

# Geographic information and Web, new paradigm of knowledge for the local government

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**Abstract:** Ten years ago Al Gore envisioned a "Digital Earth" as a model of three-dimensional and multi-temporal representation of the planet, while three years ago Kofi Annan at the "World Summit on the Information Society" saw in the Internet connection to all the world's cities a cornerstone in the development of digital democracy. These statements actually anticipated the importance and role of ICT and the Internet in the start of new governance practices for development and transformation of cities and regions. Current technological development makes it possible to imagine new models of geo-knowledge developed on the basis of interactions and contaminations between the amount of public geographic data and private information, combined with "Web 2.0" approaches and new data acquired by sensors and transmitted to the web "in real time". In this context the "wiki" approach unit with "global geo-exploration"- resulting from the new paradigm of geo-web representation - promotes the spread of the practices of "geotagging", and the creation of new public and diffused geo-knowledge (see Wikimapia.org) and potentially integrated with expert geo-knowledge (see [www.eyeonearth.eu](http://www.eyeonearth.eu)). This scenario, based on new models of shared geo-knowledge about the territory, can therefore guide the actions of local government in responding consistently to questions posed by the community, assuming the approval of the dual track of public and expert geo-knowledge and local and shared geo-knowledge of the communities. Within IUAV-FPT, two simultaneously designed geographic based applications are interesting in particular for the various solutions adopted in relation to the geo-information request and its functionality. In the GIS project for the city of Mola di Bari "geotagging" tools are applied to participatory processes and allow the "sedimentation" of historical and cultural values into a geo-database; the geo-portal for GAL Venezia Orientale is a GEO-SDK platform and is part of a Content Management System with communication and document management functions.

**Keywords:** ICT; Web 2.0; geo-knowledge; city; region; governance; models; participation; interoperability; geotagging; database; wiki; Digital Earth

## 1. Introduction

ICT are gradually transforming the society in which we live, and affecting many sectors of urban life; technologies now control time, manage traffic, regulate access to services and stimulate a new challenge for urban and regional planning and define a new scenario filled by the technological evolution processes and development of new tools for

information communication. This defines a new conceptual, methodological and operational revolution with geographic information at its centre. This principle defines an evolution of spatial knowledge of the phenomena that bases its development on the interactions and contamination between the amount of public and private geographic data and the Web 2.0 philosophy and technology (Fiaschi, 2007).

Our research aims to investigate this geo-web 2.0 scenario to integrate the different knowledge flows (community and federal information), to improve the decisional planning processes and make them easier to share by the different actors (citizens, stakeholders, etc.) involved in urban transformation and development. The research investigates both the theoretical dimension (new 2.0 knowledge paradigm) and practices (study cases and experiment). This paper aims to define the trends characterized by the new decisional process based on geo-knowledge supported by new forms of communication and participation for local government. Two study cases will be presented; they are related to applied research developed in the technological scenario defined by two key words: the Web and spatial information.

## **2. Paradigm of knowledge in the technological scenario**

The twenty-first century knowledge model is no longer a closed system for the elite, but tends towards integration, sharing of knowledge by both experts (in terms of legitimacy of information) and local. So the way of learning changes with the model based on a linear and sequential path moving towards a definable one which is interoperable and diffused. Referring to the processes of technological evolution, Melvin Kranzberg<sup>1</sup> argues that the impact of new technologies is not in itself either good nor bad, but rather neutral because of its impact in the social domain where it changes the relationship values and parameters. This is true when the information and communication technologies have not only an incredible storage capacity, but also a substantial transmission capacity which can act on that information, changing and generating a new one.

Following this evolutionary "wave", M. Castells stated that «the observation of these extraordinary changes in our instruments and our knowledge of life, and thanks to the contribution made by these instruments and knowledge, there is a more sensible technological change: the transformation of the processes». This forms the basis of Pierre Lévy's concept of cyberspace which imagined the development of e-democracy which could compare community and institutions on various themes, providing the possibility of their participation, more democratic and accountable, to decision-making processes of government departments, ensuring greater transparency and evaluation of policy decisions? undertaken.

In this new scenario, Igor Scognamiglio<sup>2</sup> suggests a second way of thinking about "community intelligence" through which to make a universal space of knowledge and

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<sup>1</sup> M. Kranzberg was a professor of history at Case Western Reserve University from 1952 until 1971, was one of the founders of the Society for the History of Technology in the US and long-time editor of its journal "Technology and Culture."

