Bringing the Value-Focused Thinking approach to urban development and design processes: the case of Foz do Tua area in Portugal

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Abstract

In Italy architectural quality and public interest are at the center of a cultural and political debate, which has not yet been definitively adopted into our legal system. By recognizing that urban developments, both public and private, have to be part of a bigger and interconnected economic, cultural and social development pattern, in the last 15 years several efforts have been made to define a draft law on architectural quality.

Designing quality alternatives is therefore a crucial issue to preserve and improve the quality of life and built environment. The public role played by architecture and the need to answer to different instances lead to consider the design process as a real decision-making process focused on values, rather than on design solutions.

In this context, the paper proposes a multi-methodological analytical framework based on the Value-Focused Thinking (VFT) approach introduced by Keeney in order to address the phases of the design process, from the elicitation of objectives, to the definition of strategies until the design and evaluation of the alternatives. With the aim of providing a contribution to the empirical line of research on alternative generation, the paper experiments the VFT procedure within a design process developed by eleven project teams.

1. INTRODUCTION

In the last fifteen years the quality of architecture has been a central topic in the Italian cultural and political debate. Following the example of the role that this issue has played in Europe, in our country several draft laws have been proposed, which have not been approved yet. Nevertheless, over time, they have confirmed the importance of the quality of development interventions on the built environment, as well as and the public dimension of architecture. According to these attempts to regulate the quality of architecture, the design activity plays a fundamental role. Architectural quality means the satisfaction of a wide system of values - such as the constructive and environmental quality of spaces and buildings, both public and private, the relationship with the landscape, well-being, social cohesion, safety and energy efficiency (Framework Law on policies for architecture, 03.05.2018, art. 2). Given the instance of achieving as much as possible of the above mentioned values, the evaluation plays an essential role in the design process from its earliest stages.

The introduction of the evaluation into development processes is not new. It has been described both from a theoretical and a practical point of view (Bentivegna, 1995; Stanghellini, 1995; Khakee, 1998; Lombardi and Micelli, 1999; Lichfield, 2001; Stanghellini and Mambelli, 2003; Giannelli et al., 2018), with reference to different operational fields, where methodological innovations and improvements have been defined (Khakee, 2008), that encourage a procedural, iterative and cyclical dimension.

Under this perspective, planning and design processes should be seen as decision processes, characterized by cognitive limits that prevent to maximize the benefits from a particular course of action (Simon, 1956) and addressed to the definition of quality alternatives (Siebert and Keeney, 2015).

Starting from the analysis of strengths and weaknesses of cities and territories and passing through a crucial phase of problem structuring, planners and architects investigate needs, values and objectives in order to identify the most satisfactory alternative from among all those available to them. Addressing decisions to the good enough solution rather than to the optimal one depends on many reasons, such as: the difficulty to access and process all the information needed to take a good decision; the instance of achieving a balance among different dimensions of territorial and urban development, namely the economic constraints and environmental objectives; the not always consensual preferences of the stakeholders generally involved in these kind of processes.

What deserves to be explored and represents a major challenge in the context of decision aiding models and practices is the modeling phase, when objectives are identified and alternative strategies and actions are defined (Sharifi and Rodriguez, 2002). Moreover, the acceptance of the bounded rationality paradigm requires to pay a particular attention to the generation of alternatives, which are not given but should be defined starting from a cognitive map of criticalities, usually not equally distributed on the territory, and potentials of urban contexts, in addition to expectations expressed by public, private and general interests (Crosta, 2010; Stanghellini, 2019).

Most decision problems discussed in the literature consider the set of alternatives as "given", although in practice such a set frequently needs to be defined. As Colorni and Tsoukias (2013; 2017) have pointed out, the mainstream decision analysis literature focus on how to "choose" an alternative without considering where these alternatives come from and how they can be established. The specialized literature, with few exceptions, seems to ignore what is implicitly well known by practitioners that alternatives are very frequently constructed during the decision aiding process where alternatives are excluded until the final configuration is reached. Some of the most relevant contributions are summarized below. Efforts can be found in the reflections of Ozernoy (1985), who has discussed empirical studies on options generation with the aim of outlining that the addition of new alternatives can be more relevant than the evaluation of the available ones. Furthermore, Norese and Ostanello (1989) have focused on the formalization activities an analyst carries out within the interaction with the client. Other contributions have been mainly focused on how to structure the decision problem by defining algorithms for alternatives generation (Baetz et al., 1990; Farquhar and Pratkanis, 1993; Pereira et al., 1994; Belton and Stewart, 2002; Chakhar and Mousseau, 2006; Colorni et al., 2017). This topic has been considered in behavioral and cognitive sciences studies too (Newstead et al., 2002) and investigated by Tavella and Lami (2019) in the soft OR field by comparing different approaches.

Keeney (1992) has based decision making processes on "values" and not on "alternatives". Values guide a decision-making process, are at its basis and explain why we care about it.

Keller and Ho (1988) point out five approaches for the creation of alternatives. Three approaches are based on attributes, states of nature, or both to generate alternatives, while the remaining approaches refer to techniques for fostering creativity such as brainstorming (e.g. Ackoff 1978).

Zwicky (1967) has proposed the use of the morphological box to identify a set of complex alternatives or innovative strategies. Similarly, Howard (1988) has defined the strategy table for breaking down a strategy decision into a set of sub-strategies and thus defining potential alternatives for each of them. These last two procedures systematically identify a comprehensive set of feasible alternatives, even though many of the combinations may be unappealing (Siebert and Keeney 2015).

Moreover, Spatial Multicriteria Analysis (e.g. Geneletti and Ferretti, 2015) and Choice Experiments (e.g. Oppio et al., 2015) have been used to support alternatives design for policy making and territorial planning (Torrieri and Batà, 2017) are as discussed in Ferretti (2016) and in Colorni et al. (2017).

