SATELLITE APPLICATIONS TAKE-UP IN EUROPE: AN ANALYSIS OF THREE CASE STUDIES WITH REGIONAL AUTHORITIES

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Abstract

European investments in space are designed to ensure that Europe makes full use of space capabilities to meet public policy objectives and the needs of its citizens and businesses alike. These investments are also expected to stimulate the development of the downstream value-added sector. In order for these programmes to deliver their expected socio-economic benefits, the innovative tools they offer should be adopted by end-users on a large scale. However, so far the take-up of value-added services on a local and regional level has been weak.

While technology push is needed, to a certain extent, to develop capabilities and ensure the diffusion of satellite services, it is not sufficient. Eurisy, a non-profit association of European government space agencies, has been working with three local and regional authorities in order to understand, from a grassroots perspective (the end-users'), what factors other than technology influenced satellite service take-up. This grassroots work aims to help further the understanding of the systemic difficulties that affect end-user take-up, as well as of how effective the current support mechanisms and policy measures are in addressing these difficulties on a local and regional level.

Case study observations confirm that the merits of the technology alone, and a technology-driven approach does not necessarily convince the user to adopt this new technology. Similarly, top-down measures to stimulate take-up are not sufficient unless they are accompanied by grassroots support to the potential end-users in their appropriation of these tools. Such support should be based on a better understanding of their operational needs and the economic realities on the field. Cooperation between early adopters and potential end-users on a peer-to-peer level, relationships between potential end-users and technologists that are based on a real business case for service use as opposed to service development, as well as political drive on all levels, including sub-national, are all crucial factors in bringing about the kind of social change that translates an effective penetration of the satellite services within society.

1. INTRODUCTION

European investments in GMES and Galileo/EGNOS are expected to result in innovative, satellite-enabled tools for tackling societal challenges such as climate change, security, and demographic growth. These investments are also seen as crucial for boosting innovation and the competitiveness of the European space sector, and to ensure Europe's independent access to space[1].

The long-term sustainability and the expected socio-economic benefits of these programmes depend however on whether professional end-user communities adopt and use these innovative tools on a wide scale. Previous field work with regional authorities as professional end-users of satellite information and services has identified a significant gap between the volume of space investments and the development of satellite information and services, on the one hand, and the slow take-up of such solutions by end-users.

Eurisy is a non-profit association of space agencies and governmental offices dealing with space affairs in Europe. In this context, Eurisy carries out a User Programme designed to inform and raise awareness of satellite information and services among potential end-user communities, as well as to organise exchanges between them and value-adding service providers and other actors of the space sector. Its User Programme activities are the basis for bottom-up feedback to decision-makers on obstacles to the diffusion of satellite services, as seen from the perspective of the end-user communities.

2. OBJECTIVE, METHODS, AND WORKING HYPOTHESIS

This paper aims at reporting on Eurisy's in-depth work with regional authorities as professional end-users, in the format of case studies, providing further insight into an end-user's decision making process regarding the identification and adoption of satellite

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solutions, and by observing this process and its stakeholders in their work environment.

Process of adoption of satellite services and the case study format

The end-user's process of adoption of satellite services in a professional environment, drawing on Rogers' theory of the diffusion of innovation[2], can be sub-divided into five distinct stages: **(a) knowledge**: a potential end-user becomes aware of satellite services and has a certain idea of how they can be beneficial for his/her work; **(b) persuasion**: a potential end-user develops a favourable or unfavourable attitude towards the satellite service solution; **(c) decision**: the potential end-user engages in a decision-making process which leads to the adoption or the rejection of the satellite solution; **(d) implementation**: the potential end-user puts the satellite solution into use and becomes an end-user; **(e) confirmation**: the end-user evaluates the results of the decision to use satellite services .

In this adoption process, Eurisy case studies focus on the stages of persuasion and decision as the critical stages that determine a successful and sustainable implementation of satellite service use. The case study research design was chosen as the most appropriate approach to analysing this process as it helps explain both the process and outcome of a phenomenon through observation, reconstruction and analysis of the cases under investigation.

Thus, the case study approach enables Eurisy to take into account a number of variables in its analysis: the end-user, as much the individuals involved in the process as their host organisation, its structure and resources; the work environment; the stakeholders advising on and providing satellite solutions.

Most importantly, the case study approach allows for the observation of the relationships and interactions between these variables and analyse the findings with a view to identifying patterns that help explain a positive or negative outcome regarding service adoption.

Eurisy's role in the case studies

Eurisy made the voluntary choice to become itself a variable in the process. The case studies are not purely research exercises; they also fulfilled operational objectives such as raising awareness, providing support to end-users and gathering bottom-up feedback. We achieved this, respectively, by introducing good practice examples of confirmed, experienced end-users, by intervening as a facilitator and advisor to the end-users in their interaction with service providers and other stakeholders, and by facilitating access to neutral expert advice on satellite technology.

Actively participating in the research process allowed us access to a privileged position for observation. It enabled us to verify and refine our support measures by testing them in field. However, it also introduced a bias which should be taken into account when considering results and conclusions.

Eurisy's working hypothesis

In previous work we observed that technology push tends to determine most of the interactions between service developers and potential end-users in the framework of R&D projects (for instance those financed through FP7 funds). However, according to the theoretical concept of the systemic approach to explain change, as formalised by D. Bériot[3], no single factor — whether technologic economic, social or other — can, on its own, account for change. Technology push, and technological merit alone cannot drive the diffusion process.

R&D projects do include end-users, so they involve social interaction that can influence outcomes. However, the primary goal of R&D projects is to develop new technical capabilities. This means they focus on technological problems, expressed in terms of technical requirements and specifications.