<sup>2</sup> Learning and consumption of knowledge in the twenty-first century takes place, says Scognamiglio, through the dual nature of being and having. The first interprets the reference to be

looked forward to a "open and collaborative" learning mode in order to achieve a public comparison. This statement clearly intercepts the hypothesis of a "transition" from a kind of "informational capitalism" (Castells, 2004) to a principle of "economy knowledge" based on new tools capable of activating a process of transformation of knowledge into a new value and the "result of imagination, communication and sharing" (Rullani, 2004). It follows a new vision of learning in information technology (geographic) based on a double track of knowledge: the public, experts and those of the virtual community.

## **2.1 Society, institutions, local communities, "new geography" and process innovation**

The revolution that our century is going through is more than an digital revolution involving only technological tools. The emerging scenario that is being outlined changes the way we think about the processes and the design of support models for development and planning. Mutations that are being observed, involve the whole scenario in its cultural, institutional, administrative and organizational dimensions. The main impact resulting from technological evolution lies in the definition of new knowledge models based on geographic information systems managed by more and more widespread tools distributed freely on the Internet. This defines a new way of observing the territorial system which its referred to as a new model of knowledge resulting from a new conceptual, methodological and operational condition, and defined by the integration of global coordinates WGS 84 and the information URL (Uniform Resource Location - that uniquely identifies the address of a resource on the Internet)<sup>3</sup>. This scenario of the geographic information spread on the Web involves multiple dimensions, not only technological but also social, educating directly and indirectly the community to the geographic earth images. This new dimension of knowledge has a dual "face", expert and local that sometimes interacts, making the interpretation of its correct use in decision making processes difficult. It is possible to attend a progressive integration of digital information normally handled by institutional and/or business users as archives, categories, images, multimedia, etc., with positional information (given by GPS devices, but not only) driven by the development of new services available to a few competitors who, by exploiting the popularity and diffusion of social networks, are competing for market share in which to place their own commercial products. In this way Geo portals develop where you can track, share and download geographic information related to the provider and even change the source and type of data they contain. In this context of the pervasive geo-image it is important to emphasize that the objective of the project is redirecting an accurate "review of the system"<sup>4</sup>, but it is also true that the review should also comprise a real involvement of the community interested in the processes of land transformation. In fact if a planning process activates creative forms of participation it is very likely to be a success because it based its actions on a shared future city scenario.

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producers of knowledge and content in a specific domain of knowledge, while the second relates directly to the consumption of knowledge within the network (web).

<sup>3</sup> This principle was theorized and announced by Luigi Di Prinzio, professor of University of Venice.

<sup>4</sup> Murgante B. comps., *L'informazione geografica a supporto della pianificazione territoriale*, Milan: Franco Angeli, 2008

The new models of knowledge are based, therefore, on this social dimension which aims to the e-democracy and participatory scenarios of the Web 2.0. The establishment of geo data set by collaborative processes opens up interesting scenarios for the enrichment of spatial knowledge (mainly urban) and can stimulate scientific research to identify the most efficient procedures for integrating "local knowledge" into a knowledge framework which supports the planning and decision-making processes. It should also highlight that every stakeholder is the carrier of specific knowledge that is potentially "combinable" in a more or less conscious way; this knowledge, properly combined and structured, can support new interpretation procedures of spatial phenomena and, in particular, can return the local perception of these territorial phenomena.

The mission of this century is to overcome the distrust and opposition of the community regarding government decisions that, through the actions of governance based on new forms of information and communication, aim to activate dialogues in order to create a scenario of "trust" between the institutions and the community. In this context, local Institutions in Italy that could benefit greatly from this integration, are plagued by continual delays, in order to acquire specific know-how for managing geographic data, and to establish synergies with businesses operating in the territory and new forms of interaction with the community. It is becoming increasingly clear that a large "gap" is gradually opening up between the huge amount of information already available (or acquired) which is useful for interpreting urban and regional-environmental phenomena and the limited effectiveness of cognitive tools generally available to the local government and other institutions that have mandates of land government. Ugo Baldini in "Il Paese con la camMicia"<sup>5</sup> speaks about the need for a «political class capable of incisive analysis», but also of an «urban planning [...] taken to discuss the best architecture rules, losing sight of the current processes, their complexity, time pressure, the problems of transparency and sharing». Following the essential phase of "diagnosis", it seems increasingly important to realize another phase without which it no longer seems possible to complete the decision-making processes with due efficiency: multi-actor, share-holding (Governance), monitoring-evaluation and, inevitably, accountability. Ugo Baldini talks about an "urban alarm" about the "loss of government of the territory" as a direct result of cognitive deficits and the use of information and operational tools plagued by inadequate and irrecoverable obsolescence.

