VCW
value creation wheel

THE VCW METHOD FOR INNOVATION, DECISION MAKING AND PROBLEM SOLVING

INCLUDES CASE-STUDIES IN SPACE BUSINESS AND EARTH OBSERVATION

POWERED BY VCW

Horizon2020
European Union Funding
for Research & Innovation

Edited by
Luis Filipe Lages, Vânia Fonseca and Peter Toh

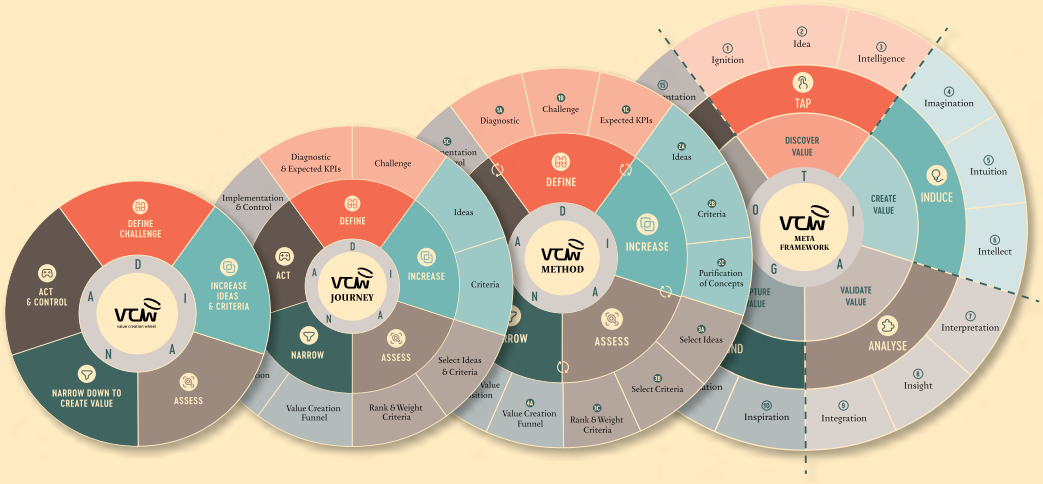
NEXT OCEAN

value creation wheel

How to innovate, make decisions and solve challenges using the Value Creation Wheel?

Degree of challenge complexity, customization, and co-creation sophistication

Requirement of human resources, budget and time (3Ms- manpower, minute, money)



4-7 hours

VCW SPRINT: "Workshops for simple challenges"

1 - 2 days

VCW JOURNEY: "Workshops for moderate challenges, requirement for VCW Sprint certification"

3 days – 5 months

VCW METHOD: "Courses, Consulting, Complex projects, requirement for VCW Journey certification"

6 months - 4 years

VCW META FRAMEWORK: "EC Horizon projects, Innovation Ecosystems, Consulting, requirement for VCW Method certification"

www.valuecreationwheel.com

value creation wheel

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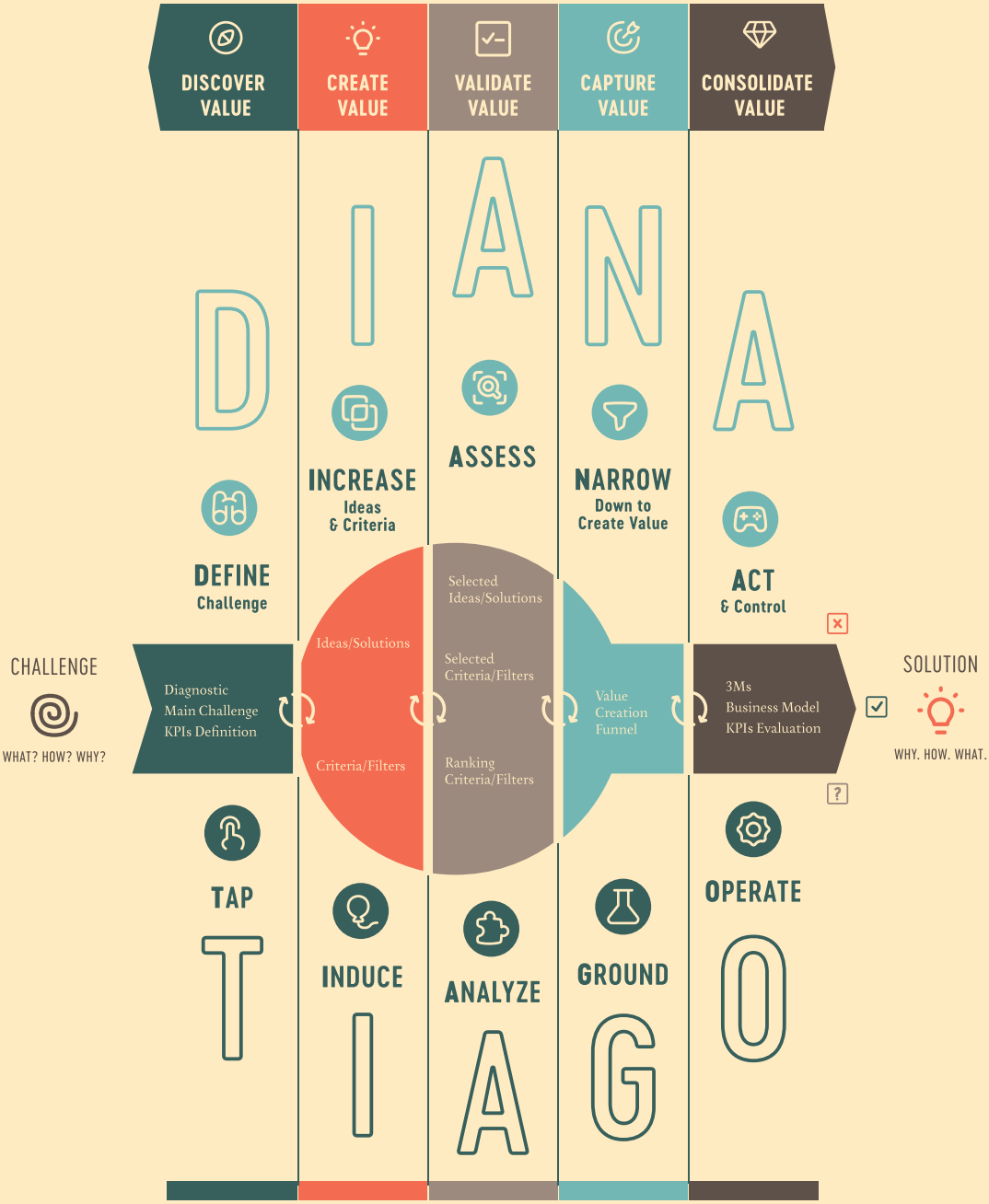


