework of the cultural toolkit design. First, the concepts of built heritage, sustainability and circular economy will be individually presented and, then, the theories will be collated in order to prove their innate correlation. The following chapter refers to the methodology used in the research to create the toolkit and its conceptual schema. Chapter four entails the application of the tool and the suggested results. The concluding chapter presents the main findings of the toolkit and sets the founding for future research.

2.

Theoretical Framework

This chapter reflects on the theories and concepts surrounding the design of the cultural toolkit. The first section starts form the notion of cultural heritage and eventually focuses on built heritage, its needs and challenges. The second section presents the relevance of sustainability in today's societies, as well as the emergence of circular economy. Lastly, in the final section, the three theories are collated, and adaptive reuse proves to be a cross-sectorial solution. Moreover, the CLIC database is presented. It will provide the toolkit with the original data on past projects of adaptive reuse (internal schema).

2.1   Cultural Heritage

The concept of heritage is the starting point for our theoretical research. Entailing the evidences of human creative activity which are inherited from previous generations, cultural heritage beholds the values of communities, groups or society at large (Roders & van Oers, 2011). Furthermore, Graham, Ashworth, and Tunbridge (2000) define heritage as *"almost any sort of intergenerational exchange or relationship, welcome or not, between societies as well as individuals"* (Graham et al, 2000, p. 1). Through this interaction, heritage boosts the national and local community identity, which is fundamental for the sense of place and social cohesion (Communities and Local Government, 2009). Yet, heritage is not created through the existence of the past but rather through the present needs of people, who are neither passive receivers nor passive transmitters (Barthel-Bouchier, 2013).

The consistent development of cultural heritage organizations took place during the post-war period and derived legitimacy from the idea that it was a human right among other human rights. Cornerstones in the protection, conservation and management of tangible and intangible cultural heritage are the following three key conventions of United Nations Educational, Scientific and Cultural Organization (UNESCO): the 1972 Convention

concerning the Protection of the World Cultural and Natural Heritage (i.e. the World Heritage Convention), the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage (i.e. the Intangible Heritage Convention), the 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions (Roders & van Oers, 2011). More precisely, as defined in the first convention of 1972 (UNESCO, 1972, p.2), cultural heritage consists of:

Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science.

Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science.

Sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

For the needs of this thesis, we will concern ourselves with the second category of cultural heritage, built heritage, as follows.

2.1.1 Built Heritage

To begin with, built heritage derives from human labour and holds a significantly limited space in the overall built environment (ICOMOS, 1993). Urban areas with a strong presence of built heritage, also known as historic urban quarters, showcase the highest qualities of well-defined urban fabric, as in architectural unity, order and visual continuity (Doratli et al., 2004). Following, the latter qualities are accompanied by values such as: cultural identity values (including age, tradition, continuity, political and national values), scarcity values (stemming from the typology, form, period of construction, design of buildings in the area/quarter, which makes them unique assets when compared with recently built ones), and resource values, considering the amount of existing housing stock, which can also be considered as an economic

issue.

Considering the economic sphere, an alternative classification of the values of built heritage is revealed. According to Benhamou (2013), the economic value of a building is divided into three complementary levels of consumption. The first level is the *"use value"*, as in the actual and observable consumption. The following two levels are considered *"non-use values"*. They refer to the public's willingness to pay and split into the *"existence value"* and the *"option value"*. On the one hand, *"existence value"* stems from the mere awareness of the existence of heritage, even if there is no planned encounter with it. On the other hand, *"option value"* relates to a potential future visit to the site. Lastly, a significant source of value is the *"bequest value"* referring to the duty of passing heritage on to the future generations.

The aforementioned values of built heritage merit special protection in order to be better enjoyed by the current generation, and passed on to the future. This need for special protection is due to various reasons. First, when compared to other cultural forms and artifacts, built heritage is exposed to the elemental forces of nature and is highly susceptible to damage, especially in the case of earthern architecture or fragile archaeological sites (Barthel-Bouchier, 2013). Secondly, due to the relative immobility of built architecture, much of the cultural significance of a structure is linked to its physical site and the involved social groups and/or nations.

2.1.2 Conservation of Built Heritage

The intention in conserving and restoring monuments is to preserve not only their cultural value but also the history they encompass (ICOMOS, 1964). The discipline emerged when western societies underwent industrialization and modernization, and distanced themselves from the natural world and the vernacular (Huuhka & Vestergaard, 2019). In todays' Western world, architectural conservation is founded on the historically "authentic" physical materials of heritage objects, which carry the memories and values of the past. Yet, the latter authenticity does not only refer to the initial state of the object (a building in our case), but also to the contributions or incidents it witnessed throughout the time. This leads to the understanding of authenticity as "honesty" where the appearance of things should portray their "true" inner nature, as in the entirety of episodes they have testified, rather than a unity of style (Huuhka &

Vestergaard, 2019).

Nowadays, the discipline of conservation, just like almost any other discipline in the twenty-first century, is facing multi-dimensional challenges. First and foremost, a new era in 'Heritage studies' has emerged, as a range of professionals have come together to question the modern idea of 'heritage' (Smith, 2006). More precisely, the previously celebrated physicality of heritage, which can be mapped, studied, managed, preserved and/or conserved, is being progressively replaced by an intangible perception of the term. Under this latter notion, heritage does not only consist of objects and sites, but rather cultural and social values, debates and aspirations.

Secondly, following the immense post-war development in the majority of Western European countries, built heritage's stock has grown massively and exceeds the conservation capacity (Hassler, 2009). As modern societies grow older, they encounter the risk of large-scale globalization and loss of their cultural identity. Consequently, there is a growing demand for heritage enlisting and conservation, regardless of the related opportunity costs. For example, could there be an alternative land use generating more benefits, rather than conservation? Are there sufficient resources ? How sustainable is heritage conservation? The low visibility of such issues links to asymmetrical information and establishes conservation as a supply-driven process. After all, Rizzo and Thorsby (2006) have argued that: *"heritage conservation is an avenue of government expenditure that enjoys general public support".* (Rizzo & Thorsby, 2006, p. 1002)

Last but not least, conservation initiatives are often grounded on subjective choices and qualitative argumentations, and therefore are linked to the academic field of political economy. In other words, the heritage enlisting raises significant questions regarding: the selection process, the impact of the institutional and economic conditions of each applicant stakeholder, the exerted political influence, and so on. Indeed, the active involvement in heritage-related committees, the economic and political power of the countries as well as rent-seeking behaviors, as in heritage opportunism, are some crucial factors favoring the heritage inscription (Bertacchini and Saccone, 2012). As a result, heritage conservation can also be considered as a demand-driven process.

Closing, heritage conservation is a rather complex issue. During the decision-making process, heritage stakeholders need to reflect on the overall societal impact. Therefore, comprehensive and objective toolkits are needed in order to guide decision-makers into autonomous, well-founded, efficient and effective conservation interventions. The current thesis is inspired by this necessity and sets out to design the accordant cultural toolkit.

2.1.3 Built Heritage's Obsolescence

Along with the internal challenges of conservation, the external environment is also dealing with crucial issues. The urban development, the industrialization of modern societies, the financial crises and the migration flows set the image of our modern world. In this image, built heritage beholds a hybrid identity. On the one hand, it is associated with commercial and tourist opportunity and showcases considerable positive externalities (Benhamou, 2013). On the other, it is considered as an inherently waste of resources and energy inefficient, due to its embedded high costs (e.g. initial stabilization and/or reconstruction, continued maintenance and interpretation to the public) (Barthel-Bouchier, 2013). Under the predominant linear economy system, both interpretations of built heritage lead to wrong evaluation processes. Whether proceeding to new constructions or demolitions, built heritage is facing the threat of degradation, damage or even irretrievable loss. Combined with the conservation's skepticism toward heritage objects (buildings or their parts) being repurposed, and thus, re-contextualized (Huuhka, S.& Vestergaard, 2019), urban historic quarters have come to be places of decline.

Obsolescence is one of the most serious threats for built property (Thomsen & van der Flier, 2011). Coming at the end of the building life-cycle, obsolescence refers to a lower level of use, erosion and effacement of the buildings. The factors leading to this issue of built properties, may arise either from conditions within the internal environment of the building, or from its external one. The types of obsolescence are (Langston et al, 2008):

1. Physical obsolescence, as in buildings' decay overtime which results in a reduced physical performance.
2. Economic obsolescence, as in the period of time over which ownership or use of a particular building stops being the cost-minimum option.
3. Functional obsolescence, as in the re-orientation of the purpose of buildings due to a change in the owners' objectives and needs.

4. Technological obsolescence, as in the higher operating costs and lower efficiency results, compared to new constructions.
5. Social obsolescence, related to fashion and behavioral changes in society (i.e. aesthetics, religious observance, etc).
6. Legal obsolescence, referring to the revision of safety, building and environmental regulations.

Following this depreciation of buildings, including built heritage, the quantity and /or quality of the demand for the services of buildings, and consequently their productiveness and value is being reduced (Burton, 1933). Demolition arises as the appropriate way-out of the problem. But is this solution really appropriate when handling sites and structures of heritage value? At this point, the only way forward is the discovery of a new vitality, livability and sustainability of built heritage (Vehbi & Hoşkara, 2009).

2.2   On Sustainability

In the Brundtland Report by the World Commission on Environment and Development (Bruntland, 1987, p.16), sustainable development was defined as *"the development that meets the needs of present generations without compromising the ability of future generations to meet their own needs"*. Furthermore, it was stated that countries were then, in 1987, more than ever, forced to re-orientate their policies and institutions towards diminishing their ecological impact. Yet, the alert for sustainable resolutions had already gone off a long time ago.