While R&D projects are a prerequisite for bringing new services to the market, ensuring they are commercially viable depends on whether they respond to an end-user need, a problem, or a challenge, that the user will not usually express in terms of technical requirements. Building a business case requires a deeper investigation into the end-users' organisational and socio-economic context, as well as adherence by the end-user, that is, a change in the end-user's perceptions and attitude towards the innovative service.

With the case studies we aimed to bypass any technological *a priori* and to move away from the technology push, which was considered an obstacle to a real understanding of end-users' needs (as opposed to mere technical requirements). We influenced the potential end-users', as well as their interactions with technologists, with the objective of considering the technology question from a different angle (see fig.1), namely the perspective of the end-user themselves.

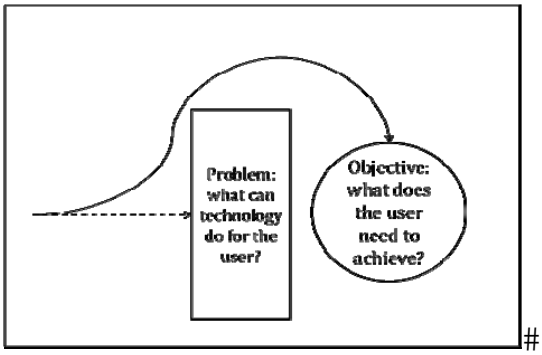

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Fig. 1. The technology problem masks the question about end-users' objectives[4]

In order to do so, we aimed at influencing the stakeholders (end-users, service providers etc.) to focus first and foremost on what the end-users needed to achieve as part of their jobs and in the framework of their organisations and in their socio-economic environment (i.e. individually, and together), not on the technology itself. Finally, we focused on how existing, operational services could fit these needs (being open to the possibility that they do not), rather than on exploring venues for new services to be developed.

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3. CASE-STUDIES: THE FACTS

In 2008, Eurisy started working with three groups of regional public authorities on case-studies, in the framework of INTERREG regional projects that focused on biodiversity, sustainable energy and coastal management. The process of establishing a partnership with them, and the scoping exercises carried out together, are described below.

a) MORE4NRG: scoping satellite service potential in the renewable energy sector

MORE4NRG was a group of 11 regional public authorities from different European countries. They worked together on a three-year project financed by the EU INTERREG funding scheme. The objective of MORE4NRG was for partners to exchange and learn from each other's energy strategies, action plans, and good practice examples related to the sustainable use and management of energy. Project deliverables included a toolkit on how to improve energy policies and measures on a regional level, and various communication activities.

Negotiating partnership (early 2008-mid 2009)

Among the three cases described in this paper, only MORE4NRG is the result of a proactive search for partners by Eurisy.

Early 2008, the Assembly of European Regions, a major association of public authorities and a working partner, introduces Eurisy to the coordinator of the future MORE4NRG project. It is agreed that Eurisy would be included as a cooperating partner in the project bid, but not as a full partner – that is, Eurisy would not apply for funding or partake in project decisions. This choice is motivated by a will for a consistent positioning of Eurisy as neutral and not-for-profit.

In May 2008, Eurisy organises a first meeting in Paris between a group of experts (representatives of most professional associations of service providers) and the coordinator of MORE4NRG. The objective of the meeting is to review the needs of the regions and identify where satellite services can be used. While the meeting arouses an interest and willingness of the parties to work together, it soon becomes clear that the MORE4NRG Coordinator alone is not in a position to provide more than a general description of needs among the partner regions, which are in fact very heterogeneous.

In order to obtain a more direct feedback from some of the regions, a case-study session is organised during a Eurisy awareness-raising conference in Dublin. Here, presentations by the regions of their challenges are echoed by presentations by satellite service experts on solutions. The event is effective for communication and awareness raising, but remains fairly general. It is realised that in order to go into an operational, project-mode, one should start focussing on one region.

End of 2008 - beginning of 2009, Eurisy attends a series of project meetings where regions present their organisations and their energy challenges. This enables Eurisy to better understand the regions' areas of interest, concluding that a majority are interested in wind and biomass as renewable sources of energy. In particular, Maramures, a Romanian region, is interested in working with Eurisy on biomass.

In May 2009 the political meeting of the MORE4NRG Consortium takes place. This meeting includes political representatives of all partners, who sign partnership letters. A "letter of intention" is also signed by the Consortium representative and Eurisy's Secretary General.

Eurisy's Secretary General presents the conclusions of the previous project meetings

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that wind and biomass are priority themes for the majority of the regions. However, photovoltaic power is chosen by the Consortium as a theme for the case-studies, being a more important political priority.

During the same meeting a couple of regions are identified as the candidates for working on this topic. It is agreed these regions would meet experts during a Eurisy awareness-raising event on satellite applications for energy in The Hague. However, eventually it turns out they are unable to join. The case-study theme is switched back to biomass with Maramures. Eurisy and Maramures start working together operationally from this point on.

Securing this partnership is a slow process that combines formal and informal approaches. It is also a learning process for Eurisy, as presumptions on what works and what does not are tested and the case-study concept is refined.

Maramures County Council: first scoping exercise (June 2009)

Once a candidate and working theme has been established, the next step is to map the stakeholders of the theme from within the organisation, and outside it (NGOs, members of the public, private companies etc).

Therefore, before the meeting in The Hague, our Maramures interlocutor identifies and invites local stakeholders. On the end-user side, participants include representatives from the County Council, the Regional Forest Administration, and a local SME that builds wooden furniture and produces wood pellets for energy production.

We identify multi-disciplinary experts who can participate in a dialogue with these stakeholders, to inform and advise. These include: satellite navigation and Earth-observation service providers; two confirmed end-users of satellite services, that is, an association of Finnish forest owners and a representative of the French Forest Administration who are invited to share their experience in implementing and using the services.