Source: **Lages, 2016**

INTRODUCTION TO THE VCW METHOD

CHAPTER 1

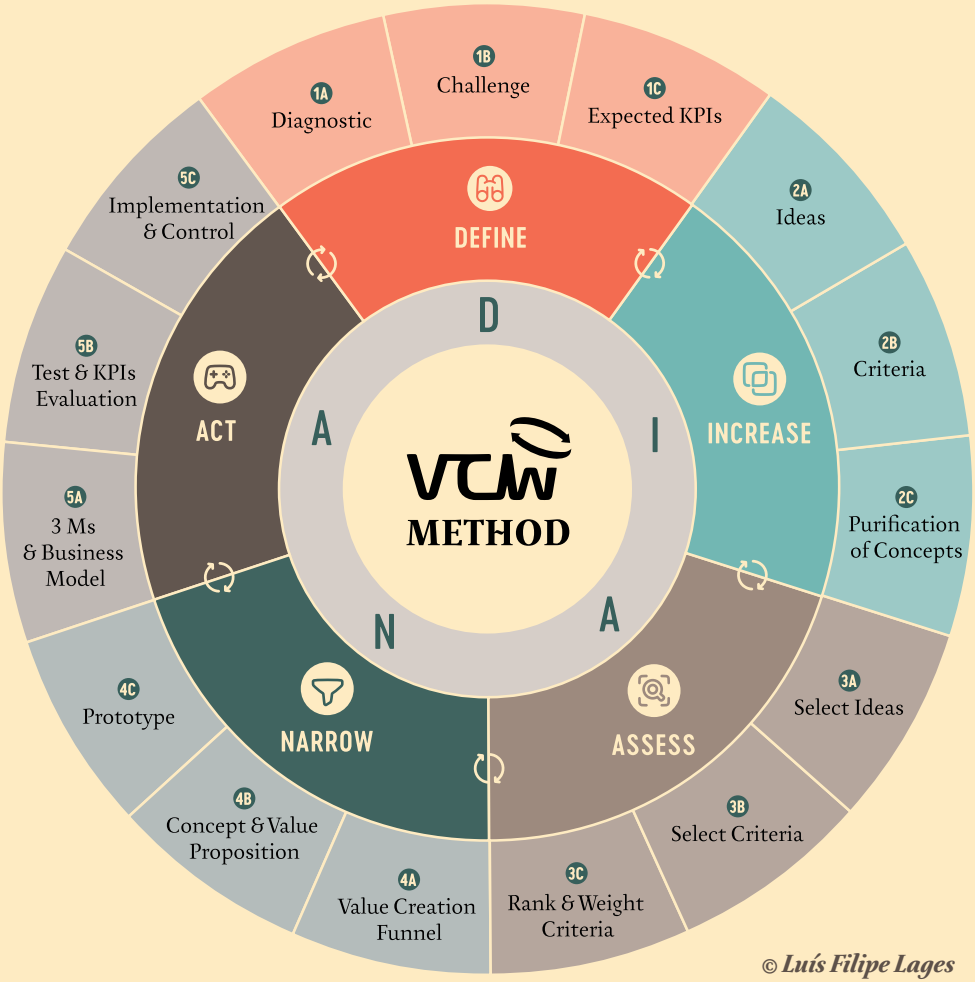
By Luis Filipe Lages

Why?

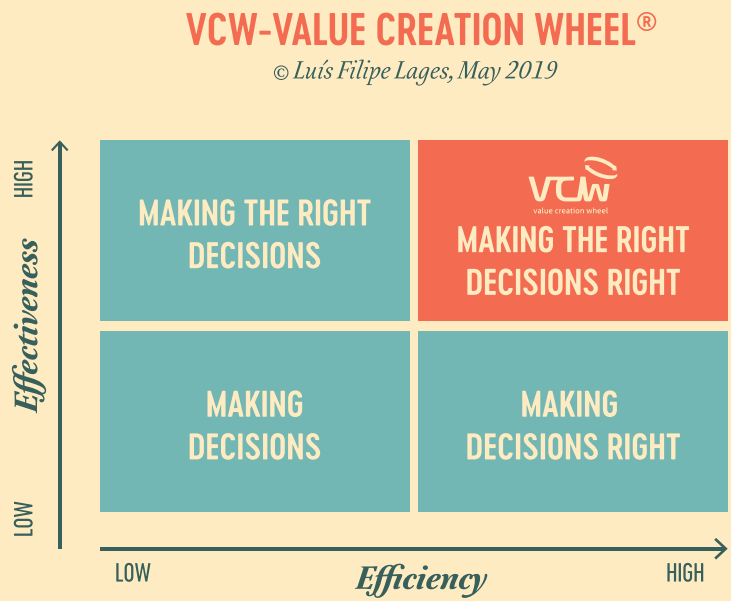
Why should we use the VCW?

THE VCW IS A METHOD for innovation, decision-making and problem solving. The VCW method can help Key Decision Makers (KDMs) to solve their challenges/problems. KDMs often have a wide range of challenges/problems that are hard to solve, due to a wide range of reasons including lack of an established problem-solving process, lack of support, lack of creativity and options, complexity of the problems, difficulties in integrating different perspectives, paradox of choice associated with the excess of options, among others. Examples of KDMs include CEOs, directors of departments, intra- and entrepreneurs, consumers, and us while managing our daily life. Depending on the context, we all can be KDMs. KDMs are unique, powerful, and have an impact while taking decisions!

The VCW has five phases. In the first phase (Define), the VCW method starts by making a diagnostic and defining a challenge/problem using the KDMs. In the second phase (Increase), with the support of different stakeholders it generates a wide range of solutions and criteria/filters to solve the challenge/problem. In the third phase (Assess), the KDMs analyze the solutions, and select and rank the filters. In the fourth phase (Narrow), the remaining ideas go through the raked filters. Finally, in the fifth phase (Act), the final solution(s) are implemented while engaging the KDMs.



The VCW is a method for optimal decision making. It supports effective decision making because it produces the intended results while involving the Key Decision Makers (KDMs) to achieve the expected outcomes. KDMs find legitimate ideas and valid arguments for their challenges, find support for their reasoning, and agreement on the final solutions. It is a process for efficient decision making because it does things in the right manner, performing well with reduced efforts and limited resources (e.g., 3Ms- Money/budget, Minute/time, Manpower/people) to create value.



Overall, the VCW method is used by decision makers and their stakeholders to make optimal decisions. VCW's effectiveness and efficiency has been proven in the context of individuals, start-ups, NGOS, SMEs, large organizations, and Fortune 500 companies.

What?

The VCW as a solution for decision makers

THE VCW IS A METHOD designed to identify solutions to complex problems through creativity, innovation, and decision-making, involving key decision-makers in different phases and stakeholders to generate solutions and filters.

The five phases of the VCW DIANA are the following. In the first phase, "Define", Key Decision Makers (KDMs) present a diagnostic and the main challenge/problem to be addressed (e.g., "What is the right value proposition for Y?", "What is the right target market for X?, "How to enter market W?"). The KDMs validate the 3Ms (manpower-people, minutes-time, and money-budget) available for each VCW project, and establish the expected Key Performance Indicators. In the second phase, "Increase", many people (e.g., VCW team, stakeholders, and KDMs) generate numerous ideas and criteria to solve the challenge. In this phase, ideas and criteria should not be evaluated. There are no good/bad ideas and criteria/filters. In the third phase, "Assess", the KDMs select the best ideas and best criteria to solve the challenge. They establish a ranking for the criteria that are compulsory. Weights are then given to the optional criteria. Stakeholders might be invited for the discussion. In the fourth phase, "Narrow", the selected ideas go through the ranked filters and through the weighted optional filters until finding the final solutions. They will then be conceptualized and/or prototyped. Stakeholders and KDMs might be involved in this analysis and discussion. Finally, in the fifth phase, "Act", the final solutions need to be operationalized by KDMs and stakeholders. KDMs validate the available resources (3Ms) and implement and monitor the execution of the final solutions. Stakeholders might be engaged in this phase.

The VCW defines the Key Decision Maker (KDM) as someone, or a group of people (KDMs), who is/are committed and has/have the power to solve a challenge/problem at the organizational and/or individual level. To become a KDM it is critical to have access to critical resources, i.e. the 3Ms (Manpower, Minutes, and Money). The KDMs need to be involved in solving the challenge/problem and, consequently, in the VCW process, because they are the only ones who can implement a solution and define the real challenge/problem.

In addition to KDMs, the VCW can be used by all the people (e.g., employees, consultants, and other stakeholders) who are empowered and desire to help KDMs make their decisions in a better way.

The VCW is supported by collective intelligence during the participative decision-making process, through the involvement of internal and external stakeholders who help to generate ideas, filters, concepts, and solutions (Lages 2016).

The VCW has some unique characteristics.

- The VCW has proven to provide well supported and convincing solutions to a wide range of relevant problems/challenges of KDMs across different industries and countries.
- The VCW is a Meta Framework that finds solutions while complementing, integrating, and/or being integrated by tools from different fields.
- The VCW does not impose any pre-established solutions and magic formulas on KDMs. It is a structured and agile Meta Framework that can integrate, be integrated, and/or complement the more traditional "in-the-box" formulas/matrices with "outside-the-box" and "no-box" tools, frameworks, and theories across different fields.
- The VCW can combine the different perspectives of KDMs and stakeholders, and get their overall input in the implementation of the final solution(s).

The VCW method should only be applied by leaders who are willing to build on five decision-making pillars:

- sustainability: e.g., balance between short- and long-term goals, and alignment with sustainable indicators (e.g., 17 SDGs and its 232 indicators, 8 MDGs, TBL, circles of sustainability),
- common good: fairness and justice for all internal and external stakeholders;
- collaboration: openness to collective intelligence and co-creation to find the best solution(s) (e.g., by engaging different stakeholders, angels' and devils' advocates on the decision-making process)
- wisdom: proper analysis and judgement, namely when facing complex problems and paradoxes (e.g., how to manage global vs. local perspectives, structure vs. agility, value creation vs cutting costs);
- transparency: clarity about a) the decision-making process, b) ideas and criteria supporting the final solutions, c) who are the real key decision makers, d) internal and external forces, among many others.

