

Chapter 6

A Statistical Model Representation and Analysis of Cultural Heritage Adaptive Reuse Practices Based on Latent Variables for Circularity Assessment



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1 Introduction

Cultural heritage is a non-reproducible cultural resource, contributing to communities' identity and wellbeing, to be preserved for present and future generations ensuring cultural identity and diversity as human right.¹ However, cultural heritage buildings, sites and often entire historic urban areas or villages can be subject to abandonment and degradation, if not used and maintained over time. Between diverse approaches to preserve cultural heritage (e.g. restoration, recovery, maintenance), adaptive reuse is a process of re-use of buildings and sites that have lost their original function, identifying new functions/uses, compatible with heritage values. Adaptive reuse can be a valid solution to keep cultural heritage in a proper

¹ UNESCO Universal Declaration on Cultural Diversity.

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conservation state, preserving cultural values at risk of irreversible loss due to abandonment, and ensuring access and enjoyment of heritage assets (Misirlisoy and Günçe 2016). Re-use is also considered the key process through which implementing the circular economy, not only in manufacturing industry but also in the construction industry and urban/regional development, thus the adaptive reuse of cultural heritage can represent an effective approach to realise circular cities and regions, bringing abandoned and underused historic buildings and sites to new life. However, from the point of view of conservation, adaptive reuse implies possible changes to adapt heritage to new uses, ranging from structural modifications, to technological improvements or lighter, reversible interventions. The degree of change of cultural heritage needed for implementing new uses can vary, and should be carefully assessed in a multidimensional perspective, to avoid the risk of threatening or reducing cultural value through the reuse process. Thus, appropriate evaluation methods and tools should be identified to support the decision-making process, particularly when multiple stakeholders are involved and different solutions can be proposed.

To effectively implement the circular economy and circular city/region model, the adaptive reuse of cultural heritage should align with circularity principles and criteria, which have been described in literature (Fusco Girard 2021; Luigi Fusco Girard *this volume*, Chap. 2; Gravagnuolo et al. 2017, 2018). The circular economy model foresees, for example, the reduction of energy use and greenhouse gas emissions, reduction of raw materials extraction, wastes minimisation, green areas regeneration and use of nature-based solutions, contribution to biodiversity regeneration, cultural and social values enhancement, place attractiveness enhancement, as well as economic and financial sustainability—to ensure maintenance and continuous use and improvement over time -, generation of new jobs, and also increase of social cohesion, higher care of cultural heritage by local communities. The multiple and diversified objectives of a circular adaptive reuse of cultural heritage require multi-criteria evaluation tools, allowing to handle priorities and values in a multidimensional framework, in particular in contexts where multiple stakeholders and groups are involved in decision making or subject to impacts of reuse actions (e.g. residents in a reused historic urban area, end-users).

The assessment on circularity of adaptive reuse alternatives for different cultural heritage typologies and contexts can be supported by the knowledge of good practices that can represent valid examples to transfer and replicate. Moreover, good practices demonstrating positive impacts in the medium and long term can support the identification of specific criteria and indicators of circularity, based on the results obtained through the adaptive reuse. In the first stage of the Horizon 2020 CLIC research, the question on the specific characteristics of the “ideal” circular adaptive reuse of cultural heritage was addressed under several perspectives and disciplines: heritage conservation, architecture, environmental studies, economics, urban studies, social science. Thus, several potential impacts of circular adaptive reuse were identified, also based on previous studies such as “Cultural Heritage counts for Europe” (2015), which identified diverse dimensions of heritage conservation impacts for cities and communities. The CLIC research aimed to go beyond the state-of-the-art, identifying guiding principles and criteria for a circular adaptive reuse of cultural heritage, to generate positive results in the cultural, environmental,

social and economic dimensions of sustainability. However, circular adaptive reuse of cultural heritage was considered an emerging research topic, which required to build knowledge through extensive literature review and case studies assessment, to identify the “best” practices that could guide future interventions.

The aim of this chapter is to propose an innovative methodology to assess the circularity of cultural heritage adaptive reuse best practice, and testing, at the same time, the validity of the theoretical framework discussed in the previous chapters. The evaluation of several practices on the base of suitable indicators collected through a European survey allowed to validate specific circularity criteria and definitions that can support decision-makers.

According to the CLIC framework (Luigi Fusco Girard [this volume](#), Chap. 2), the specific research questions on the circular adaptive reuse of cultural heritage were focused on whether and how, in which cases, and at which conditions, the adaptive reuse of cultural heritage can be able to generate self-sustainability of diverse resources, as well as external positive economic, social, environmental and cultural impacts, exploring which elements can inform its synergistic relationship with the context.

This stage of the research operationalizes the CLIC theoretical framework through the analysis of a suitable set of practices, and different typologies of circularity through a suitable model approach based on the above mentioned concept treated as latent variables.

2 Methodology

Based on the review of previous studies on cultural heritage adaptive reuse and circular economy, main principles and criteria for circular adaptive reuse of cultural heritage were identified—see Fusco Girard (2021) and Gravagnuolo et al. (2017). The CLIC methodological approach is based on the analysis of empirical evidence to explore whether and how the experiences of cultural heritage adaptive reuse have been able to turn abandoned heritage/landscape assets into a resource for new jobs, wellbeing, health, social cohesion, regional competitiveness and environmental regeneration—as advocated by all international policy documents and scientific literature.²

The methodology adopted for the identification of best practices of circular cultural heritage adaptive reuse was thus based on three main phases:

²Among the many reference documents, it is worth to recall here: European Landscape Convention (2000), FARO Convention, Council of Europe (2005), UNESCO Recommendation on the Historic Urban Landscape (2011), ICOMOS Burra Charter (2013), European Commission, Towards an integrated approach to cultural heritage for Europe (2014), European Commission, Getting cultural heritage to work for Europe (2015), Cultural Heritage Counts for Europe (2015), UN Agenda 2030 for Sustainable Development and Sustainable Development Goals (2015), UN New Urban Agenda (2016), European Parliament, Decision on a European Year of Cultural Heritage (2017), and European Framework for Action for Cultural Heritage (2018).

1. Structuring of a survey to collect data on cultural heritage adaptive reuse practices (Gravagnuolo et al. [this volume](#));
2. Data collection targeting 126 examples/practices of cultural heritage adaptive reuse;
3. Data analysis through statistical methods to test the validity of the theoretical framework and assess the level of circularity of each practice.

The CLIC Survey was designed to test—through empirical evidence—the validity of the theoretical framework of circular adaptive reuse of cultural heritage, re-interpreting the success (or insuccess) of adaptive reuse practices under the point of view of their “autopoietic capacity”, “generative capacity” and “symbiotic capacity”.

The aim of the CLIC Survey was thus to assess the level of circularity of cultural heritage adaptive reuse practices through its determinants and components, providing useful insights to support decision making. This chapter analyses the results of the CLIC survey using the statistical method of the Structural Equation Model (SEM) to test the validity of the theoretical framework based on empirical evidence (see methodological notes on SEM method below). The SEM statistical method (Carroll 1968; Wold 1983; Chin 1998; Amato et al. 2004; Tenenhaus et al. 2005; Vinzi et al. 2010; Lauro et al. 2016; Cataldo et al. 2016; Addinsoft 2019) was chosen as it allows to explore the relationships between complex, non explicit (latent) concepts through the related explicit (manifest) variables, enabling an exploratory analysis to statistically test the validity of a theoretical model.

Methodological Notes on Structural Equation Model (SEM)

The statistical method of PLS-PM to build the Structural Equation Model.

