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Co-creation of Alternative Futures Using Technologies of Geoinformation Structured in a Geodesign Method: Contributions to the State-of-the-Art

Co-creazione di Scenari Alternativi Utilizzando Tecnologie di Geoinformazione Secondo l'Approccio del Geodesign: Contributi per lo State-of-the-Art

Although community engagement is increasingly supported by the evolution of technologies, which are becoming more accessible to a larger number of people, democratised planning practices are yet struggling to emerge and be included in common practices. Future approaches urgently need to be based on innovative and comprehensive action-oriented processes. The paper is a literature review that synthesises and gathers the bulk of the turning points, which led to radical paradigm shifts for planners and designers. It illustrates approaches based on technologies of geoinformation and web-based tools, such as Geodesign, that give support to opinion and decision-making processes of co-creation and co-design of alternative futures, while highlighting potentials and critics, pushing towards more democratized practices in the real-world projects.

Sebbene il coinvolgimento della comunità sia sempre più supportato dall'evoluzione delle tecnologie rese accessibili ad un maggiore numero di persone, l'attuazione di processi democratici partecipativi fanno ancora fatica ad emergere come pratiche comuni all'interno dei processi di pianificazione odierni. È necessario dunque basare i futuri approcci della pianificazione su processi innovativi. L'articolo si prefigge di sintetizzare e riassumere la maggior parte dei cambiamenti di paradigma per progettisti e designer. Il documento tratta l'evoluzione di vari approcci basati su tecnologie di geoinformazione e strumenti web-based come Geodesign, capaci di supportare la co-creazione ed il co-design nei processi decisionali per scenari alternativi, evidenziando potenzialità e criticità, e spingendo verso pratiche più democratiche.

Keywords:
Co-creation; Geodesign; Collaborative Decision-making processes.
Parole chiave:
Co-creazione, Geodesign, Processi decisionali collaborativi.

1. INTRODUCTION

For managing the increasing complexity of the territorial socio-economic systems, urban planning was institutionalised in the late 19th century mainly starting from the western industrialised nations, and since then, it sprawled as a function of government worldwide. Its functions are exercised at national, regional, metropolitan, city, district and neighbourhood management levels.

However, planning refers to a much wider set of community groups characterised by different localised interests and concerns, instead of limiting it to only these institutional entities. Therefore, the traditional role of planning is constantly evolving towards the development of the ability to involve any functions and actors which have a spatial effect, interest and/or concern, on the territory in terms of location and mobility.

Since traditional approaches were no longer relevant, being unable to address complex conflicting challenges, planning values and practices evolved towards the embracing of new perspectives. As the urban and regional planning changed nature shifting from exclusive for professionals to more inclusive and collaborative process, so the tools supporting it should.

Yet, in order to understand how the use of computers is affecting spatial planning and design, it may be useful to consider the influence of technology on contemporary cartography. Computer-based tools become crucial in order to assist and facilitate knowledge and capacity building, enhance collaboration among all actors involved and support the decision-making process towards a final consensus.

In fact, due to the necessity of overcoming certain public participation weaknesses such as the low influential capabilities of the community, the sprawling of the Internet to the public audience, boosted both first and second-generation tools to come in quick succession, having the common point of the geo-visualisation, which enables an advanced way of community involvement, much more adaptable and inclusive.

The society is, therefore, embracing a new paradigm focused on establishing a new era of co-creation, co-design, giving support to both opinion-making and decision-making.Achieving co-creation and co-design requires citizens to inter-actively engage themselves in order to claim and protect their localised interests, while planners and designers should mediate towards the maximisation of consensus.

Indeed, smart cities should be planned through smart decision-making processes, which are characterised by robust, transparent and truly public participatory and inclusive patterns. In order to successfully accomplish the goal, multi-level governance must be empowered with more comprehensive tools and flexible frameworks. The Geodesign approach is one of the possible existing methodology able to serve the cause.

In few words, Geodesign brings together planners and designers to address challenges, issues and opportunities presented by the built environment, integrating analyses of place, space, and time in multidisciplinary ways. The approach and its tools are generally used in large, complex, politically conflicting projects in their conceptual and strategic phases, providing a co-created strategy that will inform alternative futures.

In this sense, the paper aims to present a contribution to the state-of-the-art territorial planning with a particular focus on public engagement, according to the current values and possibilities widely shared by academics. These values are related to participatory decision-making processes and the search for a common language to work together, and this is possible due to technologies of geoinformation, mainly web-based.

The focus is to narrow down to the most updated and comprehensive planning approaches in relation to community participation after having contextualised the evolution of planning practices along with the technological evolution and consequent development of outgoing planning paradigms.

This contribution discusses possibilities in participation and the role of technologies of information: evolution of methods according to the evolution of new values and expectations. The new values are translated into new possibilities and methods of sharing decision, establishing a new era of co-creation, co-design, giving support to opinion making and to decision making. Finally, the study presents Geodesign as a framework to go from data creation to co-creation of alternative futures.

2. PLANNING PRACTICES SHAPED BY THE EVOLUTION OF TECHNOLOGIES

In the last 50 years, planning practices have radically evolved in terms of approaches, methods, techniques and tools. According to Batty (2008), the planning process has rapidly shifted from rigid professionalism to collective negotiation. This change in paradigm required the development of a completely new fleet of tools aimed to enable the communication and dissemination of a multitude of information and ideas embedded in the planning process. As the urban and regional planning changed nature shifting from exclusive for professionals to more inclusive and collaborative process, so should the tools that support it.

Looking back at the 1970s, cartography, a discipline which represents the media for analysis and design in planning, and in turns cartographers, have been directly influenced by other forms of expression of geographic information. As Goodchild (2000) pointed out, cartographers were terrified by the digital “virus” because they envisaged possible rebound effects of the coming cartographic practices able to spread skills in the society that, until that moment, were solely assigned to them.

The digital transition of cartography led to geographic information technology, geomatics, geoinformatics and geographic information science. The main purposes that pushed towards the new trend implementation were related to more appropriate and all-embracing spatial analysis, data exchange, creating precise calculations, simplifying map creation, reducing production costs of paper maps.

The key software that activates and drastically speed up this transition is related to Geographic Information Systems (GIS). “Geographic Information Systems, geo-relational databases, are the tabular data set related to a geometric object representing real-world objects. Systems are used to gather, store, analyse and represent data” (Hanzl, 2007, p. 290).

The GIS systems require a high level of proficiency from users, and thus, they are not the most suitable tool for planning strategies that depend on public participation (Hanzl, 2007). Hence, more group-oriented new experiments at the local scale have been started in the 1980s. Despite the fact that planning practices were slightly opening up to citizens engagement, those methods of involvement were highly criticised, merely offering to the public the right to be acknowledged, to be informed and to object (Kingston, 2002).

