An Integrated Approach for the Assessment of Urban Transformation Proposals in Historic and Consolidated Tissues

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Abstract. The definition of a refurbishment intervention, in every step of the building process, brings to a complex decision problem; in a diachronic dimension of time, iterative and interactive must be put in relation a large variety of aspects with interrelations, concerning components, stakeholders and procedures that must be considered. The identification of the possible solutions depends on the construction of the evaluation procedures; shared goals with the stakeholders must be defined, on the basis of which can be assessed alternative intervention scenarios and make choices with regard to the matter under consideration. Thereby, in the present work a mixed method model in which are integrated Multi-Criteria Decision Analysis, Strategic Planning Tools and Participation Techniques has been proposed to be applied to refurbishment intervention in historical fabrics.

Keywords: Appraisal · Multi-Criteria decision analysis · Strategic planning tools · Participation techniques

1 Introduction and Aims of the Work

The definition of an urban transformation intervention brings to a complex decision problem involving a large variety of simultaneous and conflicting aspects that could be contemporary considered only by use of appropriate evaluation techniques.

The contribution is the result of the joint work of the four authors; it must be attributed in equal parts to the four authors.

In the field of urban transformations, when regarding historical fabrics in particular, principal aims of the evaluation are: (i) to lead the definition of hypothesis of intervention; (ii) to support the choice of the hypothesis that better give answer to the aims assumed in relation to specific aspects of complexity.

The goal of the transformation, is usually related to the integration of the intervention in an urban context that – at least in Italy – is almost always signified by stratification and over-layering of tissues and functions [1, 2]. Once established the goal, the achievement of this could be evaluated by the definition of a methodology structured by an integrated approach, mixed method type, that utilize simultaneously different clusters of assessment techniques [20].

Among multiple decision support tools, that can be utilized in the context of urban transformation processes, it must be point out:

– Multi-criteria decision analysis (MCDA), developed and applied since the Sixties' of XX century in different scientific contexts, succeed to support decision processes related to urban transformation [3, 4] and to find the best compromise solution for the mitigation of the previous aims [5, 6];
– Strategic Planning Tools (SPT), developed since the Sixties' of XX century in business management [7, 8], can be applied in urban and territorial planning to choose instruments, abilities and necessary actions to reach system's goals in medium and long period perspectives. SPT are useful in contexts characterized by multi-level activities and multi-actor processes [9, 19];
– Participation Techniques (PT), finalized to include the stakeholders' point of view in the evaluation process, the latters belonging to different categories and directly or indirectly involved in decisional process.

MCDA methods can be implemented in concert with other techniques or evaluation tools to support the choice process including, among different variables, also verbal and qualitative judges [10].

According to the European recommendations, the identification of different solution of the problem is to be correlated to the definition of shared aims with stakeholders. Alternative scenarios of intervention, referring to the analysed problem, can be evaluated on the base of the defined aims [11] by the integration of MCDA and PT. Integration of MCDA and PT with SPT can be useful to support the solution of decision problems in urban transformation allowing to motivate in greater detail the quantity and the typology of variables to be considered depending on the goal of the evaluation.

Therefore, the aim of the present work is to define an evaluation model, according to a specific set of objectives, able to support decision processes related to urban transformation in historic and consolidated tissues.

Considering the indications of some European Community documents (European Commission EC, 2006, Community Directive 2014/24/UE) regarding the actions of development and urban regeneration, transposed in Italy in the Legislative Decree n. 50/2016, the proposed procedure must consider financial, socio-economic, environmental, landscape, procedural and technical aspects that generally characterize urban intervention of transformation. In the context of historic and consolidated tissues have to be taken into account how these aspects can be applied referring to some typical

characters observed in Italy and elsewhere in these urban areas: (i) the presence of building plans strongly characterized from the typo-morphological, structural and distributive point of view; (ii) stratified structure of tissues, founded on layers that overlay structures, materials and heterogeneous forms; (iii) spaces, private and public buildings, characterized by a poor adaptability and often (iv) connected to spaces with high socio-identity values.