As such, after concluding each VCW project, we encourage the KDMs and the VCW team to look at the mirror. This will ensure that the VCW project was developed in a conscious manner and is supported by a World Development Vision, while considering the 5 VCW pillars mentioned above.

The VCW should never be used when the KDMS:

- have no power and/or access to critical resources, such as the 3Ms (Manpower, Minutes, and Money),
- are not involved and committed to the problem and the VCW process,
- do not believe in co-creation and innovation for idea generation and problem-solving.

Who?

Who has been using the VCW and for which purpose?

AT THE ORGANIZATIONAL level, the VCW has been used by:

- KDMs who are owners, C-Level, leaders, directors and managers responsible for innovation, governance, technology-transfer, transforming strategy into tactics, product and/or market growth, organizational transformation and corporate change, internationalization, corporate innovation and intrapreneuship, overcoming the lack of communication across departments, and other challenges.
- KDMs who are directors of SBUs and departments (e.g., marketing, human resource management, operations management, international business, innovation) to find transversal solutions across different fields for their specific challenges,
- Employees, consultants, and others providing support to KDMs of organizations, governments, societies, and NGOs,
- Entrepreneurs to solve their daily challenges of start-ups (e.g., finding the right partners, tech-transfer, financing, go-to-market) as well as intrapreneurs to address their organizational challenges.

Hundreds of organizations across different sectors, in over 20 countries, have applied the VCW method and have collaborated with VCW teams. Examples of organizations include Aga Khan Development Network, Ageas, Airbus Factory, Airbus Helicopters, AstraZeneca / Santis, AXA, Bank of Cyprus, BéBécar, C.A. Papaellinas group, Cathay Pacific Airways, Cyta-Vodafone, Claranet, Credit Suisse, Crowne Plaza, Deimos-Elecnor Group, Eurocopter, Everis-NTT Data, Forbach city, Flying Tiger, Four Seasons, Gemalto, GDF Suez, GirlMove, IGT, INCM, InvestLisboa, IPO Porto, ITER, Healthcare City, Jerónimo Martins, Liga Portugal, Lufthansa Technik, Mastercard, McDonald's, OKTAN, Otis, Piraeus Bank, Renault, Renova, Rio Tinto Alcan, Santander, Santa Casa Misericórdia Lisboa, Technik, theCamp, Thomson Reuters, Uniplaces, UPS, and Vienna International Airport, among many others.

These and other organizations have been using the VCW to find solutions for important challenges (see Lages 2016; Lages et al. 2020). It has been popular in Innovation and New Product Development (e.g., which new product/service shall we create?), Engineering/Technology (e.g., what is our unique selling point?), Marketing (what should be our value proposition?; what is the right target market?), Branding/Communication (e.g., what should be the right brand, slogan, message?), HRM (e.g., how to hire highly qualified people with limited resources?; how to motivate my employees over the long-term?), Strategy (e.g., how to create new markets?; how to differentiate from competitors?) and International Business (e.g., what are the right distributors in market X?; for which markets to export our products/services?).

Below we present the opinions of different key decision makers about the VCW.

> *"**VCW is an enabler of decisions which are more considered** (allows a broader range of alternatives), **more focused and supported** (allows the incorporation of filters), **and more structured** (allows to follow a process).*
> *So, **it makes decision-making more efficient and effective.**"*
>
> **Paula Hortinha**, ex-CEO of JMD-Jerónimo Martins Distribuição, who was highly involved in two VCW projects in Strategy and Marketing/Innovation at JMD

> *"**The VCW definitely helped to manage the consortium.** In the NextGEOSS, the most important part of the project was to be able to convey the message of the project to the client services. We wouldn't have such a targeted value proposition and public image for the project without the VCW. (...) **The VCW had a huge impact. If it was not for the VCW, we wouldn't have passed the message and made the decision pass.** "*
>
> **Nuno Catarino** of the Elecnor Deimos Group was in charge of managing the 10M€ H2020 project NextGEOSS, involving 27 partners across 13 countries.

Source: **VCW Conference**

"Nowadays, organizations have lots of good ideas or initiatives, but they don't have the resources to pursue all of them. ***Having a clear, transparent, and collaborative process for choosing the right actions is crucial for the success of the innovation initiatives****. When looking for solutions to address this problem, I came across* ***the VCW framework, that incorporates an excellent decision-making process****, which allows an informed decision by the decision-maker with transparent and clear reasoning for the decision."*

Paulo Malta, Innovation Expert and Managing Partner of Innovsky

"I started as a skeptic in relation to this methodology and I confess, that in the first stage, I didn't expect the results we obtained. At the end of the process, we found very practical solutions, and we achieved the objectives that we had set*. Indeed, it was a very pleasant surprise to me."*

Paulo Pires, CEO of WhyMob (IT Solutions) and Board Member of Oramix (Digital Transformation & Cloud Adoption)

In addition to organizations, the VCW has also been used for years by Individuals (myVCW) to find supported and convincing solutions to solve their challenges and problems. The VCW works particularly well when solving personal challenges because quite often at the individual level there is a single

KDM. The VCW has been successfully used at the individual level to answer for example:

- What is my value proposition for the job-market?
- What is my life purpose?
- Where shall I emigrate to?
- How to better organize my time?
- How can I quit smoking?
- How can I find an extra income?
- What to do in my free time?
- How to find a partner?

The VCW has also been used by Consumers/Buyers to find solutions for important challenges when there is a lack of choice or too much choice. It has been used to find, for example:

- Which house to buy?
- Which car to buy?
- Which computer to buy?
- Which school/university to enter?
- Where to go on holidays?
- How to design our new house?

How?

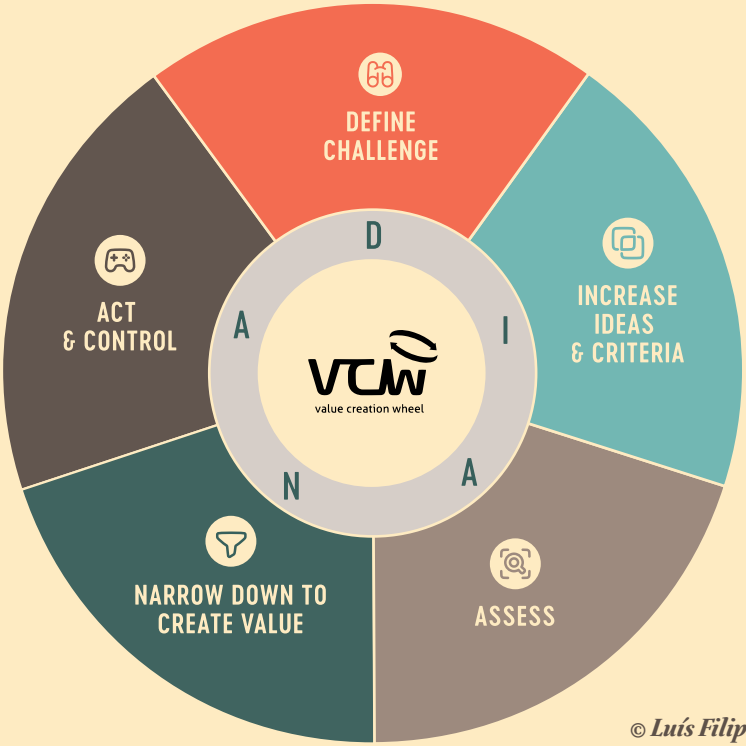
How to apply the VCW?

THE VCW-VALUE CREATION WHEEL® includes DIANA and TIAGO frameworks (Lages 2016). While DIANA is strongly driven by theory to support each VCW phase, TIAGO is a chameleon framework customizable to each specific case and problem.

There are four types of approaches to implement the VCW Method (see Lages et al. 2023). The type of approach depends on a series of factors such as: complexity of the problem/challenge to be solved, available resources (3Ms - manpower, minutes, money), the tacit know-how of the team about the VCW methodology, existing databases of ideas/solutions and criteria/filters, size of the teams, number of internal and external stakeholders engaged, know-how about the context, diversity/alignment of the teams, among others.