Meanwhile, the Internet penetrated the market in the 1990s, launching electronic information and communication services available to citizens, business and local governments. Considering that the Internet has become a part of the society quicker than any other new technologies such as television, telephone or automobile, the influence of the first-generation Internet has played a central role in individual and community development (Kingston, 2002). As stated by Pratchett (2006):

"New technologies, in whatever form, are socially and politically neutral devices and have no inevitable consequences for democracy, participation or political engagement. However, the way in which such technologies are used and the purposes to which they are put can have radical consequences for the practice of democracy. The design of particular tools and their association with existing democratic practices (and other aspects of governance) shape their value and impact, as does the way in which citizens and intermediary bodies (such as the news media, political parties and so on) adopt and use the technologies" (p. 3).

As a response to this, a vast development of various technological implementations within the field of spatial planning, have interested both academic and "real-world" projects. As Hanzl (2007) mentioned, those implementations are of various nature: from interactive 2D maps and visualisation tools to 3D models and simulation games.

Nevertheless, even though these new IT systems facilitated citizen involvement, they were built on either technologic or societal limitations, for instance, accessibility, representativeness, transparency of data, adoption of a complex language of communication and so on (Healey, 1998) (Kingston, 2002).

Due to the necessity of overcoming certain public participation weaknesses, new innovative technologies in favour of planning support systems were pushed again towards more advanced solutions. Therefore, a massive variety of software and tools based on the second-generation Internet came in quick succession. A widespread literature regarding these second-generation Internet tools has categorised and nominated the new technology systems in different ways (Figure 1).

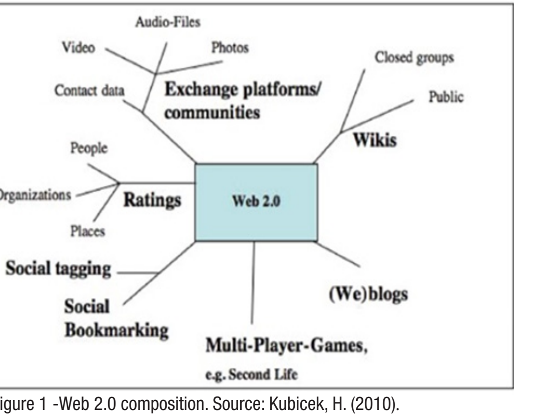

Figure 1 -Web 2.0 composition. Source: Kubicek, H. (2010).

Digital Democracy, eDemocracy, eParticipation, Participatory Planning Geographic Information Systems (PPGIS), Information and Communication Technologies (ICT), Wikies, eVoting, blogs are just a few examples of a vast classification of different tools and relevant concepts that often are grouped as Planning Support Systems (PSS) or Web 2.0.

In brief, PPGIS tools which are GIS-oriented software (as suggested by the name), denote the inclusion of usually excluded levels of the society in planning processes by employing spatial and visual tools, using them without any specific license or through simple installation of plug-ins (Kubicek, 2010) (Hanzl, 2007).

By definition as explained by Hanzl (2007) and Kubicek (2010), PSS is a general notion describing software that supports urban planning, while Web 2.0 refers to all the technological developments, which enable users to create, publish, and share new contents within the World Wide Web.

It has been pointed out that the general main goal of all the Web 2.0 software "is shifting the Web to turn into a participatory platform, in which people not only consume content (via downloading) but also contribute and produce new content (via uploading) [...] breaking the barriers between users and data-providers" (Bugs, Granell, Fonts, Huerta, Painho, 2010, p. 173).

Considering their functionalities, all the Web 2.0 and surrogate second-generation technologic systems come into place in order to be more inclusive and reach a wider audience, taking advantages of open source platforms, facilitating even further participatory practices in planning processes (Hanzl, 2007). As Hanzl (2007) pointed out, Web 2.0 and PSS enables displaying data in forms that are easy to understand by laypeople, overcoming the initial issues and technicalities, which by Pickles (1995), previously categorised GIS-based software as elitist tools. "By informing the public and allowing more in-depth feedback it can aid the decision-making process and helps to inform decision-makers of the communities view" (Kingston, 2002, p. 10). Certainly, a common point of all the software is the visualisation of data.

Lynch (1960) has initially remarked the direct relation between visualisation and individual action, as he stated: "Visual education impelling the citizen to act upon his visual world and, this action causing him to see even more acutely. A highly developed art of urban design is linked to the creation of a critical and attentive audience" (p. 120).

McCormick, DeFanti & Brown (1987) defined the science of visualisation as a relationship of images and signals, which are initially captured, consequently transformed and finally represented. "Abstraction of these visual representations can be transformed by computer vision to create symbolic representations in the form of symbols and structures" (p. 15).

Recently, the debate around existing valuable strengths and synergies between the power of visual computational techniques and the human capacity to reason and address complex space-related issues is becoming more and more animated.

One of the very first examples of space-related analysis aided by visualisation support tools has been carried out in Paris, using a cartographic map where all the cases of malaria occurred within a defined urban area. Through the visualisation of data, the researcher found out that all the cases were in proximity of water streams so that he was capable of understanding the relationship between the disease occurrences and their spatial context. Although, due to a vast complexity of territorial dynamics, heterogeneity of physical space, uncertainties, spatial and temporal scales, it is intricate for a human analyst to reason and select the most appropriate scenario in an almost unlimited variety of options. As Andrienko et al. (2007), pointed out:

"Since it is physically impossible for an analyst to review all possible scenarios, computational support is absolutely necessary [...] an isomorphic visual representation, such as a map or an orthophoto, allows a human analyst or decision-maker to perceive spatial relationship and patterns directly" (p. 842, p. 844).

Nowadays, all the theories and methods regarding visual representation revolve around the concept of geo-visualisation in general and specifically, the emerging discipline of Visual Analytics, which led to defining a sub-discipline known as Geovisual Analytics for Spatial Decision Support. The academic researchers and experts began to pose some questions concerning Geovisual Analytics for Spatial Decision Support from the GIScience conference in Münster in Germany in 2006, also supported by the Canadian International Cartographic Association (Andrienko et al., 2007)(MacEachren et al., 2004). In brief, "Geovisual Analytics for Spatial Decision Support is a research area that looks for ways to provide computer support to solving space-related decision problems through enhancing human capabilities to analyse, envision, reason and deliberate" (Andrienko et al., 2007, p. 847).

However, the domains of geo-visualisation are not only related to planning aspects but also broadened out in a variety of research areas. Public health, environmental science, molecular modelling and mathematics are just a few examples (MacEachren et al., 2004)(McCormick et al., 1987). In this picture, crisis management is one of the most relevant domain. In emergency situations, key parameters change quicker than in ordinary situations, and due to the time pressure, analysts and decision-makers do not have time to take into account all the variables, in-depth (Andrienko et al., 2007). "The cost of an error, however, may be very high. [...] Therefore, decision-support systems must provide support for distributed, shared memory along with efficient and intelligent computational and knowledge management tools that alert participants to key decision points, provide reminders about access to relevant prior information, and present and rate available options" (Andrienko et al., 2007, p. 843).

Besides, geo-visualisation tools have the potential to maintain the focus of who is observing a tangible object such as a map, avoiding different individuals to concentrate a debate on subjective or abstract matters. Nowadays, it is widely recognised that models also include elements of visions in order to better address future dynamics (Hanzl, 2007).