Further in the text will be described: the evaluation tools utilized in the construction and in the definition of the evaluation methodology proposed (Sect. 2); the structure of evaluation model (Sect. 3); the implementation of the methodology proposed for the case study of the new building for Chamber of Deputies in the historical center of Rome (Sect. 4); the conclusions (Sect. 5).

2   Choice of the Evaluation Tools

In the construction of evaluation procedure methods tools and techniques must be chosen on the base of problems to be solved and referring to the phase of the process in which evaluation is conducted. The choice of the MCDA method in accordance to the full aggregation approach or to the outranking approach can be made considering the set of endogenous ad external variables typifying different decisional contexts [12].

Among MCDA tools that develop analysis by a full aggregation approach, the Analytic Hierarchy Process (AHP) is one of the techniques that allow to point out the best option by a pair-wise comparison based on a rational scale, structured in hierarchical levels [13]. In this way, is it possible to easily and intuitively solve the problem of the choice of the best performing proposal of urban transformation, breaking up the complex problem into sub-problems technically solvable. Ones defined the specific objectives (Os), the criteria (Cn), the sub-criteria (SCn) and the indicators, by appropriate analysis and by PT, the AHP phases can be synthesized in: (a) the recognition of alternatives Ii (concept-design and/or design); (b) the construction of Matrix of Coefficients (MC) gathering the performances that various alternatives record according to SCn of evaluation; (c) the calculation of local priorities (Pij) of Cn and SCn according to the Goal, by the construction of bi-dimensional matrix of pairwise comparison through the assignment of weights Wj to Cn and SCn; (d) the calculation of global priorities (Pi) (and ranking) by the construction of bi-dimensional matrix of pairwise comparison through the aggregation of the performances recorded in the Matrix of Coefficients with local priorities (Pij).

Among SPT, the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis can be utilized to identify the before mentioned factors referring to an intervention that has to be realized in a certain system or settling context. SWOT analysis can be implemented in a static way, directly translating information gathered from analysis into actionable choices, or in a relational or dynamic way [14], considering SWOT elements as input data to be used in following steps by the integration of SWOT analysis with other techniques. In the methodology proposed, SWOT analysis is used in a dynamic way, integrated with PT (Stakeholder Analysis), for the definition of a vector of weights Wj to be attributed to each Cn and SCn, adopted for the implementation of AHP. SWOT factors are defined thanks to the consultation of experts

(focus group) and they are expressed referring to urban, legislative, procedural, socio-economic elements in the analysed context.

According to the modalities of stakeholder participation in different phases of evaluation, the choice of PT has to be made taking into account: (i) levels of comprehension (even for non-expert subjects) of contents and of procedures used for gathering and elaboration of judges; (ii) time of implementation and (iii) level of conflict in stated judges [4]. Among PT the Focus Group (FG) is characterized by a medium level of comprehension, a short time for implementation but a high level in risk of conflict; the Stakeholders Analysis (SA) is characterized by a high level of comprehension, a very short time for the implementation and a short level in risk of conflict. In the methodology proposed, these techniques are integrated in AHP because they are used, respectively, to define the necessary elements for the construction of Matrix of Coefficients and for the calculation of local priorities.