This scoping exercise is actually carried out in two days: informally, on day one, as a way of preparing the case-study session. Formally on day two, in front of the workshop audience.

As a first step of the scoping exercise we identify common as well as potentially conflicting interests of the local stakeholders in relation to the forest. The County Council needs to create jobs; the Energy Agency needs to stimulate renewable energy consumption; the Forest Administration needs to re-plant deforested areas, to protect sensitive plots, but also to support itself by selling wood; the private company needs to buy good quality wood at favourable prices. The County Council could use measures to match offer and demand for wood, by informing the actors concerned. Or it could stimulate local authorities to do tree plantation works by co-financing such projects, in collaboration with the Forest Administration. Other cooperation models based on sharing of information are discussed. However, at the moment of the scoping exercise there is no communication and coordination between these actors. Setting up a biomass value-added chain, it is concluded, could help the interest of all involved[5].

Finally it is agreed that a shared web platform containing relevant information would be a useful tool to support a cooperation model between actors and their organisations. The next step would be to define sources of information (including from satellite) and identify suitable IT solutions to set up such a platform.

It was the informal gathering on day one that produced most of these findings. The dynamic of this “rehearsal” could not be re-created the second day, in front of an audience and in a formal setting. One of the explanations is that Eurisy moderated the informal exchanges with the advantage of already having specific knowledge about all the actors involved, both on the end-user side and on the experts’ side, as well as a methodology in mind, whereas the formal chair of the case-study session — a service provider — had just been introduced to the exercise.

Maramures peer review and implementation scenario

In September of the same year, Maramures hosts a meeting with some of the MORE4NRG Consortium partners. Its objectives are for experienced energy professionals from some partner regions to analyse energy challenges in the host region and make recommendations on improvements.

It is an opportunity to involve a satellite service expert to reflect further, with the local stakeholders, on how the biomass information web-platform can be set up, and under which conditions.

It proves difficult to convince an expert to travel to Maramures and meet the end-users. Value-added service providers who also have

knowledge of biomass — which is the sort of experts we needed at this stage — do not see any imminent commercial interest, so hesitate to invest time.

Eventually, an expert in satellite applications in forestry from a service provider agrees to attend. (That he is both a forester and a university professor facilitates his exchanges with the end-users).

The expert recommends a three-option implementation scenario:

(a) integrating free Corine land cover data in the existing GIS. However, Corine data has little detail on the themes of interest, but could help build competences.

(b) setting up a pilot project supported by the national Ministry of the Environment (or other) to cover part of the costs and limit risk. This would require securing that national support.

(c) setting up an autonomous regional project It is estimated that this third option, however, may cost as much as €200 000.

These scenarios are presented on three occasions to smaller and larger audiences composed of the consortium partners and their various networks.

The report is received with interest, however, its estimated cost is perceived as extravagant relative to the uncertainty of the outcome. In the face of this, experts specify that cost is variable, and is strictly related to the type of information required, the frequency of demand, and other such technical characteristics that can only be defined directly and very closely with the potential end-user.

Maramures second scoping exercise (July 2011)

The necessity of reducing uncertainty leads to the organisation of a second scoping exercise with local and national stakeholders. It takes place in the summer of 2011.

The difference relative to the 2009 scoping exercise is that there is a more clear focus on the biomass value-added chain organisation; that it takes place in Maramures; that it involves a larger number of local stakeholders, as well as Romanian NGOs; that it is organised under the chairmanship of the national space agency.

Re-creating a local stakeholder cooperation model is done just as enthusiastically as the previous time in The Hague. By their own admission, this is a first time such varied stakeholders discuss cooperation locally.

The language being mostly Romanian helps a great deal.

However, the technical language of value-added service providers proves challenging for the end-users.

The “good practice” examples given by the user from the Romanian National Forest proves the most effective way to introducing local stakeholders to relevant satellite applications.

The case-study today

The work with Maramures was the basis for Eurisy’s contribution to the MORE4NRG toolkit[6], a contribution drafted with the support of the experts involved in the scoping exercises, and some others, consulted on an ad-hoc basis.

This information on satellite services for forest and biomass management was presented to the MORE4NRG network and representatives of other networks in the closing MORE4NRG conference. So were the conclusions of the work with Maramures, who share their interest in starting a pilot project. However, there are persisting uncertainties (technological, financial, political) that discourage the end-user from taking the driving seat for now. Formulating a demand and procuring a technical service that escapes a detailed understanding, both in terms of technology, and in terms of value for money is seen as challenging.

Maramures representatives in MORE4NRG would be more comfortable to be accompanied through the process, both financially, and technically, in particular. This would also consolidate the initiator’s position when attempting to mobilise the other regional stakeholders as partners in a potential project.

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b) Coast Alive! (CA!): scoping satellite services for natural and cultural heritage management

Coast Alive! (CA!) is an INTERREG project by a group of 14 regional public authorities from countries along the North Sea, working on natural and cultural heritage promotion and protection. Project activities included exchanges of good practice, heritage promotion activities, and a toolkit of good practice on promotion and protection measures for natural and cultural heritage.

Negociating partnership (2008-2010)

The future CA! project coordinator – a consultant with expertise in EU projects – knows Eurisy from previous contacts, and approaches Eurisy about cooperation during the project bid. He sees Eurisy as a pool of technical experts who could inject technology and new ideas in the project. The cooperation agreement with Eurisy is mentioned in the INTERREG application, under the same conditions as with MORE4NRG (Eurisy claims no financing, does not take part in decisions).

Eurisy participates in two exploratory meetings during 2009. As in the case of MORE4NRG, the CA! partner regions and their sub-partners prove quite heterogenous, so one or two specific partners to work with needed to be identified.