The component based structural equation modeling has been used in particular with Partial Least Squares Path Modeling (PLS-PM) method, employing XLSTAT software (Addinson, 2019). This is an innovative method for representing complex relationships between observed variables and Latent Variables.

Partial Least Squares Path Modeling (PLS-PM) is a statistical approach for modeling complex multivariable relationships (structural equation models) among Manifest (observed) and Latent Variables. Since a few years, this approach has been enjoying increasing popularity in several sciences (Esposito Vinzi et al. 2007). Structural Equation Models include a number of statistical methodologies allowing the estimation of a causal theoretical network of relationships linking latent complex concepts, each measured by means of a number of observable indicators.

From the standpoint of structural equation modeling, PLS-PM is a component-based approach where the concept of causality is formulated in terms of linear conditional expectation. PLS-PM seeks for optimal linear predictive relationships rather than for causal mechanisms thus privileging a prediction-relevance oriented discovery process to the statistical testing of causal hypotheses. Two very important review papers on PLS approach to Structural Equation Modeling are Chin (1998, more application oriented) and Tenenhaus et al. (2005, more theory oriented).

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Furthermore, PLS Path Modeling can be used for analyzing multiple tables and it is directly related to more classical data analysis methods used in this field. In fact, PLS-PM may be also viewed as a very flexible approach to multi-block (or multiple table) analysis by means of both the hierarchical PLS path model and the confirmatory PLS path model (Tenenhaus and Hanafi 2007). This approach clearly shows how the “data-driven” tradition of multiple table analysis can be somehow merged in the “theory-driven” tradition of structural equation modeling so as to allow running the analysis of multi-block data in light of current knowledge on conceptual relationships between tables.

The PLS Path Modeling algorithm. A PLS Path model is described by two models: (1) a measurement model relating the Manifest Variables to their own Latent Variable and (2) a structural model relating some endogenous Latent Variables to other Latent Variables. The measurement model is also called the outer model and the structural model the inner model.

The measurement model. A Latent Variable (LV) is an unobservable variable (or construct) indirectly based on its relationship to a block of observable variables which are called Manifest Variables (MV) or indicators. According to the nature of such relations of Manifest Variables to their Latent Variables, they are respectively called reflective or formative. In the first case, the MVs values reflect the characteristics of the latent concepts that can be identified using the MVs through simple regressions. In the second case, the LV is caused (formed) by its MVs, identifying the corresponding LVs through multiple regressions.

The reflective way has been adopted in our model, which implies that the variables are highly correlated between themselves, to express the latent concept univocally and in a robust way (unidimensionality condition). This condition is evaluated according different criteria such as Dillon Goldstein Rho index ($>0,7$), or highest PCA eigenvalue (>1).

PLS Path Modeling is a mixture of a priori knowledge and data analysis. In the reflective way, the a priori knowledge concerns the unidimensionality of the block and the signs of the loadings. The data have to fit this model. If they do not, they can be modified by removing some Manifest Variables that are far from the model. Another solution is to change the model and use the formative way.

The operation of the model. The PLS (Partial Least Squares) operates by means of an iterative algorithm consisting of three fundamental phases. The first phase consists of an estimate of the so-called external weights. These weights are associated with the Manifest Variables (indicators) and refer to the interrelations between each Manifest Variable and the corresponding Latent Variable (representing the latent multidimensional “concept”, not directly measurable, described by the group of Manifest Variables associated). For each block of variables, based on the type of relations, the weights are calculated as simple regression coefficients (reflexive indicators): each Manifest Variable is considered as a dependent variable of a model in which

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the role of explanatory variable is assumed by the corresponding Latent Variable. It is possible to make a regression with respect to a Latent Variable not directly observed since the latter is estimated, in the first step of the iterative algorithm, as a linear combination of its Manifest which coefficients are arbitrarily chosen.

In a second phase, the values derived in the first phase for the latent, exogenous or endogenous explanatory variables in the structural model, are summed algebraically on the basis of the sign of the correlation coefficient between adjacent variables, i.e. linked by a causal relationship. The results of this calculation introduce a new weight estimate for the Latent Variables. If the results of the estimates of the weights obtained in the two phases converge, the iterative estimation process ends and the coefficients of the structural model are then estimated through the classic least squares regression between the newly estimated Latent Variables. The PLS estimation process is able to handle a complex model without problems and requires a reduced number of observations since not all the model is estimated simultaneously.

The algorithm used during the estimation, aimed at explaining the values of latent and Manifest Variables, leads to satisfying model prediction properties, since it is aimed at maximizing the variability explained for Latent Variables and, possibly, for Manifest Variables. Furthermore, the PLS estimate is non-parametric as it does not assume a particular probability distribution for the Manifest Variables or a particular measurement scale for them. The coefficients for causal relations and the weights for the relations between latent and Manifest Variables have the important statistical property called “weak consistency”, in the sense that, as both the sample size and the number of items detected by means of the questionnaire increase, they better approximate the true values of the statistical population from which the sample of analyzed cases was extracted.

Model Validation. A path model can be validated at three levels: (1) the quality of the measurement model, (2) the quality of the structural model, and (3) each structural regression equation. The communality index measures the quality of the measurement model for each block. The redundancy index measures the quality of the structural model for each endogenous block. The average redundancy for all endogenous blocks can also be computed. A global criterion of goodness-of-fit (GoF) can be proposed (Amato et al. 2004).

The survey collected data on the name, type and localisation of the adaptive reuse practice, as well as information on the heritage construction period, state of conservation, adaptive reuse period, cultural significance, typology or original function(s), and square meters of adaptive reuse intervention. Also, information about ownership, management and investment was collected. The new uses/functions activated through the adaptive reuse was explored, including a set of possible new uses, from residential to commercial, cultural, educational and various social uses. Thus, data

on the specific characteristics of the heritage building/site, the process of adaptive reuse, and the new uses introduced was collected. Finally, a specific section on the “assessment on circularity” included a set of questions to assess the circularity performance of the adaptive reuse practice.

According to the CLIC theoretical framework of circular adaptive reuse of cultural heritage, specific *circularity criteria* were identified, that reflect the theoretical model. First of all, two main Latent Variables were considered, as determinants of the diverse expressions of circularity:

- *Cultural value enhancement*: the capacity to preserve, conserve and regenerate cultural values;
- *Management characteristics towards self-sustainability*: the capacity to become financially self-sustainable;

In turn, these two variables determine the four fundamental building blocks of circularity (outcomes):

- *Closed metabolism realization*: the capacity to realise circular metabolism flows of energy, water, materials, becoming environmentally self-sufficient;
- *Landscape quality enhancement*: the contribution of the adaptive reuse intervention to generate positive impacts in the local context such as visual quality, safety, green areas and public spaces;
- *Social impact*: the social and cultural impact of the adaptive reuse intervention, including raising the level of residents’ and visitors’ awareness for cultural heritage, increase cultural activities, place attachment, social cohesion, inclusion, wellbeing and health;
- *Economic spillover effects*: the generation of economic spillovers in the city/region through the adaptive reuse intervention.

Thus, to explain these complex elements/criteria of circularity (“Latent Variables”, LV), a set of related explicit variables (“Manifest Variables”, MV) were identified, as showed below (See Annex for detailed report of SEM model reliability factors).