VCW Sprint:
A fast approach to decision making

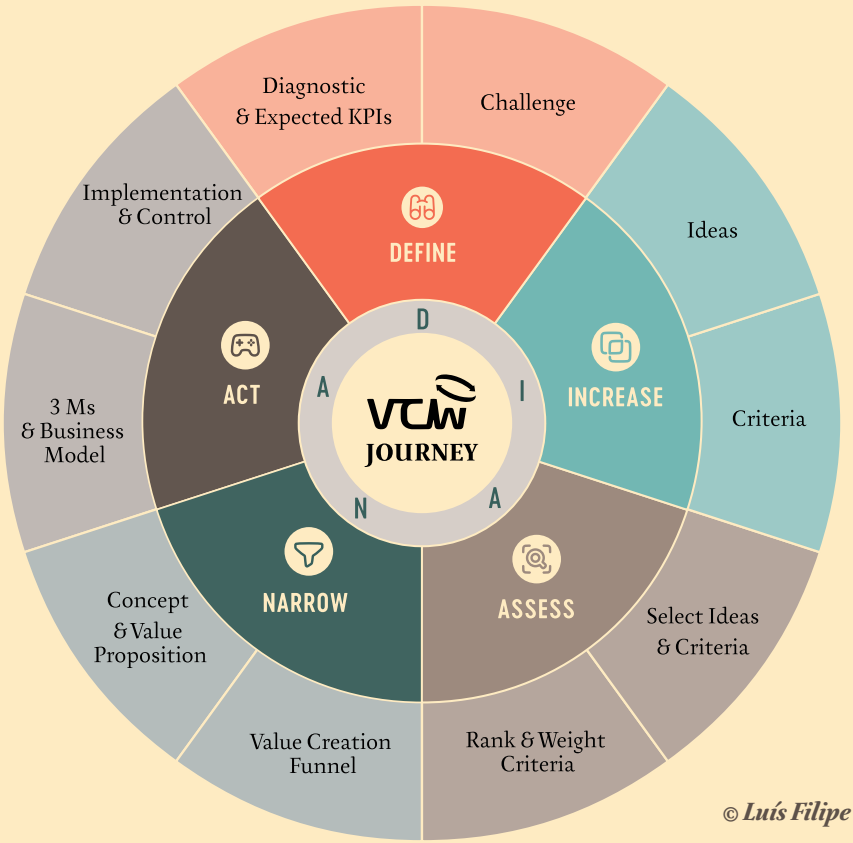
A VCW Sprint consists in the application of a very reduced number of tools from the VCW Method. It can be applied in situations which require fast solutions with very limited resources.
VCW Sprints are particularly recommended for experienced VCW users.



Sources: Lages, 2016; Lages et al., 2023

VCW Journey:
A fast approach to effective and efficient decision making

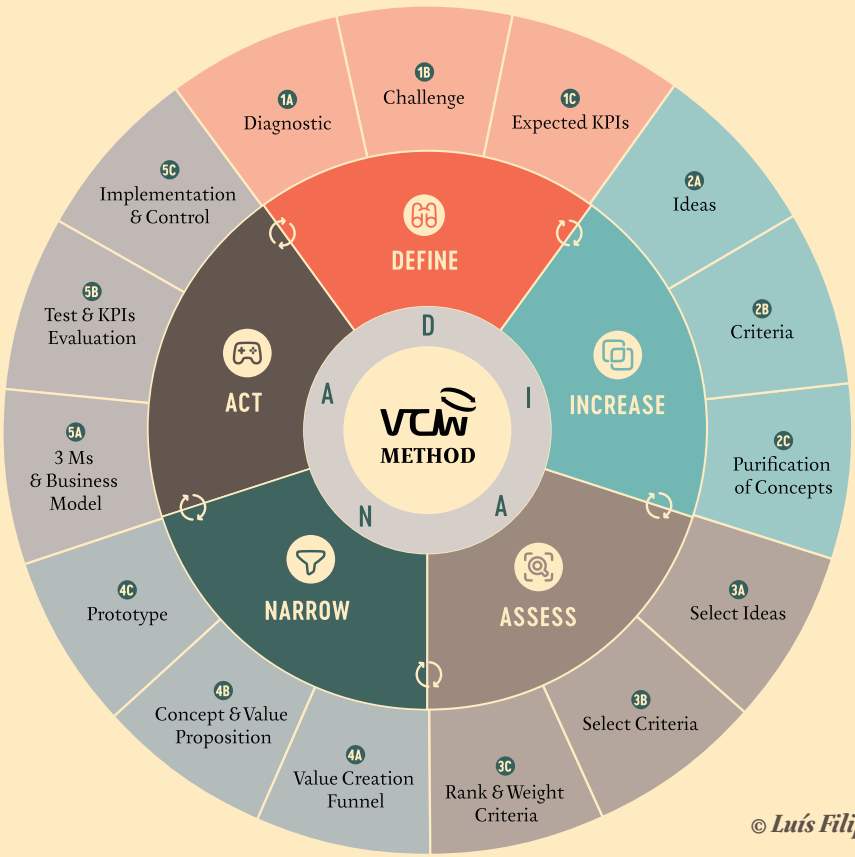
A VCW Journey consists in the application of a selected number of tools from the VCW Method. It is often applied in one-day workshops involving a significant degree of co-creation.



Sources: **Lages, 2016; Lages et al., 2023**

VCW Method:
An effective and efficient method to support in-depth projects

The VCW Method is frequently used to solve complex challenges which require the full support of Key Decision Makers while engaging the surrounding internal and external stakeholders. It provides a holistic approach to problem-solving by incorporating a wide range of methods and managerial tools. It is typically applied in educational, research and consultancy projects which range from three full days to three months.



© *Luís Filipe Lages*

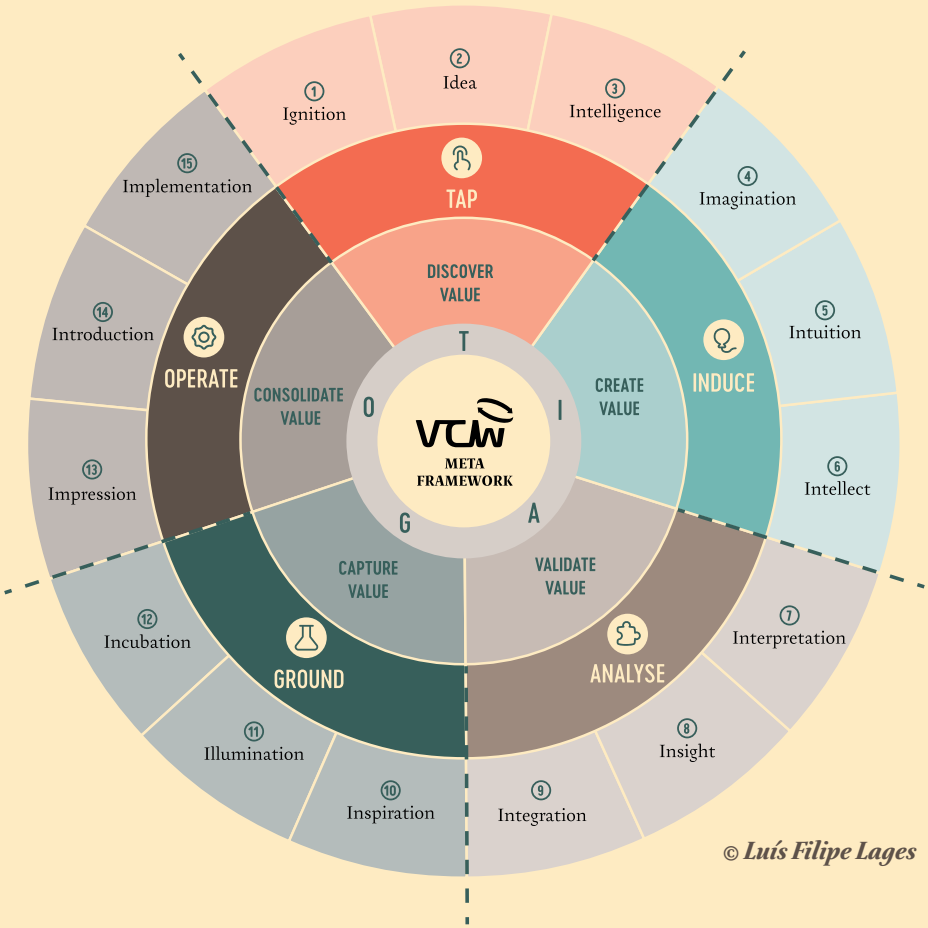
Sources: **Lages, 2016; Lages et al., 2023**

VCW Meta Framework:
An in-depth customized framework to support long and complex projects

The VCWTIAGO Meta Framework is composed by the 15Is of Innovation. Depending on the challenge as well as the input provided by KDMS, internal and/or external stakeholders, the tools of the 15 Is of innovation should be customized to each specific case.