3 Framework of the Evaluation Model in Accordance with the Mixed Method Approach

As mentioned before, the methodology proposed is based on the joint use of AHP, SWOT Analysis, FG and SA for the choice of the best solution of intervention in order to better answer to the goal and to the general Objectives (Og) – architectural and urban quality of transformation (QA), technical and functional quality (QT), economical and financial aspects (EF) – and it is structured in accordance with an integrated approach made of a number of consecutive phases (Fig. 1): (i) definition of the elements of evaluation: Criteria (Cn), Sub-criteria (SCn), Indicators (In), Coefficients (Kji) (Phase 1); (ii) weighing of Cn and SCn (Phase 2); (iii) ranking of alternatives Ii and identification of the best compromise solution (Phase 3).
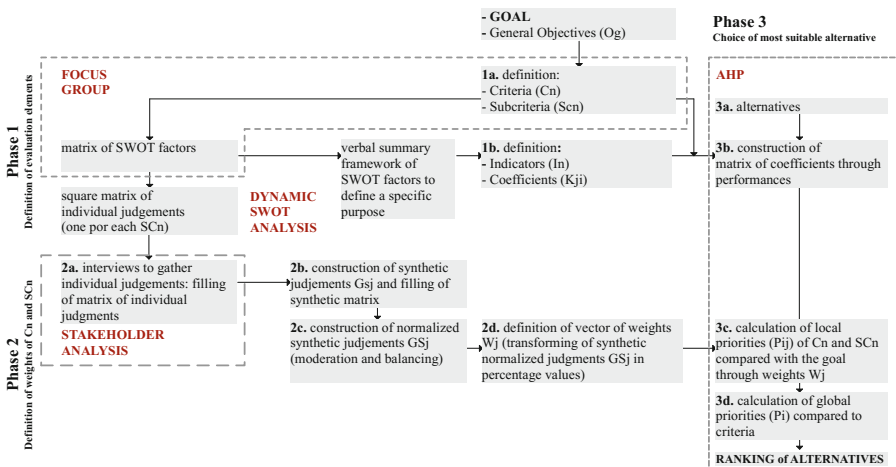

Fig. 1. Framework of methodology proposed

Referring to the specific context where evaluation procedure is applied, evaluation elements must be firstly defined (Phase 1):

(1a) a set of Criteria Cn and Sub-criteria SCn, identified through a FG (consultation of experts) in which experts for each Og define a suitable number of significant elements for the transformations to represent a coherent and equal corpus to measure the best level for achievement of the objectives [15–17].

(1b) a set of Indicators In and Coefficients Kji through the application of a dynamic SWOT analysis, structuring:

   (i) Matrix of SWOT factors: through a FG, for each SCn is defined a point of Strength, Weakness, Opportunity and Threat considered most significant. The result obtained is synthesized in a Matrix of SWOT factors. Defining the SWOT factors it must be taken into account both de facto state and the evolution perspectives, referred to the context where intervention is located, considering currently what effects the alternatives of intervention could generate;

Evaluation Elements				Matrix of SWOT factors			
				Internal Factors		External Factors	
Goal	General Objiectives	Criteria	Sub-Criteria	*Strengths*	*Weaknesses*	*Opportunites*	*Threats*
The urban void solution by the inclusion of new functions	Economic and finalncial aspects (EF)	Spending control (art. 95, art 96, art 97 D.lgs n. 50/2016; PRG art. 36, comma 1 NT, D.lgs n. 152/2006 s.m.i)	Cost reduction	Rational use of financial resources	Expensive process because of their function "Edifici e Complessi speciali" (cfr. art. 36 delle NTA, comma 1), comprehensive of open space directly connected with public spaces (piazza, gardens, streets) having high urban, morphological, symbolic and functional relevance	Functional, distributive and technical solution allowing a cost reducing	Abnormally low tenders
			Cost sustainability connected with energy saving	Rational use of financial resources implying the research of a balance between resources conservation and socio-economic development	Expensive initial investments bacause of adoption of sustainable and innovative technical solutions	Technical and functional solutions allowing management of cost reducing paying attention to energy saving and pollution control	Abnormally low tenders
			Maintenance costs por year	Rational and effective use of financial resources		Technical and functional solutions allowing management of cost reducing in ordinary and extraordinary maintainace	Abnormally low tenders
		Economic Convinience (Censimento Industria e Servizi 2001 ISTAT; art. 95, art 96, art 97 D.lgs n. 50/2016)	Environmental costs	Cost reducing referred to greehouse gas and other polluting substances emissions	Absence of activities planning on urban context in specific economic sectors	Environmental impact reducing generated from new design functions in the area of historical city centre	Low prediction of environmental impacts in long period
			Costs Benefits ratio	Economic and social regeneration for consolidated city according to design strategies based on economic convenience evaluations (best locationing for economic activities, supplay and demand, geomarketing, highest and best use, contingent values)	Difficolt monetary quantification of intangible aspects	Quantification of collective advantage regarding expected results	Unsuitability of estimation of interest rate