The "spirit" of sustainability can be traced back to the early periods of history, in Aristotle's work on ethics and politics (Vojnovic, 2014). "Sustainability", as understood today, begins to appear in environmental literature during the 1970s and derives from the understanding that the world is not ample enough, nor generous enough, to accommodate much longer the egocentric and conflictive behavior of people. With 1972 UNESCO' s World Heritage Convention, each state party agreed on not deliberately damaging, directly or indirectly, the cultural and natural heritage, while also a list of "World Heritage in Danger" was introduced for the protection of properties under threat (UNESCO, 1972). In 1992, the United Nations formed a global partnership for sustainable development and adopted the Agenda 21 (United Nations, 1992). Following, in 2002 the World Summit on Sustainable Development took place (Johannesburg Summit, 2002), in 2003 intangible cultural heritage

was linked to sustainable development for the first time (UNESCO, 2003), while in 2005 a normative instrument correlating culture and sustainable development was introduced (UNESCO, 2005). Lastly, next to these initiatives, ICOMOS has set up specific committees which consider the impact of global climate change and sustainability issues on topics ranging from earthen architecture and arctic conservation to cultural tourism (Barthel-Bouchier, 2013).

Indeed, nations become increasingly aware of the concept of sustainability. In the same time, following Schumpeter (1932), the current capitalistic economic system requires the *"perennial gale of creative destruction"*, where new products and processes are established in the place of the old ones. As a result, nations have to pursue a long-run developmental dynamism, while keeping pace with the long innovation process. Should the first waves of innovation in history be driven by market needs such as the reduction of transaction costs, Hargroves & Smith (2005) foresee that the next waves of innovation will concern not only the mere enhancement of productivity but also the environmental relief.
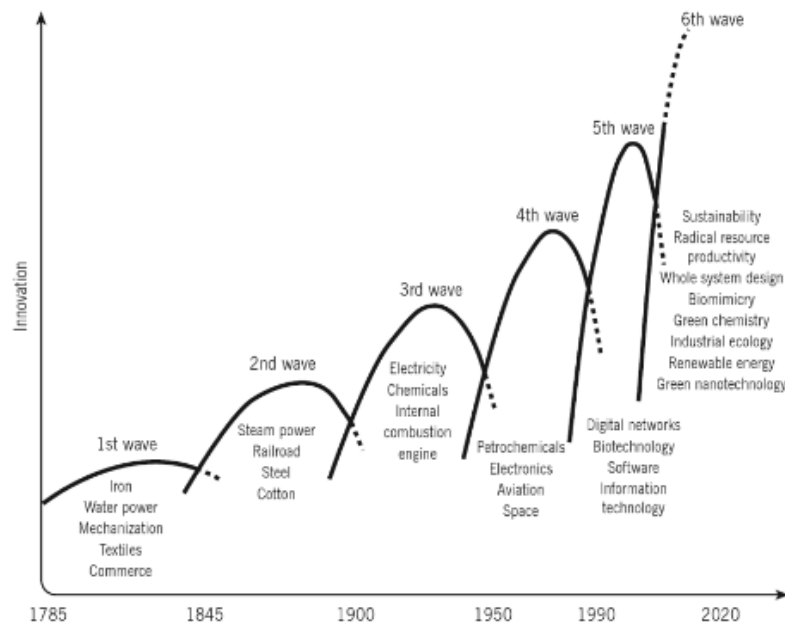
Figure 2: Waves of innovation of the first and the next industrial revolution (Hargroves & Smith, 2005)

Currently we are amidst the sixth wave of innovation where sustainability translates into a radical resource productivity, whole system designs, biomimicry, green chemistry, industrial ecology, renewable energy and green nanotechnology. Yet, although the latter terms seem to be predominantly related to the global ecological crisis, their social dimensions should not be neglected. Sustainability, in its deeper meaning, has ethical and moral connotations which generate behavioral changes and value re-orientation. Under this holistic concept, three

categories of objectives can be identified (Duran et al, 2015, p. 816):

1. *"Objectives of the economic system: maximizing the amount of goods and services produced in the technosphere, maximizing the efficient use of mineral resource flows, biologic, energy and information flows; adaptation technologies, mineral resources and reprocessing products.*

2. *Objectives of the social system: equitable allocation of goods and services between the social contract partners at local, national or global level; adequate training of all members of society in socio-economic processes; creating, using and adapting permanent structures and mechanisms of political, institutional or related to information management systems that provide flexibility and social and economic self-regulation; maintaining cultural diversity to support faster adaptation of chance.*

3. *Objectives of the ecological system: maintaining biodiversity in support of the possibility of adapting to the changing conditions of the geo biosphere; mechanisms of self-regulation and the natural cycle times in the biosphere."*

The previous sustainable objectives bring forth a new model of economic and social structure; Circular Economy.

2.2.1 Circular Economy

Until recent years, the understanding of a product supply chain was interwoven with the "take-make-dispose" model of the industrial linear economy (Huuhka & Vestergaard, 2019). In this model, natural resources are being processed into products that support human activity (Foster, 2019). Consumers use these products and subsequently dispose them as waste. Yet, in the face of the endangerment of human wellbeing, a Circular Economy supply chain is being pursued, standing in contrast to the linear one. As Walter Stahel, a Swiss architect and industrial analyst, first stated in his acclaimed paper on *"The role of the private sector in a sustainable society"*, circular economy is based upon stock management (Stahel, 1982). In this context, three loops of opportunities emerge: (1) a reuse and remarketing loop for goods, (2) a loop of product-life extension activities of goods, and (3) a recycling loop for molecules (secondary resources)

(Stahel, 2013, p. 3).

Given the fact that built heritage management entails, by definition, stock management processes, a linkage between built heritage, sustainability and circular economy already arises. Even though evaluators of cultural sites (e.g. governments, public administrations etc.) began to discuss sustainability only after 1999 (Schmutz & Elliott, 2016), today there is a growing understanding of the vital role of cultural heritage within sustainable development. The latter calls for innovative thinking, thus, going back to Schumpeter, it requires an outlet for creative destruction. Built heritage has the potential to be creatively destructed, in order to serve the arising societal goals. After all, culture has the power to appropriately articulate contemporary community needs, through its ability to empower and animate (Evans, 2005).

2.3 Built heritage, Sustainability and Circular Economy: Theories Collated

Now that the concepts of built heritage, sustainability and circular economy have been introduced, they need to also be empirically correlated. The essential argument in this exercise is that culture can be seen as both a facilitator and a driver of development (Throsby, 2017). On one hand, the facilitator role derives from the fact that the cultural sphere can determine the outcome of the implemented development policies. On the other hand, the driver role stems from the prospect of the cultural industries to generate income, growth and employment in developed and developing economies, while also preserving local cultures.

Turning the spotlight on historic quarters, where a high amount of built heritage is concentrated, sustainable development is associated with urban regeneration and/or revitalization. On a first level, revitalizing historic quarters involves the restoration of the physical fabric in the form of: *(i) refurbishments (conservation and consolidation, for the obsolescence of a building in existing use), (ii) conversion (adaptive re-use—the adaptation of buildings for new functions or uses) or (iii) demolition and redevelopment—within the various types of obsolescence (high, static and declining)"* (Vehbi & Hoşkara, 2009, p. 5). Yet, physical revitalization alone cannot be considered as a step towards sustainability. In order to achieve long-term results, a broader economic and social revitalization should be sought.

Passing on to a more practical illustration of what circular theory means for physical

revitalization, authors Huuhka S. and Vestergaard I. (2019) presented a figure of the priorities of circular economy in buildings' context, giving emphasis on the conservation of the existing stock (fig. 3). This stock not only comprises built heritage, but also modern buildings. As they assert, circular loops, as in biological cycles, refer only to the oldest heritage. This is because, pre-modern buildings were made of stone, timber, or clay without any substances that would prevent the biological processes from reabsorbing the materials at the end of the lifecycle. Modern buildings, on the contrary, are made up by extensively processed substances, such as reinforced concrete, engineered wood, mineral wools and plastics, which cannot enter the circular loop without first being technologically processed.
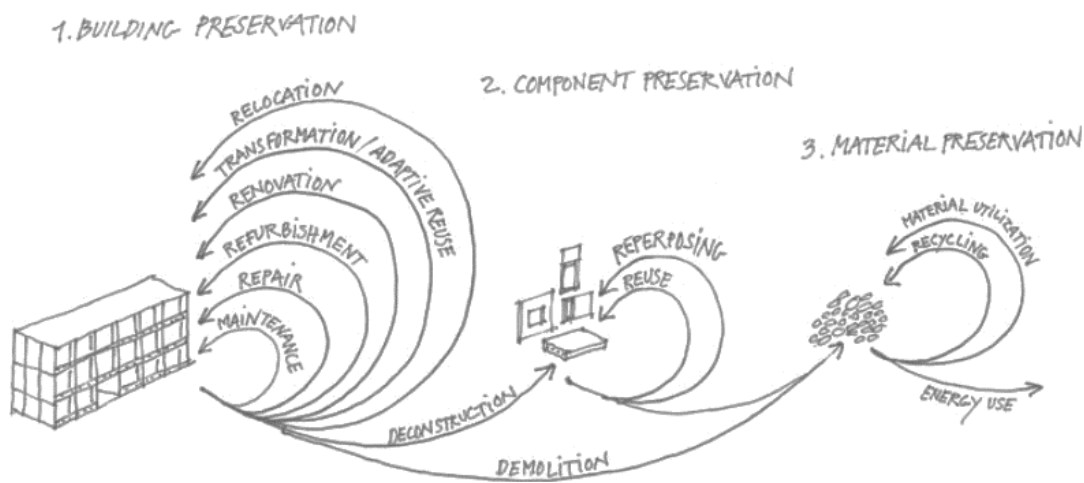
Figure 3: Circular Economy in the context of buildings (Huuhka & Vestergaard, 2019).
Note: The priority order proceeds from left to right and from inner loops to the outer ones.