The reference scenario is characterized by the development of new technologies in a social and spatial complex in which the territorial dynamics are no longer efficiently governed by the local authority, while interaction between technological tools and their effective use is fully realized in business by many companies with their "location based services."

## **2.2 *New cognitive models in the GeoWeb scenario***

The development of the Internet and the Web has stimulated the development of GIS in the "virtual" and "cyberspace" dimension. As Laurini predicted in 2001, the entry of GIS

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<sup>5</sup> Baldini U. "Appunti sull'innovazione territoriale e le pratiche di qualità", Political and Social school *La Buona Politica* (CAIRE Urbanistica), Venice, 2008

technologies into the Web has led to a review of the models, the online diffusion of geo-information in different forms of representation and language and is promoting the deployment in the web of simple and advanced GIS functionalities.

The technological evolution that has led to the present scenario, known as "Web 2.0", is stimulating the development of technologies and services that make it possible to exchange information in real time and at high-speed. The development of these services is for the purpose of creating, reworking and aggregating personal content (such as reviews about government decisions) in a distributed and collective way, to share, classify and distribute information. The growth of the role of geographic information into a "virtual" and "cyberspace" dimension is referring to a review of cognitive models related to the development of new forms of language and representation of expert and local knowledge. The description of the complex technological scenario of the twenty-first century is useful for a reorganization of all the tools and technologies available for sharing, interoperability and communication of geographic information referring to the various stakeholders involved in the production and management of cognitive frameworks based on geo-information.

This research aims to identify new knowledge dimensions related to the Web 2.0 philosophy. The idea is based on the identification not of disjointed clusters, but on a highly interactive capacity level structured by instruments, procedures and methodologies of Digital Earth.

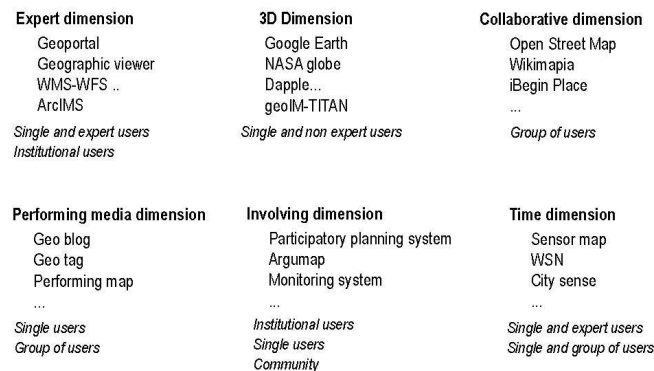


Fig. 1 First idea to study the Knowledge dimension in the Digital Earth Era

- *Expert dimension* - the spatial information is published on the geographic web portals, known as Geo Portals, and designed primarily by national or international institutions or research departments.

- *3D dimension* - the third dimension represents a part of the basic language of planning and overcoming obstacles, expensive models, for the interpretation of phenomena related to the spatial morphology of the territory.

- *Collaborative dimension* - This dimension stems from the project of the Open Street Map, and is being developed as demonstrated by the service iBegin Place and Wikimapia defined as a global geographical encyclopedia.

- *Performing media dimension* - defining a new geo-social-network characterized by new virtual map spaces to build specific knowledge based on identity of a place related to culture and experiences of its inhabitants or visitors.

- *Inclusive dimension* - aims to involve the community in specific government processes (land use, transformation, etc.) in order to initiate a participatory process to define future scenarios for the city or region.

- *Time dimension* – based on maps produced by the “physical listening of the city (or region)” which, thanks to the latest generation of sensors and networks sensor WSN (Wireless Sensor Network), are able to return flows, monitor the health of environment, etc.

The following two experiments, relate and interact with some of the new dimensions of geo-knowledge in the age of Digital Earth in order to achieve specific goals: the promotion and development of the territory for GAL Venezia Orientale and the construction of an integrated and collaborative geo-knowledge framework for Mola di Bari.

### **2.3 *Promotion and development of territory, communication and sharing in a multi-actor context: case study of GAL Venezia Orientale***

The Pianura Padana Veneta is an example of a typical urbanized system characterized by a multi-actor context. In similar contexts we consider it essential to activate innovative processes of communication, organization and sharing of all the necessary information to guarantee the performance of administrative and economic activity.