List of Latent Variables and related Manifest Variables:

LV1—Enhancement of cultural value	MV4.2 –Quality of public spaces
MV1.1 –Conservation of heritage values	MV4.3 –Enhance safety in the area
MV1.2 –Awareness raise for circular economy	MV4.4 –Enhance landscape visual quality
LV2—Management characteristics and self-sustainability	LV5—Social impact
MV2.1 –Economic and financial self-sustainable	MV5.1 –Awareness raise for cultural heritage
MV2.2 –Generates revenue flows	MV5.2 –Enhance place attachment
MV2.3 –Third sector involved	MV5.3 –Enhance social cohesion
MV2.4 –Different stakeholders involved	MV5.4 –Enhance inclusion of marginalized groups
MV2.5 –Profits are reinvested	MV5.5 –Enhance heritage community

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MV2.6 –Total number of uses (classified in 5 groups)	MV5.6 –Enhance cultural activities
	MV5.7 –Enhance people’s wellbeing
	MV5.8 –Enhance people’s health
LV3—Closed metabolism realization	LV6—Economic spillover effects
MV3.1 –Low energy consumption systems	MV6.1 –Enhance jobs creation
MV3.2 –Renewable energy sources	MV6.2 –Attract innovative start-ups
MV3.3 –Water storage and reuse systems	MV6.3 –Attract creative industries
MV3.4 –Traditional / bio / reuse materials	MV6.4 –Attract new commercial activities
MV3.5 –Reduction of construction waste	MV6.5 –Attract cultural visitors
LV4 – Landscape quality enhancement	MV6.6 –Attract new residents
MV4.1 –Increase of green spaces	MV6.7 –Increase real estate values

The six “Latent Variables” (LV) represented specific criteria or “building blocks” of circularity for cultural heritage adaptive reuse projects. A seventh LV was identified, describing the “*Global Circularity Performance Index*” of each adaptive reuse practice, derived from the direct contribution of four LVs (Closed metabolism realization, Landscape quality enhancement, Social impact, Economic spillover effects), and the indirect contribution of two LVs (Cultural value enhancement, Management characteristics towards self-sustainability).³

The survey proposed a set of specific questions to assess the performance of the adaptive reuse intervention with respect to each aspect expressed by the MVs. The level of performance was assessed by asking to respondents “whether and to which extent” the adaptive reuse intervention contributed to each of the aspects identified through the specific MVs. To make the survey accessible to a wide and non-expert public, “simple” answer options were chosen, on a qualitative self-explaining Likert scale: No, Yes scarcely, Yes moderately, Yes highly. The option “I don’t know” was included (see Chap. 5 of this book for more details). The Manifest Variables were recoded, starting from the questions of the CLIC Survey questionnaire. The answers were recoded into numerical (ordinal) values considering the different answers given: NA—I don’t know;⁴ 1—No; 2—Yes scarce; 3—Yes moderately; 4—Yes highly.

Adaptive reuse practices were collected through an online survey tool (see Chap. 5) involving heritage experts and organisations throughout Europe, maintaining a geographical balance with respect to European macro-areas (Central-Northern,

³At the “Global Circularity Performance Index” are assigned 24 Manifest Variables (MVs), in a hierarchical SEM perspective, which correspond to the 4 LVs directly impacting on it: Closed metabolism realization, Landscape quality enhancement, Social impact, Economic spillover effects (outcomes). This allows to estimate the relevance of their impact on the Global Circularity Performance Index according to the usual practice of hierarchical SEM.

⁴*Missing Data Treatment.* Specific treatment for missing data (NA—I don’t know) was applied to estimate missing values as the “nearest neighbour”. This method allows to have the most reliable estimation based on the analysis of the answers given to similar practices included in the database which present valid data.

Eastern and Southern Europe), and with respect to heritage typologies (religious heritage, civil/residential buildings or sites, industrial heritage, military structures, mixed use including more than one typology, and others). The subjects involved in the data collection selected a set of 126 good practices that were assessed in the perspective of circularity. The sample of projects included in the database was not meant to be statistically representative of the population of all adaptive reuse interventions in Europe as it is not known, nevertheless they represent a large, geographically balanced and relevant examples of adaptive reuse practices that achieved general objectives of heritage conservation, new uses in previously abandoned or underused heritage sites, and that were still in operations after at least 3–5 years, thus it was possible to observe the impacts generated by a sufficient variety of diverse projects typologies (Figs. 6.1 and 6.2).

The following sections describe the results of the data collection and statistical analysis conducted to assess the circularity performance of cultural heritage adaptive reuse practices.

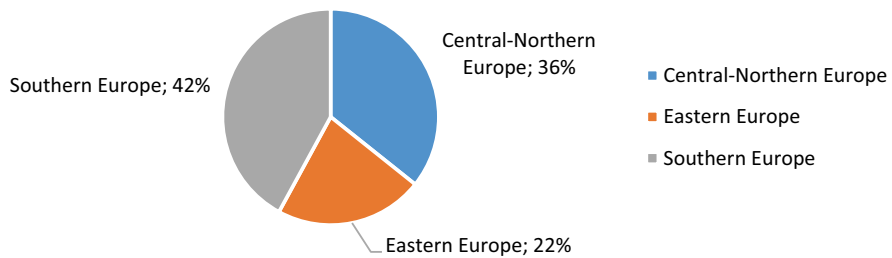


Fig. 6.1 Distribution of analysed projects for EU geographical areas

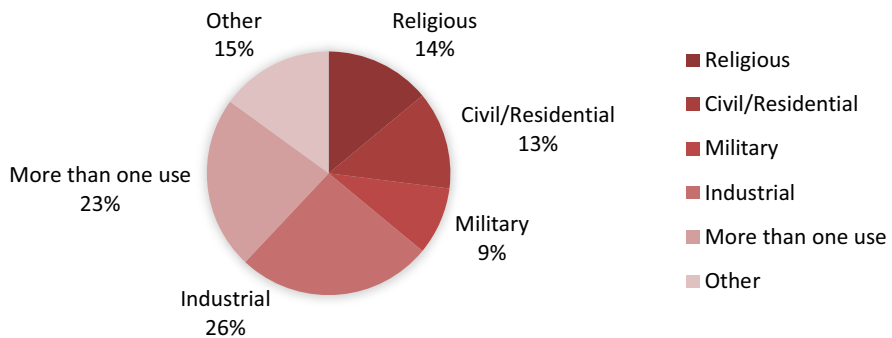


Fig. 6.2 Distribution of analysed projects for typologies

3 Identification of Good and Best Practices Through a Modelling-Based Approach

3.1 The Circularity SEM Model: Definition and Results

For the evaluation of adaptive reuse practices, the answers provided by respondents on the CLIC survey assessment on circularity section was analysed. The SEM model was designed for the statistical analysis, describing the relationships between the Latent Variables (key circularity criteria or “building blocks”).

The structural model expresses in statistical terms both the relationships between specific circularity “determinants” and circularity outcomes, and the relationships between outcomes and circularity results. Figure 6.3 shows how the SEM was built, and the relationships between the LV on which a Global Performance is based.

Figure 6.4 shows the results of the SEM, which identify the relationships between the Latent Variables.

The results of the estimation of the structural model parameters reported in Fig. 6.4 show the average score for each latent variable (m) impact (Reg) and contribution (cR2) of each explanatory LV on its own dependent LV, as well as their average scores (m). In the SEM for Circularity, all the impacts are significantly different from zero,⁵ confirming the good definition of the model in terms of cause-effect relations between its latent variables.