The VCW Meta Framework allows for the integration of a wide range of information systems (i.e., the combination of software, hardware, and telecommunication networks to collect data) as well as established tools, methods, and theories. This Meta Framework appears as a chameleon framework, completely customized to each specific case and problem. It is capable of complementing, be integrated and/or integrating existing frameworks, models and tools across different fields.

It might be used in very long teaching programs (e.g., one-year programs integrating different courses), consultancy and research projects. The resources (e.g., 3Ms- Manpower, Minutes, and Money) for this type of projects are often quite large, involve numerous stakeholders, last some years and might have budgets of several €millions.



Sources: **Lages, 2016; Lages et al., 2023**

A COLLECTION OF CASE-STUDIES ABOUT EARTH OBSERVATION AND SPACE BUSINESS

CHAPTER 2

Edited by Luis Filipe Lages and Vânia Fonseca

THE VCW-VALUE CREATION WHEEL is an innovation and decision-making model that helps KDMs (Key Decision Makers) and leaders to co-create to make effective and efficient decisions to solve their challenges and generate organizational/societal value.

The VCW method has been used by numerous organizations around the world, ranging from start-ups to Fortune 500. During the last six years, the VCW was applied in Space Business and several Earth Observation (EO) projects, namely different EU / Horizon2020 and ESA projects. All these projects were aligned with the UN Sustainable Development Goals (SDGs). In this section, six Space Business and Earth Observation (EO) cases are presented that demonstrate how the VCW was used for better Decision Making in these fields. All these case studies were done with the support of Deimos Group present in five countries and Deimos Engineering based in Portugal. António Gutierrez, Head of Ground Segment Business Unit at Elecnor Deimos Group, who was highly involved in six VCW projects, mentioned:

> *"VCW is a very effective methodology to funnel idea generation. The VCW process does not waste time and benefits from the support of several people and different stakeholders, the more inputs the better. It allows reaching a consensus on which ideas have more potential for the topic you are dealing with, without having to walk around in meetings after meetings, without reaching any results. We focus on the ideas achieved by consensus. The VCW can help Key Decision Makers (KDMs) to take a decision and focus on stakeholders' input to discover the actions that will have the most impact, based on the criteria KDMs have emerged and validated. (...) Congratulations on the VCW methodology because it really helps a lot to focus on the output and manage time. It does not leave much space to disperse in the final results and have the infinite meetings that we had before the methodology."*

The cases presented here are: NextGEOSS, Marine-EO, BETTER, SenSyF, Ground Stations, and improvement of Employee Retention and Job Satisfaction in Space Business. In all the six cases, VCW team members from Nova School of Business and Economics (Nova SBE), played a critical role in helping

to guide the decision-making process across the different partners. The cases presented in this section were written by the VCW team member involved in the project, and edited by Luis Filipe Lages, the project supervisor and creator of the VCW method, and Vânia Fonseca who was Innovation and Sustainability Specialist at Deimos Engineering. According to Fonseca, the involvement in ten VCW projects over a period of four years (2015-2019) was a very positive experience and brought Deimos Engineering a more market-oriented perspective. More specifically:

> *"The overall impact of the VCW was the commitment and understanding of the need to have resources allocated to market related activities. Since the first project up to now we have increased our activities and tasks in projects related with networking, engagement activities, business development, including business cases, business plans as well as our own marketing activities. We also hired in 2018 a trainee, after conducting a VCW project at Deimos, and last February she was promoted to Innovation analyst and now she is taking over digital marketing activities in projects. This has been a major difference from what we did before and this has enabled us to have (...) to increase the scope of the activities within the Data Systems division, the biggest division we have here in Lisbon."*

The VCW is a Meta Framework that is both structured and agile, composed of five phases. All the EO case-studies presented in these Chapter follow these five VCW phases. In the first VCW phase, each case-study starts with a brief internal and external diagnosis of the project context and the challenge defined by the Key Decision Makers (KDMs). In the second VCW phase, the VCW team generates ideas and filters to address the challenge. In the third VCW phase, the KDMs validate the generated solutions, select, and rank the filters. In the fourth VCW phase, the optimal solutions are identified by applying the Value Creation Funnel (VCF) which might be supported by a Multi Criteria Decision Analysis (MCDA) matrix. Finally, in the fifth VCW phase the final solutions to solve the challenge are implemented and resources allocated.

In the first case study, the NextGEOSS H2020 project, the VCW method played a crucial role in managing the innovation process. While involving the different partners and stakeholders present in different countries in this very large project, it helped to convey the message of the project to the client

services. The VCW method was successfully used to find and refine a targeted value proposition. Moreover, it helped to pass the message across the various internal and external stakeholders of the consortium. The fact of taking several opinions from internal and external stakeholders into account helped to build a solid case to get the value proposition to pass through the board of the consortium, which would be hard to accept otherwise. When shaping a decision at NextGEOSS, the VCW method also connected the consortium views with those of the main stakeholders, which then felt that they were involved in the decision-making process and consequently took ownership of the whole process. Overall, the VCW did help to manage the innovation process and at the same time helped to solve different challenges within the consortium (e.g., find the value proposition, identify the target market, and design the marketing mix and campaign to attract users to the platform) in a collaborative manner.

The VCW method has also been extensively used for go-to-market and sustainability purposes. This was the case of the second case-study, the MARINE-EO project funded under the H2020 Program, in which the VCW method supported the development of a sustainable platform in the marine sector. The VCW was applied to develop a strong positioning strategy, namely in terms of value proposition and marketing mix, contributing to the sustainability of the project. In the third case study, the SenSyF project (FP7 sponsored project), the VCW was used for tech-transfer purposes, namely to identify the best market application for SenSyF and identify a potential service that could be built on top of it. In the fourth case study, BETTER (H2020 project), the VCW model was implemented to identify and lock-in new external challenge promoters for the 2019-2020 activities. Once the entities were identified and engagement models were designed.

In the fifth case-study, the Ground Stations project, the VCW was used to identify the international market with the greatest potential for this technology and support the design of the market-entry strategy.

In the sixth case study the focus is on increasing employee retention in a company operating in the fields of Space Business and Earth Observation. A shortage of qualified human capital has an undesirable impact on Deimos Engineering's activities. Since Deimos Engineering cannot afford to be a salary leader in the Space Business sector, they decided to apply the VCW to find creative actions to ensure the retention of employees through job satisfaction.

What should the value proposition and go-to-market strategy be for the NextGeoss Platform?

Case-study powered by VCW

Sara Gomes

ON A SUNNY DAY, NextGEOSS's Executive Board members were discussing the future of NextGEOSS, considering a market study developed during the summer. NextGEOSS, a web-based IT platform related to Earth Observation data, was the biggest project of Deimos Engineering portfolio, and it was represented to all partners involved as promising opportunity to stimulate innovation in the Earth Observation Industry. However, as a recent and sophisticated technology, the Executive Board members had several challenges, such as define a clear value proposition, identify the research community with the highest potential for the platform, and develop a marketing strategy to create brand awareness and attract users to the platform. Nuno Catarino, Head of Data System Division at Deimos and NextGEOSS' project coordinator, was committed to overcoming these challenges and proposed the use of the Value Creation Wheel (VCW) for that purpose. Catarino had previously worked with VCW in the scope of other Deimos Engineering projects. Being aware of the complexity of the challenge ahead, he believed that the VCW could bring value, by involving different stakeholders in the co-creation of value, and allowing different representatives of the consortium to be part of the decision-making process throughout the five phases of the VCW method.

Exhibit 1: VCW Method

Sources: **Lages, 2016; Lages et al., 2023**

The Executive Board appointed nine members of the consortium to act as the Key Decision Makers (KDM) in the VCW project (see Exhibit 2: KDM & Relevant Stakeholders).