Fig. 2. (continued)

Evaluation Elements				Matrix of SWOT factors			
				Internal Factors		External Factors	
Goal	General Objiectives	Criteria	Sub-Criteria	*Strengths*	*Weaknesses*	*Opportunites*	*Threats*
The urban void solution by the inclusion of new functions	Architectural and Urban quality (QA)	Urban fabric filling in relashionship with the historical development process (PRG art. 20, co. 2, art. 22 comma 1 NTA, G2 Guida per la qualità degli interventi: Capo III)	Alignement of the new building to the urban fabrics before demolition (IGM 1873)	Organic design of urban spaces and riconfiguration of urban routes geometry broken by demolitions	Planimetric and distributive limits to design proposal	Urban void solution by valorization and refurbishments of morphological connections	Limits to design research for innovative solution finding
			Presence of inner courts (covered or uncovered) following the tradition of the historical urban fabric	Conservation of traditional characters of historical urban tissues (T1)	Planimetric, distributive and typo-morphological limits to design proposal	Valorization of urban courtyards as distribution element of several building units in order to guarantee a good permeability with outer spaces	Limits to design research for innovative solution finding
		Organic relashionship between buildings and urban spaces (PRG art. 20, co. 2, art. 22 comma 1 NTA, G2 Guida per la qualità degli interventi: Capo III)	Connection between design spaces, urban spaces and parliamentary functions close to the design area	Organic design of the urban spaces paying attention to volumetric and formal relation between the new buildings and the typical system of open spaces of historical tissues, giving attention to the hierarchies rooling all the technical, functional, symbolic, monumental components of historical centres	Planimetric and distributive limits to design proposal at the urban and architectural scale	Valorization of the urban spaces constituting the context sorrounding the Palazzo di Montecitorio as a main urban landmark	Lack of the design solution in answering to the historical and development processes of the urban tissues
			Mixed use providing by concentration of commercial functions on Matrix route in order to restore its functional and morphological continuity	Regeneration of consolidated and historical tissues (T1) according to morphological strategies	Planimetric, distributive and typo-morphological limits to design proposal	Valorization of the relationship between inner and outer spaces by the refurbishment of the morphological connections	Functional marginalisation of non commercial areas
			Easy access to non parliamentary functions on matrix route (Via di Campo Marzio)	Regeneration of consolidated and historical tissues (T1) according to morphological strategies	Distributive limits to design proposal	Directioning of entry flows to the design funcions	Functional marginalisation of non commercial areas
	Technical and functional quality (QT)	Flexibility and integrability of inner and outer spaces from functional and distributive point of view (UNI 8290 - UNI 10838, Best Practice: Scotish Parliament, Building User Brief)	Minimizing of unmovable structures to reduce the impact on the dinamic and alternative use of spaces	Dynamic and flexible spaces	Landlocked and tiny area of intervention compared with the functional needs	Appropriateness to changes in functional and managerial organisation of spaces in short, medium and long period in relation to the new dynamic and flexible character of contemporary job	Not-appropriateness of the building to the functional needs in short, medium and long period
			Minimizing of tecnical and structural elements to reduce the impact on the dynamic and alternative use of spaces	Maximization in use of inner spaces	Distributive and design limits	Modularity and standardization of technical and structural elements	Compliance of technical solution with costs limits

Fig. 2. Evaluations elements (Part 1) and Matrix of SWOT factors (Part 2)

(ii) Square Matrix of individual judgements: SWOT factors identified are entered as heading, in line (i_S, i_W, i_O, i_M) and in row (j_S, j_W, j_O, j_M), to draw up, for each SCn, a serie of Square Matrix of individual judgements that will be filled in phase 2 of the methodology proposed.