These meetings help strengthen informal relations between Eurisy and the partners. We take the opportunity to observe and identify themes of interest to most of the partners involved.

Early 2010, the CA! Consortium reaches an internal agreement that Hordaland, the Lead Partner, would be the candidate to work with Eurisy on a case-study. However, informal exchanges also elicit spontaneous interest from Norfolk County Council, another partner in the project.

Early 2010, a first, informal meeting between Eurisy and Hordaland takes place in Paris, without involving any other experts at this stage. Indeed, Hordaland's needs appear quite diverse and diffuse, so more work is needed to sufficiently narrow down the working topic. It is even envisaged for the Eurisy project coordinator to spend a few days for observation in Hordaland, with relevant organisations, as a way of achieving that.

Meanwhile, Norfolk County Council seems to already have a narrower focus, which makes it easier to start with them.

These differences do not say anything about the focus, or strategies, of the two user organisations themselves. But Hordaland is more interested in culture and tourism, while Norfolk County County in environment issues. Scoping which information can be used for environmental management seemed more obvious at the time, with GMES in mind. However, later on the work with Hordaland proved just as interesting.

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Scoping exercise with Norfolk County Council (February 2011)

We start off by interviewing the Norfolk County Council representative in the CA! by phone in order to narrow down the working topic as much as possible, and to understand the relationships between the local stakeholders.

The Norfolk representative freely presents a range of challenges the region is faced with, on and in his own terms: for instance, "there are more and more boats using our coast; we see this, but we do not know how many more, statistically and objectively"; "if more than 10% of a specific habitat is destroyed, we are obliged by European directives to re-create it. However, it sometimes occurs naturally. If we knew this, we may save time and money", etc.

He also appropriates very quickly the notion of relying on the experts mobilised by Eurisy as a way to generate new ideas. In fact, he is the first to use the term "scoping exercise" to refer to the mechanism.

That there are pre-existing, and relatively close relations of cooperation between the environment stakeholders in the County helps. We receive extensive documentation on the challenges, needs, strategies and action plans.

For the first time we use a questionnaire successfully as a way to investigate end-user needs before a scoping exercise. We receive replies from a range of different stakeholders even though they do not know Eurisy. The questionnaire investigates non-technical problems and challenges, and likely needs for information (but not data).

On our side, we identify and constitute a group of experts in satellite services whose services are likely to match the needs expressed by the end users.

During the scoping exercise itself, the other local actors demonstrate the same ease in expressing needs in a non-technical way, with a view to helping the experts understand where information is needed, or where processes need to be improved.

Some of the technical presentations from the service providers prove challenging for local participants. Operational good practice examples are received with a lot of interest.

Because the informal cooperation models are already in place (which had not been the case in Maramures), it is easier to draft a joint list of needs, and discuss priorities.

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The experts link up these needs with recommendations on the viability of satellite solutions in terms of:

(a) operational solutions

(b) pre-operational solutions

(c) solutions at an R&D stage.

Incidentally, one of the service providers offers potential users a free demonstration of a satellite navigation application allowing end users to survey and locate species of flora. This is accepted with a lot of enthusiasm by one of the local organisations involved in inventorying invasive species of fauna and flora.

The scoping exercise is the basis on which Eurisy, in collaboration with the experts present, produces a report[7] on the needs observed, and recommendations on where satellite services can be used.

Awareness raising workshop with Hordaland County Council (October 2011)

As mentioned, Hordaland County Council was interested in satellite applications for use in culture and tourism promotion. Most of these are based on satellite navigation and are easy to demonstrate on smartphones.

A scoping exercise is therefore not deemed necessary. Instead, Eurisy and Hordaland co-organise a workshop, open to participants from all European countries. Confirmed end-users working for regional authorities are invited to share their experience in using satellite applications, as well as state their evaluation of the cost and benefits.

The one-day workshop fulfils a double function of providing support to Hordaland on the one hand, and raising awareness of satellite applications in the wider framework of Eurisy's User Programme on the other hand.

The presentations given by the experienced users prove adequate and accessible to the audience. Exchanges are fluid. The CA! Consortium declares[8] its intention to take-up a satellite navigation solution similar to the ones presented in the workshop, drawing on Eurisy's network of experts in doing so.

CA! satnav pilot project call for tender (June 2012)

The CA Consortium do indeed decide to launch a pilot to set up and test a tourism and leisure satnav application for Norfolk County Council, as well as two other regions of the CA! Consortium.

Eurisy is called upon to support the drafting of the call for tender, its dissemination, as well as the bidder selection process. Consistent with our neutral position, we do not intervene in the process directly. Rather, we rely on support from the UK Space Agency, who covers the cost of inviting two neutral experts, who in turn help translate end-user needs into requirements, and act as technical evaluators during bidders' evaluation interviews.

This form of support proved crucial in covering the technical expertise gap during the selection process. Though Eurisy did not intervene on the content, we remained the mediator between the technical experts and the end-users throughout the process. This interface was indispensable to ensure the continuity of the relationship and trust as they had been built until then.

The case-study today

The Norfolk Biodiversity Information Service is currently working on a project to map habitats using EO-applications in partnership with one of the value-added service providers involved in the scoping exercise, and DEFRA (UK Department for Environment, Food and Rural Affairs).

Following the satnav bid and the selection of a service provider (though not the one that offered the free demonstration), the project is in progress.

Norfolk County Council has included the implementation of a similar satnav application as part of RINSE, another INTERREG project they are part of.