Exhibit 2: Board of Key Decision Makers (KDMs) and Relevant Stakeholders

NAME	ROLE IN NEXTGEOSS PROJECT	COMPANY/ORGANIZATION
KEY DECISION MAKERS		
Nuno Catarino	WP 1 Leader - Project Management and Coordination	Deimos Engineering
Bente Lilja Bye	WP 8 Leader – Communication, Dissemination and Assessment	Bente Lilja Bye (BLB)
Gunter Schreier	General Assembly Member	German Aerospace Center (DLR)
Geoff Sawyer	General Assembly Member	European Association of Remote Sensing Companies (EARSC)
Erwin Goor	WP 6 Leader - Innovative Research Pilots	VITO - Flemish Institute for Technological Research NV
Bart De Lathouwer	WP 4 Leader - Synergies and Engagement of Communities	Open Geospatial Consortium (OGC)
Wolfgang Ksoll	WP 2 Leader – Data Hub	Viderum Ltd.
Hervé Caumont	WP 5 – Task Leader User Integration Support	Terradue Srl
RELEVANT STAKEHOLDERS INVOLVED		
Vânia Fonseca	Part of the Management and Technical Coordination team of NextGEOSS	Deimos Engineering
Nuno Grosso	WP 7 Leader - Business Opportunities and Services	Deimos Engineering
Nuno Almeida	WP Task Leader in the scope of the Data Hub and User Integration Support	Deimos Engineering
Marie-Françoise	WP Task Leader in the scope of Communication, Dissemination, and Assessment	Open Geospatial Consortium (OGC)
Simon Scerri	Tasks 8.3 and 8.4 Leader in the scope of Communication, Dissemination, and Assessment	Euroconsult

Subtitle: **WP – Work Package**
Source: **Developed by the VCW Team.**

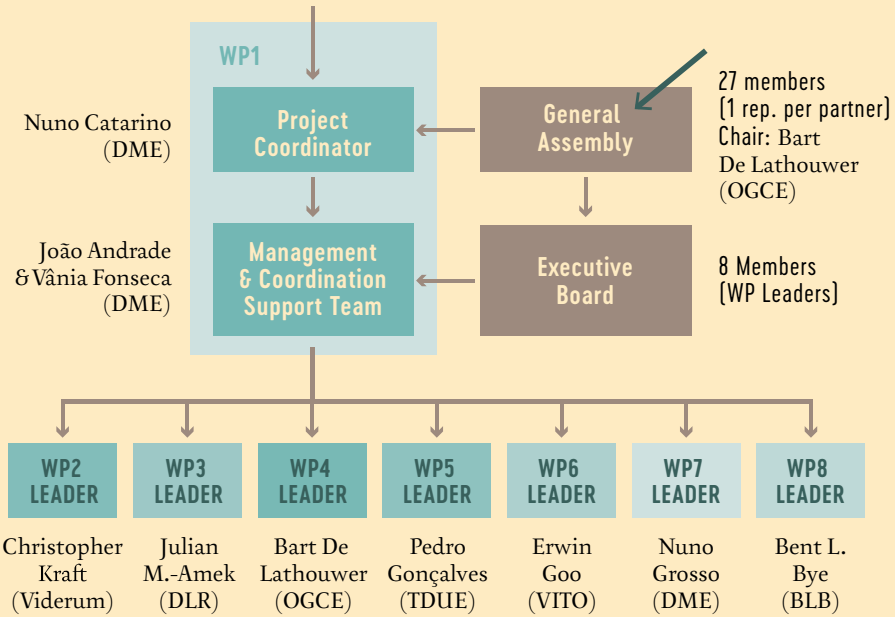
Company and project overview

Deimos Engineering (Deimos), a leading Portuguese Space Engineering company, was founded in 2002 as a technology branch of Elecnor Group. Based in Lisbon, Deimos delivers technological solutions to the Space sector, such as operational software systems and advanced design solutions. Since 2012 Deimos' net profits were growing steadily, and the company was considered a key partner in several international research projects.

In early 2016 the European Commission (EC) issued a public Horizon 2020 (H2020) tender to tackle the fragmentation of the existing data collected from Earth Observation (EO). The massive amounts of data sent by satellites were dispersed among different data centers, making it challenging for developers interested in exploiting these data. In collaboration with 26 partners Deimos was responsible for carrying out the tender's winning project, NextGEOSS. The project sought to develop a centralized data hub, aggregating the largest European data centers into a single access point. The data hub was connected to a platform that provided ICT (Information and Communication Technologies) resources and customized service support for developers interested in creating services using the data.

NextGEOSS consortium, composed of leading European companies and institutions from 13 countries, received 10 Million euros to implement the project over the course of the next three years. The project was organized in eight work packages (WP), each associated with a specific core activity (see Exhibit 3 – NextGEOSS Governance Structure). Deimos was leading the consortium and was therefore responsible for the Project Management and Coordination WP.

Exhibit 3: NextGEOSS Governance Structure



WP 1 Project Management and Coordination	**WP 5** User Integration Support
WP 2 Data Hub	**WP 6** Innovative Research Pilots
WP 3 Data Federation and Uptake	**WP 7** Business Opportunities and Services
WP 4 Synergies and Engagement of Communities	**WP 8** Communication, Dissemination, and Assessment

Observation: NextGEOSS Team is divided into 8 Work Packages (WP). Each WP has one WP Leader, and several WP Task Leaders who are responsible for managing specific tasks.
Source: **NextGEOSS Internal Documents.**

NextGEOSS Project

GEOSS (Global Earth Observation System of Systems) is a central part of GEO's Information System's mission. The NextGEOSS project, a European contribution to GEOSS, proposes to develop the next generation European data hub and cloud platform for Earth Observation data, where users can connect to access data and deploy EO-based applications. The concept revolves around providing data and resources to the user communities, together with Cloud resources, seamlessly connected to provide an integrated ecosystem for supporting applications. A central component of NextGEOSS is the strong emphasis placed on engaging the communities of providers and users and bridging the space between them.

The project has a special focus on encouraging and stimulating data exploitation by businesses. Capacity building is at the heart of NextGEOSS and the project will identify training needs to encourage wider user-engagement with EO data and its commercial potential.

The data hub is based on the Open Source solution for data portals CKAN. The data hub harvests data from many sources, including from satellites and in situ (on Earth). Harvesting means that the meta data (data provider, license, data format, attributes, location of the resources (raw data)) are stored in the hub. They are made available for web access and programmable interfaces, e.g. through an OpenSearch interface. The data hub feeds several pilot projects that are also promoted on the data hub and may have information, applications to download, or applications to run in the cloud.

Kick off Meeting: NextGEOSS VCW Project

In early September the VCW team met the KDM at the kickoff meeting to have a first introduction to the NextGEOSS project and to discuss how the VCW could be used to address its challenges. The project already foresaw the development of 10 EO-based services using the data and cloud resources available on the platform. The EC budget already included these activities, and the resources were provided for free. These services were considered proof of concept, to demonstrate to potential users that they could use NextGEOSS resources to develop valuable EO-based services. Accordingly, to guarantee the sustainability of the project after the three-years funding, it was critical to attract users interested in paying for NextGEOSS' resources, being essential to design an ef-

fective marketing strategy to achieve this goal. During the meeting, the VCW team realized that there was a problem and that it was rooted at the very core of NextGEOSS's strategy: there was no clear value proposition for the project. Many platforms were offering different solutions to solve issues like those that NextGEOSS aimed to address, and it was not clear why users should prefer NextGEOSS. Moreover, NextGEOSS was trying to reach the maximum market segments possible, which resulted in a lack of focus when defining marketing strategies. The VCW team realized that to be able to set an effective marketing strategy, it was important to first define the scope of the NextGEOSS value proposition, and then select the target community to prioritize in the short term. After the kick-off meeting, the KDMs were very optimistic about the methodology and the project itself. "I am very happy to hear this (...). The people working in the user engagement and communication activities have been discussing how we could formulate the value proposition", said Bente Lilja Bye, responsible for the communication, dissemination, and assessment of the project (NextGEOSS WP8 Leader, BLB).

First VCW project: Identification of the NextGEOSS value proposition

It was nearing time to start the project and the VCW team was excited about the opportunity to work on NextGEOSS. The KDMs agreed that the primary research question should be: "which community to target, in order to attract new users to the platform?" However, to be able to answer that question, the project should include an initial VCW to reach NextGEOSS' value proposition.

In the first VCW phase, the VCW team started by analyzing the external and internal context of NextGEOSS to understand market trends, through research in market reports and internal documents, and interviews to internal and external stakeholders.

To gain meaningful insights regarding the technology behind NextGEOSS service (See Exhibit 4 - NextGEOSS Service), the VCW team scheduled a meeting with Nuno Almeida (NextGEOSS WP 7 Task Leader, Deimos).

Exhibit 4: NextGEOSS Website & Data Hub

NextGEOSS Website:
Tool to communicate with the target audience and to publicize NextGEOSS activities and events. The website was online since the beginning of the project: https://nextgeoss.eu/

NextGEOSS Data Hub:
Centralized open & public datahub that connects the biggest European Data centers in one single catalog. The data catalog (CKAN Management system), includes user friendly tools for data discovery and exploitation.

