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PERSPECTIVES

The Role of Government in EO Services:

Influence of Government Policies over the EO Services Sector[1]

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Governments have always played a strong role in space. From the early days of exploration of near-earth and then the Moon, research and technology development has dominated government plans where space was viewed as both a strategic asset as well as a boundary to human knowledge. In the early 1980's this started to change as the potential business opportunities from communication satellites awoke commercial interest (which even here started with government owned communication agencies) and, whilst this sector has marched on to what is a €200B global business today, other elements of space have remained largely as a public sector activity. Today, this is changing. The global positioning industry is reaping the benefits of the U.S. military investment in GPS, private venture firms are competing for the potential market in space tourism as well as asteroid mining, planetary exploration and other visionary ideas. Meanwhile, the market for Earth Observation (EO) services is being disrupted by new start-ups with innovative business models seeking to shake up the larger, more traditional players. Notwithstanding, large, public investments are still being made with both civil and military objectives. Furthermore, government policy in the U.S. is equally important as in Europe for driving and shaping the market and the commercial, EO services sector. How does government policy influence this market and what can we learn from the markedly different approaches being taken in Europe and the U.S.? And how can Europe ensure that it reaps the full socioeconomic and strategic benefits of its strong investments in EO – especially now that Copernicus is becoming operational? This Perspective seeks to address the main questions in this respect.

1. Introduction

Arguably, no other domain has such a complex mixture of interests where government and commercial companies come together as does space and especially the field of Earth Observation. Whilst the communications industry could never have developed without government research and development of technology (if only to develop the rocketry needed to put commercial satellites in orbit) today this €200B per annum business has revolutionised society. Many consider that we stand on the brink of a similar revolution in the business for geospatial services.

But if space is a complex mix of civil and military interests, Earth Observation (including space-based surveillance) is perhaps the most complicated of all the space applications domains. The interaction within this field is complex due to the national strategic interest (read military / security) to observe the surface of the Earth from space. Several undisputed, government tasks require imagery which is global in nature and independently gathered. They can all be grouped under the heading of "security of the citizen" from the classical security threat to the societal threat coming from climate change. Non-dependence on access to core information for the government task, was the argument that justified the large, European investment in the Global Monitoring of Environment and Security (GMES) programme – now Copernicus.

Over the years, several attempts have been made to bring a more commercial approach to the Earth Observation domain. In the 1980's the era of Reagan and Thatcher promoted the privatisation of

[1] The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of EARSC.

Landsat which spectacularly failed. Not until 2008, when the free and open data policy was first introduced was wide-spread use of Landsat data achieved.[2,3] In Europe, data from the first European Remote Sensing satellite ERS-1 was offered for sale by commercial partners to ESA and national governments.[4] But the value was not there and beyond a few one-off projects, the effort failed.

Why did it fail? One possible explanation is that there were only limited data sources. Once the curiosity factor was satisfied, no serious user would commit to adopt new processes which depended on imagery from a few satellites which could fail at any moment. Only today, with the dawn of operational long term programmes (Copernicus) and, large number of data sources coming on line, can realistic guarantees be given to users that they can have the same data next week or next year. Of course one consequence of this where the supply has exceeded demand is that data becomes a commodity with little value except where the quality is very high (i.e. very high resolution).

This strong dual civil/military use interest has had a major effect on the market and the consequent commercial opportunities. In this Perspective I shall go on to present a personal view as to how this has shaped the industry today, drawing a contrast between the U.S. and European approaches to see what lessons can be drawn with regard to sector and market performance.

2. The EO Sector in Europe

The European EO services industry is growing well and is present in all segments of the sector, yet it is fragmented and lacks a coherent capability to address the global market. The main characteristics (strengths and weaknesses) of the sector can be grouped under the following headings:

Lacking a European Champion

I was recently in a private discussion over why there is no European champion in the IT services field equivalent to the large U.S. players like Amazon, Google or even Microsoft which can offer access to large, satellite, data-sets and the IT resources to manipulate them. Unlike the situation in space manufacturing (Airbus Defence and Space and Thales Alenia Space) or in Aeronautics (Airbus), where procurement policies have helped to create European champions, this has not been the case in the downstream sector where often public bodies have been in control.

