

# Deimos Engenharia: Organizing for Innovation using the Value Creation Wheel

## VCW Applied To the Space Sector

In December 2015, Nuno Ávila, General Manager at Deimos Engenharia (Deimos), was on his way for the last board meeting of the year. His agenda hinted a challenging discussion – The VCW team was about to present the main findings of the Deimos' first Innovation Management project, in which they applied the Value Creation Wheel (VCW). During the meeting, the VCW team suggested that Deimos should reshape SenSyF – its most recent Earth Observation (EO) project – and offer it as a valuable agriculture support service. While Ávila knew that Deimos has become a reputed R&D company in the European Space Engineering landscape, he was also aware of the risks of recurring to public co-funding and ESA tenders to sustain the company's business. On the other hand, shifting Deimos' technology focus to a hybrid orientation comprising market and technology considerations would bring challenges at the Management, Marketing and HR levels. After discussing the pros and cons of taking the consultants' advice, Ávila looked to the other Board Members and he felt they all shared the same question – What should the Board of Directors decide?

## Background – From Elecnor to Deimos Engenharia

Elecnor is a Spanish corporation operating in more than 40 countries. It specializes in the large infrastructure, renewable energy and technology sectors. Its technological arm, Elecnor Deimos (ED), was founded in 2002 by 20 highly qualified space enthusiasts with the objective of developing breakthrough space engineering solutions for the European market. In 2015, ED employed more than 500 people in Spain, UK, Portugal, and Romania<sup>i</sup>.

In 2000, Portugal has joined the European Space Agency (ESA), the main space research institution in Europe. As ESA's budget comes directly from its member states, it only offers contracts to companies from these countries<sup>ii</sup>. In order to exploit the emerging business opportunities that ESA created for the Portuguese space companies, Elecnor Deimos has founded Deimos Engenharia S.A. (Deimos) in 2002. In few years, Deimos obtained recognition in the European space market for delivering valuable space applications, satellite consultancy and control station systems. The company is split into 3 business units - GNSS Systems, Flight Systems and Ground Systems. While its key customers are the ESA and EUMETSAT, some of Deimos' projects are co-funded by European, national and local public entities.

In June 2015, Catarino, head of the Payload Data Ground Systems section at Deimos, reflected about the future of his division. He was concerned about the new rules for H2020, the major European funding programme for science and technology development, from which Deimos was obtaining part of its revenue for R&D. According to EU, from 2014 on, the project proposals that addressed European or global market needs had higher chances to get funded<sup>iii</sup> (see **Exhibit 1** for H2020 criteria). Knowing that Deimos had limited experience addressing tech-transfer and marketing for technologies, he considered that an important challenge was lying ahead.

On July's board meeting, Catarino shared his opinion with Deimos' managers (see **Exhibit 2** for the Deimos Board of Directors). He thought that Deimos sole focus in R&D and the two years in the red – 2011 and 2012 – were hinting to the need to reshape the company's strategy (see **Exhibit 3** for net profits). Yet, as space technology was characterized by long development cycles, that required continuous and considerable investments until market prospects could be in sight, the Board felt that part of Deimos' activities needed to continue to be co-funded by public entities. However the directors also believed that Deimos should explore the possibility of adapting and take profit of the new context.

Despite considering that the actual context was threatening, Catarino preferred to interpret it as an opportunity for the company to explore new revenue streams. The Board also agreed that Deimos should conduct research in order to evaluate the market potential of one of its projects. But, the company was not in position to hire market-oriented professionals for the task. So, to experiment on this new market-oriented approach, the Board decided to contract the VCW team for a 6-month innovation management project. The main objectives were to assess the market potential of a raw technology, select the most promising market application and prepare an implementation plan.

### **The kick-off meeting: Understanding Deimos and SenSyF context**

During a lunch meeting, Catarino informed that the VCW team was appointed to define a market application for SenSyF, an Earth Observation (EO) technology in which the Company had already invested around €2.5m, largely funded by the EC, under the FP7 Research Programme<sup>iv</sup>. The first moments were tough - Catarino and Nuno Grosso delivered a very technical explanation about SenSyF which could not be followed by the team.

When the coordinator of the VCW team asked “But who are you aiming at?”, Catarino unfolded the real problem – unable to identify the user with the highest potential for the technology, his team was considering to target SenSyF's large set of potential customers all at once. However, SenSyF surely had to be tailored to truly meet the needs of a well-defined

target. At this point, the VCW team realized that Deimos' representatives were facing the Paradox of Choice<sup>v</sup> - "Honestly, I consider that you have plenty of options and we just have to find a way to select the best one". VCW is a suitable methodology to be applied to companies with a strong focus on technology like Deimos, which frequently fail to deliver value-adding products or services. For the whole team it was clear that the VCW tool would help Deimos to deliver valuable experiences for Deimos' future customers. (See **Exhibit 4** for the VCW).

