ABSTRACT

In a society marked by information technology, local territories are subject to development that is increasingly shaped by top-down mechanisms, such as the global economy and sustainable development paradigms. The question then is to determine how, in such a context, these territories can also promote endogenous development that makes sense for local communities. By developing our research in the field of territorial intelligence, we explore the possible roles of the geographic dimension within Socio-Technical Information and Communication Arrangements (STICA) at the scale of inter-municipal authorities, especially to support mediation between heterogeneous actors. Our paper demonstrates that spatial representations, as STICA media products, offer a range and variety of functionalities which to date have been largely underutilized. We present an example of STICA implemented in the Thau territory (France) in order to produce a new territorial understanding and group dynamic based on local ecological knowledge.

Keywords: STICA, territorial intelligence, mediation, boundary object, territorial project, spatial representation

1. INTRODUCTION

Work on territorial intelligence first began in the late 1990s [1], providing an original focus of Information and Communication Sciences on the process of collective action for endogenous territorial development. Territorial intelligence is defined as "an information and anthropological process, regular and continuous, initiated by local actors, physically present and / or distant, who intend to appropriate land resources by mobilizing and transforming the energy of the territorial system into a project capacity"[2, p.3]. This approach requires a change of attitude from the local stakeholders in terms of their treatment of signs and information. They need to abandon their communication routines to adopt the logic of a shared project. Attitudinal change also implies the adoption of a collective territorial intelligence stance to anticipate the risks of breakdown [3-4]. The late 1990s and the first half of the 2000s were marked by a widespread inter-municipality cooperation in France, named pays, new territories borne from the Pasqua and Voynet French laws, providing a breeding ground for the deployment of territorial intelligence.

These territories have indeed been created on the basis of a cohesive social fabric and the endogenous determination of a shared future (tied down in charters with highly symbolic meaning) which mechanically determine their geographical extent [5], as shown in the following extract from the legislation: "A territory such a pays expresses a community of economic, cultural and social interests of its members. It provides the framework for the elaboration of a joint sustainable development project, in order to enhance the territory’s assets and strengthen mutual solidarity between urban and rural areas. This project takes the form of a development charter for the pays."

However, in the middle of the 2000s the fear of economic decline in France urged the government to adopt a new development model that focuses on competitiveness. This model is characterized by open competition between territories and cities through calls for projects driven by agencies. This new national frame of reference is ultimately reflected by a shift towards recentralization with the implementation of a ‘remote government’[6]. It is based on a heavy reorganization of the state administration, using the common tools and procedures of New Public Management (e.g. competitive bids, incentives, performance indicators for monitoring and control projects funding), to incentivize local governments to implement centrally designed policy.

A new reform of local government was carried out in parallel, characterized by the empowerment of institutional and planning inter-municipal authorities (so-called commumite de communes, comminute d’agglomération and comminute urbaine), mandated to collect their own taxes. These new politico-administrative structures with an indirect political legitimacy were obtained at the expense of the pays territories, the latter being left with significantly lower financial resources and expertise.

SRU²law endowed these inter-municipal authorities with a new planning instrument, the Territorial Cohesion Blueprint (Schéma de Cohérence Territoriale – SCOT). A SCOT is a 10-year strategic planning tool to align sartorial policies relating to urban planning, housing, social diversity, transport and commercial facilities. While the legislator foresaw a gradual reconciliation between former territories (pays) and inter-municipals planning authorities [7, p.113], in

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1 Institutional inter-municipal authorities have a political organ, the community council composed of elected officials, especially mayors, appointed by the municipal councils of the member municipalities.

practice this did not occur: inter-authority planning finally got the upper hand and the SCOT, a highly technocratic tool with a strong urban focus, has supplemented the ‘pays’ charter, which primarily reflected a shared political vision. The last decade was also marked by a genuine ‘greening’ of public policies to deal with environmental issues such as climate change and biodiversity loss. This resulted in a growing complexity of objects to be taken into account. In addition, this period saw the development of active democracy and citizen engagement. This development significantly increased the number and diversity of actors engaged in territorial governance arrangements [8-9], whether physically present or distant with heterogeneous codes and frames of reference [10].