In the early days of remote sensing in Europe, when the ground segment was established for ERS-1, Processing and Archiving Facilities (PAF's) were set up to with roles distributed between 4 countries (France, Germany, UK and Italy). The arrangement was very detailed involving different data and products assigned to each of the PAF's where the requirements of the 4 key nations were "satisfied". This "arrangement" has been continued and can be seen in the current plans for the Copernicus Ground Segment; why has this not led to a European level player?

In the UK, the operator of the PAF was a private company (Infoterra now part of Airbus Defence and Space) whilst in each of the other countries, the operator was a public body (CNES/Ifremer, DLR, ASI)[5]. In a commercial world, the 4 PAF's would have evolved to draw out efficiencies and adapt to the market. One might have failed; one may have become dominant, some may have merged, but the market would have decided. In a non-commercial world this cannot happen and the interests of the national governments (and it has to be said sometimes their industry as well) have prevented consolidation where it might have been logical.

A Geospatial Agency for Europe

One measure that would have encouraged market structuring at European level would have been to create a geospatial agency much like the National Geospatial-Intelligence Agency (NGA) in the U.S. This was advocated at the time, but at the time when GMES was being started in the early 2000's, many agencies were being created by the EU and the political will for more was lacking. Hence this crucial step was never taken.

Today, in the Copernicus programme, we see six services[6] being set up; all with the goal of meeting public information requirements. The provision of these will be led by one of 7 public bodies[7] (some services are divided) which have delegated authority from the European Commission.

The teams to supply the services will be contracted out and most involve a mix of public and private actors. The public bodies have a duty to supply their respective governments with information services coming from satellite observations (not only - but this is the focus for the moment).

[2] Landsat Data Distribution Policy, January 2008, https://landsat.usgs.gov/documents/Landsat_Data_Policy.pdf
[3] Chronicling the Landsat Legacy *Laura Rocchio, SSAI; The Earth Observer, Nov-Dec 2011*
[4] http://www.esa.int/esapub/bulletin/bullet94/DELIA.pdf
[5] https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/ers/ground-segment
[6] Land, Marine, Atmosphere, Climate, Emergency, Security.
[7] EEA, EMSA, Frontex, EUSatCen, ECMWF, Mercator Ocean. The 7th body is the JRC which operates under a different arrangement.

So the 6 services, run by 7 different "agencies" offer the potential to provide some structuring of the market. They can start to establish a market at the European level which can hopefully drive efficiencies and consolidation of efforts. Nevertheless, dealing with a single agency / public body would inherently be easier than dealing with 7 – all with different cultures and practices.

Governance

The space sector in Europe is further complicated where the views of 28 EU Member States and 22 ESA Member States circle the debate. In neither case are all the same countries involved; not all EU countries are members of ESA and not all ESA members are part of the EU. This leads to one of the key failures - the lack of a single market - and, where government thinking dominates the way the sector is shaped and evolves, then it becomes a major factor.

This leads to complexity in decision-taking and delays to programmes. Once a programme like Copernicus is established under the EU, like a super-tanker, once moving it is difficult to stop. But getting it moving and then in the right direction takes a great deal of time and political capital.

At critical points in the programme and especially as priorities change over time, the plurality of governance has caused and no doubt will continue to cause difficulties – not always directly caused by the programme. For instance, a PPP arrangement for Copernicus could probably have been achievable apart from the (then) recent experience of the failure to find a concessionaire for Galileo and which meant that there was no political will to even try. Hence Copernicus became a fully public programme without private participation and leaving a great deal to do to find the policies which will enable to development of the downstream sector.

Another example is the stated objective to develop the downstream industry.[8] At the outset of the GMES programme, the objective was to ensure a non-dependence on crucial information necessary for policy makers. This was enshrined in the GMES Communication of 2005.[9] Then in the 2014 communication to establish the Copernicus programme, it was written the objective to:

> *"foster the development of a competitive European space and services industry and maximising opportunities for European enterprises to develop and provide innovative Earth observation systems and services;"*[8]

The industry has welcomed the focus on its development but is concerned that the refocusing of the objectives can lead to different priorities and programmatic actions.