Considering this framework, the paper explores the potentials of Value-Focused Thinking (VTF) approach proposed by Keeney in order to test whether and how long an approach based on values can foster the generation of quality options. Compared to the evaluation techniques mentioned above, the VFT does not require specific skills and can therefore be easily integrated into a traditional design process.

More in detail, the aim of the following paper is to show an application of the VFT approach for the design of alternatives in the urban planning field, thus contributing to the empirical line of research on creating alternatives. Particular attention has been paid to the preliminary design phase, which already presents those potential elements that, through progressive elaborations and reviews, lead to the final development of the area under analysis. The assumption of a heuristic perspective allows to highlight the dynamics and contradictions (Gritti et al., 2018) of this phase where all the possible configurations are present and in which technical and regulatory constraints, objectives/values of stakeholders with different interests, as well as skills and knowledge of the professionals involved coexist.

The pilot case study has been developed by 90 students of the Master in Landscape and Sustainability Architecture (Politecnico of Milan, Campus of Piacenza) divided into eleven project teams. The results of the experiment underline how values have helped the design process by expanding the domain of design alternatives. Moreover, the innovativeness of the work is given by the effort of combining different evaluation techniques within a hybrid practical value model (Keeney and von Winterfeldt, 2007) adjusted on the peculiar features of the decision problem being faced, the time available for the process and the skills of the decision analysts who have managed the process.

The paper is divided into five main sections. After the introduction, the first section is focused on the VFT approach, that has been adapted to support a design process within a multi-methodological analytical framework, as it is described in section two. The third part provides an overview of the case study, whose results are discussed in the fourth section. The last section aims to sum up conclusions and to draw possible future research challenges in this field.

2. THE VALUE-FOCUSED THINKING APPROACH

The VFT is an approach able to guide the DMs in several phases of the process, from the elicitation of the objectives to the identification of the most suitable alternatives. The approach is developed as a process, which consists of four main phases, whose purpose is to improve the current state (Keeney, 1996):

1. identifying objectives;
2. structuring objective;
3. creating alternatives;
4. identifying decision opportunities.

For the aim of the research a literature review has been performed in order to understand in which fields the approach has been mostly applied. First of all, the keyword "Value-Focused Thinking" has been used and 175 papers have been found out, both operational and theoretical. After that a filter has been applied adding the keywords "case study" or "application" trying to narrow it down and resulting in 55 documents. Analyzing the subject area of investigation and looking at graph (Fig. 1) it is clear how most of the papers belongs to the Decision Sciences field, Business, Management and Accounting, Computer Science and Social Sciences.

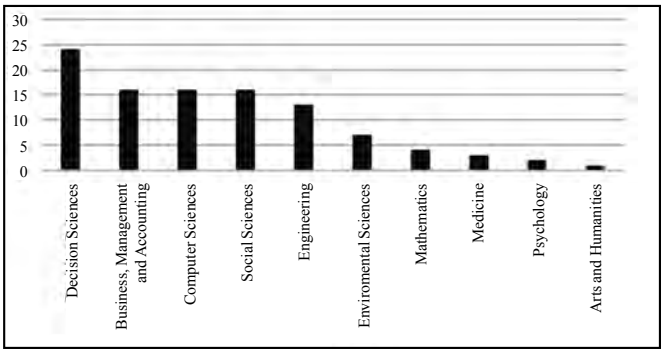

Figure 1 - *Subject areas that apply the VFT approach*

From the total number of papers only five (9% of the total) are focused in solving problems belonging to the urban planning and design field.

In 2003 and 2004 Hassan adapted the VFT to the building construction field to fulfil environmental requirements of building standards. Johnson (2005), as well as Trousdale and Nelms (2009) used the potential of the VFT to solve location problems.

Recently Alencar et al. (2017) involved the method for addressing projects to sustainability principles. .

From this analysis, it is possible to highlight the following important issues:

1. according to the keywords used for the research in the Scopus database, there are no studies dealing with the creation and evaluation of competing design alternatives at the urban scale;
2. most of the papers applies the VFT only for one specific step of the decision process;
3. in many cases the VFT has been combined with the Multi-Criteria Analysis (MCA).

3. MULTI-METHODOLOGICAL ANALYTICAL FRAMEWORK

Given these premises, the VFT has been considered for generating alternatives for the planning and design process. The Figure 2 describes the hybrid practical value model that has been defined by combining the steps of the VFT

procedure within different techniques. The creation of alternatives is supported by three specific steps according to a cyclical notion of evaluation.

The starting point of the evaluation cycle (Step 1) is the definition of values, that has been based on two side evaluation techniques: the S.W.O.T. Analysis (Kotler, 2001; Bottero, 2015) and the Stakeholder Analysis (Dente, 2014; Bourne, 2009; Dell'Ovo et al., 2017). Respectively, the first technique aims at defining development strategies according to the valorization of the strengths, the mitigation of the weaknesses (endogenous factors), in the light of the opportunities and threats (exogenous factors), and the second one maps the stakeholders and their interest/power, considering their involvement in the future of the area (Oppio et al., 2018; Sdino et al., 2018).

These two techniques have been used simultaneously to stimulate the identification of a *Wish list* (Keeney, 1992) that has been secondly reviewed and expanded on the basis of the results obtained from the analysis previously performed.

These outputs become inputs for the Step 2 since they support the identification of decision opportunities. Finally, the alternatives are created by combining the strategies (Step 3). Different combinations result in different alternatives. Higher is the set of strategies, higher the number of possible alternatives and then higher the probability to create alternatives of high quality and able to satisfy stakeholders involved.

At the end of Step 3, it is possible to proceed with the evaluation phase or, if the alternatives generated are not satisfactory, the process can start again from Step 2

The approach appears both flexible and iterative. Its cyclic nature allows to improve the overall quality of the final output (Munda, 2004) through repeating main stages as many times as it is required. This feature is fully integrated in the planning and design process from the beginning, thus supporting in producing knowledges along the whole process.