(iii) Verbal summary framework of SWOT factors: a specific purpose to each SCn indicator (In), qualitative and quantitative, and to its qualitative coefficients (Kji) (values between 0 and 1) are defined.

The definition of weight vector Wj of Criteria Cn and Subcriteria SCn (phase 2) is made by:

(2a) carrying out individual interviews (Stakeholder Analysis); during the interviews are asked stakeholders to express a set of individual judgments Gji performing, for each matrix of individual judgments relating to SCn, the pairwise comparison between the ith row element with the jth element column.

(2b) development of synthetic judgments GSJ and synthetic matrices filling; all n x n of synthetic judgments GSj for each SWOT factor is calculated on the average of the individual judgments Gji expressed by stakeholders;

I	II	III	IV	V	VI
Goal	General Objectives	Criteria	Sub-Criteria	Purposes	Indicators
				(Synthesis of SWOT elements)	
The urban void solution by the inclusion of new functions	Architectural and Urban quality (QA)	Urban fabric filling in relashioning with the historical development process	Alignment of the new building to the urban fabrics before demolition (Rilievo IGM 1873)	Architectural and urban quality improvement through the integration between the new intervention and the historical development processes and through the valorization of morphological connections	Total Partial Absent
			Presence of inner courts (covered or uncovered) following the tradition of the historical urban fabric	Architectural and urban quality improvement through regeneration of tissues; prioritization of design proposals according to the most integrated in the context paying attention to volumetric relation between built areas and empty spaces in the historic centre	Present Absent
		Organic relashionship between buildings and urban spaces	Connection between design spaces, urban spaces and parliamentary functions close to the design area	Architectural and urban quality improvement through regeneration of public spaces; prioritization of design proposals according to the most integrated in the context paying attention to the connection between new building and urban spaces	Very high High Medium Low Very low
			Mixed use providing by concentration of commercial functions on Matrix route in order to restore its functional and morphological continuity	Architectural and urban quality improvement through regeneration of public spaces; prioritization of design proposals according to the most suitable to maintain a dynamic socio-economic context	Total Partial Absent
			Easy access to non parliamentary functions on matrix route (Via di Campo Marzio)	Architectural and urban quality improvement through regeneration of public spaces; prioritization of design proposals according to the most integrated in the context paying attention to the concentration of commercial functions on matrix route	Total Partial Absent
	Technical and functional quality (QT)	Flexibility and integrability of inner and outer spaces from functional and distributive point of view	Minimizing of unmovable structures to reduce the impact on the dinamic and alternative use of spaces	Preference of design proposals characterized by open functional and distributive solutions able to answer to flexibility of functions in short, medium and long period according to contemporary dynamism of work's conditions.	Very high High Medium Low Very low
			Minimizing of tecnical and structural elements to reduce the impact on the dynamic and alternative use of spaces	Preference of design proposals that allow high use of space in relation to model of use and to the structural and technical integrability	Total Partial Absent
	Economic and finalncial aspects (EF)	Spending Control	Cost reduction	Spending control referred to realization costs	% on base amount established for call for tenders
			Cost sustainability connected with energy saving	Spending control referred to management costs. Preference of design proposals characterized by functional, distributive, technical solution allowing to reduce cost of using, energy saving and pollution reduction	€/year
			Maintenance costs por year	Spending control referred to maintenance plans for spaces, structures and technical elements. Preference of design proposals characterized by functional, distributive, technical solution allowing to reduce cost of ordinary and extraordinary maintenance	€/year
		Economic Convinience	Environmental costs	Environmental impact reducing and greenhuse gas or other polluting gas emission reducing	€
			Costs Benefits ratio	Economic convenience referred to economic and social regeneration of consolidated and historic city according to strategies able to generate benefits. Accuracy of analysis is based on studi level of detail and on the choice of suitable interest rate	NPVe (€)