A Diverse but Fragmented Industry

On the supply side, the sector comprises around 450 companies spread over 35 countries comprising EU and ESA member states.[10] Some 6,800 highly skilled persons are employed within the sector with more than 90% qualified to graduate level or higher whilst revenues are around €900M in 2014 of which around 30% is associated with data sales, 50% is for value added services and 20% is hardware or software related.

The EARSC survey confirms that over 95% of the companies have less than 50 employees and 65% have less than 10. These are distributed throughout the EU Member States which fragmentation makes it difficult for European leaders to form either as large companies or as effective and competitive groupings.

On the other hand, the large number of small companies heralds well for the future development since employment growth comes almost entirely from small companies.[11,12] In addition, they offer a diversity of ideas and approaches as well as very innovative platforms meaning this part of the sector should be well placed to benefit from Copernicus and especially the Free and Open Data Policy.[13]

Strong Public Interest

The satellite market, especially for Earth Observation, is characterised by having a strong public (i.e. government) component. According to EARSC's most recent survey, 70% of the total revenues for the European industry come from government sources. Government, and hence national policies, control the market and whilst we expect to see that change, it is unlikely to fall much below 50% due to the strong strategic interest in the technology. In short, EU Member States support national providers wherever possible and

[8] EU Regulation 377/2014 3rd April 2014 establishing the Copernicus Programme.

[9] *"At a time when the command and appropriate use of information has important geo-strategic implications, Europe needs to have the capacity to independently evaluate its policy responses in a reliable and timely manner."* Communication from the Commission to the Council and the European Parliament - Global Monitoring for Environment and Security (GMES) : From Concept to Reality {SEC(2005)1432}

[10] EARSC Survey of the EO Services Sector in Europe and Canada; latest report published September 2015.

[11] The Importance of Start-ups in Job Creation and Job Destruction, Tim Kane, Kauffman Foundation, July 2010

[12] Does marginal cost pricing of PSI spur firm growth?; Heli Koski, ETLA, September 2011.

[13] ABOUT GMES AND DATA : GEESE AND GOLDEN EGGS, A Study on the Economic Benefits of a Free and Open Data Policy for Sentinel Satellite Data; Sawyer & DeVries, December 2012, . (see also https://vimeo.com/earsc).

the market of 450 million citizens is broken into 28 or even more parts.

The government interest is divided into 2 parts:

1. Public Agencies as users: Agencies exist in many MS to gather geospatial information to meet governmental needs. Often this is internalised, meaning that they require the same technical competences as the industry.
2. National Space agencies which are sponsors of the sector but also have strong own interests including the ownership of some of the key ground-segment infrastructure with no mandate or clear interest to see them move to the private sector.

Treasury policies to find external revenues (and human nature) mean that these government agencies are often found competing with the private sector for the same business. Further, their policies to procure (and protect) locally inhibit the formation of larger European companies able to compete at global level.

These two governmental roles often lead to confusion and a focus more on what governments wish to offer in terms of infrastructure against what they wish to receive in the way of services. A move towards the latter and a focus on government as a user would provide a strong signal to the industry.

Defence and Security

One of the strong interests of "government as a user" is defence; indeed, this has formed much of the strategic interest of governments to master the manufacturing and operation of space assets. The lack of a European Security and Defence policy means that whilst DigitalGlobe enjoys the support of a single anchor tenancy contract to supply surveillance imagery to the U.S. government, this does not exist in Europe where responsibility remains with Member States. Hence, whilst the two remaining European satellite operators are 2 large companies which can and are competing in the global market, they do so without the advantages of anchor tenancy enjoyed by their U.S. competitor. The creation of the European Space Agency in 1975 was in a way a recognition of the high cost of developing space technology and a wish to share it amongst a number of countries. The lack of any overall European defence policy meant that ESA could only act in the civil domain and even today, it can only act for civil purposes; which explains also the stronger focus on civil applications in Europe compared to the U.S.