Deimos was highly funded by ESA and European Commission (EC) funds. According to Joel Silva, a researcher at ESA, "The European EO market is purely institutional, the ESA funds and the EC subsidizes a large share of the research initiatives". Similarly to what happened with navigation and telecommunication satellites in the past – firstly developed for the military and then exploited by the masses, – the EC defended that EO satellite data could change the European citizens' life. In 1998, the EC launched Copernicus – The European EO Programme<sup>vi</sup>. This scheme was intended to democratize the EO data access along the upstream and midstream sections of the EO value chain (see **Exhibit 5** for the EO value chain). With a €3.8b budget for the period 2014-2020, the EC planned to launch a constellation of 11 EO satellites under 7 Sentinel missions until 2026<sup>vii, viii</sup>.

To understand SenSyF's role in the EO landscape, the team interviewed Nuno Almeida. He was the technical manager of the SenSyF project and was responsible for the communication between Deimos and the EC. According to Almeida, SenSyF was a Software Development Platform that would help programmers to overcome the main difficulties they were facing while working with EO data. In his opinion, it was difficult to gather the right data because satellites stored its data in different data centres in a wide variety of set-ups and with difficult access channels. Moreover, the programmers were struggling to process the inputs as the data flows were huge – for instance, EC's satellite Sentinel 1A generated about 2.5 terabytes of raw data per day<sup>ix</sup>. The VCW team also took the chance to learn how SenSyF worked. The Software Development Framework was designed by a consortium of 8 partners under Deimos' leadership from 2012 to 2015<sup>x</sup>. It was designed to allow programmers to create EO applications in common programming languages such as C++, Python, MatLab, or Java, and to reduce the effort to obtain EO data by automatically gathering data from Sentinel satellites. Furthermore, SenSyF was connected to Terradue's computer cloud system that provided access to public cloud infrastructures such as Amazon Web Services, which offered flexible processing and storage power. This later feature allowed users to have access to flexible processing and storage power.

The meeting allowed the VCW team to describe how SenSyF worked – "A programmer computes an algorithm on SenSyF and selects data according to geographic and time variables. Then, this platform runs the algorithm over the data through the cloud

infrastructure and gives back the output". Overall, SenSyF's key benefits were a reduced time to market for new EO-based services, limitless resource scalability and amazingly low costs (see **Exhibit 6** for a scheme with SenSyF). Now that the technology became clearer, the main question emerged. How will the VCW team apply the VCW methodology to find the market application with the highest potential for this technology.

### **The Five Phases of the Value Creation Wheel**

The VCW methodology had 5 major stages. In the first phase the VCW team learned about the company and the technology, and defined the main research question. In the second phase, the VCW team searched for the maximum number of potential market applications for SenSyF as well as for a significant number of filters. In the third phase, the VCW team involved the board in the validation process, assessed the potential of each market application and ranks the final filters. In the fourth phase, the final filters are applied, which led to the Value Creation Funnel, which selected the market application with the highest potential. Then, the team defined a business concept that complied with the target market needs and the technology specifications. In the final stage, a business model and resources for the market application was suggested and the main steps that the company should take before launch were highlighted.

### **VCW Phase 1- Discover Value (Tap): Learning about the Technology**

Since the technology features were complex, the VCW team decided it was the moment to obtain primary and secondary data. According to the research of VCW team, the increasing democratic access to EO inputs was triggering a demand expansion both for raw data and for EO-based value-adding services<sup>xi</sup>. The European commercial EO data sales were €220m in 2013, and Euroconsult expected it to grow to €410m by 2023. Most demand came from the military industry – the most mature segment – which claimed nearly 70% of the overall market<sup>xii</sup>. The world demand in the midstream and downstream sections of the value chain was expected to more than duplicate until 2021<sup>xiii</sup>. The VCW team could also identify the five of the most promising downstream markets at the European level in 2011 – Agriculture (worth €35m), Oil and Natural Gas Exploitation (€24m), Water transport (€24m), Non-life Insurance (€14m) and Renewable Energies (€10m)<sup>xiv</sup>.

For the very first time, Deimos had access to a competitor's analysis. The company regarded DigitalGlobe and TEP as SenSyF's direct competitors. Catarino confirmed that DigitalGlobe was developing a new Software Development Framework called GBDX and his feeling was that DigitalGlobe's experience across the value chain would represent a significant advantage for the company if they decide to truly invest on the platform. The

consultant also found that ESA's TEPs are a set of thematic software development frameworks to support research in seven areas: Geohazards, Polar, Coastal, Hydrology, Urban, Forestry, and Food. Despite there were reputed companies involved in the project, it was still just starting and its potential could not be assessed yet.<sup>xv</sup>

Despite being worried about the project deadline, the VCW team argued that it was important to spend some time tracking for new indirect competitors – in fact, the team perceived that these could also represent partnership possibilities. Indirect competitors would be the services which offered part of SenSyF's attributes. As a result, the VCW team found out 7 new services that were indirectly competing with SenSyF.

After gathering secondary data, it was necessary to complement it with the user perspective. The VCW team conducted their first interview with a researcher at EU who stated that Google was on the move for EO data exploitation with the Google Earth Engine (GEE). The VCW team asked Grosso to test the platform, and he later reported that GEE is a demonstration service which allowed developers to run their algorithms or to apply built-in pre-processing tools on low to medium resolution imagery. At the time, the platform was only available for researchers. Despite GEE's limitations of data access and processing, Google's capacity to invest worried Catarino – “Even if a company has no knowledge in EO, money will attract the best engineers in business”, he said.