2.3.1 Adaptive Reuse

Given the suitability of built heritage for circular economy interventions, a new dynamic approach crystalizes in the term of "integrated conservation", as in the unique way of rendering conservation more sustainable (Salama, 2000). Under this notion, built heritage can be used for new functions or by rehabilitation of the original infrastructures (Bizzarro & Nijkamp, 1996). Rather than demolishing and deconstructing the existing buildings in order to integrate their materials in a recycle circle (efficient initiative), it is even more profitable to keep their structure intact and re-use them (effective initiative). The latter approach is called "adaptive reuse".

By adaptive reuse we refer to the process which retains as much as possible the original building while upgrading the performance, in order to suit modern standards and changing user requirements (Latham, 2000). This process is believed to contribute to sustainable development, where the existing building stock is seen as an economic, social and cultural capital that should not be wasted. Furthermore, there is a growing perception that old buildings are often cheaper to convert to new uses than to demolish and rebuild (Bullen, 2007). Overall, the expected benefits of adaptive reuse are (Langston et al, 2008):

- Economic benefits: rehabilitation processes typically take half to three-quarters of the time necessary to demolish and reconstruct the same floor area, thus adaptive reuse reduces the conservation time-span. In addition, the overall cost of rehabilitating a building is generally less than constructing a new one, where new building materials are required.
- Environmental benefits: the recycling of materials, the reuse of structural elements and the reduction in generated landfill waste are the most prevalent assets of adaptive reuse. Furthermore, a series of long-term operational benefits can be found such as the minimization of energy consumption in heating and cooling.
- Social Benefits: Older buildings are inextricably linked to intrinsic heritage value, thus can add character and status capital. Often found in the heart of city centers and close to transport, their adaptive reuse can generate vibrant communities, reduce criminality and other unsocial behavior, as well as raise the living standards.

The previous economic, social and environmental benefits render adaptive reuse as a superior alternative to demolition and new construction. Yet there is a number of barriers to adaptive reuse, mostly concerning cost. First, adaptive reuse is considered to be viable only when the related costs and benefits are factored in over the life of the building (Bullen, 2007). Following, older buildings may require extensive and costly refurbishment and still be unable to reach the performances of new constructions. Lastly, maintaining the structural integrity of built heritage while also meeting current needs and sustainability standards is considerably difficult.

In conclusion, even if adaptive reuse is perceived as highly sustainable in the long-term, there are significant, short-term, doubts on the execution and functionality of the projects. For example: Are there sufficient resources for the implementation of the adaptive reuse projects?

Should diverse revenue flows be sought? Which is the ideal functioning model? Circular economy has the potential to fill in the gap from theory to practice and provide alternative forms of governance, financing and management. It is for this reason, that research and systemic knowledge need to be developed in order to help combat the potential challenges of adaptive reuse.

2.4   Conclusion

Be it demand-orientated or supply-orientated, built- heritage conservation can initiate a series of positive effects for communities. Notably, adaptive reuse stands at the intersection of conservation, sustainability and circular economy and has the power to preserve past values, restore and/ or re-interpret them for the public. First, in architectural terms, it can revive cultural and historical values of the physical characteristics of buildings (design, materials, craftmanship etc.). Then, in sustainability and circular terms, it can promote environmental values through the extension of the buildings' life cycle.

Now that the multi-dimensional values of adaptive reuse have been illustrated, new challenges emerge. Which aspects should the internal heritage stakeholders take into account, during the decision-making process? How can they encompass the overall societal impact of conservation? The latter issues provide a proliferate ground for further reflection and research, as will be demonstrated in the following chapter.

3.

Toolkit Design Methodology

Given the previously illustrated theoretical knowledge on the topics of cultural heritage, sustainability and adaptive reuse, the present chapter concerns the ways this bulk of knowledge comes alive in the form of a consultation toolkit for decision makers. As previously mentioned, the toolkit's database consists of both physical data and a logical description of them. Initially, due to the enormous source of information on past projects of adaptive reuse, we will perform a content analysis. The methodological context will be qualitative, with an empirical application of the acquired theory. Overall, a deductive approach will be adopted, where new observations and findings emerge out of the existing theory (Bryman, 2012). In other words, the toolkit's design process aspires to enrich the current theoretical framework.

With this goal in mind and under a chronological order of the required activities, we will explore the steps to design the tool. The first section, the so-called macro level, concerns the building of knowledge on the potential impact of cultural heritage adaptive reuse. The aim is to design the conceptual schema of the tool and relate adaptive reuses with the appropriate sustainability domain, in order to construct a framework for further use. The following, meso-level section, consists of the major body of work where we will go through the design of a set of questions which hold a twofold role: 1) be a multicriteria evaluation/analysis tool for past cases of adaptive reuse (conceptual schema), 2) be the interface between the user (decision maker) and the toolkit (external schema).

3.1   Macro Level | The Conceptual Schema

The first of the two objectives of the consultation tool for decision makers is to raise their awareness regarding sustainability and help them associate their practical needs with a sustainability pillar. By having a clear view of which sustainability pillar they should go for, they are expected to be better prepared and more efficient during their future decisions. Lastly,

it the toolkit's core objective to adopt a suitable, flexible and easy user language. In this way, a common language between the academia and decision-makers of all backgrounds can be finally found, leading to quicker, feasible and sustainably successful adaptive reuses.

In order to create a framework of four pillars of adaptive reuse, following the four pillars of sustainability, a deductive way of thought was adopted. First, we went through CLIC project's survey results in order to identify the recorded new uses of the cultural heritage. Secondly, we grouped together the previous adaptive reuses and classified them under the appropriate function of built environment, following the Land Based Classification Standards System. Lastly, we linked the functions to the matching domain of sustainability impact.

3.1.1 The CLIC project

Inspired by the concepts of adaptive reuse, sustainability and circular economy, CLIC *"Circular models Leveraging Investments in Cultural heritage adaptive reuse"* is a Horizon 2020 research and innovation project on innovative governance, financing and business models for cultural heritage adaptive reuse in the perspective of the Circular Economy (CLIC, 2018). CLIC's research is coordinated by the Institute for Research on Innovation and Services for Development, National Research Council of Italy (IRISS CNR) in partnership with research institutions, local government organizations, businesses and local governments from 10 European countries. The overall objective of the project is to test, implement, validate and share circular evaluation tools, as well as to demonstrate the associated economic, social, environmental benefits.

The first phase of CLIC's Work Package consisted of the selection and analysis of the best practices of adaptive reuse projects, in order to build knowledge on the interaction beween the adaptive reuse projects, circular economy and cultural heritage. To do so, CLIC researchers executed a Literature Review, a global survey (quantitative and structured) and Historic Urban Landcapes workshops (qualititative and unstructured)[1]. Following, a database of the best

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[1] Regarding the HUL workshops, CLIC followed Unesco's recommendations and implemented a variety of activities (e.g. lectures, film screenings, expositions, performances, expert meetings, converstations etc.) which took place in : Pakhuis de Zwijger (The Netherlands, June 2018), Salerno (Italy, November 2018), Rijeka (Croatia, March 2019), Västra Götaland region (Sweden, August 2019) and Pakhuis de Zwijger (The Netherlands, March 2020). It is also worth noticing that both the survey and the HUL workshops achieved a wide stakeholder participation, covering at least 80% of EU countries.

projects of cultural heritage adaptive reuse was published online, making information accesible for everyone. This database contains information on 126 projects of cultural heritage adaptive reuse from European countries, provided by respondents to the CLIC online survey. It presents general information on the adaptive reuse project and its location, its structural characteristics, funding models, management aspects and active uses / functions. Referring to the new functions of cultural heritage, CLIC tracked down the following (Clic, 2020):

Residential, Cohousing, Hotel Accommodation, B&B Accommodation, Commercial Units, Wellness Centers, Restaurant, Café, Public Library, Gardens, Education, Museum Exhibition, Research, Cultural Events, Theatre, Conferences, Social Uses, Community Hubs, Incubator, Cultural and Creative Industries Hub, Innovative startups hub, Circular Economy Enterprises Hub, Coworking Spaces, Workshop Spaces, Living Lab, Fab Lab, Creative Hub, Artist Residencies, Materials Bank, Repair Café, Bike Sharing Place, Sports Facilities and Other Uses.

The latter identification of the new uses of built heritage constitutes the first step towards the correlation of adaptive reuse with the four pillar approach. The next step concerns the distinguishing of the appropriate Function of each adaptive reuse.

3.1.2 The Land Based Classification Standards System

Continuing on the deductive course of thought, successful adaptive reuses of cultural heritage mainly depend on the choice of efficient new uses of the properties. Decision makers, before their final suggestions for adaptive reuse, need to obtain knowledge on the different dimensions of land use in the urban, suburban and rural communities they are in charge of. For this reason, an appropriate terminology needs to be found in order to adequately describe and classify the uses of built environment. This terminology stems from the urban planning field.

The Land Based Classification Standards (LBCS) model, issued by the American Planning Association, will provide the current thesis with the needed overarching terminology of land uses. This model has been chosen due to its reliability, flexibility and up-to-date geo-referenced information on how the land is being used by the humans (Montenegro et al, 2012). Of the five different LBCS classification dimensions – i.e. Activity, Function, Structure type,

Site devleopment character and Ownership, for the needs of this thesis, we will focus only on the *"Function"* category, as in *"the economic function or type of establishment using the land"* (American Planning Association, 1999). The reason behind this decision is the fact that the *"Function"* category is considered to be broader than the *"Activity"* category, thus allowing for a wider understanding of the land uses . This is because the economic Function of each land use does not identify with the actual Activity taking place on the land. Establishments can have a variety of Activities under one single Function. For example, several CLIC projects of adaptive reuse house more than one Activities which, grouped together, form a single broader Function.

The LBCS categories of Function are (American Planning Association, 1999) :

1. Residence or Accommodation Functions: all types of establishments offering residence or accommodation. The subcategories are: private households, housing services for the elderly, hotels, motels or other accommodation services.

2. General Sales or Services: the vast majority of establishments typically associated with commercial land use. The subcategories are: retail sales or service, finance and insurance, real estate, rental and leasing, business, professional, scientific and technical services, food services, personal services and pet and animal services.