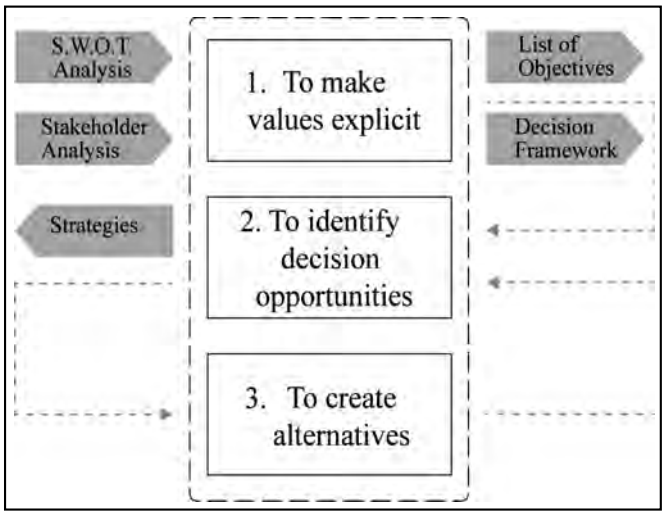

Figure 2 - *Flow chart of the Multi-Methodological approach Case study*

4. CASE STUDY

The multi-methodological approach has been applied to support the design process carried out by 11 teams called to design a Winery and an Art museum in a site located in the Foz do Tua village (Portugal) within an Architectural Design Studio course at Politecnico of Milano.

4.1 Project site

The project site is located in Foz do Tua, a small village in the Bragança district in the Northern part of Portugal (Fig. 3). The area under investigation is part of the Douro Valley, it faces the Douro river and it belongs to the Alto Douro Wine Region, included into the UNESCO's World Heritage List from 2001. Nevertheless the presence of a train station along the Tua line, the railway has been disused from the 2008 making the area under investigation difficult to be reached.

Actually nearby the area there are few services, such as some restaurants and hotels, and even if it is surrounded by a natural landscape with a high level of biodiversity, terraced vineyards and different natural elements, it lacks of sense of identity as well as of interesting places capable of stimulating processes of economic and social regeneration at the local level.

The project aims to develop a Winery that should be shared by several producers and an Art Museum, close to the Douro River.

Figure 3 - *Location of the project site*

4.2 Application of the Multi-Methodological approach

In this section the Multi-Methodological approach previously explained (Fig. 2) has been applied on the case study with the aim of addressing the development of the Tua area towards the achievement of environmental, social and economic sustainability goals. In order to support the design process from the early beginnings as described in the previous section, the evaluation activities have been structured according to the following three main phases:

1. To make values explicit;
2. To identify decision opportunities;
3. To create alternatives.

4.2.1 To make values explicit

4.2.1.1 Input

This phase consists in different analysis aimed to identify relevant objectives according both to the peculiarities of the

context and to the stakeholders' expectations.

According to the S.W.O.T. Analysis framework, the investigation of Strengths, Weaknesses, Opportunities and Threats of the site and the context has allowed to better understand which criticalities of the area should be minimized and at the same time which of the potentials have to be boosted. Consistently with the multidimensional notion of sustainability (Nijkamp et al., 1993; Forte et al., 2003a; 2003b; Cerreta and Salzano, 2009; Del Giudice et al., 2014; Sdino et al., 2016; Bassi et al., 2019), six thematic areas have been investigated: Functional; Environmental; Economic; Institutional; Social and Technological. Since they are connected, it is important to consider possible interferences in order to define strategies of intervention.

In Table 1 the most important results emerging from the S.W.O.T. Analysis have been underlined.

The second input for eliciting objectives consists in ana-

Table 1 - *Results of the S.W.O.T Analysis*

Thematic area	S.W.O.T.	Description
Functional	Strengths	Presence of railway infrastructure and proximity to a docking platform on the river.
	Weaknesses	Limited accessibility, distance to the main important cities of the country and bad conditions of existing buildings.
	Opportunities	Closeness to the international airport Francisco Sa Carneiro, to three different highways and to two dams.
	Threats	Presence of abandoned buildings and lack of attractions.
Environmental	Strengths	Presence of the Douro river, green areas and high level of biodiversity.
	Weaknesses	Potential landslides and lack of relationship among different natural elements.
	Opportunities	Presence of public policies aimed to promote sustainable development.
	Threats	Presence of the dam that causes a negative visual impact.
Economic	Strengths	Extensive wine production in the Douro valley.
	Weaknesses	Lack and degradation of existing commercial buildings and services.
	Opportunities	Tourist attractions in the surrounding area.
	Threats	Lack of accommodation and tourist facilities.
Institutional	Strengths	Part of the Region is classified in the UNESCO's World Heritage List.
	Weaknesses	Lack of communication and coordination among different parties that operate in the area.
	Opportunities	Promotion of tourist attractiveness.
	Threats	Economic crisis in Portugal.
Social	Strengths	Widespread presence of cultural and architectural heritage.
	Weaknesses	Low educational levels and lack of new job opportunities.
	Opportunities	Presence of available areas to implement and promote activities and social interaction.
	Threats	Depopulation of the Region during the months in which there is no wine production.
Technological	Strengths	Strong local identity.
	Weaknesses	Weak communication about the production of Port wine in the Douro Valley.
	Opportunities	Relevance of Port wine in the world.
	Threats	Lack of educational activities on the territory aimed at promoting development and knowledge about the production of Port wine.

lyzing the stakeholders' preferences. The exploration of both direct and indirect interest within the decision problem is preparatory to the design process, as it allows to satisfy stakeholders' needs and expectations previously elicited. Thus, the Stakeholder Analysis has been carried out mainly in two phases. The first phase concerns the identification of stakeholders involved with a brief description and a classification according to the category and the resources they move (Dente 2014), the scale of action, as well as the role they play (Table 2). The second phase consists in the organization of stakeholders identified according to their level of power and interest. The power/interest matrix (Mendelow, 1991) has allowed to understand the strategic relevance of their participation in the project. *High level of interest and high level of power* correspond to a *key player*, *high interest* and *low power* to a *keep informed* stakeholder, *low interest* and *high pow*er and *low interest* and *low power* respectively correspond to a *keep satisfied* and to a *minimal effort* one. Through this categorization, it has been easy to prioritize which expectations are more strategic to be satisfied (Fig. 4).