Within the context outlined above, we sought to investigate how territorial intelligence processes may be implemented to promote endogenous development at inter-municipal levels that make sense to local stakeholders. We focused on the role that the geographical dimension and its spatial representations can play in Socio-Technical Information and Communication Arrangements (STICA), especially to operate mediation processes between heterogeneous stakeholders.

Our article has four parts:(I) A description of the context is presented in the introduction.(ii) In the second part, we propose a meta model to represent the territory as a complex, open and dynamic system. We address the question of meaning in relation to territoriality and the territorial project. We then develop the concept of STICA (socio-technical information and communication arrangements). We position this concept in the territorial decision-making process by distinguishing ephemeral and perennial STICA types. We study the role of the geographic dimension within the STICAs through the concept of spatial representation, both mental and material. We then describe, from a theoretical perspective, the range of functions they can play from the STICA designer point of view. Finally, we analyze the place STICA occupies in practice in methodological guides for participatory land planning. (iii) In the third part, we present an example of STICA based on spatial representations developed in a case study, the Thau territory, located on the Mediterranean coast near Montpellier (France). We underline the characterization of territorial situations based on local knowledge. (iv)In conclusion, we present research perspectives in the field of territorial intelligence that emerged from our preliminary results.

2. CONCEPTS AND METHODOLOGICAL PRINCIPLES

2.1 The Territory Seen As A Complex System And The Question Of The Emergence Of Meaning Through Shared territoriality

The territory is considered here through a systemic approach [11-12] as "a set of interacting dynamic components organized towards a goal"[13, p.93]. It can be represented with the met model of Schwarz [14] which has previously been adopted by several authors in business intelligence and territorial intelligence (eg. [1, 15, 16]). Schwartz’s Meta model is based on three nested and interrelated levels: the physical level of materiality and energy, the logical level of information and representations, and the identity level of territoriality and self-reference. In a territorial intelligence process, a territory, considered simultaneously at the three intertwined levels, is self-organizing, becomes autonomous, acquires capacity of self-analysis and monitoring, and develops a shared awareness of its own image and a self-identity. Such a process cannot just be announced, it is always rooted in a specific territorial culture in terms of its governance. It requires a deliberate collective will, a networking process and specific resources in order to spread out. Meaning emerges from informational and communicational processes at work between local stakeholders which help to develop a system of shared representations, a certain culture [17].

From a territorial intelligence perspective, the question of meaning can be assimilated to that of territoriality, a true informational and communicational phenomenon at transforms a given space into a territory for a local society[18].Meaning emerges in each of the three levels of the met model: (i) the physical space, when actors appropriated resources of this shared area for their activities, a more or less regulated, recognized and negotiated process within the network of stakeholders concerned by these resources, (ii) the logical space, when actors produce, exchange and adhere to shared representations of the territorial reality (made of physical or conceptual interrelated objects) as well as to negotiated agreements for the use of land resources in the physical plane, and (iii) the identity space, when actors refer to shared symbols and social norms, to a common vision of the future expressed in a specific project which constitutes the main symbolic resource to consolidate the identity.

When a territory chooses an endogenous development based on territorial intelligence, it will seek to develop a substrate, called "formal capital" [18], necessary for this development: it is a set of values, codes, rules, forms of interaction and coordination, explicit knowledge contained in digital documents, identified and shared by local actors to formulate or implement a collective local development project.

A shared territoriality, as described above, is the main vector for strengthening this type of capital. This was the case with territories called ‘Pays’ when municipalities were cooperating to establish their development charter. It can also be the case with the new top-down land planning policies and their instruments such as the SCOT(see above):These policies can enrich the formal capital of a territory by bringing new habits of public participation, regulation of social relationships, use of shared territorial resources, and new symbols strengthening the territorial identity. Indeed, these new
public policies force local territories to organize themselves to formalize local realities in diagnosis documents and to express political choices in development projects. These top-down statutory requirements mechanically increase the formal capital of the territory. However, the formal capital will be more or less significant and its use will depend on whether planning is conducted as a technocratic mandatory exercise, or as a broad, collective and meaningful process to forge a common destiny.