At this point, the shift from the technocratic paradigm to the participative one was clear and marked, opening up to innovative collaborative software. A new paradigm of social participation in planning assumes collaboration of all interested parties (Sanoff, 2000). As Hanzl (2007) observed:

"Both citizens and planners become providers and recipients of information. Such collaboration takes place in design groups and in internet systems where users are actively engaged in design process [...]. A term groupware - software for group work had been introduced for 'computer-based systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment" (p. 297).

Therefore, groupware underlines the necessity to be used by certain group work. Nowadays, a highly debated argument among professionals and researchers revolves around the Web 2.0, ICTs and PSS within the field of the e-Planning and e-Government. Wang, Song, Hamilton, & Curwell (2007) referring to the UK Planning-Service, pointed out that: "e-Planning, as a section of e-Government, can enable easy access to information, guidance and services that support and assist planning applicants, and streamlined means of sharing and exchanging information among key players" (p. 737).

After having highlighted the evolution of technologies enhancing collaborative tools for supporting public participation, how has the theoretical framework around this concept simultaneously evolved?

3. PROGRESS IN PLANNING THEORIES: FROM THE THEORY OF PUBLIC PARTICIPATION TO THE CONCEPT OF E-PARTICIPATORY PLANNING

The roots of the concept can be traced back to the Participatory Democracy Theory of Jean Jack Rousseau, through which he idealised the community participation which according to Foucault & Gordon (1980):

"It was the dream that each individual, whatever position he occupies, might be able to see the whole of the society, that means hearts should communicate, their vision be unobstructed by obstacles, and that the opinion of all reign over each" (p. 152).

As Sameh (2011) underlines, Rousseau based his theory on the citizens' involvement benefits in the decision-making process. It helps to reduce distances between citizens and power centres by enhancing the sense of political efficacy and fostering human development. Nurturing a concern for collective problems contributes to generating an active and knowledgeable citizenry, engaged at the governmental level in participating in the development of their own territory.

Moreover, Pateman (1970) has indicated that the Participatory Democracy theory tries to solve an old antithesis, between individuality and sociality, introducing the notion that public participation has a main educational purpose:

"The theory of participatory democracy is built around the central assertion that individuals and their institutions cannot be considered in isolation from one another. The existence of representative institutions at the national level is not sufficient for democracy; for maximum participation by all the people at that level socialisation, or "social training", for democracy must take place in other spheres in order that the necessary individual attitude and psychological qualities can be developed. This development takes place through the process of participation itself" (p. 41).

Arnstein (1969) has conducted one of the first attempts to criticise the participation process and its inefficiency in providing citizens with real power. She published an article titled "A Ladder of Citizen

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Participation" in which she organised the eight steps of the ladder into three levels: non-participation, tokenism and citizen power. Aside the fact that it was of great importance to trigger the debate, nowadays it is considered quite worthless because the concept has been built around the assumption that citizen control is the only and proper goal of public participation and due to the fact that it focused merely on criticising the conventional methods rather than enlightening planners on how processes can be improved.

Community participation is a widely debated and accepted concept. Yet, it is a complicated notion as there is not a specific and homogeneous definition. According to Moser (1993), the abundant range of definitions reflects the several different ways adopted to interpret the practical approach. Indeed the interpretations are based on specific fields of interest, and the number of stakeholders involved in a planning process is quite often considerable. Agencies, non-governmental organisations, governments and citizens always have conflicting objectives related to their own interests, and it is possible to notice this conflict when it comes to the practice.

Moser (1993) pointed out that contradictions between intentions on paper and the real agenda can become evident in the practice of community participation.

According to Martin, Tarr & Lockie (1992), citizen involvement can occur for the only purpose that it provides a vehicle for diverting blame for governance failure from politicians and administrators. Another reason is that politicians and government administrators consider community empowerment as directly proportional to their own loss of control (Sharp, 1992). Kweit & Kweit (1986) have observed that democratic decision-making, in contrast to bureaucratic or technocratic decision-making, is based on the assumption that all who are affected by a given decision have the right to participate in the making of that decision.

Furthermore, they have pointed out that policies can be evaluated through two criteria:

"The accessibility of the process and the responsiveness of the policy (contextualised policies built in favour of the entire community) to those who are affected by it, rather than the efficiency and rationality of the decision [...]. In a democracy, it is the public that determines where to go, and the role of its representatives and bureaucratic staff is to get them there. In other words, ends should be chosen democratically even though the means are chosen technocratically" (Kweit & Kweit, 1986, p. 25).

According to Innes & Booher (2004), the conventional practices related to public participation do not reflect the theoretical inputs and do not achieve the targeted outcomes. For instance, in public hearings, one of the most conventional methods used, citizens are put against each other and therefore forced to think in individual terms without having real power to influence the decision-making process.

As pointed out by Craig (1998), a public participation program should have the following objectives:

- Expands the public's role in defining questions and making decisions;

- Increase public involvement in generating and employ data and information;

- Create a wider public involvement of stakeholders by using computer-based approaches.

For the program in order to be efficient, Schuler (1996) argues that it should have the following characteristics:

- Unrestricted and Community-based: anyone in the community should offer his participation;

- Reciprocal: data users should even be data providers;

- Contribution-based: all the participants should contribute;

- Accessible and inexpensive: the involvement process must be free for everyone;

- Modifiable: the public participation process itself must be flexible in order to take into consideration the evolution of planning systems and software (groupware).

According to Sameh (2011), an active community engagement could enhance the sense of civic commitment among citizens, increase the final user satisfaction, create outcomes that are more realistic and be a catalyst for building trust within the governance.

Since the eight steps of Arnstein (1969) were too abstract, and her ladder was not answering to how to improve the participatory planning process, Kingston (1998), basing on a previous work conducted by Weidemann & Femers (1993), proposed a new ladder composed by six steps more related to the planning process issue (Figure 2).

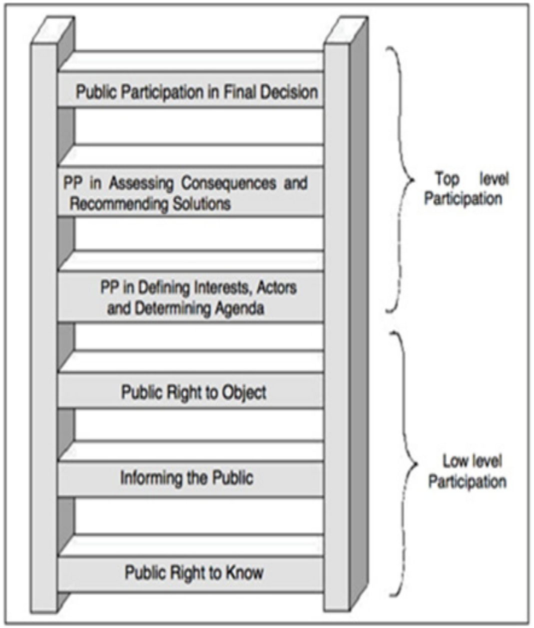

Figure 2 - The public participation ladder applied to plan according to Kingston 1998. Source: Kingston, 1998.