3. Manufacturing and wholesale trade: the establishments located in plants, factories or mills employ power-driven machines and materials-handling equipment. The subcategories are: food, textile and related products, wood, paper and printing products, chemicals, metals, machinery and electronics manufacturing, miscellaneous manufacturing, wholesale trade establishment, warehouse and storage services.

4. Transportation, Communication, Information and utilities: the transportation, communication, and utilities for essential facilities. The subcategories are: transportation services, communications and information, utilities and utility services.

5. Arts, Entertainment and recreation: the facilities covering a variety of cultural, entertainment, and recreational functions. The subcategories are: performing arts or *"supporting establishment",* museums and other special purpose recreational institutions, amusement and sports establishments, campus, camping and related establishments, *"neutral"* and other recreational parks.

6. Education, Public Administration, Health Care and other institutions. The subcategories are: educational services, public administration, other government functions, public safety, health and human services, religious institutions, death care services, associations and nonprofit organizations.

7. Construction-related businesses: the establishments constructing buildings or structures and performing additions/alterations/reconstructions/installations/ repairs. The subcategories are: building, developing and general contracting, *"machinery related",* special trade contractor and heavy construction.

8. Mining and extraction establishments: the establishments extracting mineral solids, liquid minerals and gases. The subcategories are: oil and natural gas, metals, coal, nonmetallic mining, quarrying and stone cutting establishment.

9. Agriculture, forestry, fishing and hunting: the establishments often described as farms, ranches, dairies, greenhouses, orchards or hatcheries. The subcategories are: crop production (grain, vegetable farming, fruits and trees, greenhouse etc.), support functions for agriculture, animal production including slaughter, forestry and logging, fishing, hunting and trapping.

10. Unclassifiable functions: category used for unique functions that cannot be grouped anywhere until the classification scheme is updated.

The previous Function categories constitute the second step towards the correlation of adaptive reuse with the four pillar approach. The third, and final, step introduces the various domains of sustainability.

3.1.3 The Four Pillar Approach of Sustainability

In 2013, Europa Nostra initiated the cooperation project *"Cultural Heritage Counts for Europe (CHCFE)"[2]* examining the potential of cultural heritage as a resource for sustainable development (Europa Nostra, 2015). The project resulted in the" Cultural Heritage Counts for Europe" Report where the impact of cultural heritage was demonstrated in a holistic way; economically, socially, culturally and environmentally. The division into the four pillars has the potential to serve for an accurate assessment not only of the impact of cultural heritage but also of its future pathways. Here, it is important to notice that, as expected, the Report's classification of the heritage impact under the four different domains proved to be impossible since for each impact there was more than one attribute. Alternatively, a comprehensive diagram was developed based on the four domains and subdomains of sustainability.
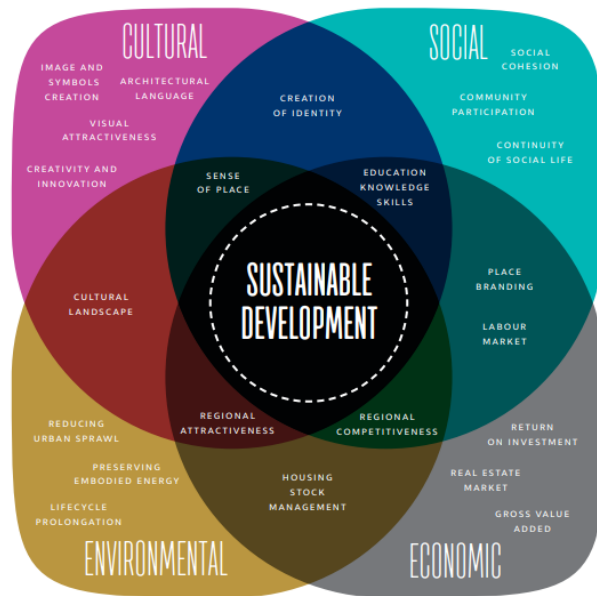
Figure 4: The different subdomains identified in the collected studies mapped in the holistic four domain approach diagram (Europa Nostra, 2015).

The previous identification of the impact domains and subdomains contributes to the overall aim of correlating land uses with the appropriate domain of sustainability. The latter correlation

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[2] The CHCFE Consortium consisted of: Europa Nostra (The Voice of Cultural Heritage in Europe), ENCATC (The European Network on Cultural Management and Cultural Policy Education), Heritage Europe (The European Association of Historic Towns and Regions), International Cultural Centre, Krakow (ICC), Raymond Lemaire International Centre for Conservation at KU Leuven (RLICC) and The Heritage Alliance, England (UK).

is exhaustively detailed in Appendix A. The criteria behind our course of thought were:

- Economic domain:

  Does the Function in question show signs of cultural tourism, jobs creation, maintainance and restoration works, real estate and/or attraction of new investements?

- Cultural domain:

  Does the Function in question show signs of education, civic pride, recreational activities, city revitalisation, policy and/ or quality of life?

- Social domain:

  Does the Function in question show signs of cultural tourism, social cohesion, education and personal development and/or quality of life?

- Environmental:

  Does the Function in question show signs of in the reduction of emission and pollution, energy efficiency and/or quality of life?

As already mentioned, the overarching aim is to connect, step-by-step, past projects of adaptive reuse with the four pillar approach. The first step was to identify the new uses/functions of built heritage, as recorded by CLIC. Then, we assigned a specific type of LBCS Function to each CLIC adaptive reuse. Lastly, we correlated each LBCS Function to the appropriate subdomain of activity, following the Europa Nostra Report (2015). The overall correlation results can be found in the following section.

3.1.4 Four Pillars of Adaptive Reuse

The last step of the previous deductive analysis is the creation of a framework where each type of adaptive reuse is classified under the appropriate pillar of sustainability. Once again, the intrinsic overlap of the four impact domains is identified proving the complexity of the impact of cultural heritage on society, culture, economy and environment. For this reason, most adaptive reuses are classified under more than one pillar of sustainability.

For example, public libraries relate to the Education, Skills and Knowledge Impact Domain, thus not only serve the transmission of knowledge and the creation of a communal identity, but also attribute skills to the local community and lead to economic development.

Lastly, the environmental aspect is always omnipresent and relevant to each type of adaptive reuse, as was indicated in the theoretical chapter. Yet, for the needs of a consultation tool as precise and relevant as possible, the adaptive reuses were classified according to their predominant impact domain. The detailed description of the correlation between the various categories of adaptive reuse and the four pillars of sustainability, can be found in Appendix A. The final form of the table is as follows:

Economic Pillar	Social Pillar
Residential, Cohousing, Hotel Accommodation, BnB Accommodation, Commercial Units, Restaurant, Café, Public Library, Education, Museum Exhibition, Research, Cultural Events, Conferences, Incubator, Innovative startups hub, Circular Economy Enterprises Hub, Coworking Spaces, Workshop Spaces, Living Lab, Fab Lab, Repair Café, Sports Facilities	Cohousing, Commercial Units, Public Library, Education, Museum Exhibition, Research, Cultural Events, Theatre, Conferences, Social Uses, Community Hubs, Innovative startups hub, Circular Economy Enterprises Hub, Coworking Spaces, Workshop Spaces, Living Lab, Fab Lab, Bike Sharing Place, Sports Facilities
Cultural	**Environmental**
Hotel Accommodation, BnB Accommodation, Wellness Centers, Restaurant, Café, Public Library, Education, Museum Exhibition, Research, Cultural Events, Theatre, Cultural and Creative Industries Hub, Workshop Spaces, Living Lab, Fab Lab, Creative Hub, Artist Residencies	Residential, Co-housing, Hotel Accommodation, BnB Accommodation, Wellness Centers, Restaurant, Café, Gardens, Museum Exhibition, Cultural Events, Theatre, Conferences, Incubator, Cultural and Creative Industries Hub, Creative Hub, Materials Bank, Repair Café, Sports Facilities

Table 1: Four pillars of adaptive reuse [SOURCE: Elaboration of the author]

Table 1 is the one, of the two, outcome of the macro-level toolkit design process. At this stage, knowledge was built on the potential impact of cultural heritage adaptive reuse. Most importantly, we established the conceptual schema of the cultural toolkit, where each type of

adaptive reuse was correlated with the appropriate sustainability domain. This schema will be further enriched in the following meso-level design process.

3.2   Meso Level

The following set of questions is a fundamental part of the flexible tool for the decision-makers who are about to decide on the adaptive reuse of a property. Their design was crucial since these questions hold a hybrid role. On the one hand, they constitute the software interface where the user (decision-maker) will exchange information with the consultation tool. As a result, the questions need to be relevant, flexible and in an easy user language. During the interaction with the toolkit, decision-makers will position themselves against a variety of queries and potentialities concerning their adaptive reuse project. Consequently, it is the questions' objective to inspire and provide the users with a new consciousness of what their options and visions could be.

On the other hand, the designed questions constitute the common language between the user and the consultation tool. The toolkit can run effectively, only if the user inserts the suitable answers. In accordance, the user can use the toolkit effectively, only if the latter is comprehensible. In order to achieve the coherence between the decision-makers' answers and the toolkit, we need to go through the available data, as gained by CLIC, and establish a new evaluation framework. This framework uses as its criteria the aforementioned set of questions. In this way, the questions' objective is also to further assess the CLIC projects.

3.2.1 The questions as a multicriteria evaluation | Conceptual Schema

In order for the interaction between decision-makers and the toolkit to be successful, a common language had to be found. This language must be comprehensible by both ends, so that the inserted answers are suitably matched, and the appropriate results are showcased. For this reason, the questions of the previous section also serve as a multicriteria evaluation of CLIC past projects of adaptive reuse.