2.2 Sharing Information for A Learning Territory

An endogenous approach as outlined above assumes that the territory itself is potentially holding all the knowledge and skills necessary to its own development. Mobilizing them in a territorial intelligence process needs to inform and to communicate, which implies the conjunction of three phenomena [1]: (i) Local actors share information (energy generation at individual and / or collective level), (ii) They give a credit to the received information because they gain a benefit(capture and exchange of information), (iii) Once the communication process is established, actors set up appropriate networks and transfer their skills in the service of a development policy (mobilization and transfer of energy: formulation of a development project).Local mediation arrangements can facilitate communication among stakeholders, both to establish first contacts, to make the most of existing skills or to develop new ones required for the design and / or the implementation of the project.

Once again, top-down regulatory procedures of territorial planning can be the trigger for networking local actors by imposing a form of "mandatory communication" [19p.603] without which on-cooperative stakeholders might be marginalized. Problem formulation and solving require collaborative learning, both cognitive and relational, a kind of "joint conceptualization" (Thoenig and Duran, op.cit.).

Indeed, these procedures go hand in hand with governance arrangements, information and communication processes, steps more or less imposed by a logic of project-based management, all of them providing opportunities for exchanges and interactions. The statutory requirement to build up a "territorial project", despite all the ambiguities around this concept [20], also helps local actors to develop and express a strategic vision strengthening their identity at the third level of the meta-model (see above). These procedures require the availability of a "territorial engineering" team [21]. This team must not only master regulatory planning procedures, but also be able to fulfill the aspirations of a local society symbolized by a singular political project and to translate aspirations in the normative frameworks imposed by regional, national and European territorial bureaucracies. In this case, territorial engineering concerns all local stakeholders, including civil society. It covers not only the understanding of territorial phenomena and the development of technical projects, but also all organizational institutional, social and individual changes which allow the territory to gain in reflexivity, autonomy, adaptability and affirmation of its own identity. This kind of territorial engineering requires a broad range of skills and tools because it addresses various actors with heterogeneous representations and codes. Informational, communicational and mediation issues occupy a central place, either in micro-events which mark the life of a "learning territory" [22], or in more permanent macro-arrangements for sharing information, signs and their interpretation, or for building and perpetuating the symbols of the territorial identity.

2.3 Spatial STICA for Territorial Decision-Making Processes

To formalize the informational and communicational dimensions at work in a territorial intelligence process, we use the concept of Distic3"(in English STICA:’ socio-technical information and communication arrangements) developed by the I3M laboratory.I3Mdefines the ‘STICA’ as "a place of mediation made up of multiple semiotic, aesthetic and technical factors in interaction which link up social actors through sensory and mediated means4.”

A ‘STICA’ consists of three inseparable entities in a relation of reciprocal co-determination: (i) The "media product(s)” (text, speech, film, graphics, tables, maps, hypermedia, etc.), which require the mastery of specific languages (e.g. a mapping language). Media products are disseminated by means of agents of mediation, either technical(channel, display device, etc.) or human (expert, intermediary, etc.), (ii) the "area of social cooperation for production «characterized by the intentionality of the designers of the STICA and the media products, (iii) the «area of social cooperation for reception «in which the participants are not just receivers, not simple message decoders, but autonomous and reflexive social subjects, with multiple resources, who can divert the interpretations and uses of the media products originally expected by the designers [23].

Different forms of mediation can take place within a STICA: technological mediation between the individual and the technique, social mediation between actors, and semi-cognitive mediation between the thought and media products. [24]

Among the media products within a STICA, we are particularly interested in spatial representations [25], both mental and material (maps, aerial photographs or field pictures, satellite images, 3D models, etc.), of land features and territorial phenomena in the role of boundary object between heterogeneous social groups [26]. The spatial dimension of territorial reality seems indeed to offer real potential of mediation and creation of meaning.