The lower three steps represent no real public participation while the top three define a more interactive process. In particular, only the fifth and sixth levels democratically enable the decision-making process to create responsive policies. According to the Wates (1998) report on Urban Design Group, the quality of development of the built environment is strictly related to the quality of citizen involvement: "Improving the quantity and quality of public involvement in urban design is one of the keys to improving the quality of the built environment" (p. 16).

Even though there are several methods to involve and engage citizens in the current practice and new ones continue to emerge, there is little knowledge about all the practices, and this makes planners and practitioners often adopt inappropriate approaches. Therefore, planners must define tailored programs, which are able to meet specific and contextualised goals and objectives.

As Cogan & Sharpe (1986) stated "a successful citizen participation program must be: integral to the planning process and focused on its unique needs; designed to function within available resources of time, personnel, and money; and responsive to the citizen participants" (p. 298) (Figure 3).

The "horizontal" ladder of Cogan & Sharpe divides the steps into two categories, a passive contribution to the process by the citizens opposed to an active one, which represents the highest level of citizen involvement achieved through a public partnership approach. This proposal from Cogan & Sharpe opened the rising path to the interactive approach, which assumes an active participation between the diverse groups of stakeholders involved. Moreover, it is possible to trace the foundations of the six steps ladder proposed by Kingston (1998) in the studies conducted with respect to Forest Service decisions and resource management planning by Lang (1986), who suggested that "an integrated approach to resource planning must provide for interaction with the stakeholders in the search for relevant information, shared values, consensus, and ultimately, proposed action that is both feasible and acceptable" (p. 35). Lang (1986) considers the traditional comprehensive and strategic planning processes as not sufficient for resource management planning. His suggestion is based on the assumption that interactive planning, which is made of open and participative processes, leads to better and more responsive decisions (Figure 4).

Following the call for interactive approach, a further step has been taken by Kingston (2002) as he integrated into the ladder of participation different forms of interactive technological systems (Figure 5).

The Kingston (2002) e-Participation ladder, initially rooted in the aforementioned Arnstein (1969) ladder

PUBLICITY	PUBLIC EDUCATION	PUBLIC INPUT	PUBLIC INTERACTION	PUBLIC PARTNERSHIP
Building public support	Disseminating information	Collecting information	Two-way communication	Securing advice and consent
<----------------- PASSIVE			ACTIVE------------------>	

Figure 3 - Criteria for an Effective Citizen Participation Program. Source: Cogan & Sharpe, 1986.

Interactive Planning	Conventional Planning
Includes information/feedback, consultation and negotiation	Limited information/feedback; maybe some consultation
Interaction occurs early on and throughout the planning process, with full range of stakeholders	Early interaction with implementers; affected interests not involved until late in process
Assumes that open participation leads to better decisions	Assumes that better information leads to better decisions
Planner as value-committed advocate	Planner as value-neutral expert
Focuses on mobilization of support	Focuses on manipulation of data
Plan = what we agree to do	Plan = what we should do
Success measured by achievement of agreement on action	Success measured by achievement of plan's objectives

Figure 4 - Criteria for an Effective Citizen Participation Program. Source: Cogan & Sharpe, 1986.

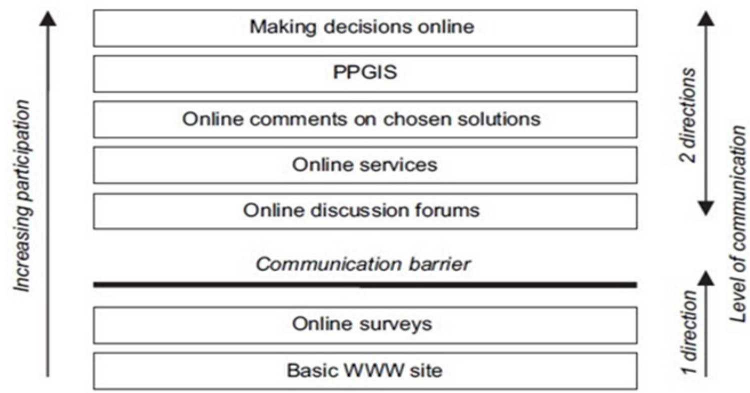

Figure 5 - The Kingston e-Participatory ladder. Source: Hanzl, 2007.

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of citizen participation and secondly, in the six-step public participation ladder (Kingston, 1998), sheds light on the possible public participation involvement according to various types of Web 2.0 and PSS. In this ladder, there are seven types of receivers and supporters of information among IT experts, professionals of planning responsible for communication of information, group of professionals with knowledge on the subject, politicians, group of citizens and stakeholders (Hanzl, 2007).

An interesting point that diversifies the e-participatory ladder from the previous ones is the crucial aspect of the level of communication, which led to reconsider the role of data providers and data users. Hypothetically, through interactive technologic systems, users become data providers. In reality, technical functions still maintain a division of data providers and data users (Hanzl, 2007). However, as mentioned before by Cogan & Sharpe (1986), technologic support for public participation has the capability of generating either passive (one-direction) or active (two-direction) level of communication.

This two-direction of communication means that users have the opportunity to directly influence the preliminary data collecting and processing along with data providers for the sake of more robust background knowledge. In other terms, "new information technology offers citizens the new possibility of participation in the planning process even though most of the PSS mentioned are still experimental" (Hanzl, 2007, p. 303). Certainly, as Hanzl (2007) pointed out, the coming Web 2.0 and PSS have to deal with three main goals:

- Provide communication platform suppressing a barrier of non-professionalism;

- Allow for distant contacts;

- Manage a participatory planning process.

The first point regards the ability of the coming PSS to be as much simplified and understandable as possible for lay people. This is a communicative improvement that reduces manipulative actions, enhancing a bottom-up approach to the expenses of a top-down one. The second aspect aims to eliminate or at least, limit the representativeness issue. While the third point, it is an obvious call for an integration of the so-called meta-planning methods in the future PSS. As Campagna (2016b) pointed out, "meta-planning can be defined as the design of the planning process" (p. 60). A list or a linear (chronologic) drawing of activities that a certain planning process will follow is a practical example of what a meta-planning method could be. It is actually the organisation and representation of all the steps composing a complete planning or design process in order to reduce confusion and give a clear picture of all the actors involved.

It is important to notice that the technological implementation together with the new planning paradigm, add greater complexity to planning practices, which demand more flexible, simplified and understandable methodologies. For this reason, the development of the future PSS should take into account also the inclusion of meta-planning methods for the sake of the entire planning process. Since the six steps ladder of Kingston, the development of efficient and comprehensive public participation programs and the support of digital technologies are not any more easily divisible. This relationship was led from a simplistic passive public participation based on a one-direction communication level to an active collaborative process organised on a two-direction level of influence.

As already largely stressed, the modern concept has been developed, among others, by Kingston (2002), which has considered the evolution of inclusive practices together with the evolution of technologies aimed at supporting participatory planning processes.