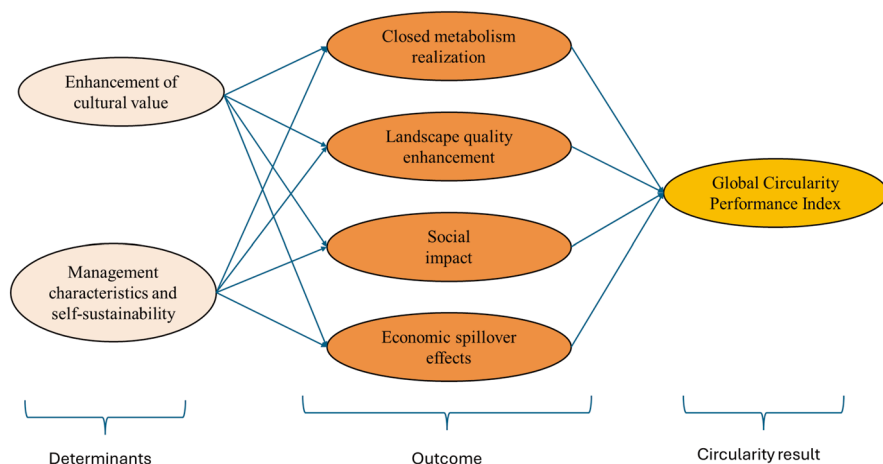


Fig. 6.3 Circularity Structural Equation Model used to assess the level of performance of circularity

⁵The model passed all verifications of reliability (showed by alfa values), complete details can be found at www.clicproject.eu. The significance of the relations between LVs in terms of impact, evaluated in terms of the probability of a t-test obtained according to a bootstrap approach, che ne nostro caso assume valori di $p < 0,01$, helps to affirm that the impact of a LV on another target LV is significantly different from zero.

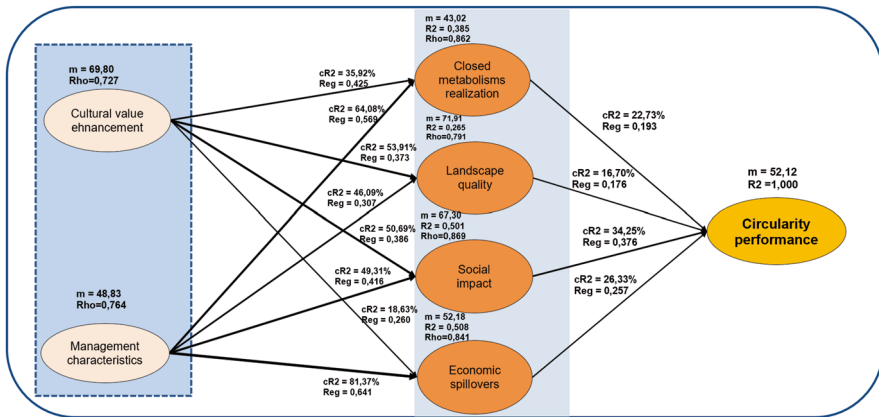


Fig. 6.4 Results of the Structural Equation Model on Circularity performance

The model allows an initial consideration of the average values of the latent variables, which are expressed on a 0–100 scale. The highest visitor evaluations concerned the landscape quality (71,91), social impact (67,30) and cultural value enhancement (69,80). Other latent variables reported average score values around 50, such as economic spillovers (52,18) and management characteristics (48,83). Around this level is also the assessment of the global circularity score.

Looking at the R² values varying between 0 and 1, it can be seen that the latent variables of management characteristics and cultural value enhancement explain well the variations in the social and economic components of circularity, presenting values around 0,50, while they explain less well the environmental and landscape aspects, as it was obvious to expect. The value R² = 1,00 for the 4 components of circularity with respect to the overall circularity score is not a judgement of the quality of the model, but simply an identity since we have assumed that the manifest variables of the latter are the same as its components.

In terms of contribution to the R² the model shows the following results:

- contributes more to the variability of the Landscape quality than the Management characteristics (53,9% against 46,1%);
- The Cultural value contributes slightly more than the Management characteristics on the Social Impact (50,7% against 49,3%);
- Management characteristics contribute more significantly more than the Cultural value to Economic spillovers (81,4% against 18,6%);
- The two Latent Variables that contribute most to the variability of Circularity Performance are the Social Impact (34,2%) and the Economic spillovers (26,3%).

In sintesi il management contribuisce maggiormente a determinare gli aspetti ambientali ed. economici mentre siaquale al valore culturale nel determinare gli aspetti sociali e paesaggistici della circolarità.

Analysing the direct impact (reg)s, the model showed the following results:

- The Cultural value has its greatest impact on the Closed metabolism (0,569) and then on the Social impact (0,386) and finally on the Landscape quality (0,373) while impacting less on the Economic spillovers (0,260);

- The Management characteristics have a greater impact on Economic spillovers (0,641), on an intermediate level on Closed metabolism (0,569) and lower on Social impact (0,416) and Landscape quality (0,307);
- The Latent Variables with the greatest direct impact on Circularity performance are the Social impact (0,376) and the Economic spillovers (0,257) while the impact of the Closed metabolism (0,193) and the Landscape quality (0,176) are lower.

The model thus shows that the aspects related to the business model and governance of the site (management characteristics) have a large impact on the global circularity score, suggesting the need of a particular attention to this aspect in the adaptive reuse of cultural heritage, taking into account that the enhancement of cultural value should be a primary objective in cultural heritage sites. It is also clear that economic and social components impact more on the global circularity performance, suggesting that a circular adaptive reuse of cultural heritage should particularly focus on the economic and social impacts.

The resulting scores for each LV were normalized in a 0–100 scale to provide a finer measurement and allow comparisons. A total score for each LV was calculated, representing different aspects influencing the circularity performance, as well as the Global Circularity Performance Index. Once the general model was estimated, the scores of the LVs could be computed in relation to the geographical areas of location of the case studies, and to the heritage typology. Analysing the scores on the basis of the geographical area to which they belong, we can immediately see how Circularity Performance is higher in interventions carried out in Central-Northern Europe (57,08) than in Southern Europe (50,75) and even more than in the East Europe (41,41) (Table 6.1).

For the Cultural value, both Central-Northern and Southern Europe express high scores (over 72) while Eastern Europe reaches the score of 60. It could be thus observed a possible higher attention of Central-Northern and Southern countries to cultural heritage values conservation.

The scores for Management Characteristics are also higher in Southern Europe and in Central-Northern Europe, although with a lower score (around 50 on a scale of 0–100), while the value for Eastern Europe is decidedly low (37,6). Management

Table 6.1 Latent Variables scores for EU geographical regions

EU Region	Cultural value	Management characteristics	Closed metabolisms	Landscape quality	Social impact	Economic spillovers	Circularity performance
Central-Northern Europe	72,86	49,62	53,48	74,09	67,55	59,88	57,08
Eastern Europe	60,16	37,63	30,36	70,46	61,15	41,03	41,41
Southern Europe	72,15	50,90	39,39	70,92	69,69	51,09	50,75
ALL	69,80	48,83	43,02	71,91	67,30	52,18	52,12

Characteristics are related to the capacity to generate diverse revenue flows, reaching economic and financial self-sustainability over time. Also, this variable is related to third sector involvement and stakeholders engagement, towards multi-level and participatory governance models. The low values reached by Eastern Europe countries in this variable could be related to more public-led investments in cultural heritage, with less reliance on private entrepreneurship, including third sector, for the adaptive reuse of cultural heritage. In fact, Eastern Europe showed generally a more “top-down” approach relying on public investments more than private or community-based interventions.