A Shared Investment Model

Whilst in the U.S., the presence of a single large customer (DGA) has led to an anchor tenancy approach, in Europe, national governments (and industry) have preferred to invest in satellite infrastructure which would then be available for their national industry to exploit. Sometimes industry invested alongside government in a PPP arrangement as is the case for Pleiades and for TerraSAR-X (where DLR talk about sharing "profit" from the venture). Whilst this shared investment model reduces the risk to the industry it also creates stronger government controls over the systems and restrains companies from developing innovative new business. Decision making is longer in contrast to a "data buy" policy where government is a (privileged) customer.

Civil Research & Development

Public support for civil R&D is generally strong in Europe. It is managed through 3 main channels; national efforts, international efforts through ESA and European efforts through the framework programme (now known as Horizon 2020).

- National efforts are of course aimed at supporting local organisations which depending on national priorities may include industry.
- ESA does provide some support for EO services but it is a very small level since the ESA mandate does not extend to the services industries.
- European R&D has no industrial policy associated with it and hence is mainly concerned with academia and public research bodies.

In the U.S., most research is channelled through defence programmes in this case with a focus on surveillance. In all cases, the industrial participation to R&D projects is sometimes difficult to manage against academic interests. Whilst in a defence driven R&D model there remains a national objective, when the principles are civil scientific research as is more the case in Europe, the goals of researchers are not limited by national boundaries and indeed they are motivated to make a mark in the global scientific community. This may be in conflict with the interests of industrial partners.

3. The EO Sector in the U.S.

There do not seem to be any surveys of the U.S. industry in the same way that EARSC covers the European sector. We presume this is because the sector is overall less developed than in Europe in terms of value-adding companies and that this domain is much more focused on military surveillance needs than on civil applications. Companies are reluctant to provide business information unless it is requested by a federal-backed source in which case it becomes a legal requirement to respond. Here one can see the first difference in policy between U.S. and Europe at

work! Nevertheless, it is clear that U.S. defence policy is the main influence to shape the sector.

Defence, the Dominating Influence

Space surveillance has been a key driver of space and Earth Observation technology in the U.S. to a much larger degree than in Europe. Most (all?) the technology used in earth observation today can find its origin in military programmes. In the U.S. there is a single market whereas in Europe defence remains a Member State responsibility with little scope or appetite for co-operation.

Many of the military capabilities in the U.S. remain out of sight but the barriers have been lowered substantially and the market position of DigitalGlobe is down entirely to the policy to outsource the data and investments through anchor tenancy contracts (see below). Central to this approach is the National Geospatial-Intelligence Agency and understanding the role played by NGA is essential to understanding the difference between Europe and the U.S.

According to its website *"The National Geospatial-Intelligence Agency is the nation's primary source of geospatial intelligence, or GEOINT for the Department of Defense and the U.S. Intelligence Community."* The NGA employs around 14,500 civilian and military personnel and is responsible for providing all geospatial intelligence to support national interests around the world. This includes humanitarian and disaster relief in support of other U.S. governmental agencies.

Hence, whilst the activities of the NGA have provided a strong commercialising influence for data, the contrary is the case for geospatial information since, whilst the NGA will work with commercial contractors, the rules and conditions make it very hard for the same contractor to provide commercial services to others. This is less the case for imagery where, whilst the NGA take priority over any request for satellite time, mostly the imagery itself is not classified. This has been re-enforced by the recent decision to lift ITAR restrictions on satellite imaging technology down to 25cm resolution.[14]

Anchor Tenancy

Anchor tenancy has been used as the tool to commercialise satellite imagery in the U.S. The NextView and EnhancedView contracts were used by the NGA to support 2 companies DigitalGlobe and Geoeye to launch high resolution imaging satellites. The outsourcing contracts underwrote the infrastructure costs and both companies were able to sell their imagery to a world market. This arrangement ceased in 2012 when the NGA announced that due to budget restrictions it could no longer afford to support 2 suppliers triggering the merger between the 2 companies and creating the DigitalGlobe company which exists today.

The concept of an anchor tenant comes from various sources and indeed according to Wikipedia was first adopted for major shopping malls in the 1950's.[15] Interestingly, according to U.S. Department of Commerce and Trade; Commercial Space Competitiveness][16] the term anchor tenancy means "an arrangement in which the United States Government agrees to procure sufficient quantities of a commercial space product or service needed to meet Government mission requirements so that a commercial venture is made viable."