Fig. 3. Qualitative and quantitative indicators

(2c) construction of normalized judgments GNj: the set of synthetic judgments GSj built for each factor within the synthetic matrices is transformed into a normalized judgment GNj through operations of:

   (i) Moderation: (i1) the arithmetic sum of synthetic line judgments GSj leads to define Line Vectors; (i2) the sum (which does not take into account whether it is positive or negative) of synthetic judgments GSj leads to define Column Vectors; (i3) a moderation algorithm built starting from the Column Vectors, for the definition of an array of values called Moderator [14]; (i4) definition of moderate Line Vectors through the multiplication of Line Vectors by the Moderator in each Synthesis Matrix.

   (ii) Balancing: construction of a weighted sum of the Line Vectors moderated in each Synthesis Matrix that determines the normalized judgement GNj.

(2d) Normalized Judgments GNj allow to define the Weights Vector Wj of Cn and SCn to be used in the AHP, transforming each Normalized Judgment GNj in terms of proportionality on the base of 100, compared to the sum of the Normalized Judgments GNj (Wj = 100*GSj /0*GSj).

The ranking of the alternatives (phase 3) is obtained by introducing in the hierarchical structure of the AHP, the elements of the evaluation and the weight vector Wj by using of specific software that will produce local (Pij) and global (Pi) priorities of the alternatives, using mathematical algorithms that lead to solve the problem of the consistency of the matrix during pairwise comparisons with the eigenvalues (MEV) method. Further in the text it will illustrate the operational application of the methodology proposed for the case of the new services building for the Chamber of Deputies in Rome (Sect. 4), integrally for phases 1 and 2, partially for phase 3.

Indicators (In)	Coefficients (Kji)
Qualitative	Range of values between 0 – 1
Very high – Total – Present	1
High	0,75
Medium – Partial	0,5
Low	0,25
Very low – Absent	0
Quantitative	
€/tar	Scale of coefficient to be built according to the amount established for call for tenders and according to quantitative aspects referred to managment plans
€	
NPVe (€) (Net present value)	

Fig. 4. Evaluation coefficients

4 Implementation of the Proposed Methodology for the Case Study of the New Services Building for the Chamber of Deputies in Rome

The case study concerns the construction of a new services building for the Chamber of Deputies in Rome remained unsolved from the design competition of 1967, on a not built area close to Montecitorio building, in the historic centre of the city. The transformation proposal is to choose the most suitable intervention solution among various design hypothesis, to solve a break of the historic tissue and to insert new offices and services nearby the Italian Parliament building. In order to identify the characters, that the intervention of a new services building for the Chamber of Deputies in the tissue of the historic centre of Rome should have, were taken into account:

- the needs of the Chamber of Deputies in term of spaces and governmental functions;
- the quantity and quality of functions included in governmental buildings built in recent decades in Italy and in the World;
- the state of planning about what the General Regulatory Plan of Rome requires for the Old City (NTA 2008, PRG Roma, art. 24, co. 1 - historical fabrics;)
- the historical, morphological, functional, distributive characters of the area surrounding Montecitorio building;
- the study of national and international Best Practice in the field of quality and functionality of spaces in the design of government buildings;
- regulatory requirements in the latest updates in the field of public works contracts (Legislative Decree n.50/2016) regarding the economic and financial sustainability, the environmental performances and the energy savings.

According to the goal of the case study the urban void solution by the inclusion of new functions and to the general objectives (Og) and following the aforementioned procedure (cit. Paragraph 3), in Phase 1 activating a Focus Group (consultation: the parliamentary technicians (1), designers and researchers (10)) it succeeded in: (1a) definition of the elements of the evaluation made of 5 Cn, and 12 SCn (Fig. 2 part 1); (1b) construction of the Matrix of SWOT factors (Fig. 2 part 2), setting up the arrays of individual judgments and the verbal summary framework of SWOT factors (assigning a specific purpose to each SCn). On the base of the verbal summary framework qualitative and quantitative indicators (In) (Fig. 3) and qualitative coefficients (Kji) (-values between 0 and 1) (Fig. 4) have been defined. Coefficients (Kji) referred to the economic and financial convenience aspects have not been defined because they need further analysis referred to the technical-economic and procedural characters that were not performed at this phase.