To obtain diverse and unbiased opinions, the VCW team interviewed 9 potential customers who had no past collaboration with Deimos<sup>xvi</sup>. For these meetings, three objectives were set: introduce SenSyF; track for its unidentified strengths and weaknesses; and measure their interest in the technology. Two interviewees were so interested in the technology that pretended to establish new partnerships with Deimos. The first was a researcher at a European public authority who wanted to develop a one-year project with the objective of measuring the subsidence of European dams' surroundings. The second was a representative from a Portuguese public authority who offered a two-year contract during which Deimos would develop a coastal monitoring service. From the feedback the VCW team got, Deimos could easily complete the projects by allocating the personnel who had just finished SenSyF's development. The risk of failing was low. At the end of Phase 1, the VCW team was highly motivated and sure that they were on the right track. The technology has a lot of potential and it would be an interesting challenge to find an interesting application for this breakthrough technology.

## **VCW Phase 2- Create Value (Induce): Looking for New Markets and Filters**

In this phase, while using the input from various stakeholders, the aims were: 1) to achieve as many potential applications as possible and 2) a significant amount of filters.

In the first step, after gathering primary and secondary data, the VCW team started to write down ideas for SenSyF's new market applications. Each application derived either from a market-pull or from a technology-push perspective. Under the market-pull, the team thought about the customer needs that SenSyF could satisfy in the future. For the technology-push, the consultants discriminated each of the technology attributes and analysed how these were valuable for different target markets.

From past research, internal documents and interviews, the VCW team had 33 ideas. Yet, they wanted to deliver a more robust set of options. To do so, the VCW team provided a 25 minute presentation about SenSyF in a Technology Transfer class for 18 PhD students from different backgrounds. Then, students were engaged on a brainstorming session to find new potential market applications for SenSyF. The students were requested to think how SenSyF could be useful for their professional or personal life. At the end of the process, the team gathered 54 potential applications.

Feeling that the team had already a large set of applications, the VCW team knew that the best one would need to reach a strong customer base and to be technically feasible. Bearing this in mind, he pursued with the identification of the important criteria to filter the pool of applications. To begin the process, the consultants gathered 63 potential filters that were used in past VCW projects. "Filters are criteria that help managers to select the best applications in a methodical way", explained the VCW team to SenSyF's stakeholders. Given the specifications of Deimos business, Catarino and Grosso considered that only 20 filters were relevant for the project. Knowing that sometimes the best insights are unexpectedly revealed during conversations, the team relied on the records of all previous interviews, from which they found 12 new filters. In the meantime, the VCW team decided to attend a Bio-Entrepreneurship class to present this ongoing work to 42 PhD candidates. On that day, the VCW team delivered an exercise to the students that unveiled 19 new filters for the project. At the end of the whole process, the VCW team was able to find 49 potential filters, aggregated into 4 areas – Funding; Market & Macro Trends; Technology; and Team and Company.

### **VCW Phase 3- Validate Value (Analyze): Feedback from Deimos Board and SenSyF internal stakeholders**

To validate the final ideas and filters the VCW team applied the Poker Method<sup>xvii</sup>. All the potential market applications that emerged in the previous stages were purified, analysed and discussed in detail by the Board. Despite the large pool of applications gathered, the team knew that they had to validate them with Almeida, Catarino and Grosso. While the VCW team presented the market applications, SenSyF's stakeholders pointed out

that most of them were targeted for the downstream market. However, they believed that most of the options were leading to niche markets. Instead, they preferred Deimos to build a set of tools for programmers who could create final services by their own.

The VCW team understood that should focus on defining a midstream market for SenSyF. While understanding the perspective of the stakeholders, the VCW team argued that midstream market data was scarce and that studying the downstream applications' market was useful to estimate the potential of midstream solutions – “If there is a market for downstream applications, there will be for sure programmers willing to create these”. Despite understanding that different possible midstream applications could be useful to create some of the final services, the VCW team relied on VCW's paradox, that technology and market are often contrasting forces that complement each other. In fact, neither the market nor the technology parts have all the answers alone. Hence, the VCW team asked the SenSyF's stakeholders for help and it was a success. In less than an hour, the stakeholders could aggregate the 54 final services into 15 toolkits which would allow for the development of final applications.

Additionally, the VCW team also asked the Board and SenSyF stakeholders to apply the Poker Method to the filters that were collected in the previous phases, from which 40 passed. At this point, the VCW team was recommended by the Board to reject 16 filters that were considered to be impossible to measure given the timeframe and company resources. Then, the Board defined the final raking of filters to be applied in the Value Creation Funnel.

#### **VCW Phase 4- Capture Value (Ground): Selecting the Final Market Application**

As the complete pool of potential market applications and the final filters were defined from the previous phase, the VCW team designed the Value Creation Funnel (See **Exhibit 7** for the Funnel). Two of the market applications passed through all the filters. After speaking with Catarino and Almeida, it was clear that those applications were really promising and feasible. Hence, Catarino decided to be practical by adding a new filter to select between the final two – “Deimos should select the option that is closer to the funding we have already obtained”. Given the current funding and company expertise, the selected market application was SenSyFLand. Besides SenSyF's key attributes, SenSyFLand offered a Toolkit (set of processing tools) which would support the development of EO-based applications within 3 areas – Agriculture, Land Cover and Coastal and Inland Waters (see **Exhibit 8** for examples services which can be built with SenSyFLand). Bearing in mind that it was impossible to communicate with multiple targets at once, the VCW team argued that Deimos should focus in one community. According to the research of the VCW team, agriculture was the area with the highest market potential for SenSyFLand.