These results will be presented in the CA! final conference as well as in a Eurisy User Programme conference hosted by the other partner in a case-study, the Region of Nord-Pas de Calais, in October 2012.

c) ARCH: satellite services for biodiversity

ARCH (Assessing Regional Changes to Habitats) is an INTERREG project bringing together the Region of Nord Pas-de-Calais, France, and the Kent County Council, UK. The objective of the project was to coordinate and improve measures to protect biodiversity on an interregional level. Project deliverables were:

- an interregional map of natural habitats, based on aerial remote sensing;
- a study of suitable software to handle habitat maps;

- a feasibility study on the potential of using satellite information and services to update the aerial maps;
- dissemination of results.

Establishing partnership (2008)

In 2008, the project coordinator for Nord-Pas de Calais first gets to know about Eurisy thanks to a Eurisy awareness-raising event in Brussels. Subsequently, the project coordinator invites Eurisy to be a cooperating partner in the ARCH project, under the same conditions for Eurisy not to claim INTERREG financing or partake in project decisions.

Cooperation is foreseen to focus especially on the study of the potential of satellite information to be used to update the aerial habitat map. The coordinator's expectations of Eurisy are to access Eurisy's network of experts, and to join communication efforts on project results. Because of the relatively low level of commitment on both sides, and given that the topic is narrow and clear, work starts informally, very rapidly, before formalising cooperation in an agreement letter.

The support Eurisy has provided to ARCH takes a different route to the other case-studies. The reasons are obvious: Nord Pas de Calais is already at a more advanced stage of awareness of satellite services and already engaged in a decision process about these solutions.

ARCH call for tender

End 2009, Nord Pas de Calais consults Eurisy for any suggestions about the call for tenders on the realisation of the study on the potential of satellite information for habitat mapping.

The initial draft requires of the potential contractor to inform on the available technology in terms of types of satellites, sensors, types and characteristics of raw data, and other such technical parameters.

However, Nord Pas de Calais does not process raw data in-house, nor does it intend to develop such an in-house competence in the future. Our first recommendation is therefore that, in order for the study to be relevant to the Region's situation and needs, it should highlight operational value-added services (that is, processed satellite data in the form of maps) that could be used seamlessly, as part of the regional GIS tools.

Furthermore, in order for the Region to be able to easily compare and assess the services, we suggest the economic value of the services should also be included in the scope of the study.

We also suggest it may be difficult for a value-adding company to provide an entirely objective view on services that are available commercially.

In the beginning of 2010, Eurisy supports the dissemination of the call for tender. Because of internal deadlines (in terms of budgets, political changes), there is relatively little time to respond. The realisation of the aerial habitat map, as well as the study on the potential use of satellite services, is contracted to a regional value-added service provider who is already known to the Region from previous work.

ARCH state-of-the-art report and analysis of needs (2010-2011)

Between 2010-2011 Eurisy was invited to participate in several project meetings concerning the study on satellite applications.

The understanding of and attitudes towards satellite information among the potential end-users are mixed. They vary from high placed expectations to strong reservations. The tendency in some cases is to compare the technical characteristics of aerial and satellite, for instance resolution, to the disadvantage of the latter.

Interestingly, the service provider themselves are sceptical about operational solutions relying on satellite data and are thus more inclined to look into the R&D projects to aliment the study.

The interactions between the end-users and the service provider are not unlike those observed in the other case-studies. Technical presentations on remote sensing are, if not inaccessible, at least less interesting to the end-users than the functionalities and value for money of operational applications.

In order to counter balance the scepticism related to operational solutions, we work with the service provider on identifying "good practice" examples of regional authorities who have used satellite applications for similar challenges. These are outlined in the state-of-the-art report, one of the intermediary project deliverables.

The good practice examples are also an opportunity for us to promote the idea that satellite information should not be regarded as a replacement alternative for aerial, but rather, as a complementary tool which can make sense in given organisational contexts/business models.

This same argument supported the idea of an investigation into the two regions' respective organisational contexts, stakeholders, and needs: an analysis of needs that extended beyond looking simply at technical requirements.

We offer to share our questionnaire model with the service provider to support the analysis, and this is accepted. When sending out the questionnaire, we suggest that a distinction should be made between the needs of information of environment professionals, as end-users, and the needs of the in-house GIS professionals, as internal value-adders/ service providers. This is accepted.

The questionnaire responses serve as a basis for a workshop on needs with local stakeholders, which should function like a scoping exercise (identifying stakeholders, challenges, common problem). The interactions between the service provider, who conducts the workshop, and the potential end-users, are hesitant.

The service provider maintains a relatively narrow focus on technology with the expectation that end-users will formulate requirements, or a specific demand. The "good practice" report is presented by Eurisy and the service provider jointly. We present the "soft", organisational and financial aspects, while the service provider presents the technical aspects. However, the focus shifts on the technology, and the organisational aspects of the good practice examples are not really discussed.

The case study today

The report on the potential of satellite services to help update the habitat map is currently in progress, and some satellite data has been obtained by the service providers for tests.

Eurisy and the Region of Nord-Pas de Calais are co-organising a conference in October 2012, which will present the ARCH project results, including the conclusions of the report on the satellite services suitable for habitat mapping.

The conference, open to a European audience, will feature good practice examples presented by the end-users themselves, including Nord-Pas de Calais. In addition to awareness raising, it is expected to be a platform for stakeholders to evaluate and provide bottom-up feedback on how well R&D have translated into suitable, operational tools for end-users from regions.

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4. ANALYSIS OF FINDINGS

The following findings are not intended to cover every observation we have made during the case-studies, but rather to indicate some recurrent patterns and factors that can facilitate, or hinder satellite service take-up.

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a) End-users' attitude to cooperation on the topic of satellite services

It took longer and it was more complicated for Eurisy to be set up with MORE4NRG than with CA! and ARCH consortia. There are several explanations to this, including that the case-study working format was new. But the fact that the process of partnering with CA! and ARCH was built from the bottom-up, on an operational level first, visibly helped the process.