NextGEOSS Platform:

- User Integration Support (users develop applications in a cloud development environment specialized in Earth Observation)
- Service Desk (users may request support from highly specialized engineers)
- Technical Cloud Computing Broker Service by contract

Data Hub Catalog Structure (2017):

- Agriculture and Food Security
- Biodiversity
- Land
- Energy
- Space and Security
- Cold Regions

Source: Developed by the VCW Team

Almeida explained the NextGEOSS concept and why it could be used to disrupt the industry. Developers interested in exploiting EO data faced several challenges that were complex and often difficult to overcome. The EO data were dispersed among different European data centers. Moreover, each data center used its own specific dissemination language, making it difficult for developers to find the data they needed. NextGEOSS provided a centralized data hub, a unique access point to the diverse European range of EO data, using an open and standardized data catalog.

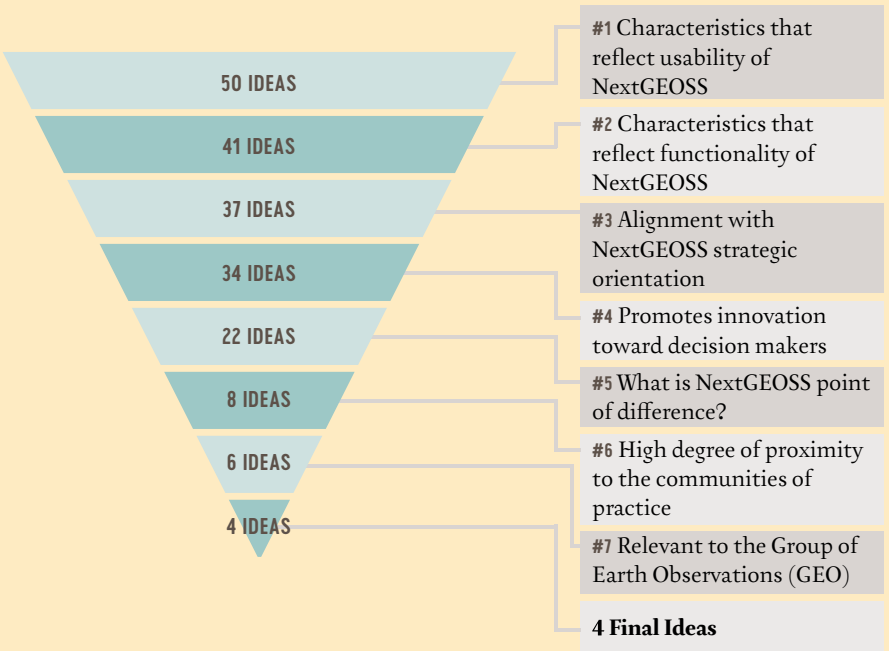
The NextGEOSS consortium was composed of leading companies from different market segments, which allowed them to provide a data hub covering a broad range of thematic areas. Moreover, the data hub was connected to a cloud platform that allowed developers to create their applications directly using the available data. This was very important since EO big data needed robust ICT resources to be processed. The platform also provided data analytic capabilities, so users could manage information and extract knowledge. According to NextGEOSS' internal documents, competition was based mainly on cloud data storage and processing power, and domain expertise. The EC was investing in several initiatives to promote a competitive environment in the EO industry, including platforms with goals similar to those of NextGEOSS, which represented a threat to the project's long-term sustainability. A recent trend of global IT players like Google and Amazon entering the market was also perceived as a threat.

In the second VCW Phase, the VCW team realized that KDMs had fallen into the paradox of choice. Defining NextGEOSS' value proposition is critical since it is a core element of the technology strategy. With so many ways to highlight the value of NextGEOSS, technical and strategic, the board was not able to select the most important ones to increase the perceived value of the platform to potential users. Accordingly, the VCW team started to induce ideas and filters, through primary and secondary data, such as interviews, brainwriting, and research through internal documents. Different stakeholders, internal (stakeholders directly involved in the NextGEOSS project) and external, were involved in the process. Due to the nature of the challenge, the focus was mostly on industry experts, such as developers, PhD students, and professors, among others. In the end, the VCW team was able to collect 62 ideas and 42 filters.

In the third VCW phase, the VCW team applied the Poker Method with Nuno Catarino and Vânia Fonseca (NextGEOSS Management and Technical Coordination Team, Deimos) to analyze all the ideas and filters. The selected filters were sent to the board, to be ranked on a scale from 1-5 (1 - not relevant; 5 - crucial), according to its importance for NextGEOSS.

In the fourth VCW phase, the VCW team was able to build a Value Creation Funnel (VCF) for NextGEOSS' value proposition, as illustrated in Figure 1:

Figure 1: Value Creation Funnel applied to VCW 1



Source: Developed by the VCW Team

Due to the technical nature of some of the solutions and filters involved in this VCF, the VCW team involved internal stakeholders to apply the filters. For instance, to apply filter 1, "Characteristics that reflect usability of NextGEOSS," the team interviewed Almeida, while to apply filter 2, "Alignment with NextGEOSS Strategic Orientation," the team interviewed Lilja Bye. The VCF identified four main characteristics that together enhance the perceived value of NextGEOSS platform, which is illustrated in Figure 2:

Figure 2: Final Solutions for VCW 1

FINAL IDEAS – DESCRIPTION
1 It helps users who want to get global EO related data and information for thematic areas by providing **advanced discovery** tools to exploit the data hub
2 It provides an **EO platform with tools tailored to the user's specific needs** by developing solutions with the communities, for the communities (open resources & processes)
3 It helps users who want to efficiently deliver and find fit-for-purpose GEOSS data and information by integrating a **user feedback mechanism** in the data hub
4 It supports users who want to build applications to achieve the UN Sustainable Development Goals* by focusing on solutions aligned with this mission

* The Sustainable Development Goals (SDGs) are a set of 17 global goals, established by the United Nations, to be achieved by 2030. EO-based service applications may contribute to the achievement of several of these goals by enabling increased Earth monitoring capacity.
Source: Developed by the VCW Team

The team realized that while competitors were focusing on the cloud data storage and processing power capabilities, NextGEOSS could exploit a new market space by focusing on the characteristics identified through the VCW. Nuno Catarino and Lilja Bye were extremely satisfied with the result obtained, and the latter incorporated the output from the VCW in NextGEOSS' communication material. When confronted with the results, NextGEOSS' KDMs were impressed with the impact that the VCW was already having at

such an early stage of the project. NextGEOSS now had a clear value proposition that would be the foundation of their strategy to attract new users. In the next week, Catarino presented a poster with these four messages at the Group of Earth Observation (GEO) Week 2017, in Washington D.C., one of the main events for the EO community at a global level, with 700 participants (see Exhibit 5 – NextGEOSS' Value Proposition Poster). The VCW team felt that they could proceed and implement the second VCW to identify the priority target with more potential for NextGEOSS' activities in the short term.

Exhibit 5: NextGEOSS' Value Proposition Poster

Second VCW project: Identification of target community for NextGEOSS

Earth Observation (EO) denotes the use of remote sensing technologies to monitor land and marine environments, and the atmosphere. NextGEOSS operates in the European EO Services industry, which was valued at around 2.4 € billion in 2017 and expected to evolve rapidly in the coming years.

Traditionally, the EO Services industry has been composed of two main segments: the midstream segment, operators that sell or provide EO data; and the downstream segment, companies offering value-added services based on the EO data. Accordingly, NextGEOSS was positioning itself as an innovative player in the midstream segment, by providing a centralized hub for EO data, where players in the downstream segment could connect to access data and deploy EO-based services for the communities.

EO-based services covered a wide range of applications, from different market segments, such as agriculture (e.g., precision farming), renewable energies (e.g., solar and wind energy production forecasting), among many others. The major trends affecting the EO service industry were mostly political, through strong governmental influence under institutional funding, and technological, with the most recent digital revolution enabling the emergence of new services such as cloud computing platforms. Moreover, the introduction of the Copernicus program, an initiative that provided public and free data from the European Sentinel Satellites, had been disrupting the industry, by reducing the costs to access EO data.