As noted in the European section, anchor tenancy provides a more flexible and more clearly delineated approach to combining public and private interests than the shared investment model which has become the norm in Europe. The latter requires joint control and decision making so hampering commercial activities whilst anchor tenancy provides a clear contractual framework for both parties. Hence, whilst the U.S. data suppliers can enjoy the possibility to sell to the NGA via the anchor tenancy so creating a single market, data suppliers in Europe face a fragmented market across over 30 countries.

A Focus on EO Data?

The strong military interest in surveillance technology and the fact that applications are essentially "internalised" as we have seen, has apparently led to a focus more on the supply of data than of value-added information. This has not only allowed DigitalGlobe to develop its position on the global market but has also triggered the emergence of private satellite ventures such as Skybox Imaging, Planetlabs and BlackSky Global.

Whilst it would appear that the focus is mainly on the supply of data but the growing convergence between satellite data and that coming from different sources e.g. drones, geolocation services etc., is increasing the interest in commercial geospatial information. As a result, companies like Google start to see the potential for new services around their core offering and seek to gather as much data as possible under their platform further re-enforced through the acquisition of Skybox Imaging. Curiously, the open data movement is helping large data agglomerates to strengthen their

[14] ITAR International Traffic in Arms Regulation is the US regulation controlling the export of militarily sensitive items. It has recently been strongly overhauled and many items taken off the list of restrictions. This includes satellite technology offering resolution down to 25cm meaning that export restrictions are now only governed by the Department of Commerce and not by the Department of Defence.

[15] https://en.wikipedia.org/wiki/Anchor_store

[16] http://definitions.uslegal.com/a/anchor-tenancy/

position whilst claiming to be helping innovative start-ups to enter the market.

In some domains, such as meteorology, there is a strong private industry which is developing in competition with government bodies i.e. the U.S. National Weather Service. But resistance to change is everywhere and as we shall see below, despite legal moves to open some parts up to commercial interests, this is happening much more slowly than had been hoped.

But Increasing Interest in Geospatial Data

As geospatial data becomes more prevalent and the big data movement takes hold, IT giants such as Google, Amazon and Microsoft have all taken a strong interest to integrate EO products onto their platforms. All have proposed to make the European Sentinel data available which will be realised through an EU-US agreement recently signed.[17]

These market-dominating platforms could provide excellent means for service providers to access and process data before making it available for clients through a (say) Google marketplace. However, this will circumvent the EU objective to be non-dependent for access to key information. The EU stakeholders will need to address alternative means to access information which could well be complementary to the U.S. IT giants.

An "Enterprise Culture"

U.S. space policy is much more favourable to private enterprise than is the case in Europe. Leaving aside the history of commercialisation in the last century which mainly involved the data policy for Landsat and is discussed elsewhere[13], in 2003, the Commercial Remote Sensing Act was introduced which has been probably one of the main factors in creating the economic climate for Earth Observation which exists today.

This act basically stated that any EO activity should be performed in the private sector (i.e. commercially) unless there were strong reasons why it could not (for instance no commercial interest or overriding considerations of national security). It paved the way for the NextView contract which initiated the private supply of high resolution data for the U.S. NGA and has led to the dominant position of DigitalGlobe in the market today.

This was set against a background of wider attempts to bring more commercial approaches into the space business. NASA sought private suppliers for the launch services, space tourism started to become of commercial interest and a number of large players, with business or interests in other areas, started to invest in the space business; e.g., Space-X, Virgin, Bigelow etc.

Then in the last few years, the interest has exploded. There seemed to be announcements of new start-ups, new business plans each week many of which had the goal to launch constellations of small satellites to provide data on the Earth, its weather, its land/atmosphere/ocean or its climate. Many of these found financing and some have already launched sensors into space and are offering data to customers.

A few examples can be revealing. Skybox Imaging was a start-up coming out of Stanford University Business School which succeeded in launching its first satellite at the end of 2013. Within 6 months came the announcement that it had been acquired by Google so achieving an exit strategy in less than 5 years (which is shorter than most space projects in Europe!). PlanetLabs and Urthecast are 2 more start-ups in the U.S. and Canada, respectively. Even with a short history and business record, both have recently bought out European satellite operators.