Table 2 - *Stakeholders analysis*

Stakeholders	Type of Actors	Action Scale	Resources	Needs and Expectations	Position
Municipality of Carrazeda de Ansiaes	Political	Local	Political	Improvement in tourism, overall image of the city and tax revenues.	To encourage the development of the site as a key project for Foz do Tua.
Local Chamber of Commerce	Political	Local	Political	Improvement of existing businesses and opportunities for new ones.	To promote the development of the project as a catalyst of the area.
Ministro do Planeamento e Infraestruturas	Bureaucratic	National	Legal	Preservation and upgrade of the existing train and road infrastructure.	To improve public transports and design new infrastructures.
Institute of Douro and Port Wine (IVDP)	Bureaucratic	National	Legal	Improvement of the local producers of wine.	To preserve the local identity, the new project must not damage the existing heritage but promote it.
Ministerio da Cultura (Ministry of Culture)	Bureaucratic	National	Legal	Art museum for the promotion of Portuguese plastic artists.	To promote the culture and arts in the region.
Investors	Special Interest	Local	Economic	Profit and sustainable development of the community.	To promote the profitability of the intervention.
Inhabitants of Foz do Tua	Special Interest	Local	Political	Improvement of Foz do Tua external image. High quality public spaces. Preservation of the peaceful ambience.	To encourage the development of an attractive and sustainable area.
Community Winery Producers	Special Interest	Regional	Economic	Profit and improvement of the environmental quality.	To promote the profitability of the intervention.
Local Businesses and Manufacturers	Special Interest	Local	Political	Profit, improvement of the environmental quality and the wine production.	
Artists	Special Interest	International	Cognitive	Exhibitions spaces.	To implement the presence of well-equipped exhibition sites.
United Nations Educational, Scientific and Cultural Organization	General Interest	International	Economic	Fulfillment of all of the recommendations and guidelines for the preservation and development of the valley.	To protect the Douro's Valley natural landscape heritage.

Table 2 - *Stakeholders analysis*

Stakeholders	Type of Actors	Action Scale	Resources	Needs and Expectations	Position
Tourists	General Interest	International	Economic	Variety of experiences in wine production, art installations and natural landscape.	To implement the tourist facilities in the Douro Valley.
Turismo de Portugal I.P.	General Interest	National	Legal	Increase in national and international visitors to Douro region.	To promote the project as a keystone for the development of the area.
Associacao Portuguesa dos Arquitectos Paisagistas APAP	General Interest	National	Cognitive	Preservation and development of the landscape.	To guarantee the correct approach in the landscape transformation.
Ordem dos Arquitectos	General Interest	National	Cognitive	Promoting the profession of architect through the good practice.	To guarantee the correct exercise of the architectural profession.
Architects	Expert	Local	Cognitive	Increasing profits through practice and knowledge exchange.	To develop a project able to solve the major issues identified and have a monetary return from the exchange of their cognitive resources.
Enologists	Expert	Local	Cognitive	Increasing profits through practice and knowledge exchange.	
Engineers	Expert	Local	Cognitive	Increasing profits through practice and knowledge exchange.	

Figure 4 - *Power/interest matrix*

4.2.1.2 Output

Once understood the decision context, through the previous analysis, in order to identify relevant objectives and model it, a series of questionnaires have been submitted to each design team asking key questions about the development of a sustainable project in a site located in the Foz do Tua village (Portugal).

The interaction among the teams has helped to underline more in deep, both positive and negative features of the area, by recognizing the priority instances on which it is necessary to intervene.

The experimentation of the VFT approach with the students has required an introduction on the key concepts, the definition of a first *Wish List* through the explanation of objectives/values relevant for the design according to the sustainability principles and the subsequent review of the *Wish List* on the basis of the results obtained from the S.W.O.T. and the Stakeholders Analysis.

The third phase involved the translation of Values as Objectives. After that, teams have been asked to share their own list, and after a unique objective list has been obtained, by merging results of each group and through a deep investigation of the results emerged.

To switch from the Objective list to the overall Decision framework it has been necessary to structure the decision problem. Thus, fundamental objectives and means objectives have been defined and their connections drawn.

The final evaluation framework and the overall process to obtain it are described respectively by Table 3 and Figure 5. Design teams have recognized as fundamental objectives the six dimensions investigated during the S.W.O.T. Analysis since they cover the main sustainability issues.

4.2.2 To identify decision opportunities

The definition of a shared evaluation framework and the analysis previously performed has allowed to define a set of strategies able to implement Strengths, minimize Weaknesses, take advantage by the Opportunities and solve Threats. The strategies have addressed the process of alternatives designing and they have been defined with respect to stakeholders' expectations, criticalities and potentials (Table 4). With regards to the results of this phase, the quality of the design alternatives defined, strongly depends on the consideration of the values and on the interpretation of the results of the S.W.O.T. and of the Stakeholder Analysis, based on the knowledge and on the relationships among data of different nature that can be considered as a sort of invisible technology (Sinopoli, 2002) that allows to finalize the design phase. In this sense, the process thus outlined is consistent with the choice to experiment the VFT approach (Keeney, 1996; Siebert and Keeney, 2015), rather than the more traditional AFT (Alternative-Focused Thinking) approach.

Table 4 shows some of the strategies identified and then combined in order to create alternatives.

4.2.3 To create alternatives

Based on the previous analysis and the subsequent strategies, each team defined its own design alternative (Tab. 5; Fig. 6) with respect to a mixed functional program (winery: 2,000 sqm; art museum: 2,200 smq; parking: 1,000 sqm).