The amount of information to be gained for each single CLIC project surpassed the

timeframe of this current thesis. The dataset was enormous and concerned multiple aspects of the adaptive reuses' implementation. In order to diminish the volume of the available data, a common feature was selected so that the suggestions are more relevant but still trustworthy. Since the consultation tool aims at inspiring decision makers rather than just showcasing the expected results, the selected common feature should not concern aspects such as the budget range or the ownership type, which radically eliminate the showing results. For example, the realization of an adaptive reuse project does not fully depend on the available budget, since alternative funding sources could cover the financial gap. Eventually, we decided the common characteristic between CLIC projects to be the state of *"Bad Condition"*, prior to the adaptive reuse. This decisions is because this state is an often encountered state and related closely to the constraints in time and budget. In this way, out of initially 126 CLIC projects of adaptive reuse, we ended up with 33 projects of *"Bad Condition"*.

The multicriteria evaluation of the 33 projects was executed following the succession of the questions of Appendix B. Regarding group A of questions (Definition of the problem), the evaluation followed the information gained by the CLIC survey. This choice was made because of the technical, precise and objective nature of our questions which leaves no room for accuracy doubts. Then, the following criteria were applied:

- The multifunctionality of the adaptive reuses, as in the co-existence of different types of function according to the Land Based Classification Standards System.
- The possibility of adding extensions to the property/ building, in order to pursue a multifunctional (financial, cultural, social) activity.
- Should the building be inhabited, the residents had been consulted regarding the adaptive reuse decision.
- The possibility of a participatory type of governance as a people-centered approach involving various cultural heritage stakeholders to the management of the properties.
- The self-sustainability of the project.
- The relation to European, national, regional or local strategic documents as a sign of cross country/region collaboration in order to achieve common goals.
- The stance of current regulations, cultural heritage's policies and/or private organizations values, towards the execution and viability of the adaptive reuse, since these can be signs of funding instruments.

- The possibility of the execution of the adaptive reuse through partnership, so that diverse funding sources are sought.
- The vision (short-term or long-term) behind the project.
- The innovativeness of the adaptive reuse in terms of function comparing to the prior function of the property/building.
- The expectations for the maintenance costs of the property, as in the operating costs, revenue streams, alternative ways of financing etc.
- The presence of cultural heritage and/or an acclaimed built environment nearby the cultural heritage property/ building, going for a cultural spillover effect
- The level of environmental value in the surrounding area.
- The adaptive reuse's anticipated impact on the local, regional or national community.
- The size of the city where the cultural heritage property is located.
- The accessibility of the location, as in flexibility of the transportation infrastructures.
- The safety of the location.
- The existence of land in the surrounding location of the building, allowing for circular economy, well- being of residents, engagement with the public etc.
- The existence of human resources so that there is contribution such as volunteering, training, crowdfunding, material supplies, technical assistance etc.
- The dynamics of the population of the surrounding area.

Given the multicriteria evaluation of the 33 CLIC projects, following the aforementioned criteria, a new database is created for the toolkit. This database is the outcome of the meso-level toolkit design process. At this stage, the second, and final, part of the conceptual schema of the cultural toolkit is developed. With the latter acquired knowledge, we proceed to the design of the external schema of the toolkit, as follows.

3.2.2 The questions as the interface between decision-makers and the consultation tool | External Schema

Upon first encounter with the tool, decision makers will come across a set of questions waiting to be answered and will subsequently be provided with the appropriate results. The questions'

scope is to guide decision-makers, of different backgrounds, towards a recommended type of sustainability (environmental, economic, social, cultural) along with a list of adaptive reuse suggestions, which best comply with their answers.

With this concept in mind, the questions are divided into three groups:

- **Group A - Definition of the problem:**

    In the questions under the first group, the decision-maker is expected to describe some introductory but crucial aspects of the property subject to adaptive reuse. Through these answers, we will be able to narrow down the list of CLIC's suggested adaptive reuses. For example, the budget range significantly narrows down the list of CLIC's list of adaptive reuses.

- **Group B - Description of the adaptive reuse:**

    In this group of questions, decision-makers are expected to answer questions related to the managerial and financial characteristics of the desired adaptive reuse. More precisely, they are called to position themselves, by *"Yes"* or *"No"*, against: the multifunctionality of the property, the synergies between different stakeholders, the impact on the local community and the overall vision of the adaptive reuse.

- **Group C – Vision of the adaptive reuse:**

    With the last group of questions, the decision-maker is expected to reflect on the cultural, social and environmental pillar of sustainability. He/ She will provide answers related to the desired impact of the adaptive reuse such as the contribution of the adaptive reuse to the community, the cultural significance, the natural environment and the circular mindset.

The design of the questions is inspired by the CLIC survey, Europa Nostra's *"Cultural Heritage in Action"* programme of 2020, the *"Heritage Houses for Europe"* study by the European Landowners' Organisation, the European Historic Houses Association and IDEA Consult (2019), as well as the *"Guidelines for sustainable heritage adaptive reuse"* by ROCK project (2019). The questions can be found in Appendix B, yet it is essential that some aspects be clarified:

- The state of the building subject to adaptive reuse is obsolete, underused or misused. This means that these buildings do not function under their previous use, neither do they exploit their full potentialities. For this reason, these questions do not refer to fully functional cultural heritage properties, which seek for improvements.

- The questions do not pursue a technical comparison between different adaptive reuses (e.g. budget, country, type of ownership). Albeit, they are based on a holistic approach of the infrastructures with seemingly different characteristics can provide an inspiration for an adaptive reuse. For this reason, the questions are categorized into three different groups, aiming to capture multiple aspects of sustainability.

- The questions are closed meaning that decision-makers can only answer by specific options (Yes/No). This not only serves for finding a common language between the academia and decision makers of different background, but it also helps for better drawing similarities to past projects of adaptive reuse. Altogether, closed questions render the application of the consultation tool more flexible.

- The questions are project-based, meaning that the decision makers have to have a clear cultural heritage property/building in mind in order to answer the questions. In addition, they are expected to have an as clear as possible perspective of what their resources, opportunities and challenges are.

- Not all answers have an equal weight. Yet, they all equally serve to extract crucial information from decision makers.

Closing, the second and last part of the meso-level toolkit design process, consisted of the toolkit interface. The questions of Appendix B constitute the external schema of the tool, thus are the closest to the decision-makers. These questions are what the users see upon usage of the toolkit. Having inserted their answers, they will be shown the appropiate results. An introduction to the toolkit's practical implementation in Chapter 4, takes place in the following micro-level stage.

3.3   Micro Level

In order to test the application of the consultation toolkit, a key sample of decision makers has to be chosen. Since the tool is a Microsoft Access application which requires usage instructions, we decided to execute the testing in the form of interviews. The interviews themselves were conducted by telephone or email with the interviewees. This method of testing the tool is considered to be equally suitable and accurate, since it imitates the time and place of running the application toolkit.

Referring to the selection of decision-makers, a representative sample of decision makers had to be found in order to ensure the accuracy of the toolkit. Since this research will be applied to a case study of Athens, Greece, we decided to interview only Greek decision makers. The reasons behind this decision is that there are short lines of communication between the interviewees leading to fast and confident responses to the posing questions. Ultimately, three decision makers reacted and were interviewed. First, Irini Gratsia being an Archaeologist and funding member of MONUMENTA, a non-profit civil company established in Athens, Greece with the objective of protecting and promoting the natural and architectural heritage of Greece and Cyprus. Secondly, Dr. Maria Daniil, Architect, head of the Department of Building Projects of the Municipality of Athens, and member of the Executive Committee of the Hellenic Section of ICOMOS and Conservation of Historic Cities and Villages (CIVVIH). Thirdly, Eleni Maistrou, Emeritus Professor of Architectural Design, School of Architecture at National Technical University of Athens (NTUA), member of the scientific committee of the post-graduate specialization course: "Conservation and Restoration of Historic Buildings and Sites" of NTUA and member of the scientific committee of ICOMOS for the Conservation of Historic Cities and Villages (CIVVIH). The individual answers to the questions are available on request.

Following, the three decision-makers were selected thanks to their conceptually wide and well-organized knowledge base, their empirical experience, as well as their ability to detect subtle cue insights. It is also because of these latter traits, that we asked for a suggestion on a potential case study for the toolkit application . The only presented condition on our term was for the case study to be a representative building in *"Bad Condition"*, so that it matches the dataset of section 3.2.1. The decision-makers unanimously suggested the Prokesch von Osten Mansion, located at the city center of Athens, Greece (Feidiou Street, 3). The two-story

building was constructed in 1837 and initially served as the residency of the homonymous Austrian ambassador. Hans Christian Andersen, the well-known Danish author, was invited in the house in 1841 and described it as *"one of the furthermost buildings in Athens, ranked with those of Naples, Vienna and Copenhagen"* (Moraitis & Rassia, 2019). Between 1919 and 1971, the building housed the Greek Conservatory. Today, the Prokesch von Osten Mansion is considered to be severely obsolete and urgently calls for attention. The current thesis comes at the height of concern for the future of this piece of built heritage, as proven by the unanimous suggestion of the three decision-makers.

Lastly, since the application of the toolkit will not concern a single decision-maker but a total sum of three, it is expected to encounter a deviation in decision-makers' answers. In order to tackle this issue, a common ground of analysis needs to found. The *"Highest and Best use"* theory provides the needed analytical context. This theory relies on the identification of the most profitable, competitive use to which the subject property can be put (Appraisal Institute of Canada and the Appraisal Institute, 2002). The "Highest and Best use" method presents a series of four implicit tests, as will be shown in the Chapter 4.

4.

Results of the Toolkit Application

Given the previous methodological framework surrounding the design of the consultation toolkit (conceptual and external schema), the present chapter entails a practical implementation of the tool.

The chapter follows the structure of the toolkit design methodology (chapter 3). The first section concerns the overall results of the multi-criteria evaluation of the 33 projects of adaptive reuse. The objective is to correlate the different aspects of the adaptive reuse projects with sustainability, compare and classify them under the appropriate pillars. In the second section, we will put the cultural toolkit into implementation. First, we will select a decision-makers sample and a representative case study of built heritage. Then, we will run the application and results will be drawn on the suggested type of adaptive reuse.