In order to define the Vector of Weights Wj of the Cn and SCn (Phase 2) it proceeded:

(2a) to interview (SA) a sample of parliamentary technicians (3) and a sample of designers and researchers (10) to fill the arrays of individual judgments based on judgments Gji formulated from each of the selected subjects following the procedure described in paragraph 3;

(2b) to calculate for each SCn the average of individual judgment Gji obtaining the synthetic judgments GSji which are reported in the Summary Matrix (Fig. 5a);

	a. Synthesis Matrix				b. Moderation and balancing operations				
	Organic design of urban spaces and riconfiguration of urban routes geometry broken by demolitions	Planimetric and distributive limits to design proposal	Urban void solution by valorization and refurbishments of morphological connections	Limits to design research for innovative solution finding	LINE VECTOR (LV.Sc$_n$)	BREAK-VALUESa (BVa$_n$Sc$_n$)	BREAK-VALUESp (BVp$_n$Sc$_n$)	MODERATOR (MS$_{cn}$)	MODERATE VECTOR (Vm$_n$Sc$_n$)
	S	W	O	T					
S Organic design of urban spaces and riconfiguration of urban routes geometry broken by demolitions		1	1	2	4	3	50,0	0,5	2,00
W Planimetric and distributive limits to design proposal	0		0	0	0	5	83,3	0,8	0,00
O Urban void solution by valorization and refurbishments of morphological connections	2	2		1	5	1	16,7	0,2	0,83
T Limits to design research for innovative solution finding	1	2	0		3	3	50,0	0,5	1,50
COLUMN VECTOR (VC$_n$Sc$_n$)	3	5	1	3	NORMALIZED JUDGEMENT GNj				1,08
BREAK-VALUES (BVa$_n$Sc$_n$)*	3	5	1	3					
Δ Vc$_n$Sc$_n$	5								
BREAK-VALUES (BVa$_n$Sc$_n$)	1	2	3	4	5				
ATTRIBUTION of BVa$_n$ Sc$_n$ to VC$_n$ Sc$_n$	1	2	3	4	5				

(b. Moderation and balancing operations)

Fig. 5. Synthesis matrix, (a); Construction of normalized judgements GNj, application for SCn1, (b)

(2c) to carry out operations of moderation and balancing of synthetic judgments GSji in order to obtain the construction of normalized judgment GNji; (Fig. 5b);
(2d) to define the vector of weights Wj of Cn and SCn by the translation of normalized judgments GNji in percentage values (Fig. 6).

Cn of *Urban fabric filling* in relationship with the historical development process (30%) and of *Organic relation between buildings and urban spaces* (29%) related to general objective of the architectural and urban quality of transformation (QA) obtained a bigger weight. Cn referred to the general objective of the technical and functional quality (QT) and of the economic and financial aspects (EF) obtained a progressively smaller weight.

General Objectives	Criteria	Sub-Criteria	Wheight subcriteria V%	Wheight criteria V%
Architectural and Urban quality (QA)	Urban fabric filling in relashionship with the historical development process	Alignement of the new building to the urban fabrics before demolition (Rilievo IGM 1873)	17	30
		Presence of inner courts (covered or uncovered) following the tradition of the historical urban fabric	13	
	Organic relashionship between buildings and urban spaces	Connection between design spaces, urban spaces and parliamentary functions close to the design area	6	29
		Mixed use providing by concentration of commercial functions on Matrix route in order to restore its functional and morphological continuity	8	
		Easy access to non parliamentary functions on matrix route (Via di Campo Marzio)	15	
Technical and functional quality (QT)	Flexibility and integrability of inner and outer spaces from functional and distributive point of view	Minimizing of unmovable structures to reduce the impact on the dinamic and alternative use of spaces	4	24
		Minimizing of tecnical and structural elements to reduce the impact on the dynamic and alternative use of spaces	20	
Economic and financial aspects (EF)	Spending Control	Cost reduction	2	8
		Cost sustainability connected with energy saving	5	
		Maintenance costs por year	2	
	Economic Convinience	Environmental costs	5	9
		Costs Benefits ratio	4	