3. GEOGRAPHIC INFORMATION SYSTEMS: BASIS TO GO FROM DATA TO INFORMATION, FROM INFORMATION TO KNOWLEDGE

It is an argued debate of current society to place themselves within the so-called Age of the Information. Nowadays, the main trend in both the academic world and the public and private sectors are seeking and investing in new methods of data collection to gather as much information as possible. Nevertheless, it is a wrong belief to look at new information as an endpoint. In fact:

"Information occupies a middle stage in a process modelled on the scientific method. The starting point involves data-raw observations that have no particular value for themselves. Somehow, [...] these raw data acquire value when placed in a frame - a system of relationships among objects and assumption about those relationships" (Chrisman, 2002, p. 15).

This means that initial raw data have to be put in perspective to gather a certain value so that, knowledge can be developed further. In this context, human beings play a crucial role to activate and ensure the sequential flow, from data to information, to knowledge (Chrisman, 2002). In order to activate this process, in particular within the field of planning, a milestone passage from the analysis and elaboration of cartographic maps into advanced digitised georeferenced information is attributed to GIS.

Explaining GIS with a clear and understandable explanation is really complex, due to its applications in numerous disciplines which adopted different perspectives. Although, a general definition of GIS could be "a Computer-based system that stores geographically referenced data, links it with non-graphic attributes (data in tables), allowing for wide range of information processing including manipulation, analysis and modelling. A GIS also provides for map display and production" (University of Maryland Library, 2012, p. 2).

Another way of describing GIS has been given by Chrisman (2002) where he saw GIS as:

"the organised activity by which people:

- Measure aspects of geographic phenomena and processes;

- Represent these measurements, usually in the form of a computer database, to emphasise spatial themes, entities and relationships;

- Operate upon these representations to produce more measurements and to discover new relationships by integrating disparate source; and

- Transform these representations to conform to other frameworks of entities and relationships" (p. 13).

In general, GIS differs from the other information systems because it handles geo-referenced data and attributes. Moreover, the major GIS studied aspects concern locations, conditions, trends, patterns and models (Liu et al., 2017).

However, GIS has always tried to grasp three basic components such as space, time and attribute. Initially, as mentioned previously in the text, space and in turn place, refer to objects shaped by length, width and height, which are in relation to each other according to distance and direction. Secondly, the element of time links the geographic information to temporal reference which "works like a snapshot - valid for a specific moment in time" (Chrisman, 2002, p. 17). Instead, attribute covers the storage of information which could be qualitative and quantitative, either based on physical properties or subjective observations. GIS measures and associates the three components to spatial reference system established by the science of geodesy. The spatial reference system is:

"A mechanism to situate measurements on a geometric body, such as the earth; establishes a point of origin, orientation of reference axes, and geometric meaning of measurement as well as units of measure. While geodesy is the "science of measuring the shape of the earth and establish positions on it," it involves the study of geophysical properties such as variations in the gravitational field" (Chrisman, 2002, p. 20).

Having a common spatial reference system is a fundamental aspect because it creates the possibility to compare different information and maps. Besides, coordinates, which are a range of alternative spatial reference systems, can always be converted.

Objects are obviously geographically represented and visualised by graphic symbols used on digital maps by a data structure (Chrisman, 2002). A data structure is an "arrangement of data entities that permits the construction of relationships through software operations; implements a data" (Chrisman, 2002, p. 71). The two dominant models of geometric representation in GIS are vector and raster.

On one hand, the vector model is based on analytical geometry and attribute control, building a complex spatial representation from primitive objects, such as points, lines and polygons (areas), located in a spatial reference system by coordinate measurements (Chrisman, 2002).

"These primitives have a nested dependency: areas are described by boundary lines, and the location for a line can be approximated by a string of line segments connecting a series of points. At the base, points are represented by coordinates" (Chrisman, 2002, p. 76).

On the other hand, the logical structure of raster model is based on physical characteristics of computer graphics hardware, dividing the image into grid cells or pixels (rectangular building blocks) which are associated to attribute values. In addition, raster cells follow a spatial reference system. To improve the quality of an image, raster model is supported by compression methods, procedures for storing attribute values in less space (Chrisman, 2002). One of the main difference between the two representation methods is that by allowing creating new primitive elements, the vector model attributes control-oriented, while the raster one adopts a framework that controls space in order to measure attribute (Chrisman, 2002).

GIS concepts and methods related to software have generated a variety of applications which have been included in numerous software packages. The use of GIS software aims to go from storage and organisation to visualisation and mapping, from data editing to both basic and advanced spatial analysis of the geographic context for the sake of the creation of strong knowledge, realist maps and robust results. These tools are very useful to construct models that will be used in the steps of co-creation and co-design in territorial planning.

4. WEB 2.0 AND SOCIAL MEDIA: ADDED VALUES TO PARTICIPATORY PLANNING

With the advent of the internet, the accessibility to knowledge and to participate in sharing opinions and information has become an easy and common task, as far as the potential user can afford a device. It is important to differentiate the Internet, which is the system infrastructure of interconnected computer networks widely spread around the world and the many existing applications using such infrastructure. Lately, most of the newly developed tools have the form of app(lication)s, which do not require the web to function (Carr & Hayes, 2015).

In short, the internet brought the opportunity to create large and well-connected networks between individuals and between them and organisations. As a result of collaborative and communicative relationships between a vast number of individuals and organisations is the co-creation of social capital. "The idea behind social capital is that networks of individuals share information and benefit from their relationships" (Kent & Taylor, 2014, p. 13). In other words, Kent & Taylor (2014) explain the social capital as the benefit, under the form of added value from user-generated content, built through the interaction and shared opinions of citizens and organisations acting together in reaching collective goals.

Together with Web 2.0 technologies, the concept of social media has risen, even though it is still missing a clear and mutually agreed definition. It seems that "there is no commonly-accepted definition of what social media are, both functionally and theoretically. Moreover, there is a higher consensus of what can be considered social media but not on what defines a specific tool as social media" (Carr & Hayes, 2015, p. 2-3). Boyd & Ellison (2007) have defined social network sites as:

"Web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (p. 211).

Often social media has been wrongly described as social network sites. In reality, the latter belong to the broader set of tools of social media, but it is not that all social media are social network sites.

In the last decade, a vast number of studies have tried to define what social media are. By most, they are often considered as channels that use digital technologies wherein interaction, and user-generated contents are the necessary core feature.

Kent (2010) has defined social media as "an interactive communication channel that allows for two-way interaction and feedback could be called a social medium" (p. 645). It has been further specified by him that social media, which allow the creation of social networks, are characterised by "real-time interaction, reduced anonymity, a sense of propinquity, short time response and the ability to engage the social network whenever suits each particular member" (Kent, 2010, p. 645). Furthermore, Howard & Parks (2012) have seen social media as composed of three parts:

"(a) the information infrastructure and tools used to produce and distribute content; (b) the content that takes the digital form of personal messages, news, ideas, and cultural products; and (c) the people, organisations, and industries that produce and consume digital content" (p. 362).