The context of GAL Venezia Orientale appears emblematic in many ways. VEGAL is based on a network of public institutions (mostly municipalities) that operates in a coordinated way to access finances and national and European opportunities with the ultimate aim of activating processes of economic, cultural and social development in its territory. The first step during of the GAL project consisted in the restructuring of the institutional web to innovate and enhance internal and external communication by the project's stakeholder network. Depending on the profile of the final users, the new site was to have new communication requirements, dynamism, efficiency and immediacy and, in particular, to support the relationship between partners in a network deal, to promote knowledge and the exploitation of land resources. Moreover we designed a dynamic, versatile and immediate tool by collecting the expertise (information) acquired in a systematic way and we implemented the geographic dimension like the new key(way) to the reading of the data stored. In practice, the mission was to establish a web-oriented content management system (CMS) with highly-customized features and geographic interface.

The first draft of the project was divided down into the following components: graphics and communication; a platform for a dynamic web projects data set, web-based maps application; geographic base reference map; database model; data optimization and uploading. The comparison between the first version of the draft and the final version makes for an interesting analysis of the opportunities offered by new geo-enabled/web-oriented tools. However, before describing this, it is appropriate to briefly describe the features and characteristics of the created portal. The new portal for GAL Venezia

Orienteale is a web tool structured with a typical dual-interface front-end and back-end. On the public side, web-users can see the usual general information sections and obtain information about the agency initiatives. More importantly, they can access the data base of the projects organized in synthetic informative form which contains specific details of each transformation or service. The web search page makes it possible to combine the following criteria: action area; title; beneficiary; year; finance program; thematic area which articulated the first set of synthetic form by which to gain access to the detailed project sections. The first innovation introduced into this traditional web structure was based on the relationship between the informative project form and the geo-localized geometric features; and the second innovation consisted in making it possible to associate groups of keywords to each project form to allow semantic searches through the "popular tags" and the thematic areas themselves.

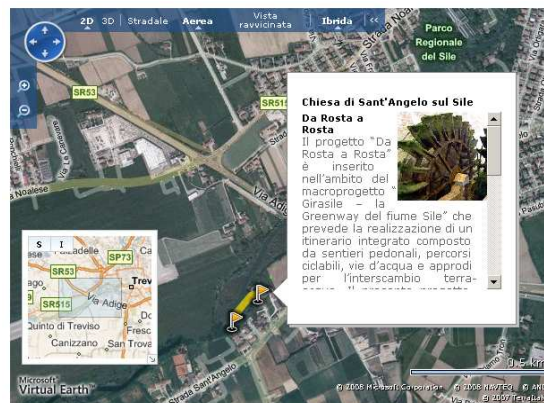


Fig. 2 Web Geo-portal of GAL Venezia Orientale

From the administrator side the user is able to access the database of web pages and project form using a browser and he can make updates and changes by means of the user-friendly interface. The map section is based on the same public web-side interactive map with the addition of a few buttons to design three geometric type objects (editing tools): points, lines, closed areas; these geometric features have two types of related information: the name and sequence of connected form, or else the information that the user sees exploring the map. From the technological point of view the platform used is a geo-SDK<sup>6</sup> that consists of an interface and data presented to the community on the web, which moves the focus from a project based on a traditional client-server Web mapping component to a solution characterized by low impact in terms of software development which can guarantee more resources to the graphical project, communication and exploitation of data set.

So we designed a solution based on a geographic web interface familiar to the web community, making geographic navigation extremely useful for non-expert users, while

<sup>6</sup> Software Development Kit (SDK) is typically a set of development tools that allows a software engineer to create applications for a certain software package, software framework, hardware platform, computer system or similar platform

allowing administrative users to integrate geographic data without developing GIS expertise.

#### **2.4 *New knowledge dataset for a municipal GIS: case study of Mola di Bari city***

The request to integrate new information sources and traditional knowledge<sup>7</sup> frameworks is mainly determined by two factors: the first is the progressive difficulty in acquiring new data about the territorial context (surveys, analysis, etc.) due to the limited financial resources available from local governments; the second is caused by the multi-actor nature of the urban context which requires institutions to establish new forms of interaction with communities, involving participatory, transparency and accountability processes. This request, today, can assume competitive value whenever the local authority is able to exploit the opportunities offered by information technology, especially those applied to social dynamics in urban context to establish a new active relationship with the community.

Our GIS Municipality project for the city of Mola di Bari is based on these assumptions and aims to make all the information directly or indirectly linked with geographic dimension associating semantic information to a datawarehouse; lastly, we aim to integrate common knowledge and expert knowledge referred by the community and other stakeholders involved in the city transformation processes. According to these principles, the GIS was designed in three sections: the history of Mola; actual and future scenarios, urban program, plans and projects. The first section contains all the knowledge about the history and evolution of the city in terms of culture, identity and social themes; the second part is about the state of play of the city; the third contains information about its current urban planning process and its "future", such as strategic planning or monitoring trend transformations.