## **VCW Phase 5- Consolidate Value (Operate): Business Model and Resources**

Within agriculture, the team identified software developers as potential customers, which were divided into 2 segments – research institutions (Public Authorities and Academia) and private companies. Private companies had a high purchasing power and a more market-oriented perspective than research institutions. Though, if there were private companies developing agricultural services, they would most likely have already built their own development tools. On the other hand, research institutions tended to be more eager to try an immature service and could be willing to support SenSyFLand's improvement while exploiting its resources at an affordable price. However, they lacked funds to support SenSyFLand. Deciding the target market was one of the biggest challenges the team faced. After brainstorming with SenSyF stakeholders, one thing was clear – only private companies could turn SenSyFLand sustainable in the long-run. But to reach that segment, Deimos needed to engage with the students, who would be willing to ask their companies to pay for SenSyFLand's licence in the future. Therefore, the stakeholders decided to target universities at a first stage until the service reached to a mature level of development and acquired a robust customer base. On a later stage, private companies would be SenSyFLand's target.

Despite being enthusiastic, Grosso was concerned about the required resources to develop and sell SenSyFLand. Therefore, the VCW team worked closely to the SenSyF's stakeholders to design a business model which would assure SenSyFLand's sustainable launch. It needed to comply with the service attributes, market conditions and company specifications. The business model consisted in offering two license plans: The "Student-License", available at a reduced price for researchers that are willing to build either imagery processing tools ordered by Deimos or final services while sharing its revenues with Deimos; and in the future, the "Professional-Licence" would offer SenSyFLand continuous support and full infrastructure flexibility. Since there was no educated market for this service, direct selling was crucial for customer relationship management, building engagement and success. Although cost and revenue structures were somewhat clear, the VCW team realized that further research should be conducted in order to refine it.

Besides planning the business model, the team developed the Money, Men and Minute Framework<sup>xviii</sup> to define the key needed resources for the project. Starting with Money, the VCW team realized that in order to carry revenue and cost estimates, Deimos would also have to analyse the size of the potential customer base and their willingness to pay. The revenue would come from licence fees and from a share of final service sales in



the case of being developed under the “Student-Licence”. The team perceived infrastructure, personnel and marketing as the most relevant costs. For Men, the company defined six major stakeholder profiles – a product coordinator, internal programmers, external programmers, a salesperson and a marketer. After inquiring SenSyF’s stakeholders, a timeline was defined (see **Exhibit 9** for the 3 M framework).

### **Time for a tough decision**

On the 3<sup>rd</sup> of December, the Board of Directors met to approve the business plan for 2016. Given the strategic importance of the VCW project and the need to allocate the SenSyF team for a new challenge, the respective members were also present in the discussion.

The VCW team was invited to present their main findings. Despite consistently perceiving SenSyFLand as a valuable and robust concept, the board seemed not to agree whether Deimos should develop it or not. To trigger discussion, the VCW team questioned if Deimos was committed to implement their recommendations. Almeida mentioned that “So far, we have been driven by research rather than by a customer. We must go ahead and test SenSyFLand in the real world”. Catarino observed that SenSyFLand could bring a new and important revenue stream for the company. Despite understanding their opinion, Nuno Ávila, seemed to be quite more conservative, as he asked “Shouldn’t we gather more information on the competitors and on the demand before going forward with SenSyFLand?”. The remaining SenSyF’s stakeholders preferred to kill SenSyFLand. They defended that the Board of Directors should go for a short-term solution and accept both projects that have been offered during the round of interviews conducted by the VCW team. In their opinion, both the two-year project for the development of a coastal monitoring service and the one-year assignment for the measurement of European dams’ subsidence could provide a safer revenue in 2016. Moreover, these were technologically feasible and would not require Deimos to hire new collaborators.

Everyone could feel the tension in the room. The cards were on the table and it was clear that there were three valid perspectives: Kill SenSyFLand, conduct further research before acting or accept the consultants’ advice and use this as a unique opportunity to start transforming the organization. What should the Board decide?

## Exhibits

### Exhibit 1 – H2020 Evaluation Criteria for Research and Innovation Actions (RIA)<sup>xix</sup>

**Note:** Deimos main points of concern are underlined.

**1 - Excellence** - The extent that the proposed work corresponds to the topic description in the work programme.

- Clarity and pertinence of the objectives;
- Credibility of the purposed approach;
- Soundness of the concept, including trans-disciplinary considerations, where relevant;
- Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art.

**2- Impact** – The extent to which the outputs of the project should contribute at the European and/or International level to:

- The expected impacts listed in
- the work programme under the relevant topic
- Enhancing innovation capacity and integration of new knowledge;
- Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets; and, where relevant, by delivering such innovations to the markets;
- Any other environmental and socially important impacts (not covered above);
- Effectiveness of the proposed measures to exploit and disseminate the project results, to communicate the project, and to manage research data where relevant.