Considering Table 5, most of the alternatives proposed aims to strengthen the environmental dimension since the site project is included into the UNESCO's World Heritage List and the area has to be preserved. Another important strategy considered as a priority by the 11 teams concerns the implementation of accessibility since, how already described, the existing infrastructures are in bad condition. On the side of not tangible aspects, tourism attraction plays a crucial role.

4.3 Multi-Criteria Analysis

A Multi-Criteria Analysis (MCA) has been performed to rank the 11 projects from the most to the least sustainable according to the set of objectives identified by the VFT approach. Each alternative has been analyzed according to the unit of measurement selected and a performance matrix

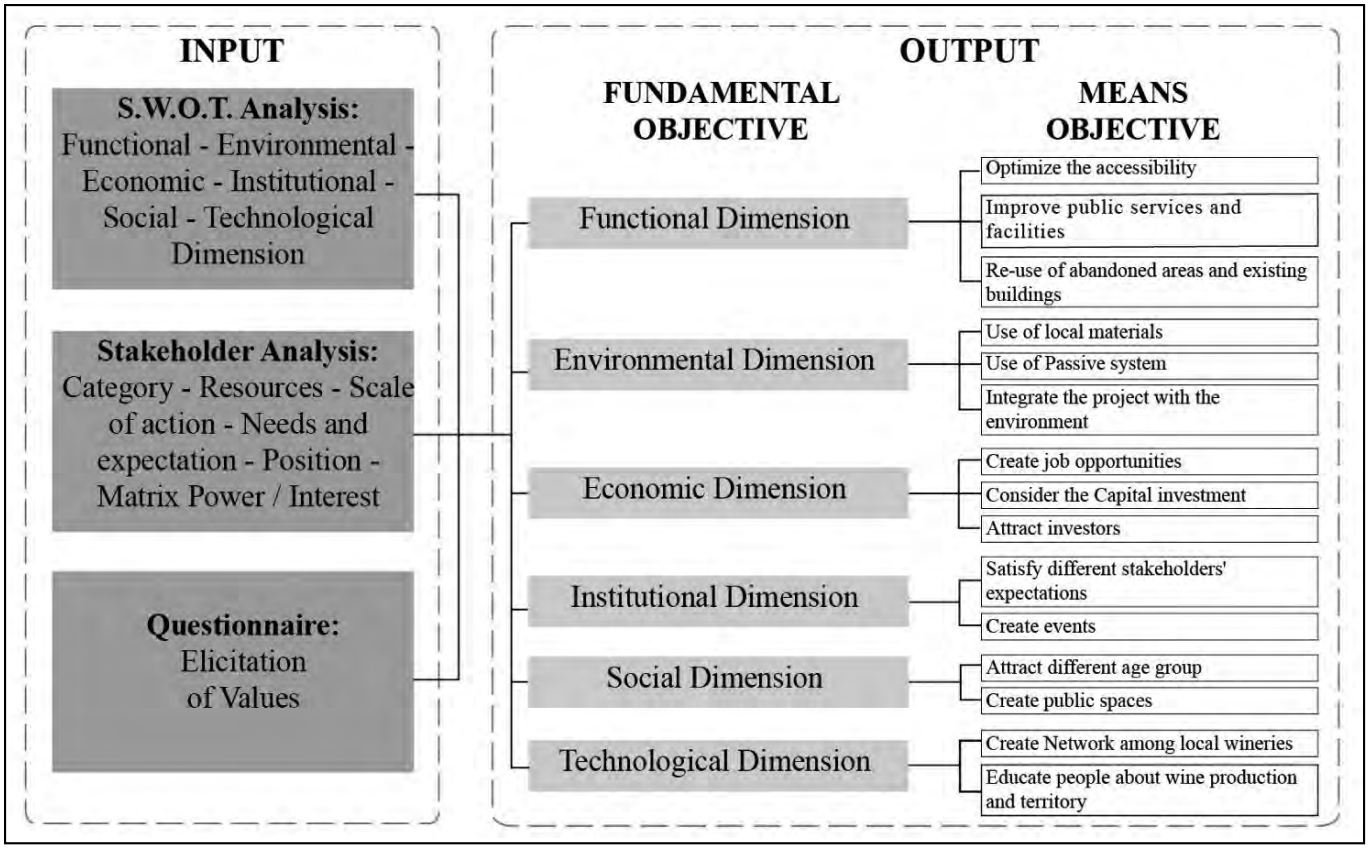

Figure 5 - *The process for structuring the decision problem*

Table 3 - *The overall decision framework*

Fundamental objectives	Means objectives	Description	U.M.	Direction of preference
Functional dimension	Optimize the accessibility	Pedestrian path along the project	meter	Maximize
	Improve public services and facilities	New public services infrastructure	sqm	Maximize
	Re-use of abandoned areas and existing buildings	Reuse of existing buildings	sqm	Maximize
Environmental dimension	Use of local materials	Reuse of local materials	low/medium/high	Maximize
	Use of Passive system	Use of passive technologies, compact shape, orientation of the building	low/medium/high	Maximize
	Integrate the project with the environment (topography - landscape)	Connections between the project site and the river	sqm	Maximize
Economic dimension	Create job opportunities	New potential positions	n°	Maximize
	Consider the Capital investment	Related to the GFA, n° of floor underground and sqm of landscape	low/medium/high	Minimize
	Attract investors	Activities able to attract investors	n°	Maximize
Institutional dimension	Satisfy different stakeholders' expectations	Stakeholder satisfaction (n° of categories)	(1-5)	Maximize
	Create events	Areas designed to host entertainment activities (concert, vernissage, etc.)	sqm	Maximize
Social dimension	Attract different age group	Diversity of activities involving different age groups	low/medium/high	Maximize
	Create public spaces	Outdoor public spaces	sqm	Maximize
Technological dimension	Create Network among local wineries	Activities or space designed to involve local wineries	y/n	Maximize
	Educate people about wine and territory	Spots for advertising	n°	Maximize

resulted from the investigation. Since there were no thresholds to respect or prescriptive criteria, a compensatory model has been used and in particular the Weighted Sum Model (WSM):

$$A = \sum WiXi \quad (1)$$

where:

A =alternatives represents its suitability in the final rank;

Wi = is the normalized weight of i-th objective;

Xi = is the standardized score (Fishburn, 1967).