Considering the above definitions to be only a few among the multitude provided by authors, Carr & Hayes (2015) have noticed that some authors have tackled the issue mostly from a technical perspective while others from a more conceptual one, in term of principles. Carr & Hayes (2015) ended up with providing their own more comprehensive definition of social media, which "[...] are Internet-based channels that allow users to opportunistically interact and selectively self-present, either in real-time or asynchronously, with both broad and narrow audiences who derive value from user-generated content and the perception of interaction with others" (p. 8).

Whatever it will be the most suitable definition of social media is not the core issue of this project. As opposed, the focus is more on the valuable user-generated content which social media and Web 2.0 bring to the participatory process within spatial planning.

As it has been aforementioned, social media and Web 2.0 are providing new channels not only for the dissemination of information but above all, for their mass production of content. This can be identified as a facilitating factor in term of a paradigm shift regarding the relationship between citizens and decision-makers towards a more inclusive and democratically participated process. In this context citizens are shifting from being considered by governments as data consumers (clients) to being treated as data providers (partners), losing the passiveness which always has characterised public communities.

As it is clearly shown by Linders (2012), citizens, generating information by evolving technologies, are gaining more control over the decision-making process while the responsibilities of decisions are spread and shared throughout the entire community. According with Linders (2012), it is possible to see a clear transition within the Digital Era Governance (DEG), in particular from e-Government (one way web communication as Web 1.0), which treats citizens as clients (or more appropriately as objects) towards We-Government (interactive and empowered citizens through Web 2.0 and social media tools), in which citizens are now treated as partners in managing the unknown future.

This sets the basis for a reconsideration of the role of Governments and of the responsibilities of the citizens. Citizens may now better collaborate with businesses and organisations in creating their own outputs and products while agencies and governments are left in charge to provide better tools and facilitate the processes through evolving frameworks for action to serve the best-empowered citizens. In planning as in others disciplines, within the framework that governments can provide to engage empowered citizens, stand out the approaches of Crowdsourcing and Volunteered Geographic Information (VGI).

Broadly, crowdsourcing is a specific sourcing model in which individuals or organisations use contributions from Internet users to obtain needed services or ideas. It can be even the collective development of a certain project made by a crowd of people external to the entity which has created the project itself.

More in detail, "crowdsourcing is a set of techniques that allow the creation of datasets by collecting and joining contributions from citizens with no previous training or special expertise. Usually, citizens contribute voluntarily, and the Web is used as a platform for receiving contributions" (Borges et al., 2015, p. 366).

Crowdsourcing can help in defining citizens' needs and opinions and so helping in narrowing down the identification of a certain problematic issue to solve (identify problems). It can be seen as a tool for collecting stakeholders' point of views helping to understand how they look at the problem and how they assess the existing conditions. Moreover, it enhances the citizenship, fostering the creation of a shared code and a mutual understanding among diversified actors, of urban systems and values fruitful for better collaboration.

Very similar concepts are related to VGI, which, together with crowdsourcing, is based on two meaningful assumptions: a) a group can better solve a problem than an expert and b) observations gathered from a crowd (more observers) are more likely to be true than information obtained by a single observer (Goodchild & Glennon, 2010).

Providing georeferenced platform as OpenStreetMap or Wikimapia allows the co-creation of maps by the users. Photos, videos and comments once uploaded on the web-based platform can be seen as georeferenced information about a precise geographical space.

Moreover, "it is becoming increasingly common for the content of Twitter, Facebook, Flickr and many other social network sites to be georeferenced" (Goodchild & Glennon, 2010, p. 233).

In a post-disaster context, it has been shown by Goodchild & Glennon (2010) that VGI, which considers peoples and users as "sensors", is a much faster and responsive approach in generating valuable geographic information. When an emergency occurs, agencies are under pressure, and damages are the highest (natural, artificial and in term of life loss), slowest is their ability to release information.

Rather than waiting for common browsers as Google or the agencies' staff in collecting all the information, organise, synthesise and release them to the public (by the time the natural disaster could be already controlled), people with their local information contribute in creating quick responsive maps useful for the immediate post-disaster. This is happening simultaneously, while agencies are losing their resources (decreasing staff) and the consequent limited ability to provide fast geographic information which is vital to effective response, "citizens have been empowered with tools and the ability to georegister observations bounded within the impacted area, share them through the internet and synthesize those observations into intuitive maps" (Goodchild & Glennon, 2010, p. 240).

Within this societal transition where the changing in citizenship role is driven by the technological evolution, geographic information will not only be used by all, but they can be created by all. This can provide effective assistance to responders and emergency managers in dealing with planning post-natural disasters as well as in more general planning and design settings.

5. GEODESIGN: A TERM, A PROCESS AND A FRAMEWORK

The concepts behind Geodesign are not new and actually, begun when old philosophers such as Plato and Aristotle have introduced the significantly different concepts of space and place. More recently, as the Italian geographer Farinelli (2003) said regarding the different meaning of the two concepts that ancient Greeks gave:

"Place [...] is a part of the terrestrial surface that is not equivalent to any other, that cannot be exchanged with any other without everything changing. Instead with space [place as location], each part can be substituted for another without anything being altered, precisely how when two things that have the same weight are moved from one side of a scale to another without compromising the balance" (p. 11).

According to Miller (2012), the main idea beyond Geodesign concept is that a given geographic context (space), it affects and influences the way we are going to design it, how we adjust and adapt to our surroundings (creating places). Geodesign seen as a term or a noun is quite new. It is not the case for Geodesign seen as an integrated process of activities (Miller, 2012).

For instance, it is considered that Frank Lloyd Wright, when he was creating the "Fallingwater" house, he was doing Geodesign (Miller, 2012). Wright had in mind the geographic context of the space (topography, streams and waterfalls, environmental issues related to the site, etc.), recognised by him as a fundamental requirement, which leads to designing a more integrated with the landscape of the site. He was able to do all these pre-design considerations in his mental space, but this approach has a defined limit. It has been shown by George A. Miller (1956) that humans, in average, are able to mentally handle seven processing information (it ranges from 5 to 9 depending on the mental ability of people). The importance of knowing the geographic context for designing was at the core of Neutra's thinking as well. The architect, which has collaborated with Wright, called for a holistic approach to design, able to include in the premises of the project the importance of the geographic site, its natural characteristics and its surroundings (Miller, 2012).

The advent of electricity in 1910 triggered the creation of some basic technologies, like light tables equipped with translucent glass and illuminated from the bottom. Manning, a landscape architect, in 1912 has used this technology to make an analysis of the geographic space by overlaying maps (Miller, 2012). Most likely based on Manning's method, McHarg is considered one of the principal pioneer of Geodesign approach. In fact, in 1969, he assessed locations (best or worst) for land use by overlapping thematic layers of geographic information. While he was setting the bases for the conceptual development of GIS software, he was also improving the narrow singular point of view, very common in those decades, in favour of a multidisciplinary approach. Meanwhile, McHarg was formulating his graphical overlay method,

Carl Steinitz (1995) was developing and formulating his complete framework for Geodesign (landscape, regional and urban planning). Relying on his experience, he was able to create a conceptual framework, define design strategies and even shape procedural techniques. Furthermore, in the last couple of decades, both Dangermond (2010) and Goodchild (2000) have contributed to make digital integrated spatial analysis happening (knowledge of the geographic space and of the existing places), the first one in terms of technologies (GIS software) and the latter more as a scientific development in GIS science. "The disciplines of geography and design have been around for a long time, but in the last half of the twentieth century, they began co-evolving with computing technology" (Steinitz, 2012).