**3 - Quality and efficiency of the implementation** - The following aspects will be taken into account:

- Coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources;
- Complementarity of the participants within the consortium (when relevant);
- Appropriateness of the management structures and procedures, including risk and innovation management.

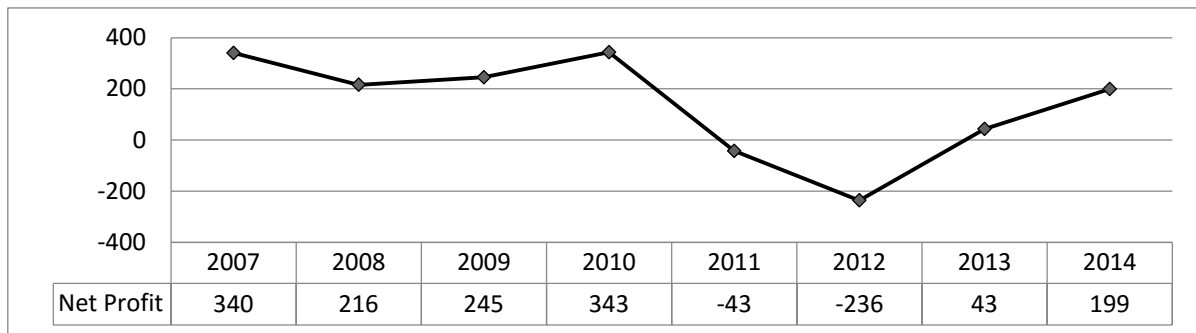
**Source:** European Commission

**Exhibit 2 – Composition of Deimos Board of Directors**

Position	Name
CEO group Deimos	Miguel Bello
Deimos General Manager	Nuno Ávila
Deimos Business Development Manager	Elsa Alexandrino
Head of the GNSS Systems & Flight Systems Divisions	Pedro Silva
Head of the Ground Systems Division	Antonio Gutierrez
Head of the Payload Data Ground Systems Business Unit	Nuno Catarino

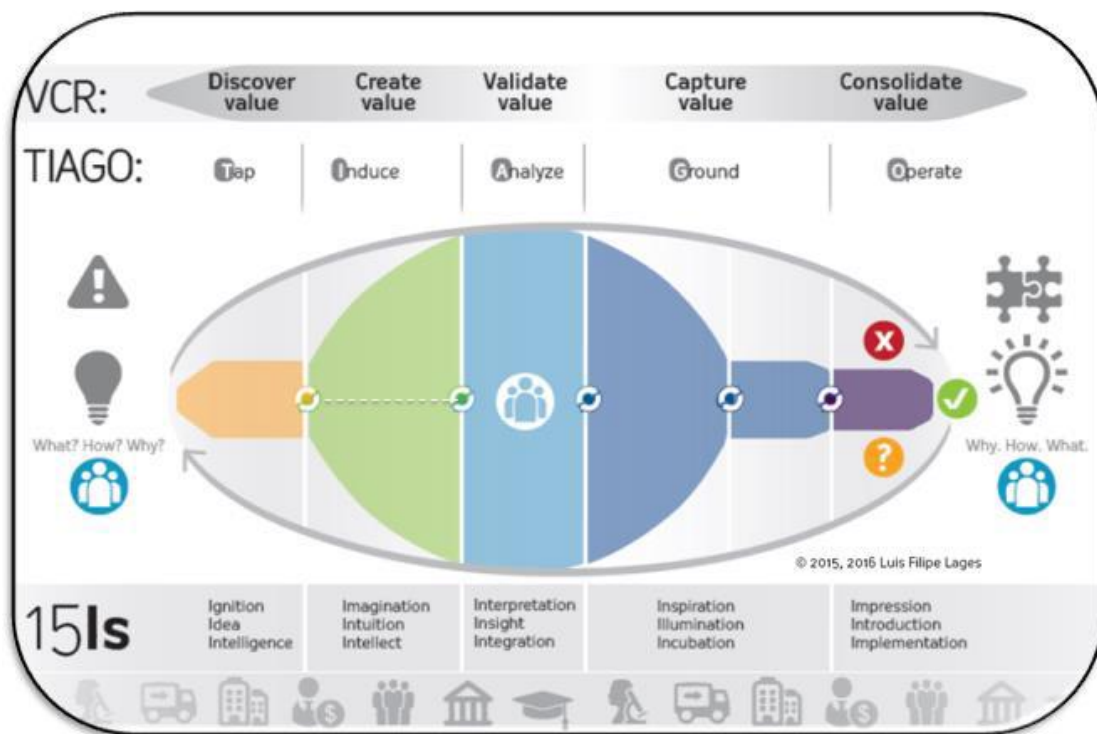
Source: Deimos

**Exhibit 3 – Deimos net profits (2007-2014), in thousands of euros**



Source: Elecnor

**Exhibit 4 – The Value Creation Wheel<sup>xvi</sup>**



Source: **Lages, Luis F.** 2016. "VCW – Value Creation Wheel: Innovation, technology, business, and society", *Journal of Business Research*, DOI: 10.1016/j.jbusres.2016.04.042.

### Exhibit 5 – Earth Observation –Value Chain <sup>xx</sup>

**Note:** This is the actual value chain. Deimos pretends to offer new solutions for the midstream section of the chain by selling not only data but also software development tools and by renting infrastructure.