3 Distic : Dispositif Socio-Technique d'Information et de Communication
http://i3m.univ-tln.fr/Seminaires-DISTIC.html?var_recherche=distic
In fact, the issue of territorial development concerns, by essence, phenomena with spatial roots. As such, they affect the field of private property and sensitive dimensions, both individual and collective, such as identity, territoriality, and attachment to place, familiar spaces and emotions, as has been shown by many researchers in social geography [27-29]. Communicating on space and territories can be done, of course, through words and verbal languages. But there are also phenomena we cannot easily speak about due to a lack of appropriate words. However, these phenomena can be shown using imagery or spatial representations to allow actors to discuss them.

In the field of spatial planning, the decision making process is directly related to the model of bounded and procedural rationality [30]. It is a cyclical process, organized in several iterative phases, in response to a problem, either identified locally or imposed externally (e.g. a SCOT imposed by the State to coastal municipalities): (I) the organization of actors affected by the problem (ii) a phase of intelligence (inventory, diagnosis, prioritized issues) (iii) a prospective phase to imagine the future to address these issues, (iv) a modeling and choice phase (comparison of scenarios) (v) a phase of development and implementation of an action plan (vi) a phase of monitoring and evaluation to measure the effects of actions and possibly redirect the remaining ones.

Public policies are also accompanied by specific "policies of representation" (in the cognitive, informational and communicational sense of the term), that is to say arrangements of formal representations of reality, as it has been highlighted by the sociology of quantification [31] and illustrated for instance in the field of flood risk management [32].

These representations can take the form of measurements, numbers, statistics, databases with their associated conceptual models and semantic description, maps and their legends, indicators, and model results. The representations play a fundamental role for the public policy promoter. Indeed, they can impose analytical frames, especially through mapping, for the interpretation of a complex reality to develop shared representations, both of the object to manage and of the stakeholder community. They also reinforce the authority of the policy maker, legitimate public actions and regulate the practices of local actors.

Within multi-actor decision-making processes, we distinguish ephemeral STICA, used to support specific events (workshops, public meetings, etc.), and STICA that have a greater permanence in time (online newspapers, websites, steering committees, municipal councils, etc.). In this second case, we emphasize two perennial STICA, used to manage the formal capital, that we call "Heritage-type STICA" and "Observatory-type STICA."

The "Heritage-type STICA" aims to fuel various ephemeral STICA with cartographic supports (maps and aerial or satellite images used as background layers) and information content (data, reports, thematic maps, etc.) from the beginning of the decision cycle till the choice of a project and its translation into an action plan. In return, it receives, classifies (through metadata cataloging), archives and makes accessible the media products produced by ephemeral STICA or the perennial STICA of the partners.

The "Observatory-type STICA" supplements the first type from the moment the territory has determined a development project which provides a horizon of meaning, legitimized by the local political authorities and implemented by those involved in the action plans. Based on monitoring and warning indicators which make sense to local actors, this STICA allows measurement of changes at the physical level of the territory meta-model. Such an arrangement requires a preliminary analysis and design phase with all stakeholders to identify relevant media products [33]. In the "area of social cooperation for reception", sharing and interpreting this information and their associated signs allows assessment of the progress of the territory towards the desired horizon in relation to the actions which have been implemented.

### 2.4 Potential functionalities of spatial representations and gaps with current practices in territorial engineering

Defining and designing STICA based on spatial representations call for questioning the roles that these media products can play to establish purposely specific communication situations between participants of a development project, whether in the "area of social cooperation for production" or in the "area of social cooperation for reception".

Analysis of the scientific literature has highlighted six major categories of functionality that can be performed by various spatial representations, each within a particular register [20],[25]: (I) analytical (understanding) (ii) creative (imagining) and (iii) cognitive (learning), (iv) relationship - between individuals, social groups, institutions - (connecting), (v) decision (changing) and (vi) operational (acting).

Below we synthesize all functionalities that have been identified within each of these six broad categories.