5.1. WHAT IS A GEODESIGN PROCESS?

Since the framing of the concept is quite new, it is needed to provide a range of definitions, coming from several practitioners at the frontline of the approach, in order to be as much comprehensive and complete as possible.

Carl Steinitz (2012), the formulator of the framework for Geodesign as already mentioned, has broadly defined Geodesign as "a set of concepts and methods that are derived from both geography and other spatially oriented sciences, as well as from several of the design professions, including architecture, landscape architecture, urban and regional planning, and civil engineering, among others" (p. 1).

As Rivero, Smith, Ballal, & Steinitz (2015) has pointed out, "Geodesign borrows from a number of different domains: architecture, engineering, landscape architecture, urban planning, traditional sciences etc. and takes a holistic and complementary view on the design process incorporating the different stakeholders" (p. 42).

Indeed, it is widely recognised that Geodesign is "a new approach to design and decision-making in urban and regional planning which is deeply rooted in the geographical sciences" (Campagna et al., 2016a, p. 3) and has the purpose of facilitating life in the geographic space (geo-scape) (Miller, 2012).

More into the specificity of the concept, Campagna (2014) has described the approach as:

"an integrated process which includes project conceptualisation, analysis, projection and forecasting, diagnosis, alternative design, impact simulation and assessment, and decision-support techniques. The process integrates these activities by using enabling technologies for planning built and natural environments, and it involves a number of technical, political and social actors in collaborative decision-making" (p. 213).

As it is clearly possible to notice from the definitions, Geodesign is an innovative approach to complex urban and regional planning problems (wicked), and for this reason, its process should be carried out adopting a multidisciplinary approach. As a matter of fact, the approach stresses the importance of the collaboration between public authorities, specialists of the design field, professionals belonging to geographically oriented sciences, ICT experts (Information and Communication Technology) and laypersons coming from the local communities.

To prove the innovative nature of Geodesign, it becomes relevant to highlight some of the most fundamental differences in respect to the traditional approach in spatial planning and design.

Firstly, "Geodesign changes geography by design"

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(Steinitz, 2012, p. 1). It means that design projects and processes are going to affect and change the geographic space of the area wherein they are intended for. In order to change for better the geography of a given area it is fundamental to have a complete geographic knowledge of that space and consequently the approach at the beginning of the process focuses "on the extensive use of digital spatial data, processing, and communication resources" (Campagna, 2014, p. 213). As opposed, in a traditional context the design principles fundamentally did not take into account the local geography and the knowledge related to it, rather they were often more dedicated to following individual styles and oriented to the consideration of projects as aesthetic artworks over their suitability and functionality in respect of the surrounding space.

Secondly, the designing process, which goes to change natural or artificial environments, or both, takes place within a certain geographic spatial context (Miller, 2012). In other words, it is now possible to design directly into a geographically referenced space. This means that not only created new entities are referenced to a geographic coordinate system, but even that they are, directly or indirectly, referenced to all the other information related (referenced) to that space (Miller, 2012). Conversely, following a traditional approach, entities would have been thought, designed and created in conceptual space (mental space), or using pencil and paper (paper space) or again even in a Cartesian coordinate system (CAD space) (Miller, 2012). All these approaches have in common that none of them has a geographic coordinate system to which refer.

These kinds of traditional approaches have some advantages as disadvantages. For instance, on one hand, using pencil and paper have the advantage to be intuitive, and users are very familiar with this sort of basic tools. On the other hand, it creates a sort of passive environment for the designer since performing analysis and accounting simultaneously for several factors is an action hindered by the method itself (mental and paper space). Indeed, the suitability of this approach decreases with the increase of the complexity of the case, while GIS software allows the professionals to handle at the same time a wide range of complex spatial analysis. Given this, the challenge now is to develop valuable digital technologies, which are "easy to use as using pencil and paper" (Miller, 2012, p. 22).

Thirdly, the Geodesign process is characterised by a workflow, which ends with the creation of a design. This innovative approach has the "capacity to promote a unified, collaborative, and mutually agreed design, as a result of a multidisciplinary environment" (Rivero et al., 2015, p. 44). The Geodesign workflow differs from traditional ones even for its capability to allow the co-creation of a design project by supporting platforms which facilitate the collaboration and communication among actors, thanks to fast iteration processes, fast design cycles and for its ability to compare and account for the impacts as you proceed with the flow (Rivero et al., 2015).

5.2. THE GEODESIGN FRAMEWORK

For over thirty years of work experience, Carl Steinitz (2012) has defined and redefined a framework for Geodesign seen as a methodological process rather than as a theory nor as a discipline. The reason behind the formulation of a clear framework is that the current complexity of design projects forces them to deal with a vast range of sizes, scales, cultures, contents and time (Steinitz, 2012). Moreover, if the required collaboration among actors is taken into account as should be, it becomes clear that a certain level of organisation is fundamental (Steinitz, 2012).

Indeed, according to Moura (2015), the framework has been formulated in order to "overcome the lack of a clear methodological process that clarifies the roles of the different actors involved" (p.2). Hence, here the scope of the framework for Geodesign: since the process cannot rely only on a singular methodology, due to the reason that different approaches, principles and methods are needed depending on the specificity of the case, the framework becomes essential for the sake of the organisation which eases the collaboration among actors within the Geodesign process (Steinitz, 2012).

Furthermore, the Steinitz' framework (Figure 6), by supporting visualization tools, allows for feedbacks along the entire process and promotes the understanding and assessment of both, existing situation and possible proposals. "Visualisation of simulated future landscapes can promote a common base to understand urban decisions, as a common language, to promote shared decision-making" (Moura, 2015, p.2).

The framework for Geodesign consists of three iterations, and for each of them, six questions have to be asked. The answers to these questions represent models. The framework has not been thought to be a singular linear process because for every Geodesign study the process has to be shaped and modelled along with the case study needs. Rather, it entails many iterative cycles as needed in order to reach the final agreed outcome. Indeed, the Geodesign team has always to consider variations to the application of the framework which can appear linear, but in practice, often prompt responses to the flow's variations are required. This structure is fundamental for any Geodesign study.

As Steinitz (2012) has presented them, the six questions are the following:

1. How should the study area be described in content, space and time? The answers are representation models, and they represent information and data on which the study has been built.