The Definite Software (Janssen et al., 2000) has supported the process according to the traditional steps of MCA:

1. Problem definition;

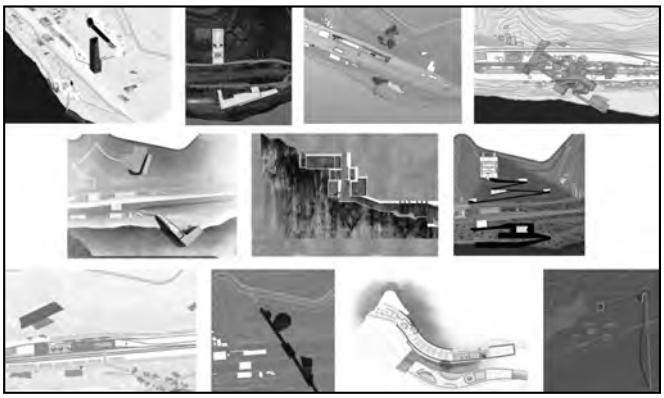

Figure 6 - *Design alternatives*

Table 4 - *Strategies*

Decision	Opportunities
1. To design recreational activities.	14. To design commercial activities for the sale of Port wine.
2. To connect the two banks of the river.	15. To start a sustainable development with low impact on the environment.
3. To promote the soft mobility.	16. To preserve the environmental and cultural heritage present in the territory.
4. To design a sightseeing place.	17. To facilitate the access for elderly and disabled people in all the site
5. To create routs in the vineyards.	18. To create accommodations for visitors inside the site.
6. To design gathering and public spaces.	19. To manage job opportunities for local people.
7. To create parking in proximity to the area.	20. To enhance the condition of the train station's existing buildings and their efficiency.
8. To improve the accessibility to the site.	21. To create and improve the infrastructure conditions.
9. To take advantage from the train station.	22. To improve the connections between Foz do Tua and Oporto.
10. To promote education about the production of Port wine.	23. To improve river access.
11. To design tourist facilities (information & welcome point).	24. To promote private investments in tourism and hospitality sector.
12. To design areas equipped for festivals and events.	25. To propose a multi-functional program.
13. To design areas for wine tasting.	26. To guarantee the fulfilment of the green polices adopted by the industries.

2. Performance evaluation;
3. Standardization (Tab. 6);
4. Weighting through the direct allocation. Each group assigned his own preference by allocating 100 points among the criteria available and considering their influence in achieving the final aim. Afterwards the average has been calculated to obtain the final weight (Fig. 7 and Tab. 7);
5. Ranking (Fig. 8);
6. Sensitivity Analysis (Fig. 8a; 8b).

5. DISCUSSION OF THE RESULTS

Figure 7 clearly shows that there is one alternative significantly more suitable than the others. In fact, while Team 10 ranks with on overall score of 82%, all the other groups have a slight difference one from the other, from 59% (second place) to 43% (last place).

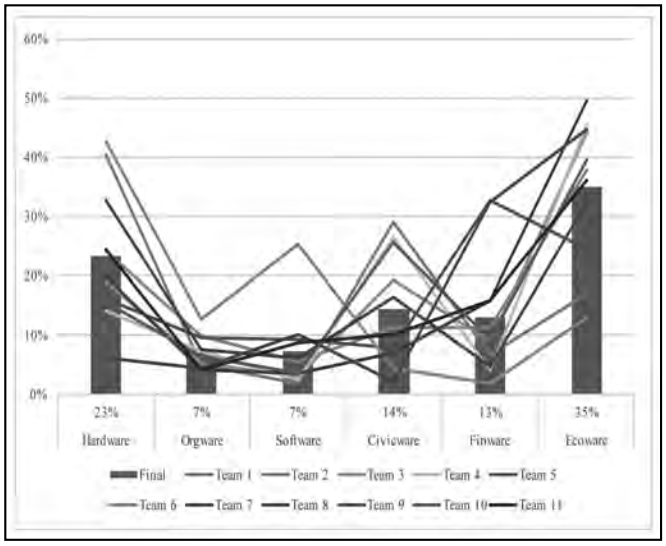

Figura 7 - *Final and partial weight assignment*

Table 5 - *Description of the alternatives identified*

Alternatives	Description
1. Landmark	Creation of a landmark. The objective has been achieved developing the project in two directions: vertical and horizontal. It was in fact created a connection among three existing levels: hills, train station and the river.
2. Dialogue with nature	Connection and dialogue with nature. The objective has been achieved by working both vertically and horizontally through the respect of the existing topography and the design of indoor and outdoor spaces.
3. Vertical axis	Dialogue with the river. The objective has been achieved by improving the existing accessibility, connecting the hill with the river through the design of a vertical pedestrian axis in order to promote the soft mobility.
4. Widespread village	Visual and real connection. The objective has been achieved by creating a small permeable village connected to the existing villages with the aim of improving the economic and social dimension.
5. Topographical connections	Revitalization through accessibility. The objective has been achieved by improving the accessibility and taking advantage by the existing topography, exploiting the station that is currently disused and creating new routes.
6. Underground connections	Culture and nature. The objective has been achieved by integrating the project with the surrounding landscape and improving the view over the valley through the design of terraces.
7. Climbing platforms	Internal and external accessibility. The objective has been achieved by creating climbing platforms to maximize the integration of the project with the surrounding landscape starting from the level of the river. Internal routes have also been created to improve the accessibility for all users.
8. Functional and perceptual integration	Accessibility, topography and vision. The goal has been achieved by reorganizing the existing accessibility, integrating the project with the topography through the creation of underground and non-underground volumes and creating terraces to improve the view over the valley.
9. Environmental and technological trade-off	Integration between natural and built environment. The objective has been achieved by paying particular attention to the environmental and technological dimension, preserving natural resources through the use of passive systems and through the implementation of activities to involve local wineries.
10. Topographical curves	Integration of the project with the surrounding landscape. The objective has been achieved by emphasizing the morphology of the buildings for a greater integration with the existing topography and improving the accessibility.
11. Perceptual approach	Synergistic system. The objective has been achieved by strengthening the visual impact with particular attention to the functional and technological dimension. The volumes of the buildings have been designed highlighting the relationship with the surrounding landscape and creating physical connections between them.