With regard to the Closed Metabolism, the Centre-Northern Europe reaches the score of 53,4 while the results of Southern Europe (39,4) and Eastern Europe (30,3) are quite distant. This variable is related to the adoption of low energy consumption systems and renewable energy sources, as well as water storage and reuse systems, use of traditional / bio / reuse materials and reduction of construction wastes. The results reflect the general higher attention in Central-Northern Europe towards the use of renewable energy sources, for energy retrofit also in cultural heritage buildings and sites. On the other hand, the low scores in Southern Europe could reflect a difficulty in using new technology for renewable energy generation in heritage sites, showing the necessity of establishing a dialogue with heritage authorities and professionals to enhance capacity and awareness with regard to environmental issues in the heritage field. Moreover, Eastern Europe countries could lack capacity and resources for the identification and implementation of new compatible technologies for energy retrofit of historic buildings and sites.

Landscape quality scores were more balanced, all above 70 with a maximum in Central-Northern Europe (74,1) and at similar levels in the East (70,5) and Southern Europe (70,9), showing a general attention towards specific aspects such as increase of green spaces, enhancement of the quality of public spaces and safety, as well as landscape visual quality.

The Social impact shows fairly high scores with a peak in Southern Europe (69,7) and followed by Centre-Northern Europe (67,5) and Eastern Europe (61,1), related to how the adaptive reuse of cultural heritage contributed to raise awareness for cultural heritage, enhance place attachment and social cohesion, enhance inclusion of marginalized groups, stimulate cohesive heritage communities taking care of cultural heritage, and thus increase cultural activities in the target areas. Moreover, this variable shows the contribution of the adaptive reuse of cultural heritage to the enhancement of people’s wellbeing and health.

Finally, the Economic spillovers scores reach a maximum in Central-Northern Europe (59,9) while less brilliant scores are reached in Southern Europe (51,1) and in the Eastern Europe (41). This result could be related to a higher capacity in Central-Northern Europe to generate new jobs in the heritage sector through the adaptive reuse, establish new uses able to make the heritage site attractive for innovative start-ups, creative industries and commercial activities, while attracting also new residents in the heritage site area and visitors for tourism and educational purposes. Also, the economic spillovers related to the enhancement of real estate values are here considered (Table 6.2).

Table 6.2 Latent Variables scores for heritage typologies

Heritage typology	Cultural value	Management characteristics	Closed metabolisms	Landscape quality	Social impact	Economic spillovers	Circularity performance
Religious	71,94	38,45	34,59	59,37	61,68	38,11	38,83
Civil/residential	67,40	37,30	32,89	72,79	73,80	53,68	51,53
Military	79,19	46,56	51,55	81,03	73,51	58,33	59,79
Industrial	72,42	53,01	46,82	74,01	67,48	59,77	55,38
More than one use	65,94	55,53	44,33	71,22	63,16	49,90	49,41
Other	64,56	43,00	41,36	75,11	67,36	49,20	50,86
ALL	69,80	48,83	43,02	71,91	67,30	52,18	52,12

Observing the results based on the typology of case studied, the main evidences are the following:

- For the global circularity performance the highest scores are realized for the Military heritage typology (59,8) and the Industrial (55,4) while the lowest ones concern Religious structures (38,8), which could be related to higher difficulties in religious heritage settings to activate a diversity of new uses and implement effective energy retrofit technologies, also observing the lowest scores in this category for the variables related to management characteristics, closed metabolisms and economic spillovers.
- The Cultural value is higher in the case-studies of Military typology (79,2), Industrial and Religious one (approximately 72), expressing a higher attention in the conservation of heritage values for these categories, probably linked to larger buildings and sites that highly impact the urban landscape, compared with civil and residential buildings categories and other mixed typologies.
- The highest scores about the Management characteristics are found in heritage typologies such as the Industrial (53,01) and in the mixed (More than one use) typologies (55,5) while they are lower for Civil / Residential (37,3), showing that these categories could be more adaptable to a diversity of new uses, allowing diverse revenue flows with less barriers also for participatory governance models and involvement of the third sector.
- The Closed Metabolism receives higher scores in typologies like the Military (51,55) and Industrial ones (46,8) and lower for the typology Civil / Residential (32,9) and Religious (34,6), here also it could be related to the higher flexibility of those heritage typologies to implement effective energy retrofit strategies.
- The Landscape quality is higher in the Military typologies (81) while it is lower in the Religious ones (59,4), expressing the relevant impact that forts and other large historic military buildings have for the urban and coastal landscapes. Also, it could be observed that the adaptive reuse of large military heritage could be more easily linked to increase of green areas and public spaces quality, while the reuse of small religious buildings could have less impact on the change of surroundings and related public spaces.
- The Social impact is greater for the Civil / Residential (73,8) and Military (73,5) and lower for the Religious typologies (61,7), however the scores obtained by all categories are relatively high, showing the importance of adaptive reuse of cultural heritage for generating positive social impacts, including the establishment of heritage communities to care for heritage, and the enhancement of wellbeing.
- Finally, the Economic spillovers variable score is higher for the typologies like the Industrial (59,8) and the Military ones (58,3) while it has lower scores for the Religious typologies (38,1), showing the existence of higher barriers in religious heritage sites to generate economic impacts in the urban/rural areas, as it is clearly more difficult for religious heritage owners, managers and communities to accept in a religious (or ex-religious) place a wide range of diverse profitable uses related to commercial activities, startups and companies.

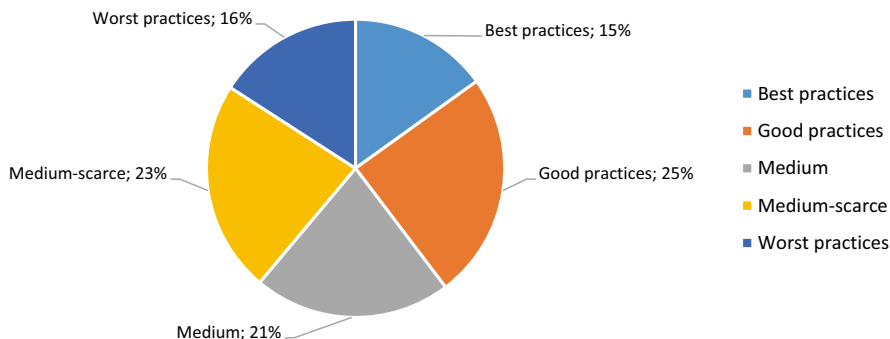


Fig. 6.5 Distribution of practices in each class of circularity

Finally, based on the scores reached in the Global Circularity Performance Index, a classification into five classes with equal intervals was defined to identify groups of projects as follows:

- Scores 80–100—“Best practices”
- Scores 60–80—“Good practices”
- Scores 40–60—“Medium performance”
- Scores 20–40—“Medium-scarce performance”
- Scores 0–20—“Scarce performances”

The percentage of practices included in each category is showed in the Fig. 6.5.

It should be noted that 40% of the analysed sites fall into the good and best practice classes with a score of over 60. The cases belonging to the first class are all interesting for a total circularity score of at least 80 in a 0–100 scale (Table 6.3). Analysing the best practices in terms of Circularity Performance, it is possible to underline the “Top-5” projects with the highest global scores: they are represented by C-Mine, Grand Hornu, De Hoorn, Tour à Plomb, Pianofabriek.

3.2 Characterization of Circularity Classes: Best Practices Common Features

This section analyses the characteristics of best practices emerging from an additional data mining analysis. The characteristics of each circularity class were identified through the technique of “variables characterization”, considering the Classes of circularity as the variables to be characterized, and the general characteristics of the site and the project (based on the survey answers) as the characterizing variables. Below the characteristics of best practices are described.