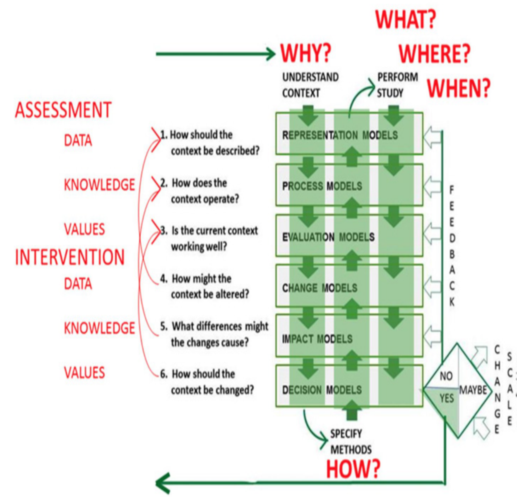

Figure 6 - The Kingston e-Participatory ladder. Source: Hanzl, 2007.

2. How does the study area operate? What are the functional and structural relationships among its elements (systems)? The answers to this question represent the process models, information for the analytical assessment of the study area.

3. Is the current study area working well? The answers to this question represent evaluation models. Here the cultural knowledge about the study area of the decision-makers makes the difference.

4. How might the study area be altered? By what policies and actions, where and when? The answers to these questions represent change models. They will be created and compared within the Geodesign study, and they will be used as newly generated data to project future conditions.

5. What differences might the changes cause? This question is answered by impact models. They represent assessments produced by the process models under changed conditions.

6. How should the study area be changed? This question is answered by decision models, which as the evaluation models, are highly influenced by the cultural knowledge of the decision makers.

The first three questions mainly investigate past and present conditions of the study area even though process models might also simulate future trends, while the last three are concerned about the future ones (Steinitz, 2012).

As aforementioned, all these six questions have to be asked for each of the three iterations. In the first iteration also seen as a pre-workshop phase, the answers to the questions are elaborated from one to six, and it has the purpose to understand the study area and develop a general knowledge of how the area, and its systems, works. This facilitates the definition of the scope of the study. In this first iteration, the six questions are thus intended to answer Why the Geodesign study has to happen.

The second iteration is about defining the methods to use for the study and the six questions, this time presented from 6 to 1, are to answer to How to carry out the study. The reverse order of the questions is crucial in creating decision-driven process rather than a data-driven one (Steinitz, 2012).

Possible questions that need to be answered can be (Steinitz, 2012):

6. How will the decisions be taken? What is important for the decision makers to know?

5. Which impacts are most important to take into account? How much detailed should the impact assessment be?

4. Which scenarios for change have been identified? Which time horizons to select? At which scale?

3. Which are the indicators to be used to evaluate whether the existing conditions are working well?

2. How complex should the process models be?

1. Where is the study area exactly? Which one are its boundaries? In which way is the study area represented?

Ultimately, the third iteration, which is generally mainly composed by a workshop phase, translates into practice what the Geodesign team have defined during the second iteration. Here, once again, the six questions are proposed in their original order from one to six. In the proceeding with the performing of the study, the questions What, Where and When must find an answer.

Hence, the iteration starts with the collection of the data, the ones identified throughout the first two iterations. Then data are analysed in order to understand how the processes and systems of the area operate. Then a range of evaluations is given in order to establish what is working well and what is not. Only now, it is possible to design some changes in the geographical space and subsequently analyse the impacts caused by the suggested changes. Likewise, for any design projects to become real, decisions must be made.

At this stage, decisions can fall towards a positive end; in this case, a yes means present the results to the decision makers towards the implementation. A negative decision (no) implies that unsatisfactory results have been reached and through feedbacks, the cycle can restart from the second iteration or even from the beginning. At last, a maybe can be finally reached, and some agreed smaller changes are proposed and considered, upon whose the study restarts and can be carried out faster since it can take advantage from the already built knowledge.

6. CONCLUSION

The paper is intended to be a contribution to the discussion of the evolution of paradigms within the planning domain which in turn shaped theories, methodologies, technologies and therefore, practices from the mid-1900s, until now. It retraces the origins that contributed to the development of the Geodesign approach for the purpose of stimulating the debate and constructing critics. It is appropriate to contextualise the evolution of the framework proposed by Steinitz also considering increasing its applications either in research or projects, stimulating new values by the experience. The scientific discussion along with practical investigations are essential for testing the applicability of Geodesign as a new planning approach primarily as a design methodology and secondarily as a coordination tool, fostering its practice to be internationally recognised as a significant progress within the planning domain.

It is, therefore, recommendable for those who are interested in adding new values and knowledge to the subject to initially comprehend all the steps overcame in the past, catching sight of possible directions and future opportunities for new methodologies and technologies in support of opinion and decision-making.

The paper sheds lights on paradigm shifts in planning practices, jointly considering their contextualisation that is both a cause-effect of main societal behaviour changes.

In the history of planning development trends, practices have shifted in a variety of forms: from cartographic representations to digitise 2d and 3d maps and models elaborated on enclosed desktop-based software. With the advent of the Internet and constant improvements of the World Wide Web, also tools have been differently conceived. Indeed, these transformations were also a result of main shifts from a theoretical perspective that triggered more inclusive and legitimate participation processes, highlighting a new responsibility subdivision at a community level. Shareable contents and information have pushed towards the production of open-based technological solutions which in turns opened up new avenues for involving citizens as both providers and data users.

The role of visualisation has been fundamental in this context, and it should lead the way in the spatial domain. In developing new models of human behaviours, we need a focus on questions of location and mobility, and in this sense, the role of social media and web access is crucial.

Hence, Web 2.0, VGI, crowdsourcing and all the PSS have been set on a new planning paradigm more bottom-up and participatory-oriented, which is the result of the two main transformations: from technocratic to democratic decision-making processes and from passive to proactive engagement.

Indeed, cities are complex environments which are linked to many different disciplines and professional fields that have the city as their concern. Due to its nature, a city can only

be studied in an interdisciplinary manner for the sake of fully and comprehensively understanding their mechanisms and related risks.

Although the common conviction directly associates a programme related to smart cities, intended as an ultimate urban model merely welcoming improvements on the hardware infrastructural network, the focus should be parallelly redirected on questioning the most efficient manner of organising, managing and putting in a mutual relation both the already existing and the advent of new approaches and tools.

Coordination, communication, coupling and integration gather together a slightly different trajectory for the sake of the same goal of developing new smart cities, combining continuity among diversity between components and sectors in urban functioning and new forms of organisation and governance, which will enable such connectivity to become effective and fair. New governance structures, therefore, should be focused not only on the integration of physical technologies but also on advanced planning methodologies and processes able to optimise coordination in decision-making.

As a new approach to design and decision-making in urban and regional planning, Geodesign, which aims to change geography by design, is an integrated process which includes project conceptualisation, analysis, projection and forecasting, diagnosis, alternative design, impact simulation, assessment, and decision-support techniques by incorporating the different stakeholders.

Simultaneously to its design purposes, the Geodesign approach could be one among several existing methodologies that provide coordination for exerting a more inclusive governance. Accordingly, it might be seen as a systematising approach, able to easily integrate the use of different tools by providing a structured process updated to the currently required planning principles. Geodesign facilitates software and tools integration by potentially maintaining high participation, representativeness, sharing responsibility, ensuring co-creation activities and therefore encouraging more democratised decision-making processes.

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