The partial rankings explain the reasons of the dominant position of Team 10 proposal, since it keeps the first place for the most important thematic area (Environmental dimension) and still the first or the second one for the others. The only exception can be underlined for the Economic dimension in fact, the project does not strengthen this aspect.

These results are confirmed also by performing a sensitivity analysis with a 30% of uncertainty to the scores and to the weights, considered as maximum percentage of error acceptable for this kind of project. While the position of the other alternatives is variable, Team 10 proposal has obtained the 100% of probability to rank at the first place (Fig. 8a; 8b). The sensitivity analysis has been performed in order to validate the rank obtained and to check its internal robustness. Reading the degree of probability in Figure 9a and 9b, the stability of Team 10 is confirmed and it is possible to affirm that is the most performing alternative considering the defined framework. From the graph, moreover, the variability of the other alternatives has been detected.

Table 6 - *Standardized performance matrix*

FUNDAMENTAL OBJETIVIES	MEANS OBJECTIVES	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8	Team 9	Team 10	Team 11
Functional dimension	Maximize Accessibility	0,48	0,36	0,70	0,82	0,28	0,59	0,58	0,29	0,51	1,00	0,99
	Improve Public services and facilities	1,00	0,01	0,21	0,38	0,33	0,27	0,88	0,05	0,35	0,23	0,76
	Re-use of abandoned areas and existing buildings	0,40	0,02	0,11	0,16	0,04	0,00	0,20	1,00	0,00	0,31	0,00
Environmental dimension	Use of local materials	0,50	0,50	0,50	0,50	1,00	0,50	0,00	0,50	1,00	1,00	0,50
	Use of Passive system	0,50	1,00	0,50	0,50	1,00	1,00	0,50	0,50	0,50	1,00	1,00
	Integrate the project with the environment (topography - landscape)	0,49	0,33	0,21	0,35	0,33	0,30	0,75	0,25	-	0,46	0,17
Economic dimension	Create job opportunities	0,50	0,29	0,42	0,58	0,42	1,00	0,54	0,17	0,30	0,00	0,29
	Consider the Capital investment	0,00	0,50	0,00	1,00	1,00	0,00	0,00	0,50	0,50	0,60	0,50
	Attract investors	0,30	0,50	0,70	0,60	0,50	0,30	1,00	0,40	0,40	1,00	0,20
Institutional dimension	Satisfy different stakeholders' expectations	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,75
	Create events	0,33	0,26	0,10	0,16	0,25	0,33	0,20	0,09	0,14	1,00	0,02
Social dimension	Attract different age group	0,50	0,50	1,00	1,00	1,00	1,00	0,50	1,00	0,50	1,00	1,00
	Create public spaces	0,97	0,39	0,09	0,70	0,15	0,17	0,46	0,42	0,00	1,00	0,03
Technological dimension	Create Network among local wineries	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	Educate people about wine production and territory	0,50	0,75	0,20	0,50	0,25	0,10	0,30	0,30	0,15	0,25	1,00

6. CONCLUSIONS

The present research proposes a multi-methodological analytical framework for the generation of alternatives able to support the decision-making process in the field of urban planning and design.

The process and the results obtained highlight some aspects of adopting the VFT approach in the design phase:

1. the S.W.O.T. Analysis allowed to identify potentialities and criticalities of the project area and of the context;
2. the analysis of needs and expectations of the stakeholders involved in the process as well as their roles, facilitates to recognize how they influence the development of a project and which are the values/objectives emerging from their vision and preferences;
3. the elicitation of objectives/values as starting point phase has allowed the 11 project teams to point out strategies for framing the design of their alternatives. Passing from the preliminary identification of the values – *Wish list* – to the following development options, carried out on the basis of the results of the S.W.OT. and of the Stakeholder Analysis, it has been possible to expand the system of objectives/values of almost 10%, from which follows an increase of the domain of alternatives;
4. all teams have joined and contributed in equal measure to the identification of the final value tree. The role of the

Table 7 - *Objectives weight elicitation*

Fundamental objectives	Weights (C)	Means objectives	Weights (I)
Functional dimension	23%	Optimize the accessibility	53%
		Improve public services and facilities	33%
		Re-use of abandoned areas and existing buildings	14%
Environmental dimension	35%	Use of local materials	25%
		Use of Passive system	21%
		Integrate the project with the environment	53%
Economic dimension	13%	Create job opportunities	34%
		Consider the Capital investment	23%
		Attract investors	43%
Institutional dimension	7%	Satisfy different stakeholders' expectations	55%
		Create events	45%
Social dimension	14%	Attract different age group	44%
		Create public spaces	56%
Technological dimension	7%	Create Network among local wineries	56%
		Educate people about wine and territory	44%