Fig. 6. Definition of vector of weights Wj of Cn and SCn

Five preliminary design drawn up specifically for the present application have been evaluated to obtain the ranking of alternatives. Economic and financial aspects were not analysed at this stage of research, so the implementation of the methodology was partial developing the ranking of alternatives on the base of solely qualitative criteria. The use of *transparent choice* software allowed to calculate the local priority Pji and global priority Pi taking into account the vector of the weights Wj determined in phase 2 and to obtain the ranking of the alternatives (Fig. 7).

Alternatives	Global priorities Pi	Local priorities Pji											
		Architectural and Urban quality (QA)								Technical and functional quality (QT)			
			Urban fabric filling in reationship with the historical development process	Alignement of the new building to the urban fabrics before demolitions	Presence of inner courts (covered or uncovered)	Organic relation between buildings and urban spaces	Connection between design spaces, urban spaces and parliamentary functions	Mixed use provided by concentration of commercial function on Matrix route	Easy access to non parliamentary functions on matrix route		Flexibility and integrability of inner and outer spaces	Minimizing of unmovable structures to reduce the dynamic and alternative use	Minimizing of technical and structural elements to reduce impact on the dynamic and alternative use
Project 3	0,8748	0,8748	0,5785	0,4303	0,1481	0,2963	0,0232	0,0508	0,2223	0,0508	0,0102	0,0004	0,0020
Project 4	0,7431	0,7431	0,4468	0,4303	0,0165	0,2963	0,0232	0,0508	0,2223	0,0508	0,0102	0,0004	0,0020
Project 6	0,7082	0,7082	0,5926	0,4444	0,1481	0,1156	0,0203	0,0508	0,0445	0,0508	0,0102	0,0004	0,0020
Project 2	0,3960	0,3960	0,1025	0,0861	0,0165	0,2935	0,0203	0,0508	0,2223	0,0508	0,0102	0,0004	0,0020
Project 5	0,3751	0,3751	0,1000	0,0836	0,0165	0,2751	0,0020	0,0508	0,2223	0,0508	0,0102	0,0004	0,0020
Project 1	0,1616	0,1616	0,1025	0,0861	0,0165	0,0591	0,0044	0,0102	0,0445	0,0102	0,0020	0,0002	0,0004

Fig. 7. Ranking of alternatives

5   Conclusions

The proposed procedure allowed to define a methodology for evaluating alternatives in complex urban and/or multi-layered contexts like those of historic fabrics, through the construction of a framework of structural elements of the evaluation model and the definition of their relative weight [18]. The total implementation of the first and second phase of the procedure and partial implementation of third phase where weight of the elements of the evaluation of Cn and SCn and ranking of project alternatives were defined, was possible thanks to integrated assessment techniques, consultation of experts, inclusion of stakeholders point of view. The defined set of Cn and SCn is suitable to be used to formulate design guidelines and possibly to integrate the functional and distributive program to support a competition call for design proposals.

The proposed methodology is useful and effective in different contexts. Its organization in phases lends to successive improvement levels able to answer to heterogeneous ambit of complexity. Despite the moderation and balancing operations (step 2c) on synthetic judgments GSj used to define the weight of Cn and SCn, the inconsistency in the expression of individual judgments may cause small changes in percentage points in weighing Cn and SCn. This limitation could be overcome with the development of methods of consistency-check and the development of software and specially designed tools.

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