The most important innovation developed in this project, is the design of a geographic "participatory" section based on "geotagging" tools over free maps and service such as Virtual Earth to connect citizen knowledge and proposals to policy decision making. The mapping tool which we chose for the PPS (planning participatory system) is the same Geo-SDK platform described in the previous case study where the features update in the map was directed to the community rather than exclusively to technical administrators, allowing them to easily define geo-referenced objects on a user friendly map like Virtual Earth. Cartography, as a system of signs, once again gave way to a geo-base consisting of sets of images enhanced by a few essential and auxiliary layers (road network and place names) in which the usability and quality have reached satisfactory levels, and whose maintenance and use costs are rapidly and steadily decreased. High accessibility of the web-interface associated to a "natural" territory representation make it possible to activate phases of friendly community interaction to capture many contributions and to associate and compare them to geographic areas. The core of this project is the "themes-areas matrix" designed as a means to simplify the interpretation of complex spatial phenomena. The themes-areas matrix is based on the possibility of searching any kind of georeferenced information at both positional and thematic levels. The aggregation of

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<sup>7</sup> cfr. 2.1



information by spatial location is possible by the typical GIS query operators. The thematic information classification is possible by relating each item of information to groups of keywords which belong to a dictionary based on the GEMET<sup>8</sup> thesaurus created by the EEA and a customized dictionary containing words not found in the latter. Groups of these keywords have a priori set "semantic weight" and they form  $n$  filters to search information by a thematic point of view. Placing geographic areas and themes along the two axes of a matrix, makes it possible to select a matrix cell to access all the information necessary to understand a particular question related to a specific geographic location. For example, you can search for geo-information related to social disadvantage in city suburb areas and obtain an informative form, in both summarized and detailed versions, showing tags of the community, goals of urban planning and operative plans, expected finances, taxes, urban services and more.

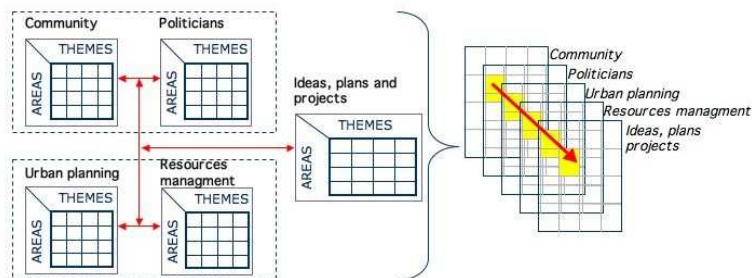


Fig. 3 Logical scheme of areas/themes matrix

So, the contributions (tags) are updated from stakeholders and placed on the map by new geo-objects or by linking the information to geo-objects which have already been updated. An aspect of great importance is that these geo-objects are characterized by keywords chosen with the support of a simple help tool which can suggest the appropriate theme and area (based on GEMET) in order to avoid redundancies and inconsistencies in the data.

The actual state of play of the tool of analysis is that it is not yet active due to the reduced size of the data set, but there will be a first analysis test based on a specific section and which concerns the geo-base monitoring of urban financial management. This section is based on allocation with micro-areas of financial costs and the goals of economical urban planning in order to make this information comparable, by the themes-areas matrix, within other spatial information from urban planning, participatory process, the population and tax database, to update the economical urban scenario with the project geo-web protocols.

## 2.5 Conclusion

The research into new technology, web 2.0 and geo-information is still in its early stages, but we can support the idea which explains the existence and progressive

<sup>8</sup> [www.eionet.europa.eu/gemet](http://www.eionet.europa.eu/gemet)

contamination between a type of shared and collective knowledge (produced by citizens and the community) and typical federal and public knowledge. The new geo-tagging and SDK platform improve new knowledge relationships but their impact in terms of true citizen participation in policy decision making processes is still unknown. Two study cases have been presented which may be considered innovative for their methodological approach:

- The first concerning GAL Venezia Orientale is innovative for its project management supported by new web technologies for geo-information use. Through the use of geo-SDK it is possible to gain more time and save cost for the communicative project phase and integration and enhancement of an existing dataset;
- The second, regarding the municipal GIS for Mola di Bari city is an important test scenario for a new participatory process based on user friendly and free services like Virtual Earth. This project is also innovative for the research into the relationship between the tag-information (proposal, problem identification, etc.), the real geographic identification and the urban government themes (use of soil, mobility, urban management, etc.) by development of the Themes/Areas Matrix.

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