4.1. The evaluation framework for sustainable adaptive reuse

Applying the criteria of section 3.2.1. to the 33 CLIC projects of adaptive reuse, a new database is created. Each criterion is applied to each adaptive reuse project, leading, eventually, to the identification of the overall impact of the project. By impact, we refer to the pillar of sustainability (economic, cultural, social, environmental) which is influenced the most by the adaptive reuse. Once again, the intrinsic overlap of the four different impact domains was encountered. In order to deal with this, we reflected on the most reoccurring impact of the criteria, in an effort to eliminate the cross-sectorial classification. Yet, as was the case with Table 1, the criteria fell under more than one pillar of sustainability. The overall evaluation framework for sustainable adaptive reuse is:

Economic Pillar	Social Pillar
Multifunctionality of adaptive reuse, Construction of extensions, Self-Sustainability, Relation to strategic documents, Regulations and/or Organizations Values, Partnership, Vision, Innovativeness, Maintenance Costs, Presence of cultural heritage, Size of the city, Accessibility, Human Resources, Population dynamics	Construction of extensions, Residents' Consultation, Participatory Governance, Partnership, Vision, Innovativeness, Impact of adaptive reuse, Size of the city, Safety, Human Resources, Population dynamics, Land existence
Cultural	**Environmental**
Construction of extensions, Presence of cultural heritage, Environmental value, Land existence	Self-Sustainability, Innovativeness, Maintenance Costs, Environmental value, Land existence

Table 2: Evaluation Framework for Sustainable Adaptive Reuse [SOURCE: Elaboration of the author]

At this stage, it is worth noticing that Table 2 is considered to be the evolution of Table 1. While Table 1 set the foundations for the correlation between the four pillars of sustainability and the various types of adaptive reuse, Table 2 manages to further connect sustainability with the key impacts of adaptive reuse. In their essence, both evaluation frameworks, Table 1 &2, are hybrid. On the hand, they help decision-makers be better aware of the property in question and reflect on the multiple dimensions of it. On the other hand, decision-makers are guided into the concept of sustainability, they become accustomed to it and, eventually, are able to identify the presented opportunities and challenges. All in all, both Tables are facilitators of sustainability, as well as a by-products of it.

## 4.2 The application of the cultural toolkit

Given the case study of the Prokesch von Osten Mansion, the balanced analysis of the three decision-makers' answers requires the adoption of the *"Highest and Best use"* theory. Under the latter, there are four implicit tests to undertake (Appraisal Institute of Canada and the Appraisal Institute, 2002):

1. Legal Permissibility

2. Physical Possibility

3. Financial Feasibility

4. Maximal Productivity

These four tests will guide us through the application of the toolkit. The decision makers' answers based on our case study were step-by-step inserted in the Microsoft Access application leading to the following results:

1. **Legally Permissible Adaptive Reuse**

During this test, we engaged with the regulatory barriers put by the respondents. To begin with, only one out of the three respondents is open to a change in the type of ownership of Prokesch von Osten Mansion. Following, all of the respondents agree on a potential multifunctionality of the space, a participatory governance and maintenance without extending the building capacity. Lastly, two out of the three see current regulation in Greece as an asset, despite the fact that the residency belongs to the Greek national heritage. The application of the tool suggested 4 matching CLIC projects of adaptive reuse, as follows:

Project Name	Typology	Ownership	Change in Type o	Square Met	Size	Property wi	Deadline of	Funding Sou	Budget	Multifnctio	Construction	Residents' a
Lanthieri Manor, Slovenia	Residential	Public	No	2500	Medium	Yes	6	Mixed	Large	Yes	No	Yes
Fort Vechten, Netherlands	Military	Public	No	20000	Large	Yes	4	Public	Medium	Yes	No	No residents
Scuola Holden, Italy	Industrial	Public	No	4300	Medium	Yes	4	Private	Large	Yes	No	No residents
Casino Palace, Poland	Leisure	Public	No	800	Small	Yes	5	Public	Small	Yes	No	Yes

Participator	Self-Sustain	Relation to	Regulations	Partnership	Short-term	Innovative /	Decrease of	Region with	Pure Envirc	Impact on C	Type of area	Easily Acces	Safe
Yes	Yes	National	No	Yes	No	Yes	No	No	Yes	Yes	Small Town	Yes	Yes
Yes	No	National	Yes	No	No	Yes	Yes	No	Yes	Yes	Intermediate (	No	Yes
Yes	Yes	National	No	Yes	Yes	Yes	Yes	No	No	Yes	Intermediate (	Yes	No
Yes	Yes	National	No	Yes	No	Yes	No	No	Yes	Yes	Village	No	Yes

Human Resc	Dynamic Envirc	Uses/Functions	Sustainability Impact
No	Yes	Commercial Units, Public Library, Gai	Economic and Social
No	No	Residential, Hotel Accommodation, (	Economic, Social, Cultural
Yes	Yes	Public Library, Gardens, Education, R	Economic and Social
Yes	Yes	Restaurant, Gardens, Education, Mus	Social

Table 3: Toolkit Results of the *"Legally Permissible"* Test

All of the four showing results are publicly owned. Moreover, none of these 4 projects underwent a change in the ownership type, walking hand in hand with the respondents' unanimous position against alternative types of ownership. Lastly, the projects were self-sustainable by 75 % but with a rather short-term vision. The most commonly found adaptive reuses are:

> Public Library, Gardens, Museum Exhibition, Cultural Events, Theatre, Conferences, Community Hubs, Cultural and Creative Industries Hub, Co-working Spaces, Workshop Spaces.

Summing up, the application of the respondents' legally permissible criteria mainly led to economically and socially sustainable adaptive reuses.

2. Physically Possible Adaptive Reuse

In this test, we focused on the respondents' answers regarding the typology of the cultural heritage, the size of the property and the existence of land in order to gain an initial view of what they consider physically feasible. Interestingly enough, respondents' answers differed. Initially, we inserted the respondents' answers and searched for buildings under the residential type, medium/large in size and with the existence of land within its permits. Our application of the toolkit resulted in 8 matching projects of past adaptive reuse. Following, we took into account the accessibility, safety and lack of pure environment in the surrounding area of our case study, and searched for relevant data. The toolkit suggested only one case of adaptive reuse, as follows:

Project Name	Typology	Ownership I	Change in Type o	Square Met	Size	Property wi	Deadline of	Funding Sou	Budget	Multifnction	Construction	Residents' a
Vetriniski dvor. Maribor. Slo	Residential	Public	No	1816	Medium	Yes	5	Mixed	Large	Yes	No	No residents

Participator	Self-Sustain	Relation to :	Regulations	Partnership	Short-term I	Innovative /	Decrease of	Region with	Pure Envrirc	Impact on C	Type of area	Easily Acces	Safe
No	No	National	No	Yes	No	Yes	No	Yes	No	Yes	Intermediat Ci	Yes	Yes

| Human Res	Dynamic Envirc	Uses/Functions	Sustainability Impact
No	Yes	Café, Research, Cultural Events, Thea	Cultural and Social

Table 4: Toolkit Results of the *"Physical Possible"* Test

The only matching result to our case study is the Vetrinjski dvor residency in Maribor, Slovenia, located in an intermediate city and with the following current uses:

Café, Research, Cultural Events, Theatre, Cultural and Creative Industries Hub, Co-working Spaces, Workshop Spaces, Artist Residencies

Furthermore, as suggested in Table 4, the decision-makers of our case study should pursue a cultural and social sustainability impact, since the matching project is neither self-sustainable nor does it adopt a considerable environmentally-friendly behavior (e.g. circular economy, materials reuse etc.) As a result, should we focus only on the physical possibilities, the toolkit suggests that the adaptive reuse focuses on cultural and social activities.

3. Financially Feasible Adaptive Reuse

In this test, we looked into the expectations of the respondents regarding the financial attributes of the adaptive reuse. The unanimous decision-makers' answer was the self-sustainability of the project, the launching of partnerships and the high dynamics of the area. The toolkit application resulted in 7 matching past projects of adaptive reuse projects:

Project Name	Typology	Ownership	Change in Type o	Square Met	Size	Property wi	Deadline of	Funding Sou	Budget	Multifnctior	Constructior	Residents' a
Pfefferwerk, Germany	Industrial	Public	Yes	22000	Large	Yes	>10	Mixed	Large	Yes	No	Yes
Gasometer City, Austria	Industrial	Private	Yes	36900	Large	No	3	Mixed	Large	Yes	No	No residents
Lanthieri Manor, Slovenia	Residential	Public	No	2500	Medium	Yes	6	Mixed	Large	Yes	No	Yes
De Lakfabriek, Netherlands	Industrial	Mixed	Yes	1200	Medium	Yes	>4	Mixed	Large	Yes	Yes	Yes
Scuola Holden, Italy	Industrial	Public	No	4300	Medium	Yes	4	Private	Large	Yes	No	No residents
Van Nelle Fabriek, Netherla	Industrial	Mixed	Yes	68000	Large	Yes	5	Mixed	Large	Yes	No	No residents
Casino Palace, Poland	Leisure	Public	No	800	Small	Yes	5	Public	Small	Yes	No	Yes

Participator	Self-Sustain	Relation to	Regulations	Partnership	Short-term	Innovative /	Decrease of	Region with	Pure Envrirc	Impact on C	Type of area	Easily Acces	Safe
Yes	Yes	Local	No	Yes	No	Yes	Yes	No	No	Yes	Metropolis	Yes	Yes
No	Yes	National	Yes	Yes	No	Yes	Yes	No	No	Yes	Metropolis	Yes	Yes
Yes	Yes	National	No	Yes	No	Yes	No	No	Yes	Yes	Small Town	Yes	Yes
No	Yes	Local	Yes	Yes	No	Yes	No	No	No	Yes	Intermediate (	Yes	Yes
Yes	Yes	National	No	Yes	Yes	Yes	Yes	No	No	Yes	Intermediate (	Yes	No
No	Yes	Unesco	No	Yes	No	Yes	Yes	No	No	Yes	Intermediate (	Yes	Yes
Yes	Yes	National	No	Yes	No	Yes	No	No	Yes	Yes	Village	No	Yes