We notice that political priorities are not always the priorities, or realities, in the field. All three case-studies have shown, to different extents, that pushing institutional decisions without the adherence of the professionals on the working levels is often counterproductive .

That the adhesion of operational actors is essential to the diffusion of innovation does not surprise. Michel Crozier[9] underlines the importance that individual actors can attribute meaning to the process of change in order to accept it. Otherwise, actors use their "margin of freedom" (Crozier, 2011, p. 42)[9] to resist change. Indeed, Crozier argues, "even though domination and constraint are always present in society, change only occurs if the actors, even the ones seemingly the least modest, get involved."

But political drive and institutional cooperation are useful to build trust and offer a working framework for different actors. As it turns out, even in the case of ARCH and Coast Alive, where cooperation came about from operational professionals ("bottom-up"), it was formalised in the INTERREG application.

This is more than just form. It helps establish trust because it makes the "rules of the game" clear to all involved. It makes it legitimate to work together and share information. Trust is vital in establishing cooperation. Formal agreements also represent a commitment, which acquires weight because it is made public.

There was an additional institutional mechanism that facilitated cooperation: the INTERREG funding scheme. INTERREG is a mechanism strictly designed and tailored for

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regional authorities and for interregional cooperation, which is very familiar to the regions. The regions we worked with considered that adding the topic of innovation and technology in their projects provided their projects with a competitive edge when applying for funding. In this way, INTERREG has been an excellent tool for influencing cooperation in a "soft" way, not by constraint but by encouraging regions to explore innovative ideas and rewarding such practices (a "carrot vs stick" approach). This confirms Eurisy's Position Paper of 2010[10] when we made the case that more operational, end-user dedicated funds should be made available to the end-users directly, even, if necessary, by transferring part of the space budgets to operational, thematic budgets. Again, the avail of the INTERREG technical committee clarifies the operating rules and offers legitimacy to decision-makers' calls to work on the topic of satellite services. This is consistent with what Bernoux calls "the new institutionalism", that "makes the behaviour of decision-makers lie on seeking legitimacy just as much as on material interest". (Bernoux, P. 2010, p. 171)[11].

However, as previously hinted, such institutional agreements offer a framework, but should not be overestimated in terms of the content they can trigger. Eurisy's formal agreements with users are as free as possible, and are aimed more at establishing certainties and rules as to what cooperation will *not* involve, rather than precise prescriptions on the form it will take. This was actually a major advantage; it allowed us to co-build useful content and explore new forms of working together that were not on the plan, but made sense to all involved.

The fact that Eurisy does not ask to be remunerated for its work with the potential end-users does not mean that Eurisy's work is "free" and it is far from being sufficient to trigger cooperation. It helps initially, but it is not what motivated these actors and their organisations to put in the significant extra work that a case-study involves, such as mobilising local stakeholders, co-organising workshops, sharing dissemination efforts. The awareness raising events co-organised with Hordaland in October 2011, and the conference co-organised with Nord Pas de Calais in October 2012, are only a couple of the more visible examples of how significant resources were mobilised by the host organisation itself in working with Eurisy. The main reason for such efforts is trust, and well-justified pragmatism: it made sense relative to their objectives. This shared sense was co-build gradually, through working together; it was not formally planned or determined by institutional agreements.

The cooperation and its evolution beyond the original "contractual" boundaries came about because Eurisy has given support before we asked back, without expecting a guaranteed outcome other than the commitment to consider innovation and change and participate a dialogue about it. We obtained the users' trust only when they could verify our actions were consistently serving in their best interests, over time.

This "soft" mechanism to stimulate cooperation has been described in literature as "cooperation is thus not a mere matter of barter, but it comes about when one of the members, by giving something, will create a debt. Cooperation means that one of the members agrees to enter the exchange initiated by the other who creates the relationship (for free?)" (Bernoux 2005, p. 213)[11].

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b) End-users and the technology question

All the public authorities we worked with viewed satellite services, at least initially, in terms of self-standing technical solutions to be applied to problems, themselves, technical. This made the end-users feel compelled to formulate a *technical* problem, or *technical* questions.

They dealt with this in two ways:

(a) either end-users (environment professionals, etc) request a "shopping list", seeking to know what services there are and how much they cost; they are reluctant to talk about "needs", as they do not feel competent for the discussion.

(b) or within the end-users' organisations, they designate technically competent persons, for instance, those in charge of GIS, to talk about their needs as end-users.

However, satellite information and services are rarely off-the-shelf applications. They require co-production with the end-user to be relevant[12] to the latter, so it is impossible to effectively present a list, at least in the current state of development of the satellite services.

The case (b) suits both end-users and value-added service providers because it allows both parties to circumvent the difficulty of dialogue

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with unnatural, unfamiliar interlocutors about unfamiliar topics.

This approach – discussing end-user needs among technologists in the absence of the end-users themselves – obscures the end-user needs, which are the very basis for creating operational, useful services. Why? Invariably, and quite naturally, the GIS experts from within the end-user organisation formulate *technical* needs (in terms of image resolution, file formats, data interpretation automation etc.). Although they are part of the user organisation, such GIS experts are actually part of the added-value chain; they are service providers *within* the organisation, so they are more likely to know better and speak about service requirements than needs.

However, implementing satellite services is only effective to the extent to which information and applications are shared and used across the organisation, and not only as a consequence of a top-down decision to do so. This requires involving the stakeholders concerned, as we have seen above.

Unless the end-users are consulted and the wider framework of the organisation's needs is discussed, we remain within the realm of a relatively sterile discussion on how to replace a technical tool with another technical tool.