<table>
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<th>Table 1: functionalities of spatial representations in STICA</th>
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<td><strong>F.1.</strong></td>
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<td><strong>F.2.</strong></td>
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</table>
F.2.3. Imagine innovative solutions
F.3. Cognitive: learning
F.3.1. Provide shared spatial background data
F.3.2. Access to mental representations
F.3.3. Express and articulate multiple relations to the world
F.3.4. Reframe perspectives
F.3.5. Develop awareness, make an impact on thinking
F.3.6. Access available information
F.3.7. Ensure a collective memory, visualize, explore, explain the available information
F.3.8. Simplify the territorial complexity
F.3.9. Create an epistemic community
F.4. Relational : connecting
F.4.1. Identify stakeholders
F.4.2. Develop awareness of diversity of mental representations
F.4.3. Legitimize institutional actors
F.4.4. Engage and legitimize local actors
F.4.5. Objectivize the words of actors
F.4.6. Generate openness between social groups
F.4.7. Create a community of destiny
F.5. Decision-making: choosing
F.5.1. Validate the diagnosis and associated stakes
F.5.2. Prioritize and select issues to be addressed
F.5.3. Consult, discuss, compare
F.5.4. Negotiate, convince, select
F.5.5. Show an agreement, a political intention
F.6. Operational: acting
F.6.1. Specify action plans
F.6.2. Frame works execution
F.6.3. Guide, prescribe, prohibit, legitimate actors and practices
F.6.4. Create a community of action

In parallel, we conducted the analysis of thirteen guideline documents used by territorial engineering practitioners. Our goal was to assess to which extent the functionalities of the spatial representations that we have identified were used in practice by these professionals. We also wanted to disclose the type of underlying socio-political culture behind these practices[20]. This analysis demonstrates that half of the guides do not refer to any spatial representation. In the other guides, map is by far the most cited spatial representation-type. On the other hand, representations such as block diagrams, graphic models, maps based on local knowledge, or mental maps are never mentioned. 3D physical models, sometimes mentioned as cognitive tools, are always presented as a tool to represent localized urban projects but never larger areas.

Images (satellite, aerial photography, field pictures) are not included in these guides, except in their analytic function. Their potential of mediation, of common spatial reference frame, is never mentioned. Several functionalities identified above are also not included in these handbooks, at least not in relation to the roles of spatial representations: perspectives reframing, expression of mental representations, commitment and legitimacy of actors, objectivation of actor’s discourses, increasing openness between actors, creation and upholding of a shared vision. The co-construction of territorial knowledge between heterogeneous actors and the importance of local knowledge are not addressed.

Our results show that the model of expertise and technical rationality, dominated by the traditional coupling of elected officials and technicians, continues to drive the content of current methodological handbooks dealing with public participation. They also show that cognitive and relational functionalities of spatial representations are not taken into accounting territorial mediation practices, thus confirming observations already made by territorial development specialists [34]. For example, in the reference manual for territorial development professional skills, the association of economic development professionals of the Rhône-Alpes Region (France) points out that facilitation and communication skills remain poorly developed among practitioners since they are poorly paid and recognized [35], whilst they are nevertheless considered as decisive [36].

3. STICA BASED ON SPATIAL REPRESENTATIONS TO FOSTER THE TERRITORIAL INTELLIGENCE PROCESS

3.1 The Thau Territory (France)

The Thau territory is located on the French Mediterranean coast in the department of Hérault, about 20 km west of Montpellier, the regional capital. Sète, Mèze and Frontignan are the major cities in this area between land and sea. With 117,000 inhabitants in 2010, the Thau basin is the third most populated area of the Department of Hérault. It is a land dominated by water: 30 km of coastline, several lagoons, including the Thau lagoon (7500 ha) which represents the unifying element of the territory (or indeed its great controversy, depending on the adopted perspective), a watershed of 44 000 ha covering 22 municipalities, 27% of the area covered by water (the highest rate among French coastal territories).