Human Resc	Dynamic Envirc	Uses/Functions	Sustainability Impact
Yes	Yes	Co-housing, Bnb-Hostel, Commercial	Economic, Social and Cultu
No	Yes	Residential, Co-housing, Commercia	Economic and Social
No	Yes	Commercial Units, Public Library, Gar	Economic and Social
No	Yes	Residential, Hotel Accommodation, I	Economic and Cultural
Yes	Yes	Public Library, Gardens, Education, R	Economic and Social
No	Yes	Commercial Units, Restaurant, Welln	Social
Yes	Yes	Restaurant, Gardens, Education, Mus	Social

Table 5: Toolkit Results of the *"Financially Feasible"* Test

As the showing results suggest, only 1 of the 7 matching adaptive reuses is identified as a residency. Interestingly enough all of the projects required a rather large budget (3-10 M€), despite being part of the *"Financially Feasible"* Test. This founding justifies our previous assumption that budget range should not be the dominant criterion during the decision-making process. Instead, as shown in Table 5, large investments can be achieved through mixed funding sources (71, 4% of the matching results), partnerships (100% of the matching results), innovativeness and multifunctionality (both found by 100 % in the matching results). Moreover, it is worth noticing that human resources are found by 42,8% in the matching results, suggesting that the implementation and functioning of the adaptive reuses depends considerably on human contribution (i.e. volunteering, training, crowdfunding, material supplies, technical assistance etc). The most common types of adaptive reuse are:

> Restaurant, Café, Gardens, Education, Museum Exhibition, Cultural Events, Theatre, Commercial Units, Cultural and Creative Industries Hub, Conferences, Workshop Spaces, Research and Incubator.

Summing up, economically sustainable adaptive reuses demand for collaborations, such as co-operatives between cultural organizations, donations, sponsorships, non-for profit organizations and so on. What is more, decision makers need to work with the local supply chains (craftmanship, workforce, etc.) pursuing a reciprocal community contribution. Last but not least, they need to innovate going beyond the cultural sphere and, instead allow for research and incubator related adaptive reuses.

4. **Maximally Productive Adaptive Reuse**

During the last testing of the toolkit, we took a look into the respondents' anticipations regarding the impact on the community, the presence of cultural heritage in the surrounding area and the accessibility of the building. It is also important to notice that we inserted the *"residential"* building type as a filter for the application results. This criterion was only adopted during the current test since we assumed that the maximum productivity of a building is directly linked to its typology. The consultation toolkit

suggested the following 4 projects of adaptive reuse:

Project Name	Typology	Ownership	Change in Type o	Square Mete	Size	Property wi	Deadline of	Funding Sou	Budget	Multifnctior	Constructioi	Residents' a
Villa Campolieto, Italy	Residential	Public	No	0	Medium	Yes	>6	Public	Large	Yes	No	No residents
Vetrinjski dvor, Maribor, Slo	Residential	Public	No	1816	Medium	Yes	5	Mixed	Large	Yes	No	No residents
Švicarija - Hotel Tivoli, Slove	Residential	Public	No	2232	Medium	Yes	>10	Public	Large	Yes	Yes	No residents
Former Royal Stables in Villa	Residential	Public	No	710	Small	Yes	4	Mixed	Large	Yes	Yes	No residents

Participator	Self-Sustain	Relation to :	Regulations	Partnership	Short-term l	Innovative /	Decrease of	Region with	Pure Envrirc	Impact on C	Type of area	Easily Acces	Safe
No	No	National	No	No	No	Yes	No	Yes	Yes	Yes	Intermediate (	Yes	Yes
No	No	National	No	Yes	No	Yes	No	Yes	No	Yes	Intermediat Ci	Yes	Yes
No	No	Local	No	No	No	Yes	No	Yes	Yes	Yes	Intermediate (	Yes	Yes
No	No	National	No	Yes	No	Yes	No	Yes	Yes	Yes	Intermediate (	Yes	Yes

Human Resc	Dynamic Envirc	Uses/Functions	Sustainability Impact
No	No	Gardens, Education, Research, Cultur	Cultural
No	Yes	Café, Research, Cultural Events, Thea	Cultural and Social
No	Yes	Commercial Units, Restaurant, Café,	Economic, Social, Cultural
No	No	Commercial Units, Restaurant, Café,	Economic

Table 6: Toolkit Results of the *"Maximally Productive"* Test

All of the matching results are publicly owned, multifunctional, not self-sustainable, and with a short-term vision. In addition, all of the 4 adaptive reuses required a large budget which stemmed by either public funding (50 %) or mixed funding (50%). The most frequent types of adaptive reuse are:

Restaurant, Café, Gardens, Education, Museum Exhibition, Cultural Events, Theatre, Conferences, Workshop Spaces, Co-Working Spaces.

Closing, the predominant sustainability suggestion for our case study is the economic and cultural pillar.

4.3 The suggested adaptive reuse of the Prokesch von Osten Mansion

In the previous section, we tested the cultural toolkit under the four different aspects of the *"Highest and Best Use"* theory. The application of the tool resulted in four sets of adaptive reuse suggestions which are illustrated in Tables 3, 4, 5 and 6. Should we cross-check the results of each Table, we find that the optimum and most sustainable adaptive reuses for our case study, the Prokesch von Osten Mansion, are:

> Café, Gardens, Museum Exhibition, Cultural Events, Theatre, Conferences, Cultural and Creative Industries Hub, Workshop Spaces, Co-Working Spaces.

Furthermore, going back to Table 1 and 2, it has to be noticed that the suggested adaptive reuses for the Prokesch von Osten Mansion have an impact on all of the four pillars of sustainability. Indeed, as already elaborated by Casson (2006) and Bertacchini & Saccone (2012), among others, cultural heritage has the power to provide the economic sphere with considerable profits. In other words, one should not only focus on the predominant cultural impact of built heritage. Instead, we should consider adaptive reuse as a multifunctional tool towards achieving economic, cultural, social and environmental sustainability.

Closing, the application of the toolkit addressed the potential adaptive reuse of the Prokesch von Osten Mansion. Based on this case study, three decision-makers were invited to provide answers keeping in mind the specific traits of this piece of built heritage. Yet, it should be pointed out that the toolkit is applicable to any other case study. Indeed, decision-makers are only expected to insert their answers keeping in mind a specific building. Then, the toolkit will perform a comprehensive and objective comparison between past projects of adaptive reuse.. In the end, the toolkit will provide the users with their matching results, leading them to efficient and effective conservation adaptive reuses.

5.

Conclusions

The motive behind this research was to answer the following research questions:

> *Is it possible that built heritage responds to the urgent economic and environmental pressures of today with links to sustainability? Could a cultural toolkit facilitate the decision-making process of adaptive reuse? How can decision-makers incorporate the overall societal impact of adaptive reuse?*

The step-by-step process of designing the cultural toolkit, led to various sub-questions. The latter have been a guideline in addressing the main research question. The present chapter discusses the main findings of the research, as well as the limitations and the pathways for future research.

5.1 The Main Findings

To begin with, the methodological context of the current thesis is qualitative. The enormous source of data on past projects of adaptive reuse led, initially, to a content analysis, followed by an empirical application of the acquired theory. Overall, a deductive approach was adopted, aiming at the enrichment of the existing knowledge.

In Chapter 2, we set the theoretical framework of the cultural toolkit. Through the examination of the theories of built heritage, sustainability and circular economy, adaptive reuse emerged as the cross-sectoral common point, which is able to bring about positive effects for society.

In Chapter 3, the toolkit was designed step-by-step. First, we engaged with the macro-level stage of the design process. In this stage, we set the foundations of the conceptual schema of the tool, by correlating each type of adaptive reuse with the appropriate sustainability

domain. To do so, we identified the various types of adaptive reuse, as recorded by the CLIC project, we went through the LBCS Land Based Classification Standards system and we distinguished the four pillars of sustainability impact. The results of this process are found in Table 1: *"Four pillars of adaptive reuse".*

Following, the conceptual schema of the toolkit was further enriched in the meso-level design process. During this stage, we designed a set of questions which hold a hybrid role. On the one hand, the questions constitute the common language between the user and the consultation tool,. For this reason, we had to achieve coherence between the decision-makers' answers and the toolkit results. To manage this goal, we considered the questions to be criteria and performed a multi-criteria evaluation of the available data.

 On the other hand, the questions constitute the software interface where the user (decision-maker) will exchange information with the consultation tool. As a result, the questions form the external schema of the toolkit, as in what the user will view upon interacting with the toolkit. The set of questions can be found in Appendix B.

Chapter 4 entails the results of the multicriteria evaluation of past projects of adaptive reuse, as well a practical application of the toolkit. First, the evaluation led to Table 2: *"Evaluation Framework for Sustainable Adaptive Reuse".* This table is considered to be the evolution of Table 1 and manages to further connect sustainability with the key impacts of adaptive reuse.

Then, we ran an empirical application of the cultural toolkit. First, we selected a key sample of three experienced decision-makers of adaptive reuse: Irini Gratsia, Dr. Maria Daniil and Eleni Maistrou. Then, we assigned the Prokesch von Osten Mansion, Athens, Greece, as our case study. This building was suggested unanimously by the three decision-makers. Moreover, in order to find a common ground of analysis between the three respondents' answers, we adopted the *"Highest and Best use"* theory. Following the latter, we performed four implicit tests on: Legal Permissibility, Physical Possibility, Financial Feasibility and Maximal Productivity. The toolkit's results for each single test are found in Tables 3, 4, 5 and 6, accordingly.