The procedure called characterization of a categorical variable was used to describe the main characteristics of the best and worst classes. The statistical software used

Table 6.3 “Best” and “Good” practices of cultural heritage adaptive reuse for global circularity performance

	Best practices site name	Circularity performance score
1	C-Mine	100,000
2	Grand Hornu	94,511
3	De Hoorn	94,145
4	Tour à Plomb	92,851
5	Pianofabriek	90,752
6	Alden Biesen	90,086
7	Mercato Centrale San Lorenzo	89,129
8	Fort Monostor	88,953
9	Van Nelle Fabriek	88,378
10	Botanical Garden of National Palace of Queluz	86,839
11	Zitadelle Spandau	86,773
12	Hotel Katajanokka	86,628
13	Mercado Da Ribeira	86,616
14	Fort Vechten	86,300
15	Le Brass Centre Culturel de Forest	85,463
16	Kinsterna Hotel	85,162
17	Albergo Diffuso Zoncolan	83,696
18	Meelfabriek Leiden	83,332
19	Catacombe di Napoli	82,258
20	Hal 5	80,615
	Good practices site name	Circularity performance score
21	Zeche Zollverein	79,896
22	Villa Campolieto	79,419
23	H-Farm	78,684
24	Gasometer City	78,485
25	ReDock La Junquera	78,067
26	Omeriye Ottoman Baths	77,999
27	De Lakfabriek	77,052
28	Geofort	76,735
29	Fort K' IJK—Fort bij Krommeniedijk	75,583
30	Molino Stucky	75,565
31	Škratelj Homestead—Slovene Cinemateque museum	75,038
32	Caballero Fabriek	74,766
33	Convent Carmen	74,696
34	Urbact 2nd Chance	72,351
35	Pakhuis de Zwijger	72,344
36	Hotel Cais De Santarem	72,180
37	Lesczynski Manor: Elderly Healthcare & Residencies	71,666
38	2nd Chance—Waking up the sleeping giants	71,211

(continued)

Table 6.3 (continued)

	Good practices site name	Circularity performance score
39	Atlas building, Eindhoven University of Technology	70,055
40	Fort Resort Beemster	69,587
41	Riot studio	69,489
42	Ssmoll / San Sebastiano Monte dei Morti Living Lab	68,445
43	Battersea Arts Centre—performing arts centre	67,806
44	Spirito Santo Palazzo Storico	67,755
45	Lanthieri Manor	65,141
46	Train World Museum	64,030
47	L'Asilo	63,986
48	Bauska Fortress	62,981
49	Pfefferwerk	60,358

is SPAD, a well-known statistical software of the French school (e.g. Lebart, Morineau), which uses this procedure to describe for example sub-populations of a sample (Lebart et al. 2016). Through the comparison between a subpopulation (for example the case-studies that have achieved a score between 80 and 100 as Circularity performance level) and the total sample (which is composed of the case-studies that have achieved any score between 0 and 100 as Circularity performance) this procedure through the Test-value procedure makes it possible to respond to questions of the type: are the case-studies located in Southern Europe over-represented or under-represented in the class of cases with a Circularity performance score between 80 and 100 compared to the total sample? Is public ownership over-represented or under-represented compared to the total sample?

Methodological Notes on Characterization of Variables (DEMODO)

Characterisation of variables. The analysis of the characteristics of a nominal variable (or DEMODO procedure) is a statistical procedure used to describe the characteristic variables and the modalities of the response of specific categories of people/businesses/statistical units in a sample (e.g. survey questions with two or more modes of response) widely used in data mining. By comparing a sub-population (e.g. those who choose to visit a location for cultural purposes and the total sample), this procedure through the Test Value allows answering statistical hypotheses such as: are males over-represented or under-represented in the sample of those who choose a location for cultural reasons? Is the age group over-represented or under represented compared to the total sample? The Test Value allows to identify the response patterns (consumer characteristics) most associated with specific responses to the survey. Values of 1.4–1.5 and higher are considered as particularly interesting, while lower values can be relevant in particular cases or small samples. The results are described through three main elements (columns): % of category in group (referred to the selected sub-sample); % of category in set (referred to the total sample); Test Value (response pattern as described above).

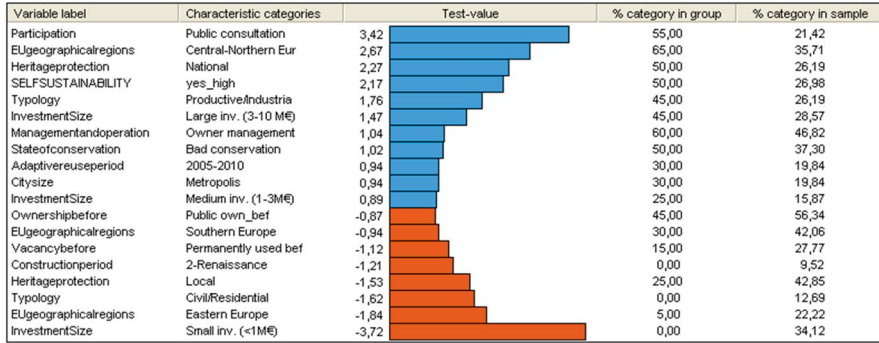


Fig. 6.6 Characterization of the circularity class of “best practices”

The group of “best practices” included 15% of the total number of projects (Fig. 6.6). It described the best practices in terms of circularity, shows the characteristics that differentiated the cases identified as best from the rest of the sample of the projects in the sample.

The cases identified as best practices were distinguished by a greater use of public consultation as a form of participation (55% in this group compared to 21,4% in the overall sample), for a greater presence in the Centre-Northern Europe area (65%) and minor in the South and Eastern Europe. These are cases that have a type of protection that was more often national (as much as 50%), with a greater frequency of self-sustainable projects (50% against 27% in the overall sample) and there is a higher presence of large investments or average (the first at 45% of the total, between 3 and 10 million euro). The prevalent projects’ typology in this class were the ones in the production, industrial or commercial field in 45% of cases. These are projects that are most frequently developed in Metropolis areas (30%), with a period of re-use between 2005 and 2010 (30% of the cases) and in a state of poor conservation (50%). It is also worth noting that the typology of small investments under 1 million euro is absolutely not present in this group, while it represents the 34% of the entire group of projects, showing a lower capacity of small investments to generate high returns in terms of financial sustainability and positive impacts in the target area. Also, in this group of “best” practices are not present the categories of civil and residential heritage, as well as renaissance buildings or sites—probably mostly civil/residential, showing that other categories of larger buildings and larger investments such as industrial heritage sites and investments above 1 million euro tend to generate more visible impacts.

Observing the results, some considerations emerge from the analysis of “best practices”. First, the best “circular” practices are those where stakeholders’ involvement in decision making has been realized (mostly through public consultation with stakeholders, but also through other forms of citizens’ engagement); this confirms the positive role of collaboration and cooperation between public institutions, private organizations able to provide new services and uses, and the local community as final “user” of the adaptive reuse projects; however, a specific role of the Heritage

Community has not emerged in the practices observed, thus more clear investigation will be needed to explore the real implementation and potential of the Heritage Community for the adaptive reuse of cultural heritage.

Then, it could be observed that the investment and management model influences the global circularity performance, generating economic-financial self-sustainability and social impact through the new uses. The best practices are characterised by a high level of financial self-sustainability. These are the projects in which revenue flows are higher, and are able to cover investment and management costs. The most common management model observed within the best practices sample is direct management from the owner, however “use concessions” for free or “renting” models emerge as common practice in the entire sample of adaptive reuse projects. Through these models, the abandoned heritage for which the legal owner has no resources for recovery and reuse can be still maintained and conserved for future generations, avoiding to “sell” properties also from public bodies due to lack of financial resources, in a win-win strategy that guarantees benefits in the short time for private subjects, and net benefits in the long time for public body.