Not only are the end-users excluded from this discussion – since the question is not for them – but the GIS professionals themselves are often frustrated about what they perceive as "limits" of the satellite technology compared with the established, aerial remote sensing, for instance, purely from the point of view of technical characteristics (spatial resolution etc). The discussion must be extended to the *economic* and *organisational* implications for the stakeholders of adopting satellite services. When it is not, technology push stifles user pull.

c) Translation as a method to stimulate end-user pull

The case-studies were designed and conducted in such a way as to ensure that potential end-users were mobilised and became part of the solution.

The approach is consistent with "translation" (Bernoux, 2005, p. 219)[11], a concept used to describe how innovation occurs in an organisation by way of cooperation between stakeholders (with different backgrounds) of a problem.

Unlike more traditional ideas that the intrinsic qualities of innovation are sufficient to ensure its diffusion, the "translation" method takes better into account the importance of the end-user attitude, perceptions, and of the relationships between innovators and beneficiaries of innovation for a successful outcome.

Translation consists of several stages, which we find in the case-studies as well.

Contextualisation and network creation supposes the mapping of all the stakeholders and their own stakes in a given issue, and this issue should not be technology itself.

Identifying stakeholders and their challenges was consistently the first step of all our case studies. The approach was first met often with surprise, as it went against the obvious approach of the "shopping list", or of leaving it to technologists. But end-users realised the interest of the approach and agreed with it, which is why all have been open to mobilising colleagues from within and outside their own organisations.

During scoping exercises stakeholder organisations engaged quite enthusiastically in contributing their own point of view on an issue. Their interactions during the exercises already delineated the potential links of cooperation for exchanging information. The rationale of sharing information as a basis for working together emerged very rapidly from the end-users' contributions themselves.

What the scoping exercises have shown is that indeed, not all, or any information is useful. The useful information needs to be shared and used jointly across the organisations to be most effective. It is the end-users themselves who have the knowledge of the information they need. They can say what they need it for. They know who gains from sharing it in solving a problem. Exchanges have led to spontaneous new problem-solving ideas that could not have occurred in the absence of all these actors.

What also emerged however is that sometimes cooperation between regional stakeholders, despite the obvious common interests as expressed in scoping exercises, cannot in fact be taken for granted. Organisations must obey certain rules and regulations about the data they possess and the channels to use to make it available, and renegotiating these can prove a significant hurdle.

Experts from the space sectors must be made part of the solution as well, since they are able to link up the needs, as expressed by the end-users, to operational solutions available. What the case study exchanges revealed was that for now, most value-adding service providers – i.e.

companies who process raw satellite data – are more at ease addressing the needs of the users of data – i.e. working out technical specifications of their clients and coming up with technical solutions for producing information – than they are to tackling the non-technical issues of the end-users, and building business cases for specific services. In general (but not always), value-adding service providers were more at ease with a technical language and presenting technical capabilities, without linking them enough with the needs as expressed by the end-users. There is a persisting gap on that level, which can be explained by the fact that the value-adding service providers who work with satellite data are, for now, more used to working in an R&D environment, where they solve technological problems.

Another conclusion was that the involvement of value-adding service providers is a delicate exercise. Eurisy's legitimacy, and what allows it to build a relationship of trust with the users, is precisely its neutrality vis-à-vis commercial interests. But it is indispensable to include value-adding companies, as they are in the most suitable position to speak about operational services – whether paying or free of charge.

However, when inviting commercial companies to a dialogue with the end users, there is always the danger that Eurisy may be perceived as being partial to those companies.

But even value-adding companies have reserves in participating in the exercise with potential competitors, and in absence of a short-term, guaranteed return.

In addition to the technical experts' tendency to speak about the technology, we observed reserve and a certain reluctance of the end-users to question what they are presented with, even when the material is not accessible to them. There are seldom any admissions that purely technical presentations do not answer the question of the end-users: "how will this help me?".

Defining a common good.

Once the largest number of stakeholders has agreed on how they can contribute to solving a common problem, the idea of a common platform allowing them to share the information or the service was the next logical step. When such a platform materialises, it allows all actors – technologists and non-technologists alike – to take equal ownership of the problem.

The idea of such a platform was indeed the conclusion of both scoping exercises with Maramures. It has yet to materialise, for reasons already described above: relationships between potential end-users, experienced end-users and the service providers were not strong enough yet. From the end-user perspective, implementing such tools is associated with a high degree of uncertainty, which they do not feel they can take on board confidently.

If and when it will materialise however, it should allow the Maramures stakeholders to test both if operational applications work for them and the cooperation relationships between stakeholders as envisaged during the scoping exercise.

Norfolk County Council has invested in such a testing platform with two of the other CA! Consortium members. The satellite navigation solution will be tested in the field in the summer of 2012, by members of the public in Norfolk County Council and other local actors.

Nord-Pas de Calais and Kent already have a common platform for cooperation, that is, the interregional aerial map of habitats, one of the project deliverables. It is one of the visible signs that ARCH were more advanced in their exploration of solutions. The efficiency of this platform as a tool for future cooperation between the two regions depends on the conclusions of the report on the potential of satellite services for updates and the sustainability of their cooperation beyond the INTERREG project.

Disseminating results

The process of mobilising end-users and experts, of facilitating their exchanges, has led to the consolidation of new types of heterogeneous networks of professionals.

Jointly presenting results, as was the case with Maramures in the final MORE4NRG conference, and will be the case with CA! and ARCH in October 2012, means that end-users have acquired the confidence needed to present these results – their conclusions – themselves. It is also the very visible sign that a new "conviction", a new standpoint has emerged as a result of the case-study exchanges. Why is this important?