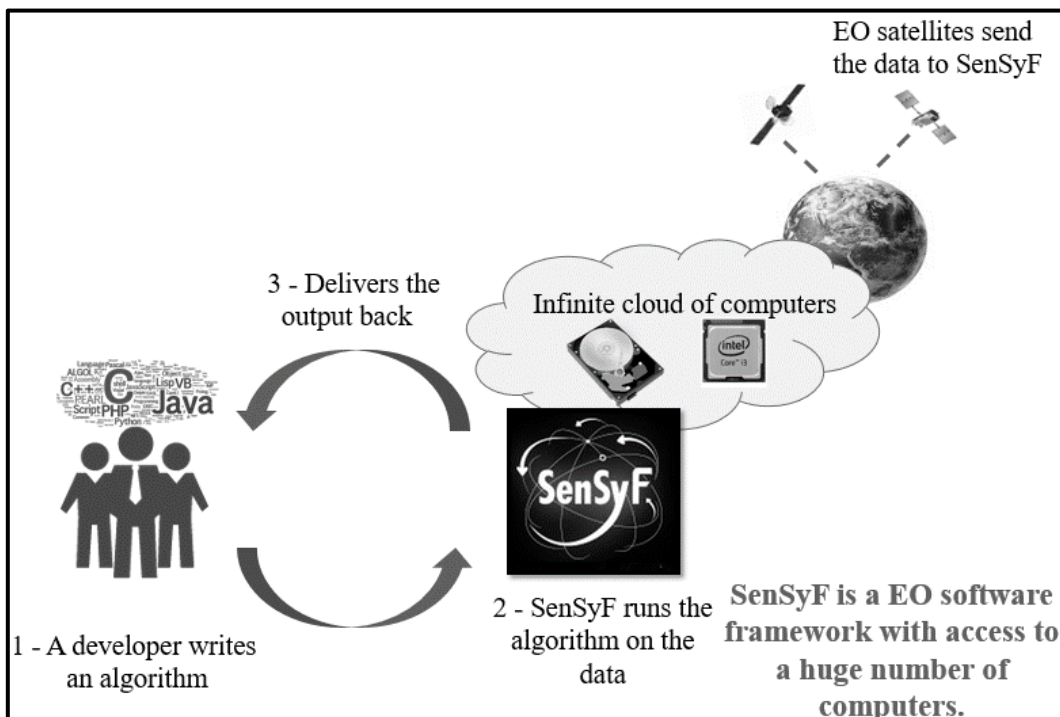
**Upstream** - Refers to the providers of EO Space infrastructure, comprising satellite and ground system manufacturers and operators, as well as the providers of launch capabilities.

**Midstream** - Refers to data providers, who make use of upstream infrastructure for commercial and institutional purposes. The core activities include the acquisition, production, processing, archiving and distribution of Space-derived data.

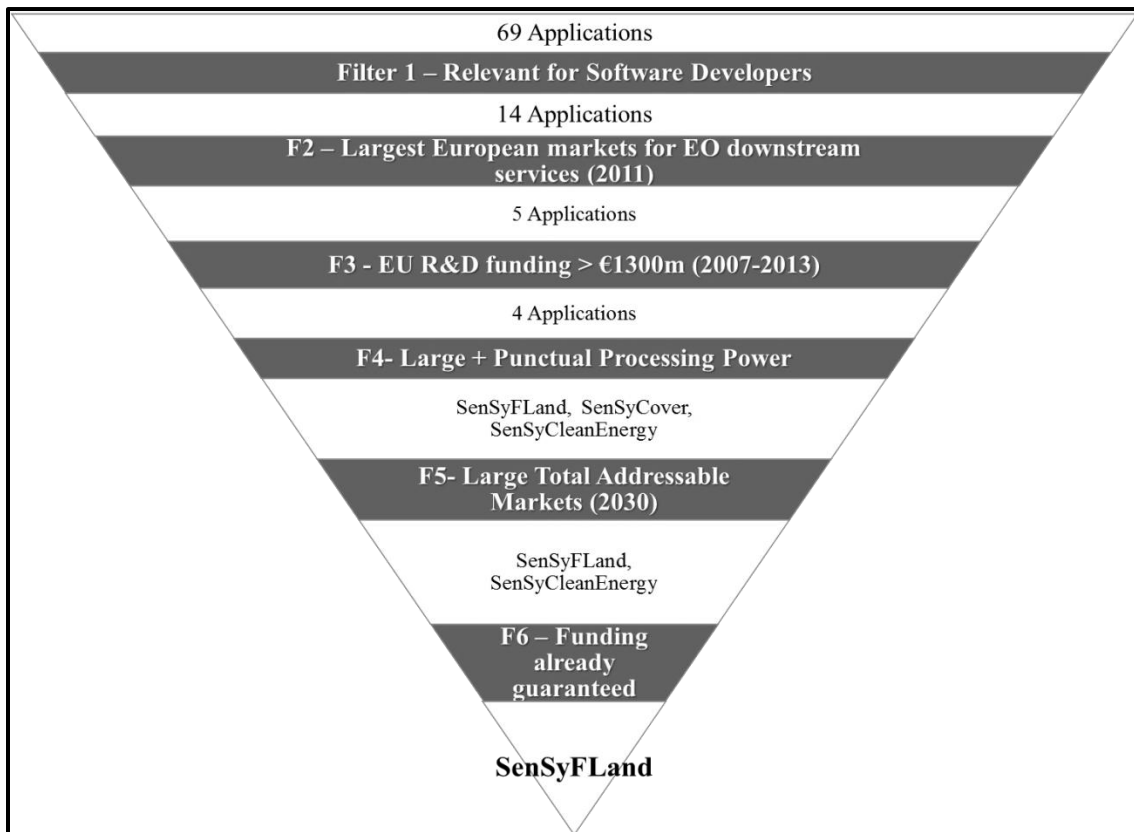
**Downstream** - Represents companies offering Value-Added Services. Such companies typically develop commercial applications based on EO data provided by the commercial data resellers.