The Thau territory is extremely rich in terms of biodiversity and landscapes, between land and sea, coastal plain and wooded reliefs, among lagoons, wetlands and agricultural plains. Major economic activities are Sète’s harbor industries, shellfish farming and fishing, wine growing, thermal baths, tourism and leisure activities. Located on the Mediterranean coast near Montpellier and Béziers, crossed by the A9 and A75 motorways, accessible by train, this highly attractive area is subject to strong demographic pressures and urban sprawl. These dynamics threaten ecosystem stability; generate tensions between traditional economic activities and the residential economy as well as social inequalities.
due to steep real estate price increases. Industrial and wine production are in crisis although some local production has remained viable. Broader-scale changes, including climate change, also affect the Thau territory with impacts such as coastline erosion and sea flooding risk.

The Thau territory comprises two inter-municipal authorities which have been cooperating since 2005 through a joint planning engineering structure, the SMBT (Syndicat Mixte du Bassin de Thau), in order to deal more effectively with issues related to the dynamics described above. The SMBT is responsible for simultaneously coordinating the development and implementation of several planning instruments: a lagoon contract, a strategic master plan (SCOT - Schéma de Cohérence Territoriale), a water development and management plan (SAGE - Schéma d’Aménagement et de Gestion des Eaux) and a Natura 2000 conservation project for the entire Thau lagoon. From the start, the representatives and technicians of the SMBT chose to encourage the engagement of local actors and civil society in addition to the mandatory participation of public bodies (state agencies, local authorities).

Our research in partnership with the SMBT began in 2005, allowed us to observe and support the planning process of the Thau territory by introducing innovative STICA and spatial representations. For example, 3D physical models of the territory were produced to support mediation between heterogeneous actors in a traveling exhibition presenting the results of the SCOT diagnosis [37]. Below we present an example of spatial STICA used for the co-production of a map of the state of the environment derived from local ecological knowledge.

3.2 An example of STICA to enhance ecological knowledge of local actors

Some authors defend an ecological and perceptive definition of information [38]. This approach assumes that our environment contains information and meanings immediately available, directly perceptible and autonomous, which do not depend on acts of communication and cognitive interpretation by humans [39]. These statements are based on invariance within a more or less complex system, i.e. constant and regular relationships between facts, events or situations, because of physical or ecological laws.

For example, a weathervane informs of the wind direction, even if no human observed it. This information present in the environment, however, can be captured by sensor technology, but also by actors accustomed to the particular environment with its constraints, its invariants and its dynamics [40]. Thus, actors such as farmers, fishermen, hunters, naturalists, hikers, use forms of knowledge that are required for action and are built over long periods of time through intensive practice of the natural environment in which they operate.

In our epistemic and scientific approach of territorial intelligence where we focus on the environmental dimension of the territory, this naturalistic conception of information appears as particularly relevant. It ties up with a wider trend related to the progress of sustainable development as a major and global paradigm and should foster the recognition of local ecological knowledge as underlined by a recent bibliometric analysis [41]. The environmental sociologist Carole Barthélémy also highlights the social issues of such a change. [42] According to her, emerging practices of co-management of environmental resources leads to the recognition that local stakeholders are not only resources users, but also potential experts. The use of this kind of knowledge thus becomes a new challenge for the social recognition and legitimacy of these territorial actors.

However, in reality this local knowledge is rarely formalized in a manner that is at par with explicit knowledge from the technical and scientific spheres. Local knowledge often falls within the category of tacit knowledge [43]. The challenge of successfully using tacit knowledge in territorial intelligence processes requires transformation into explicit knowledge by using different methods of data capture and processing, then subjecting the new knowledge to various tests of legitimacy in order to be recognized as «confirmed facts”.

The case described below deals with the achievement of an inventory of zostera seagrass the Thau lagoon within the framework of a Natura 2000 project. Zostera seagrass is considered as a good indicator of the degree of conservation of the lagoon. Seagrass is a habitat provider for important biodiversity, contributes to water aeration and also limits the lagoon bank erosion.