It is observed also that large and medium investments (over 1 million euro) characterize the best practices, while small investments are not present (0,00% in the group, compared to 34,12% in the whole sample). This could lead to explore the possibility of mixed private and public investment, including also contribution from local communities (public-private-people partnerships), to stimulate higher performance of the adaptive reuse intervention. Within the best practices group, it emerges also the presence of industrial heritage reuses, as well as interventions in large cities. Thus, it is possible to hypothesize that interventions in rural or peripheral areas have currently less probability of success, as they are located in less accessible areas with lower numbers of users and lower investments, thus a specific support could be planned for this kind of interventions.

The group of “good practices” characterised by a score in the global circularity between 80 and 60, showed specific characteristics with a higher presence of small investments (less than 1 million euro), private funding and financing, a low but possible financial self-sustainability, and non profit organisations as managers of the heritage sites. This shows a particular group which also includes a higher percentage of religious heritage linked to ecclesiastical bodies as owners. The link between religious heritage and third sector actors as possible managers, with smaller investments from mostly private organisations can be a interesting model, showing the compatibility of social uses and socially oriented manager organisations with the particular category of religious heritage.

After analysing the emerging characteristics in the groups of best and good practices, the average scores obtained for each Latent Variable (“building block” of circularity) were assessed within a Impact-Performance matrix, providing practical suggestions for future adaptive reuse projects, based on the empirical evidence built through the statistical analysis results.

3.3 An Operational Use of the Latent Variables to Support Decision the Impact-Performance Matrix (IPM)

The results of the circularity structural model can be used to identify critical variables of circularity for decisional aim by comparing the score reached by each project with the value of its impact on the variable of the global circularity performance. Accordingly, 4 intervention areas are identified based on the level (low, high) reached by these criteria. For instance the most critical area concern latent variable that present low performance score and high impact (Fig. 6.7).

A scatter diagram (Impact, Performance Map) based on the representation of the 6 explanatory latent variables affecting indirectly (Management characteristics, Cultural Values) or directly (Closed metabolism, Landscape quality, Social impact, Economic spillover) the Global circularity defined in the model is then built.

The diagram is divided into four quadrants separated by a vertical line that represents the threshold that distinguishes the acceptable average scores from the unacceptable ones, and from a horizontal line that represents the threshold that separate low impacts from high impacts.

In the specific case, the thresholds are respectively based on the average of the 6 explanatory variable mean score and the average of their impact on the Global Circularity. The total impact considered for the determinant Vs include both direct and indirect effects whereas as for the 4 circularity outcomes only their direct effect on the Global circularity LV is considered.

The upper left quadrant is characterized by the variables that have a worst performance and have a higher impact on Circularity performance (or another target variable); therefore, it represents an area of intervention or priority for improvements to be designed/foreseen. The lower left quadrant describes variables that have a worse performance but have a lower impact on the Circularity performance; therefore, they represent a monitoring area. The score can be improved but the impact is not high. The upper right quadrant in which are positioned the variables that have a better performance and that have a greater impact on the Circularity performance, represents an area that must be maintained. It will be increased easily if the scores are not so high. The lower right quadrant shows the variables with good performance and a lower impact on Circularity performance and represent an area to be enhanced.

Fig. 6.7 Impact performance matrix

		Latent variable average score	
		Low	High
Total Impact	High	Priority intervention Area	Maintenance Area
	Low	Monitoring Area	Enhancement Area

Observing the overall scores of Latent Variables in the sample as a whole, and their associated weights (importance), some considerations can be made. Analysing the intervention matrix for the Latent Variable “Circularity performance”, in the priority intervention area (upper left quadrant) the only Latent Variable is the one measuring the Management Characteristics: in this area, the impact on the outcome index represented by the Circularity is high, but the scores for the case-studies are low. It is therefore a priority area to be improved to bring reuse interventions closer to a higher level of circularity. The Maintenance Area at the top right is also interesting. These are Latent Variables with high but also high in terms of impact. It is a level of performance absolutely to be maintained because the absence of these elements would hinder the ability of an intervention to achieve a good level of circularity (Cultural Value and Social impact). The bottom left quadrant is the Monitoring Area, characterized by variables with low scores for the case-studies and low impacts too. This is an area to be monitored, where the impact is not high but the scores can be easily improved (Closed metabolisms and Economic spillovers). At the bottom right there is an area to be enhanced. The Landscape quality has high scores but low impact on the circularity and the challenge is to favour a greater capacity of this variable to bring returns to the circularity score.

To identify critical intervention items in order to improve the circularity approach results in the area under study, these maps can be replicated for each of the six LVs of the SEM model, with respect to the MVs that contribute to them, using the weights and average values of each MV (see Annex).

In the following, due to its position in the Priority intervention area (Fig. 6.8), we report the impact-performance map realized for the Management Characteristics (Fig. 6.9).

Critical indicators (in the upper left part of the map) are not present, however some lower scores indicators are present (e.g. Financial self-sustainability, Third sector) which require some intervention to move in the right part of the map. At the same time the map (upper right quadrant) highlight indicators which performance should be maintained such as revenue flows and reinvestment of profits, which are localized in the upper right part of the graph with due to their high impact and high performance as well.

4 Conclusions

The contribution of the present chapter concerns both an innovative representation for the Circular adaptive reuse of cultural heritage by a suitable model based on latent variables, and the possibility to operationalize the theoretical framework on the subject matter established by the CLIC project (Luigi Fusco Girard [this volume](#), Chap. 2) by analysing the data issued from the CLIC Survey (Chap. 5).