**Source:** Space Tec Partners

### Exhibit 6 – The functioning of SenSyF



**Exhibit 7 – The Value Creation Funnel applied to SenSyF<sup>xxi</sup>**



**Exhibit 8 – Examples of value added services that can be built with SenSyFLand.**

<b>Agriculture</b>	<b>Land</b>	<b>Coast or Inland Waters</b>
<ul style="list-style-type: none"> <li>• Optimization of field inputs (water, fertiliser, pesticides)</li> <li>• Optimization of seed density</li> <li>• Deciding the crop type (based on type of soil)</li> <li>• Assessment of growing crop</li> <li>• Assessment of yield potential</li> <li>• Relative Chlorophyll maps</li> <li>• Forest vigour and health (fire insurance)</li> <li>• Crop insurance apps</li> <li>• Biomass Maps</li> </ul>	<ul style="list-style-type: none"> <li>• Urban Planning</li> <li>• Study land use (type of vegetation, soil parameters...)</li> <li>• Forest management (plan forest roads, assess fire impact...)</li> <li>• Measurement of the effects of natural disasters</li> </ul>	<ul style="list-style-type: none"> <li>• Erosion impact on coast</li> <li>• Pollution</li> <li>• Quantity of Inland water</li> <li>• Measure conditions for practicing water sports (sail, surf, kitesurf...)</li> </ul>

**Exhibit 9 – The 3 M's: Money, Men and Minute** <sup>xix</sup>

<b>Money</b>
<ul style="list-style-type: none"> <li>• <b>Revenues to be estimated:</b> Full price licenses (for professional customers); Reduced price licenses (for students); Share of revenues from the applications developed with the reduced price licenses.</li> <li>• <b>Costs to be estimated:</b> Research and Development; Customer Relationship Management; Personnel; Infrastructure (Website and Terradue's cloud).</li> </ul>
<b>Men</b>
<ul style="list-style-type: none"> <li>• <b>Product Manager</b>   Background: Technical and Management Tasks: Coordinates the implementation of the business model and manages the team.</li> <li>• <b>Internal Developers</b>   Background: Engineering Tasks: Support external developers; Develop of tools and platform; Define tools to be built externally; Perform quality tests for tools developed externally.</li> <li>• <b>External Developers</b>   Background: Technical (MSc. Or PhD candidates) Tasks: Develop tools ordered by Deimos as a MSc. or PhD final project</li> <li>• <b>Marketing Specialist</b>   Background: Marketing or Management Tasks: Responsible for CRM, Promotion and Market Research.</li> <li>• <b>Salesperson</b>   Background: Technical and with previous selling experience Tasks: Communicate with prospect customers and universities.</li> </ul>
<b>Minute</b>
<p><b>*Planning:</b> Defining which tools should be built by external developer; Measuring Potential Costs and Revenues.</p>

## Endnotes

<sup>i</sup>**Elecnor Deimos.** “About Us”, Available from <http://www.deimos-space.com/en/elecnordeimos/> Accessed 10 September, 2015.

<sup>ii</sup>**ESA.** “What is ESA?”, from [http://www.esa.int/About\\_Us/Welcome\\_to\\_ESA/What\\_is\\_ESA](http://www.esa.int/About_Us/Welcome_to_ESA/What_is_ESA). Accessed 10 December, 2015.

<sup>iii</sup>**European Commission.** 2014. “General Annexes – H. Evaluation.”, in *Horizon 2020 – Work Programme 2014-2015*, Available from [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\\_2015/annexes/h2020-wp1415-annex-h-esacrit\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-h-esacrit_en.pdf) Accessed 12 September, 2015.

<sup>iv</sup>**Copernicus.** “Project Database – SenSyF”, from <http://www.copernicus.eu/projects/sensyf>. Accessed 6, September 2015.

<sup>v</sup>**Schwartz, B.** 2004. “The paradox of choice: Why more is less.” January, New York: Ecco.

<sup>vi</sup>Copernicus was called Global Monitoring for Environment and Security until 2012.

<sup>vii</sup>**Euroconsult.** 2012, “Satellite-Based Earth Observation, Market Prospects to 2021”, 116

<sup>viii</sup>**European Commission.** 2013. “Copernicus: The EU Earth Observation Programme - good for jobs and the environment!”, Available from <http://www.wired-gov.net/wg/news.nsf/articles/Big+Data+is+Big+Business+16042014092500?open>. Accessed 20 November, 2015.