To achieve the seagrass inventory, the SMBT set up a hybrid working group consisting of local lagoon professionals (fishermen), scientists in ecology and geo informatics, diving and marine ecology associations. As there was no set national methodology for seagrass mapping, three complementary methods were used based on the expertise and skills of the group members: (i) the first one relied on direct observations by free divers, towed by a boat equipped with a GPS, (ii) the second one was performed through remote sensing techniques (iii) and the third one was based on the knowledge of professional fishermen operating on the lagoon. Here we present the third approach.

We designed a STICA in partnership with the SMBT in order to produce a zoning map of the lagoon seagrass by transforming tacit knowledge of local fishermen representatives into objective data.

The first design activity was to produce a cartographic background to help fishermen to ‘outsource’ their local knowledge by specializing it as accurately as possible. Preliminary exchanges with the fishermen and other stakeholders of the working group showed that fishermen get their bearings using observable landmark
son the lagoon (bathymetry, shallows named “toc” parallel to the coast line) and ashore (permanent fishing stations equipped with nets, mobile fishing stations located by fishermen within two meters based on landmarks such as shellfish tables, water towers, groves of trees, steeples or other tall buildings).

The background map was developed on the basis of pragmatic semiotic criteria. The aim was to provide a geo-referenced support with meaningful features for the fishermen (F.3.1. Provide shared spatial background data). On the other hand, this background map had to be free of any information that may bias the cognitive activity of the fishermen based on their mental representations. This cartographic document should also support an exercise of co-design mapping done by various people working simultaneously and interactively. This document eventually took the form of a 1: 10 000 scale base map, two meters long and 80 cm wide, composed for the terrestrial part of IGN (French National Geographic Institute) map and for the lagoon area, a bathymetry grayscale map representing depth ranges. The above-mentioned landmarks were added and highlighted: lagoon shellfish tables, number of each fishing station, “Toc” shallows (as mentioned below), lighthouses and towers.

The actual drawing exercise took place over less than half a day. It was recorded and filmed for a later detailed analysis of the process. During the workshop, the first discussion focused on the alignment of the above-described backdrop landmarks on those mentally used by fishermen for the exercise of their profession. This alignment was done through a series of individual activities and several exchanges between fishermen and other participants, leading for example to modify the “Toc” shallow location, which was incorrectly positioned. Delineation of seagrass was then held quickly (F.1.1 represent and understand the territorial complexity). During this exercise, we observed the fishermen suspended the drawing on several occasions, looking for landmarks with their eyes and through gestures (e.g. counting the rows or columns of shellfish tables or tracing gestures of imaginary lines with landmarks) and then resume the drawing. They also told several stories about their practical experiences (F.3.2. Access to mental representations). They expressed sometimes extremely detailed knowledge of the lagoon, providing interpretations of its ecological functioning, related to perceived signs, and of seagrass changes over time (F.1.1 represent and understand the territorial complexity). They also managed to draw and date former areas of seagrass (F.1.3. Monitor changes, detect weak signals).

At the end of the drawing exercise itself, which lasted less than half an hour, the map produced by the fishermen was used as a visual support for informal discussions, extended and renewed by overlaying the map with another one made by a scientist in 1994 (F.3.3. Express and articulate multiple relations to the world). The handmade map produced by fishermen was digitized and given to the SMBT’s GIS engineer to derive various maps (F.1.1 represent and understand the territorial complexity).

Maps were subsequently compared with those obtained through two other methods (visual surveys by free divers towed by a boat, remote sensing mapping) during a workshop with all the participants and the scientific reporter of the Thau Natura 2000 project. The few discrepancies identified between the drawings were discussed one by one, each bringing some explanations (F.3.3. Express and articulate multiple relations to the world, F.4.5. Objectivize the words of actors, F.5.4. negotiate, convince, select).

The record of the meeting shows that these differences were mainly due to differences in the geo-positioning techniques and the categorization systems of reality. If the maps provided by free divers towed by a boat equipped with GPS are the most detailed, the hybridization and complementarily between the three methods have increased the reliability and the recognition of the final maps produced by this working group (F.1.1 represent and understand the territorial complexity).