Spire, GeoOptics and PlanetiQ are three more start-ups which are looking to enter the weather business. This can be possible due to the Weather Forecasting Improvement Act[18] passed in U.S. in 2014 which mandates that the National Ocean and Atmospheric Administration (NOAA) should introduce commercially sourced satellite weather data into its mix. It requires NOAA to conduct a project and report back to congress in 2017 on how they have progressed to integrate commercial data alongside their own sourced data. Nevertheless, despite the legal requirement to do so, NOAA is resisting stating that their international agreements for data sharing make the project impossible. [19]

4. The Changing Business Climate

The Competitive Environment

The competitive environment for geo-information services is developing and evolving fast. In Europe, sustained government investment has been made available for the first time through Copernicus; the first operational EO system in the world. Yet over the last 2 years most of the change in the private sector has been taking place in the U.S. and European companies are facing increasing challenges to their business. Three trends, all discussed earlier, are challenging the European industry:

[17] http://www.state.gov/r/pa/prs/ps/2015/10/248336.htm

[18] http://spacenews.com/40092bill-with-commercial-weather-study-mandate-passes-house/

[19] http://spacenews.com/new-noaa-satellite-boss-shoots-down-commercial-weather-pilot-program/

- The U.S. policy change to ITAR[14] restrictions,
- The emergence of new business models such as Skybox Imaging (now part of Google), Urthecast and PlanetLabs amongst others offering a different, low-cost business model; challenging the market in new ways,
- The growing interest of IT giants Google, Amazon and Microsoft in geospatial information.

Recently, we have seen two of the 4 European satellite owners and data providers acquired by North American companies[20] showing that whilst European technology is appreciated, risk capital is far more easily deployed in the U.S. than it is in Europe. That their new owners are industrial companies raises doubts over the allocation of future investments and the commercial benefits of those already made. Clearly European technology is of interest if U.S. companies wish to invest but there appear to be structural issues in Europe concerning financing and risk. As private individuals they are not accountable to stock investors, whereas in Europe perhaps the only source of capital is coming from "old-money" investors who are far more risk averse.

As an aside, it is interesting that the deal to acquire Deimos was accompanied by the announcement that Urthecast would buy its constellation of satellites from SSTL, a low-cost satellite manufacturing arm of Airbus Defence and Space. Airbus also announced at almost the same time that it would be building the OneWeb constellation offering global internet services. This can be considered a success for the European industrial policy for the space manufacturing sector. Maybe it is time for an industrial policy around the services sector?

A driver for this should be the European Copernicus programme which is becoming operational but so far, this has not yet had a strong impact on the provision of downstream services by the private sector even if €7B investment has been committed. The EO services companies in Europe have many strong points and have established a good position in many markets yet, with the strategic changes in the sector seen today they face challenges to play a significant role in the future. An industrial policy for the sector could be one way to help.

A Policy to Access Data

Data policy and access to data are becoming one of the key areas to shape the sector. Europe has learned from the experience of the 1980's and 1990's when both the U.S. and Europe tried to commercialise EO data without any success. As the open data movement grew and data from government owned satellites was considered to be Public Sector Information (PSI)[13], firstly Landsat data (in 2008) was opened up for free and open access and now Copernicus Sentinel data is the same.

The need to co-ordinate satellite programmes and the interest to promote open data led to the establishment of the Group on Earth Observations (GEO) in 2005 as:

> *"….a voluntary partnership of governments and organizations that envisions "a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations and information." Together, the GEO community is creating a Global Earth Observation System of Systems (GEOSS) that will link Earth observation resources world-wide across multiple Societal Benefit Areas."*

Today GEO has 96 government members and many participating organisations and has as one of its main policy goals that all government programmes should follow the free and open data principles. But this strong trend to open data sources can pose a problem for commercial operators where free data can potentially undermine their business models.

In the U.S. this is controlled through acts like the commercial remote sensing act mentioned earlier. In Europe the situation is vague since nothing would prevent a public procurement of a very high-resolution satellite which, if the same data policy were to be followed, would probably kill any commercial satellite ventures.