<sup>ix</sup> Source: **Wiredgov.** “Big Data is Big Business”, Available from <http://www.wired-gov.net/wg/news.nsf/articles/Big+Data+is+Big+Business+16042014092500?open>. Accessed 20 November, 2015.

<sup>x</sup>Consortium: DEIMOS Engenharia S.A. (Portugal), DEIMOS Space (Spain), Terradue SRL (Italy), Centro Nacional de Información Geográfica (Spain), ACRI-ST SAS (France), Northern Research Institute Tromsø AS (Norway), ARGANS Limited (United Kingdom), Instituto Superior Técnico (Portugal) and Universitat de Valencia (Spain).

<sup>xi</sup> **Copernicus**. “Copernicus in brief” Available from <http://www.copernicus.eu/main/copernicus-brief>. Assessed 21 December, 2015

<sup>xii</sup> **Euroconsult**. 2014, “Brochure - Satellite-Based Earth Observation, Market Prospects to 2023”, 5

<sup>xiii</sup> **Northern Sky Research**. 2012. “Global Satellite-Based Earth Observation, 4th edition – Report Briefing”, 5, Available from [http://www.nsr.com/upload/research\\_reports/NSR\\_EO4\\_Brief.pdf](http://www.nsr.com/upload/research_reports/NSR_EO4_Brief.pdf). Accessed 17 October, 2015.

<sup>xiv</sup> **Space Tec Partners**. 2012. “Assessing the Economic Value of Copernicus: “European Earth Observation and Copernicus Downstream Services Market Study” (Executive Summary) – 4, Available from [http://www.copernicus.eu/sites/default/files/library/GMES\\_GIO\\_LOT3\\_PublishableExecutiveSummary\\_final.pdf](http://www.copernicus.eu/sites/default/files/library/GMES_GIO_LOT3_PublishableExecutiveSummary_final.pdf). Accessed September 22, 2015.

<sup>xv</sup> **ESA**. “About the TEP initiative”, Available from <https://tep.eo.esa.int/about-tep>. Accessed 29 March, 2016.

<sup>xvi</sup> The potential customers interviewed were Ana Fonseca (Head of the Applied Geodesy Unit at Laboratório Nacional de Engenharia Cívil), Mário Caetano (Principal Researcher at Direção Geral do Território), Joel Silva (Researcher at ESA), Marta Oliveira (PhD student in Public Health), Francisco Fonseca (Ecology professor at FCUL) and Helena Paulino (MSc. Student in Agronomic Engineering).

<sup>xvii</sup> **Lages, Luis Filipe**. 2015, "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599

<sup>xviii</sup> **Smith, P.; Taylor, J**. 2004, “Marketing Communications: An Integrated Approach”. 26-27. London: Kogan Page

<sup>xix</sup> **European Commission**. 2014, “HORIZON 2020 – WORK PROGRAMME 2014-2015, General Annexes: H. Evaluation”, 2-3, Available from: [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\\_2015/annexes/h2020-wp1415-annex-h-esacrit\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-h-esacrit_en.pdf). Accessed 10 September, 2015.

<sup>xx</sup> **Space Tec Partners**. 2012, “Assessing the Economic Value of Copernicus: European Earth Observation and Copernicus Downstream Services Market Study (Executive Summary)” – 4, Available from:



[http://www.copernicus.eu/sites/default/files/library/GMES\\_GIO\\_LOT3\\_PublishableExecutiveSummary\\_final.pdf](http://www.copernicus.eu/sites/default/files/library/GMES_GIO_LOT3_PublishableExecutiveSummary_final.pdf).  
Accessed 22 September, 2015.

<sup>xxi</sup> The sources of the filters used in the Value Creation Funnel are described below:

- **Filter 1 – Relevant for software developers**

In this specific case, the filter was chosen and applied by the SenSyF stakeholders involved in the process. Only the applications for the midstream users passed through this filter.

- **Filter 2 - 5 largest European EO markets of EO downstream services (2011)**

**Space.TecPartners.** 2012, "European Earth Observation and Copernicus Downstream Services Market Study"

- **Filter 3 - EU R&D funding > €1300m (2007-2013)**

**European Commission.** 2014, "FP7 Research and Innovation – Budget 2007-2013". Available from: [https://ec.europa.eu/research/fp7/index\\_en.cfm?pg=budget](https://ec.europa.eu/research/fp7/index_en.cfm?pg=budget) Accessed on 10 December, 2015

- **Filter 4 – Large and punctual processing power**

In this specific case, the filter was chosen by the SenSyF stakeholders involved in the process. For the question "How often does each application typically require large and punctual processing power?", Nuno Catarino classified each application by attributing a number in the range from 1 (never) to 5 (very often). Since the SenSyF rents the infrastructure, the best market applications will need large punctual power during short periods of time.

- **Filter 5 – 5 largest Total Addressable Markets by 2030**

**Space.TecPartners.** 2012, "European Earth Observation and Copernicus Downstream Services Market Study"

- **Filter 6 – Funding already guaranteed**

In this specific case, the filter was chosen by the SenSyF stakeholders involved in the process. For the question "Does DEIMOS have already guaranteed a fund with which the company can develop the next market applications?", Nuno Catarino replied Yes or No.