The testimonies of participants, including selected scientists, expressed in an evaluation survey at the end of this workshop, highlighted that the main benefits of this participatory experience were both mutual recognition (F.4.4. Engage and legitimize local actors) and creation of shared representations of reality from scattered knowledge (F3.9. Create an epistemic community).

Although several points of improvement have been suggested, the complementary of the methods and their cross-validation has reassured all participants after the initial uncertainties due to the novelty of the approach compared to the as-usual professional practices to implement environmental public policies. Scanning the handmade map into the GIS also helped to give it a technical credibility among the State administration and the experts of the domain.

The results were formally presented to the steering committee of the Natura 2000 project, a formal body of elected representatives, governmental services, local authorities and professional users of the lagoon. Validation of the results by all participants explicitly meant the recognition of local stakeholders’ knowledge and skills, thereby reinforcing their commitment to the project (F.4.4. Engage and legitimize local actors). It also demonstrated the ability of SMBT to develop innovative approaches (F.4.3. Legitimize institutional actors). The maps produced by the free divers and the fishermen have been included in the regulatory documents of the initial seagrass inventory. This test of external legitimacy of the approach and the data produced has been successfully extended through presentations of the project by various participants who
acted as spokesmen of this approach within their respective professional networks.

Our example of map production based on complementary approaches and the mediation of local ecological knowledge demonstrates that is possible to rely on local resources to increase the formal capital of the territory as well as to strengthen networking and local actor involvement. This result fulfill the conjunction of the first two of the three factors required for the development of a territorial intelligence process: (I) agents share information, and (ii) they give credit to the received information because it provides them a benefit. Once the communication process is established, the third factor will occur in the subsequent step of the Natura 2000 project: it consists for the actors in developing appropriate networks allowing them to transfer their expertise for the development of a policy. Once the diagnosis is made, a document of objectives has been defined in order to carry out an action plan at the physical level of the meta-model of territory.

4. CONCLUSIONS AND PERSPECTIVES

We have shown in this article what might be the effects of public policy changes for the development of territorial intelligence processes within new intermunicipal authorities. More complex governance arrangements require the engineering territorial teams to broaden their scopes to mediation activities between social groups with heterogeneous codes and divergent interests. However, these mediation skills are far from being mastered by territorial engineering practitioners. We have proposed a pragmatic approach based on the concept of socio-technical information and communication arrangements(named STICA all along our article) to support the process of territorial intelligence. Within these arrangements, the use of spatial representations offer a range of mediation functionalities that we have highlighted but which are still largely ignored and under-practiced.

Our case study in the Thau territory illustrates this potential by showing how local ecological knowledge can be used both for increasing the self-analysis capacity of the territory, but also to legitimize the arrival of new participants in the circles of territorial decision-making processes. If operational outcomes can already be derived from this research, new issues are emerging in the field of information and communication sciences, warranting further theoretical and applied research on a spatial approach of territorial intelligence. Deepening our understanding of territorial mediation arrangements based on spatial representations opens up a vast field of research owing to the diversity of representations and situations of use. For example, an approach based on quasi-experimental protocols would allow measuring the effects of specific variables related to media products themselves or to users. Ethno-methodological approaches would help to grasp the subtlety of communication that comes in mediations carried out with spatial artifacts.

Our discussion of two permanent STICA, the “heritage-type” and the “observatory-type »ones also points to further research questions For example, what are the conditions required to achieve a long term commitment of local communities in measurement and observation activities to strengthen such STICA? What are the effects of these forms of information production on the STICA themselves, their durability, their legitimacy, the debates set off by their informational content?

Finally, we believe that the issue of data uncertainty, either in raw data or derived from models, will gain in importance since information sources to describe the same reality are increasing and lead to controversies. How to represent this uncertainty? What kind of mediation operations can be promoted to take into account these uncertainties in territorial decision-making processes? What difference does it make to the beliefs of individuals, to the nature of arguments used in discursive acts, to the progress of decision-making process?

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