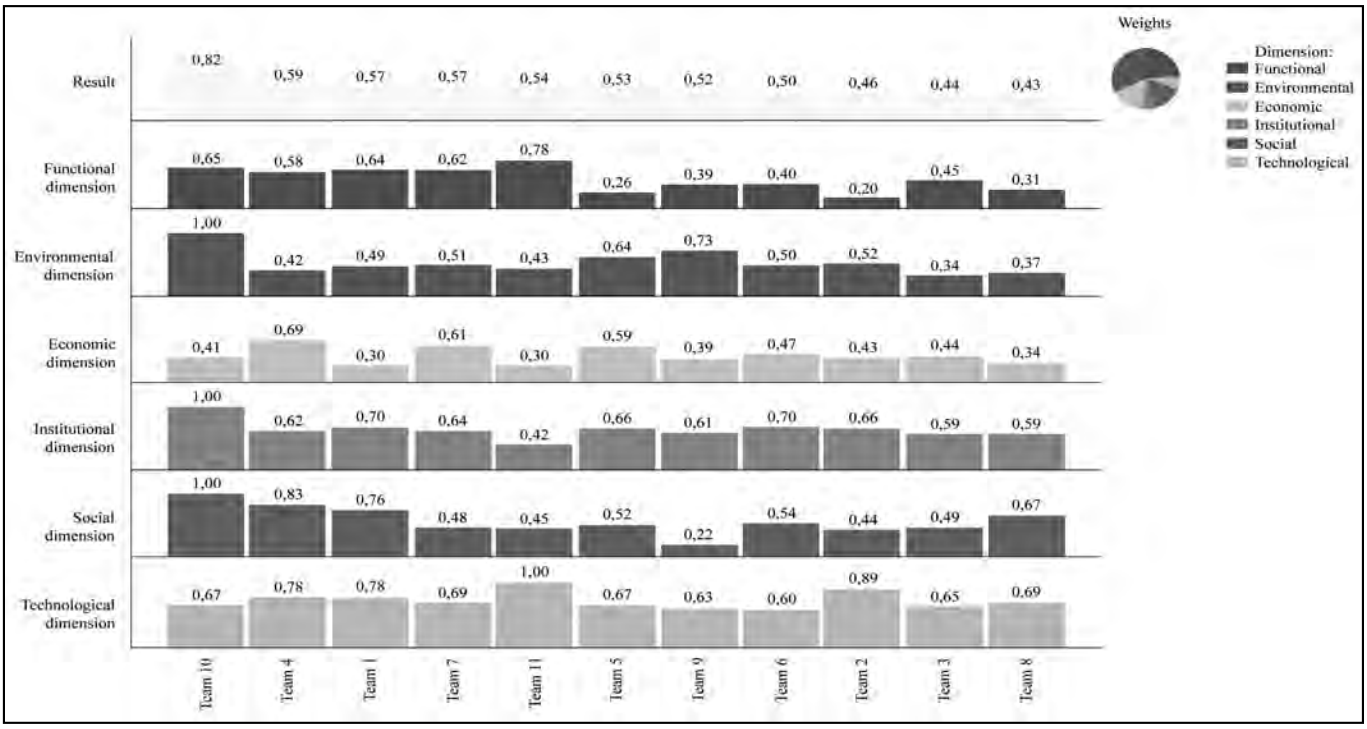

Figure 8 - *Final and partial ranking*

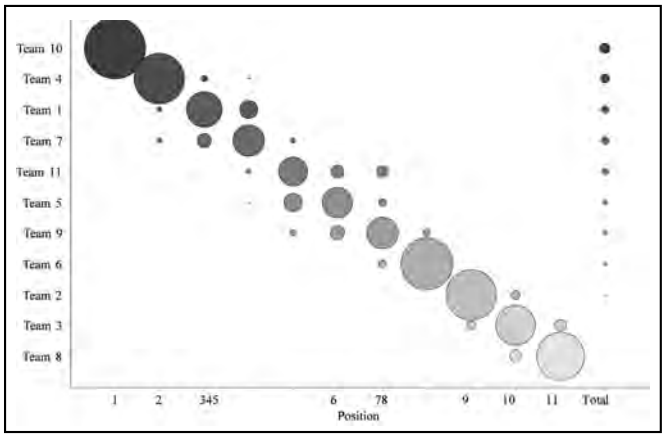

Figure 9a - *Sensitivity Analysis. 30% weight uncertainty*

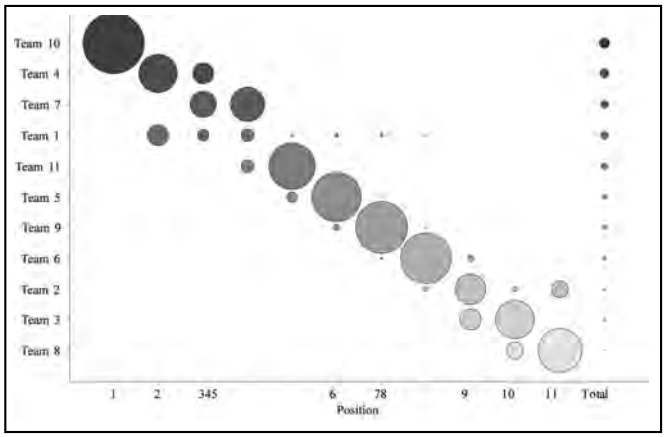

Figura 9b - *Sensitivity Analysis. 30% score uncertainty*

analyst has been necessary in this step in order to avoid redundancy and double counting;

5. the definition of strategies, based on the objectives previously described, has enhanced the creation of new alternatives through their combination.

The development of thus defined must therefore be considered as potential actions (Roy, 2005), which are likely to evolve during the decision-making process, and in particular as a result of the knowledge generated in the context of preliminary analyses and from the interaction with stakeholders.

Shifting the focus from an alternative-based approach, where the role that the evaluation plays is limited to choosing the most satisfactory alternative, to a value-based approach, in which instead evaluation plays a leading role in the whole process, starting from objectives' identification and modeling, has been essential to generate robust design alternatives. The iterative and flexible nature of the multi-methodological approach proposed in this study, in addition to increase the awareness about objectives and values elicited by stakeholders, is conceived as a support to the design phase according to a heuristic perspective, thus addressing the quality of the project towards the direction recently suggested by Fattinnanzi et al. (2018).

Finally, it is relevant to point out how the evaluation of design alternatives based on a deep reflection and explanation of values can find an operational dimension in design competitions, widely recognized as an essential tool for improving the quality of plans and projects.

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