We observed that the partners from the case-studies are not willing to speak about the case studies unless they have acquired this shared understanding and especially, unless the case-study work has meaning to them. For instance, we had already invited Maramures to present their feedback on the case-study in 2010, but they were reluctant to do so; in addition to not

feeling in control of the subject, the idea that they would present this to a community they were not familiar with – the space community – made them turn down the offer.

We observed similar reserve to take the floor in other cases, as the end-users do not feel legitimate to enter a dialogue that concerns technology.

The conferences hosted by the end-users, where the end-users present the results of the case-studies are a first, since the beginning of Eurisy's User Programme. We observe that although working on slightly different topics, these networks are naturally coming together during such events: ARCH, Coast Alive and the RINSE project results will all participate in the Nord-Pas de Calais conference on biodiversity and satellite applications. They have constituted a hard core, a critical mass that attracts, we observed, other end-users, as well as service providers, universities, and other organisations.

Organised by Eurisy, this communication platform belongs to the end-users, and highlights a change in their attitudes and perception of satellite services.

Here, it is worth mentioning what "results" mean for Eurisy, in the framework of a case-study. It is an easy shortcut to assume that "results" in our case mean that the end-user has successfully taken up the service. Although it is a desired outcome, and it has happened in the case of CA! it is not the objective of the case-study to "sell" the service, nor is it our role as a mediator.

On the contrary, trying to push the service would be completely unproductive for us as mediators, since as mentioned all along this article, that the very foundation of Eurisy's relationships with the users is its neutrality and lack of commercial interests.

Similarly, users do not engage in the case study with the objective of buying a service, but to learn about it and evaluate it.

The conclusions of the case studies – as they will be highlighted at the October conference, for instance – will be the new questions and conclusions that belong to the end-users, formulated by the end-users. They may not say that all services are suitable for them, but they will engage with the space community in providing feedback on what works and what does not for them. These new questions are just as many avenues for (co)development. And having transformed the attitudes of the end-users from passive to active engagement in this discussion is our result as a mediator, and what we base our bottom-up feedback on.

Consolidating and extending end-user networks

The consolidation (or not) of the networks that have been created thanks to the efforts of all involved in the case-studies will remain an open question.

An informal proposal from Nord Pas-de-Calais was Eurisy to help animate the network of good practice exchanges and expertise that has been constituted during the lifetime of the ARCH project, with an opening that it can include more actors,. The request arose from Nord-Pas de Calais's observation that while there were a few regions in Europe that are working on the topic of implementing satellite services for environment management (the "good practices"), there is little communication between peers.

In the case of CA!, the satnav pilot led by three of the Consortium regions, as well as the inclusion of a satnav application in a further INTERREG project by Norfolk County Council (the project RINSE) has naturally created a continuation of the network and its extension to Norfolk County Council's new working partners in RINSE.

Similarly, following the end of the MORE4NRG project, Eurisy has been invited to become involved in its continuation – the INTERREG project Regions4GreenGrowth, that includes a lot of the MORE4NRG

The lessons learnt from the case studies so far inform us that a grassroots structure that is based on the willingness of the individual actors to participate and on the relationships between them has a better chance of success than a structure dictated from the top, without involving end-users at a grassroots level, as we have done through the case-studies.

Informal networks of exchanges might enable professionals to capitalise on each other's knowledge and experience and to generate more clout as more and more actors (including the private sector) interested in the topics, come together. Primordial for such a network is that the end-users appropriate it as being their own network, and not as driven by industry or R&D projects.

Such an operational, informal network of practice could probably respond to another problem we observed during the case-studies: when evaluating new technologies, the end-users do need technical support, notably to translate needs into technical requirements. At

an early stage in the adoption process, advice coming from a neutral actor, especially a colleague, or a peer seems to be the best received option. The "good practice" examples have consistently been most effective in presenting satellite services and informing potential end-users on their value for money. They are even more effective when presented by the end-users themselves.

Finally, the critical mass of the network is likely to generate an effect of "leader" emulation – with more and more users becoming interested in the topic by following the example of the early adopters.

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5. CONCLUSION

In the period 2008-2012 Eurisy's intensive work with local authorities under the case-study format has generated a unique opportunity for Eurisy to observe the process of end-users scoping the potential of (operational) satellite services in a variety of disciplines.

In this exercise Eurisy deliberately choose to intervene and become itself a variable in the process. Being both an observer and a factor influencing the process enabled Eurisy to test its basis hypothesis that a technology driven approach does not necessarily convince the user to adopt this new technology. The observations made are largely supporting this hypothesis. Results should be interpreted with caution as observations might be biased by the intervention of Eurisy as a variable in the case-studies. E.g. Eurisy focussed as much as possible on transferability of existing operational services, rather than pre-operational technologies derived from R&D projects.

The detailed observations have given insight in various aspects of the process of adopting innovative solutions by regional actors. A recurrent conclusion is that the realities in the field, in particular the economic and organisational implications of adopting satellite services for the potential end-users, must be better taken into account by support structures and value-adding service providers at once. In particular, value-adding companies have an essential role to play in efforts to build a case for the use of the satellite services in such that it makes sense to the potential end-users within their organisational and economic environment.

Peer-to-peer exchanges where confirmed end-users inform and advise colleagues about their experiences remain the ideal means for guaranteeing a user-oriented approach. Informal grassroots networks of confirmed and potential end-users, accompanied by suitable formal structures that favour trust and clarify working relationships but do not constrain them, are an effective ground for the diffusion of satellite services.

Trust relationships between stakeholders and cooperation on all levels are crucial. It requires the active involvement and adherence of actors, especially the inclusion of potential end-users on a grassroots level.

The diffusion of satellite services will become effective when it triggers a change not only in the attitudes and perception of the innovative services by the potential end-users, but also in working processes and cooperation patterns within end-user organisations, following take-up.

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