In the end, the toolkit's optimum and sustainable adaptive reuses for the Prokesch von Osten Mansion, were:

Café, Gardens, Museum Exhibition, Cultural Events, Theatre, Conferences, Cultural and Creative Industries Hub, Workshop Spaces, Co-Working Spaces

5.2 Limitations

This research has various limitations, some of which some have been already hinted throughout the previous chapters. To begin with, one of the limitations is the limited initial data, as in the internal schema of the toolkit database. Only thirty-three projects of built heritage in *"Bad Condition"* were found, with the risk of underrepresentation of equally relevant adaptive reuses. This may have an impact on the functioning of the toolkit, since the inserted answers may not match the available data. Thus, more projects of adaptive reuse should be added to the existing database.

Furthermore, we should bear in mind that decision- makers' answers are subjective and their decision-making behavior has an impact on the application of the toolkit. The issue of decision making behavior goes hand in hand with the fact that the respondents' privacy level also has an impact on the given answers (Brousseau et al., 2006). Decision-makers take different actions in public, when they know they are being observed, than in private.

Lastly, the classification of the evaluation criteria under the four pillar of sustainability was rather complex, since there is significant overlap, which makes it difficult to distinguish them in an accurate way. This links to the overall dependence of cultural toolkit depends on our interpretation of the theory as well as functioning of the adaptive reuses. Assumptions and decisions were made along the process which are left open for discussion. All in all each case of built heritage is different and setting labels on each distinctive features, accompanied by the economic, social and cultural set up of each location, is rather complex.

5.3 Future Research

Most of the limitations in the previous section, can also be seen as opportunities for future research. The current research merely explored the design of a cultural toolkit for future adaptive reuse of built heritage. As a result, future research should focus on improving the toolkit, and outweigh the limitations of this thesis.

First, a number of further criteria need to be considered during the evaluation of the past projects of adaptive reuse. Some examples are: the life cycle assessment of the property, public perception, the technical ability of the building to adapt, the stakeholder opinion and so on. Moreover, future research should also look for quantitative data, so that the benefit of

adaptive reuse can be more realistically estimated. Also, following Collins and Baccarini (2004), *" product success consists of three criteria which are "satisfaction of owner's needs, satisfaction of the users, satisfaction third parties"* (Collins and Baccarini, 2004, p.3). Assuming "product" to be the adaptive reuse, researchers should gather feedback on the interventions and keep the toolkit update through constant evaluations. Lastly, an alternative potentiality of adaptive reuse should be considered, under which built heritage can become flexible. This flexibility stems from not assigning any particular function to the building, yet restore it for open causes. In this way, physical space can be offered for the multiple future needs of society.

In conclusion, the future of (built) environment is largely determined by the research carried out today and therefore we need to ensure it is well founded. While the different academic fields highlight a plethora of different aspects of built heritage and sustainability, eventually, we may find ourselves missing out the bigger picture for our future. Going back to Italo Calvino, the city of Zaira beholds and preserves the intrinsic relationship between built envrionment and the events of the past. Just like Zaira, sustainable cities should safeguard their cultural heritage and further expand on it. Cultural Economists, next to other disciplines, can contribute to the achievement of the former goal and the design of sustainable, synergistic and symbiotic world.

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APPENDIX A:

The correlation of Clic adaptive reuses, the Land Based Classification System and the four pillars of Sustainable. The latter contribute to the creation of Table 1: Four pillars of adaptive reuse.

Clic Functions	LBCS	SUBDOMAIN OF IMPACT	DOMAIN OF SUSTAINABILITY
Residential	Residence or Accommodation Functions	Housing Stock Management	Economic and Environmental
Housing	Residence or Accommodation Functions	Housing Stock Management & Continuity of Social Life	Economic, Environmental and Social
Hotel Accommodation	Residence or Accommodation Functions	Housing Stock Management & Regional Attractiveness	Economic, Environmental and Cultural
B&B Accommodation	Residence or Accommodation Functions	Housing Stock Management & Regional Attractiveness	Economic, Environmental and Cultural
Commercial Units	General Sales or Services	Labour Market	Economic and Social
Wellness Centers	Arts, Entertainment and recreation	Cultural Landscape	Cultural and Environmental
Restaurant	General Sales or Services	Labour Market and Regional Attractiveness	Economic, Cultural and Environmental
Café	General Sales or Services	Labour Market and Regional Attractiveness	Economic, Cultural and Environmental
Public Library	Transportation, Communication, Information and utilities	Education, Skills and Knowledge	Social, Cultural and Economic
Gardens	Agriculture, forestry, fishing and hunting	Preserving Embodied Energy	Environmental
Education	Education, Public Administration, Health Care and other institutions	Education, Skills and Knowledge	Social, Cultural and Economic
Museum Exhibition	Arts, Entertainment and recreation	Cultural Landscape and Education, Skills and Knowledge	Social, Cultural, Economic and Environmental
Research	General Services and Sales	Creativity and Innovation, Skills and Knowledge	Cultural , Economic, Social
Cultural Events	Arts, Entertainment and recreation	Cultural Landscape and Place branding	Cultural, Environmental, Economic and Social

Theatre	Arts, Entertainment and recreation	Cultural Landscape and Creation of identity	Social, Cultural and Environmental
Conferences	General Services and Sales	Regional Competitiveness and Community Participation	Social, Economic and Environmental
Social Uses	Education, Public Administration, Health Care and other institutions	Continuity of Social Life	Social
Community Hubs	Education, Public Administration, Health Care and other institutions	Community Participation	Social
Incubator	General Sales or Services	Housing Stock Management	Economic and Environmental
Cultural and Creative Industries Hub	Arts, Entertainment and recreation	Cultural Landscape	Cultural and Environmental
Innovative startups hub	General Services and Sales	Labour Market	Social and Economic
Circular Economy Enterprises Hub	General Services and Sales	Labour Market	Social and Economic
Coworking Spaces	General Services and Sales	Labour Market	Social and Economic
Workshop Spaces	Education, Public Administration, Health Care and other institutions	Education, Skills and Knowledge	Economic, Social and Cultural
Living Lab	General Services and Sales	Creativity and Innovation, Skills and Knowledge	Cultural , Economic, Social
Fab Lab	General Services and Sales	Education, Skills and Knowledge	Economic, Social and Cultural
Creative Hub	Arts, Entertainment and recreation	Cultural Landscape	Cultural and Environmental
Artist Residencies	Arts, Entertainment and recreation	Image and Symbols creation	Cultural
Materials Bank	General Sales or Services	Lifecycle Prolongation	Environmental
Repair Café	General Services and Sales	Housing Stock Management	Economic and Environmental
Bike Sharing Place	Education, Public Administration, Health Care and other institutions	Community Participation	Social
Sports Facilities	Arts, Entertainment and recreation	Regional Competitiveness	Social, Economic and Environmental
Other Uses	Unclassifiable functions	-	-

APPENDIX B:

The set of questions:

Group A | Definition of the project

1. Which typology of cultural heritage do you identify in the property?

    (Answers: Religious, Military, Civic, Industrial, Residential)

2. Is the property under a public or a private ownership?

    (Answers: Public, Private)

3. Is the property enlisted in UNESCO and/or the National Heritage of your country?

    (Answers: UNESCO, National Heritage, Both)

4. In which category would you place the size of your property?

    (Answers: Small, Medium, Large)

5. Does your property include land?

    (Answers: Yes, No)

6. What is the condition of the building?

    (Answers: Bad, Mediocre, Good)

7. Do you have time-constraints for the realization of the reconstruction works?

    (Answers: Yes, No)

8. If yes, when would your deadline be?

    (Answers:1 year, 3 years, 5 years)

9. What is your budget for the entire adaptive reuse project?

    (Answers:)

Group B | Description of the adaptive reuse

1. Would you allow a multifunctional adaptive reuse of your property?

    (Answers: Yes, No)

2. Would you allow the construction of extensions in the building?

    (Answers: Yes, No)

3. Would you allow a change in the type of ownership?

    (Answers: Yes, No)

4. If your property is currently inhabited, will you take into consideration the residents' aspect on the adaptive reuse?

    (Answers: Yes, No)

5. Would you allow a participatory type of governance?

    (Answers: Yes, No)

6. Is your ambition to be economically viable, i.e. make the project self-sustainable?

    (Answers: Yes, No)

7. Will the adaptive reuse be related to any European, national, regional or local strategic documents?

   (Answers: Yes, No)

8. Are current regulations and cultural heritage's policies in your country considered to be an asset for the execution and viability of the adaptive reuse?

   (Answers: Yes, No)

9. In the case of privately-owned cultural heritage, do you consider your values, mission and vision for the adaptive reuse, to be commonly shared?

   (Answers: Yes, No)

10. Would you execute the adaptive reuse through partnership?

    (Answers: Yes, No)

11. The adaptive reuse is part of a short-term or a long-term plan?

    (Answers: Short-term, Long-term)

12. Comparing to the prior function of the property/building, do you pursue an innovative adaptive reuse?

    (Answers: Yes, No)

13. Do you expect the maintenance costs of the property to decrease after the adaptive reuse?

    (Answers: Yes, No)

Group C | Vision for the adaptive reuse

1. Is your property located in a region with a strong presence of cultural heritage and/or an acclaimed built environment?

   (Answers: Yes, No)

2. Is your property located in an area of high environmental value?

   (Answers: Yes, No)

3. Do you expect the adaptive reuse to have a beneficial effect on the local, regional or national community?

   (Answers: Yes, No)

4. Do you consider your property to be located in a remote area?

   (Answers: Yes, No)

5. Is the location of your property easily accessible?

   (Answers: Yes, No)

6. Is the location of your property considered to be safe?

   (Answers: Yes, No)

7. Would you depend on human resources to substitute a potential lack of financial means?

   (Answers: Yes, No)

8. Do you consider the population of the area to be dynamic (e.g. students, artists, workers etc.)?

(Answers: Yes, No)