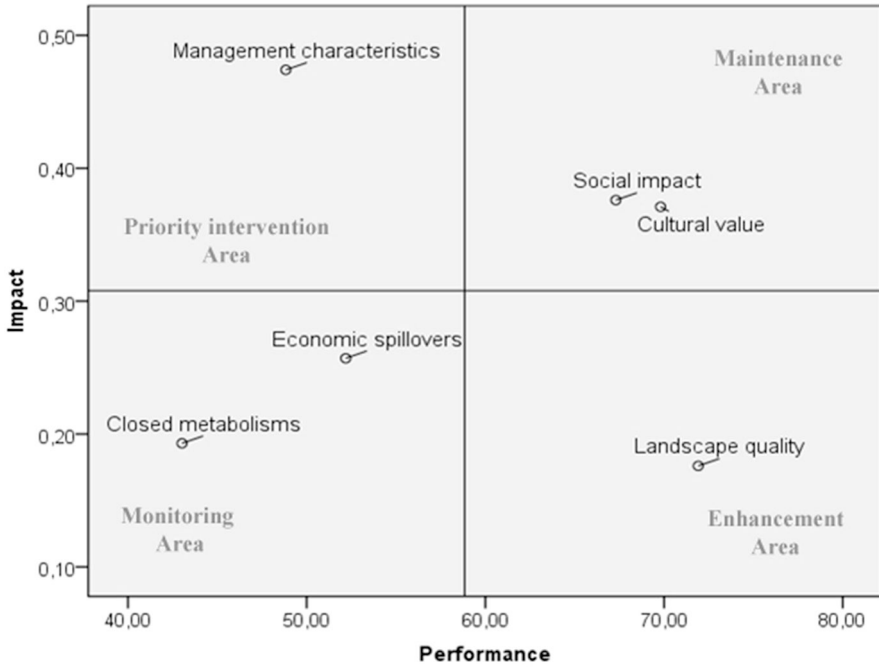


Fig. 6.8 Impact-performance map based on Latent Variables of circularity

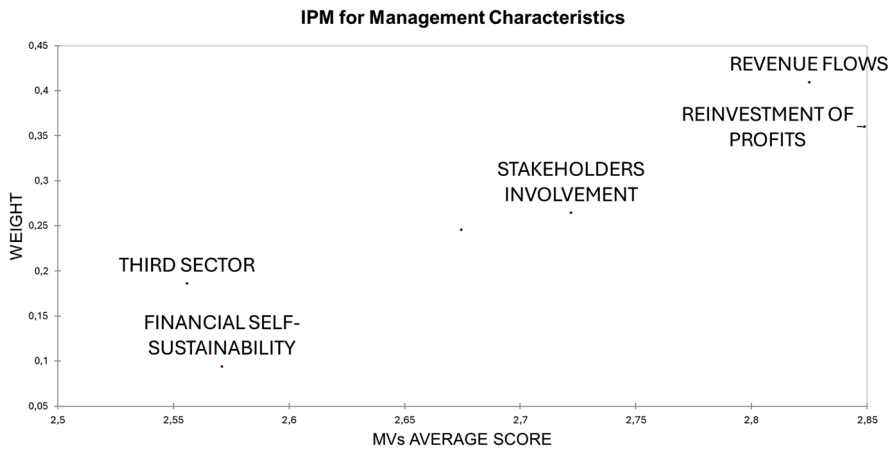


Fig. 6.9 Impact-performance map for the manifest variables on management characteristics

The Survey on Circular adaptive reuse of cultural heritage allowed to identify some best and good practices, as well as less satisfying reuse practices, and also to test the validity of the circular theoretical model for cultural heritage adaptive reuse through empirical evidence.

In particular, through this Survey it was asked whether the adaptive reuse of cultural heritage:

- has enhanced social cohesion and heritage communities;
- has generated economic wealth through adequate revenues/cash flows vs. investment and operating costs (economic/financial self-sustainability);
- has enhanced the attractiveness of the area for new investments, in particular attracting cultural and creative industries, and enhancing the perceived visual quality of the landscape;
- has been implemented with a specific role of the third sector (which is more and more considered as a key actor between public and private);
- has demonstrated win-win solutions combining private short term interests with public longer term objectives;
- has employed circular models through closed micro-metabolisms in water, energy and materials use.

Although the different levels of circularity observed, all projects were able to provide abandoned and underused buildings / sites / landscapes with new use values, avoiding the loss of cultural memory and enhancing their cultural values, confirming adaptive reuse as a viable and effective strategy to give “new life to old buildings” (but also, as said, sites and landscapes, as well as objects), thus contributing to the implementation of the circular city model; almost all projects reported positive impacts in the enhancement of quality of public spaces, safety and landscape visual quality of the area in which they are located. All projects reported positive impacts for “place attachment”, confirming the relevance of the adaptive reuse of cultural heritage as contribution to urban regeneration.

The aim of the statistical analysis performed was to assess the level of circularity of the analysed case studies, specifying whether the practices regenerated resources (human, environmental, economic, cultural, etc.). Data on each project was collected through the CLIC Survey and analysed through the statistical method of Structural Equation Model identifying the relevant ‘building blocks’ underlying the Global Circularity Performance Index for 126 cultural heritage adaptive reuse projects. The SEM allowed to validate key concepts of circularity in cultural heritage (latent variables) and to explore the relationships between them, “overcoming” the traditional approach of “pillars” of sustainability and making operational the theoretical “circularity model”. The “weights” of Latent Variables emerged from the SEM showed that the social impact variable is stronger: this represents on the one hand a signal of the importance of the generative capacity in the “social” dimension. The best practices were thus analysed more in-depth through a data mining technique (characterisation of variables—DEMODO), identifying the emerging characteristics in the specific group of the “best” adaptive reuse projects in terms of circularity. Finally, an Impact-Performance Matrix was used to explore the possible uses of the indicators of circularity in the adaptive reuse of cultural heritage, for further implementation and test towards planning and design decisions aid / support.

Beyond the cognitive and decision-supporting aspects that derive from estimating the assumed circularity model, it should be noted that its mathematical formalisation also allows it to be used for predictive purposes, making it possible to simulate the effects of intervention policies or the calculation of the circularity score for new sites.

To conclude, the statistical analyses performed in this section allow to confirm the validity of the proposed model for circularity assessment and understand the nature and relationships of data collected through the CLIC Survey on cultural heritage adaptive reuse practices. This study represents the result of a specific stage of the CLIC adaptive reuse of cultural heritage project aiming at developing multicriteria methodology and multidimensional evaluation tools to support the implementation of innovative “circular” governance, financing and business models for cultural heritage adaptive reuse. The complexity of the data analysed in this experimental analysis could not lead yet to definitive conclusions, nevertheless the statistical analysis approach pursued enabled the validation of the theoretical model, identifying “building blocks” and “best practices” of circular adaptive reuse of cultural heritage, and allowing to glimpse some interesting hypotheses that could be explored further through qualitative and quantitative analyses (in-depth case studies).

Annex—Reliability of the SEM Latent Variable Model, Scores and Weights of Manifest Variables

Latent variable	Manifest variables	Mean	Outer weight	Outer weight (normalized)
Cultural value (Rho = 0,727)	HERITAGE VALUE	3571	0,921	0,571
	CIRCULAR ECONOMY (CE) AWARENESS	2762	0,693	0,429
Management characteristics (Rho = 0,764)	FINANCIAL SELF-SUSTAINABILITY	2571	0,094	0,064
	REVENUE FLOWS	2825	0,409	0,278
	THIRD SECTOR	2556	0,186	0,126
	STAKEHOLDERS INVOLVEMENT	2722	0,264	0,179
	REINVESTMENT OF PROFITS	2849	0,360	0,245
	TOT N. OF USES	2524	0,160	0,109
Closed metabolisms (Rho = 0,862)	LOW ENERGY SYSTEMS	2516	0,208	0,179
	RENEWABLE ENERGY	2111	0,212	0,183
	WATER RECOVERY	1833	0,276	0,237
	MATERIALS REUSED	2802	0,236	0,203
	WASTES REDUCTION	2278	0,230	0,198

(continued)

Latent variable	Manifest variables	Mean	Outer weight	Outer weight (normalized)
Landscape quality (Rho = 0,791)	GREEN SPACES	2619	0,230	0,160
	PUBLIC SPACE QUALITY	3389	0,384	0,267
	SAFETY	3095	0,423	0,294
	LANDSCAPE QUALITY	3310	0,402	0,280
Social impact (Rho = 0,869)	CULTURAL HERITAGE (CH) AWARENESS	3397	0,229	0,137
	PLACE ATTACHMENT	3310	0,256	0,153
	SOCIAL COHESION	3175	0,214	0,128
	INCLUSION	3000	0,151	0,090
	HERITAGE COMMUNITY	2730	0,151	0,090
	CULTURAL ACTIVITIES	3302	0,196	0,117
	WELLBEING	3310	0,274	0,164
	HEALTH	3135	0,202	0,121
Economic spillovers (Rho = 0,841)	JOBS CREATION	3008	0,238	0,171
	STARTUP ATTRACTION	2151	0,185	0,133
	CREATIVE INDUSTRIES	2841	0,159	0,114
	COMMERCIAL ACTIVITIES	2794	0,194	0,139
	CULTURAL TOURISM	3024	0,212	0,152
	RESIDENTS ATTRACTION	2595	0,216	0,155
	REAL ESTATE INCREASE	2540	0,190	0,137

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