GEO is also co-ordinating the development of downstream applications and products linked to 9 Societal Benefit Areas (SBA's) largely through national (or regional in the case of the EU) research activities. Industry is barely involved in GEO but which now has the expressed objective to "engage with the private sector". Will the free and open policy now extend to geospatial information products which would be directly competitive with the industry?

So uncertainty extends also into the downstream industry where Copernicus services will also be offered on a free and open basis following the same open data principles. Companies are reporting that products which they have launched are being copied by a public body supplying a

[20] PlanetLabs and Urthecast are buying European capability in the form of Rapideye and Deimos Imaging respectively. Another similar example is CartoDB, a Spanish company bought out by U.S. capital and which is now advertised as a New York start-up.

Copernicus Service which amounts to unfair competition.

Guardians or Merchants?

Scott Pace in his presentation to the ESA High Level Industry Forum 2015[21] talks about two cultures in policy and regulation; guardians and merchants. The merchants wish to encourage risk taking and commercial activity whilst the guardians seek to control these activities. These two cultures are constantly linked and in tension due to different people and interests within the political sphere. To this dimension should be added a second one which is government as user or regulator. As a result, Pace identifies 3 cases;

- Government only where due to the high system cost and strong government interest all activities are government funded.
- Private-sector only where the market is strong and private investments dominate. Here government interest may be important but generally enterprises are in control.
- Grey areas where interests overlap and there is often tension between the guardians and the merchants over control.

This provides a neat model from which to continue. In the U.S., the roles of the guardians and merchants are much more clearly defined. In Europe this is not the case and, whilst the EC is trying to assume the merchant role in Copernicus - to establish information flows for policy makers and to create new opportunities - the MS are mostly still acting as guardians; on the one hand declaring that they wish to develop a European capability whilst on the other investing in national capabilities first so as to "achieve a better position in a European solution".

5. A Roadmap for Europe?

What steps can Europe take to realise the goals that have been set out for Copernicus – namely to develop the downstream sector? The situation outlined in this ESPI Perspective has identified a few measures for European policy makers to consider:

Establish a single market for EO services: as described is one of the key barriers is the lack of a single market in Europe for services on the public side. A solution would be to create a geospatial agency as is the case in the U.S. However, given the presence of multiple entities with responsibility for the Copernicus Services, it will be hard and maybe inefficient to create a new body with real power. Consideration can be given to finding a technological solution to this issue through innovative public procurement processes.

Improve the governance: When 28 governments of the EU and 22 sometimes different governments of ESA need to agree on a measure, inevitably decision making is slow. Many other policies are drawn into the mix notwithstanding the questions of whether each is a guardian or a merchant. The project to establish better governance has been on the table for the last 15 years; it is time to resolve the differences and progress more rapidly.

Create improved conditions regarding the boundary between public and private activities which would enable private investments and reduce the sometimes unfair competition. One way to do this would be to create an EU directive so that Members States must justify a governmental action if taken in favour of one involving the private sector.

An EO Services directive could also help to position MS in the EU as merchants rather than as guardians through the procurement of services rather than infrastructure. If the infrastructure is in private hands then it can be equally used for commercial delivery of services as well as serving governmental needs. Only for core government tasks (such as defence) should consideration be given to public ownership (and even here as Skynet/Paradigm has shown it may not be the best solution).

Procuring services rather than infrastructure, especially within MS, will also enable a transition to anchor tenancy arrangements rather than the shared investment model currently popular.

Create an Industrial policy for the EO Services sector: which could be combined with several of the above actions in a single legislative action.

6. Conclusions

We have seen how governments have a very strong interest and play a strong role in shaping the EO Services Sector. Policies differ between Europe and the U.S. where defence dominates the policy framework. In Europe, the civil use of EO services is good but better public policies, especially at European level, could help the industry exploit the investment being made in Copernicus. The lack of a single market and the unclear boundaries between the roles of the private and public sector are perhaps the most important issues needing to be addressed. Steps to improve the policy framework in these two areas would be excellent starting points.

[21] Public private partnerships in space: a US perspective. ESA High Level Industry Forum, ESTEC 2nd June 2015.

Mission Statement of ESPI

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