In the second VCW phase, the VCW team decided to analyze current projects/initiatives promoting the development of new services to represent the different types of communities and to select the target. The downstream market is not yet demand-driven. Entities who are interested in exploring and bringing new services to the market depend heavily on the available funding programs. The VCW team generated ideas of existing R&D projects, from which developers could use NextGEOSS resources to build or improve applications, as illustrated in Figure 3:

Figure 3: Examples of R&D projects promoting EO-based services

PROJECT	THEMATIC AREA	PROJECT COORDINATOR
Rotterdam Ground Water Level	Urban Monitoring	European Commission
Access to Raw Materials (ARM)	Renewable Energy	GEO CRADLE

Source: Developed by the VCW Team

The VCW team sent an online survey to 26 participants of NextGEOSS project to collect primary data. Moreover, the VCW team interviewed Marie-Françoise Voidrot (WP4 Task Leader, OGCE), who was responsible for engagement and networking activities for NextGEOSS. Françoise explained that the list was based on previous investments from the EC and current red flags initiatives selected by the GEO community. By doing extensive research about the institutions on this list, the team was able to identify more potential solutions to add on the pull of ideas. The VCW team also performed extensive research to identify initiatives promoted among European funding entities. In order to generate filters, in addition to the surveys, the VCW team organized a brainstorming session at Deimos with five industry experts. The VCW team also involved external stakeholders with different backgrounds to ensure a large variety in the filter's generation. Brainwriting sessions were held with masters' students from Nova School of Business and Economics, and masters' students of environmental engineering from Nova Faculty of Science and Technology. In addition, the team presented the project to an International Marketing class in the Faculty of Law at the Nova University of Lisbon to collect suggestions of filters. Finally, the VCW team was able to gather 93 ideas and 156 filters.

In the third VCW phase the VCW team obtained feedback from NextGEOSS' Executive Board. The poker method was used to validate ideas and filters. The VCW team scheduled a meeting with Nuno Grosso (NextGEOSS WP 7 Leader, Deimos), to apply the poker method for the ideas. Due to his role in the Business Opportunities and Services WP7, Grosso was considered the stakeholder with the most knowledge to validate whether the suggested R&D

projects could be integrated into the NextGEOSS platform, taking into consideration the resources available. Then, to analyze the filters, the VCW team applied the Poker Method with Nuno Catarino and Vânia Fonseca. Catarino considered that the filters collected were very interesting and that the KDMs were ready to rank them on a scale from 1-5 (1 - not relevant; 5 - crucial). To facilitate the rank of the filters, the VCW team grouped them into three main categories: Funding, Market & Macro Trends, and Attractiveness, as illustrated in Figure 4:

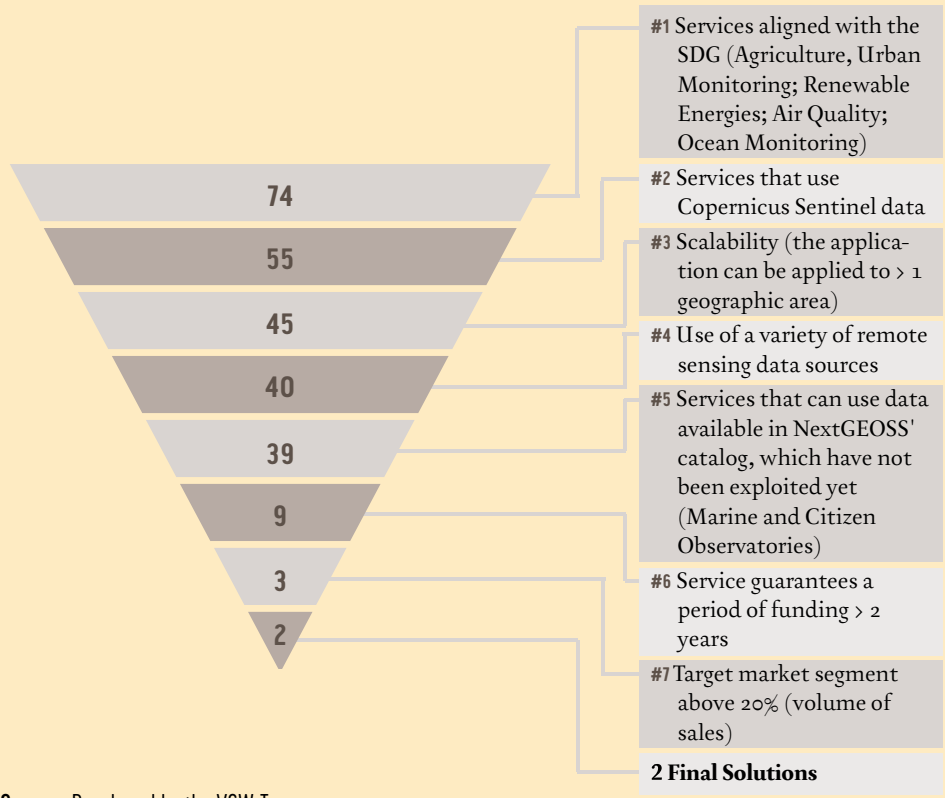
Figure 4: Categorization of Induced Filters

CATEGORIES	EXAMPLES
Funding	e.g., *"Funded by ESA" and "Existing financing support from the EU to the industry associated"*
Market and Macro Trends	e.g., *"Forecast industry growth of the target market" and "Activities targeting the Agriculture Sector"*
Attractiveness (Strategic and Technical fit, Maturity and Timing)	e.g., *"Service is replicable for other sensors (not dependent on a specific mission or in-situ source)" and "Initiative that brings a new service which does not exist yet in NextGEOSS portfolio"*

Source: Developed by the VCW Team

In the fourth VCW phase, the VCW team built the VCF. The ranked filters were applied until the team was able to reach a group of R&D projects similar in terms of community and sub-sector specific needs. In total, seven filters were applied, as illustrated in Figure 5:

Figure 5: Value Creation Funnel (VCF) applied to VCW 2



Source: Developed by the VCW Team

Overall, the output of the VCW funnel enabled the team to characterize a target of the research community with the highest potential for NextGEOSS – in this case the marine community, focused on managing marine ecosystems R&D projects. The ultimate solutions are two R&D projects, in the scope of Ocean Monitoring from Managing Marine Ecosystems sub-sector: 1) Ocean biotic and abiotic parameters, climatological information, and historical statistics, and 2) Regular monitoring of Marine Protected Areas (MPAs). Both research projects were part of Marine-EO project. These two R&D projects were identified as opportunities for 2018. Accordingly, they could be used to define the marketing strategy, and leverage NextGEOSS' communication campaign

among the marine agents in the following year. The goal was to convince bidders applying for the Marine EO public tender and other similar initiatives to use NextGEOSS' resources to build their solutions.

Nuno Catarino and Nuno Grosso seemed very satisfied with the final solution. In order to characterize the target market, the VCW team sought to contact Marine-EO to obtain further insights regarding the profile of entities that the project was targeting, and what the main challenges are that these entities face to meet Marine-EO requirements. However, since it is a public tender, the Marine-EO representatives decided not to share this information. Due to time constraints, the VCW team then decided to perform an internal brainstorming with Nuno Grosso and Nuno Catarino to identify what the specific needs of bidders applying to this type of initiatives could be and understand how NextGEOSS could help them. The team was able to identify different ways that NextGEOSS could address the community's specific needs, such as the fact that these bidders were focused on open standards and needed specialized tools to explore Copernicus Marine services easily. The team also assessed what the barriers would be for users, such as the need to access near real-time data (NRT) and very high-resolution data, to prepare ways to overcome it, stressing the platform flexibility in integrating new data sources and commercial data (e.g., Deimos 2).

In the fifth VCW phase it was necessary to design a marketing plan to capture the opportunities identified. Taking into consideration the situation analysis performed during the diagnostic phase, followed by the segmentation and target selection in phases two and three, the VCW team defined the following value proposition statement: "For IT developers who want to bring to the market disruptive service applications for Ocean Monitoring, using Earth observation data, NextGEOSS is a platform tailored to the user's specific needs that provides advanced discovery tools for marine related data". Unlike competitors, NextGEOSS focuses on supporting the Sustainable Development Goals. Accordingly, the team proceeded to the adaptation of the Marketing Mix - Product, Price, Distribution, and Promotion - to meet the community's specific needs. Given the early stage of the project, the VCW team suggested a pricing strategy for market penetration, by providing a special package with a discount for research activities aligned with the Sustainable Development Goals.

Another important step to take into consideration was the promotion. To build awareness and attract the marine community to NextGEOSS' service, the promotion needed to include a marketing campaign with the goal of cre-

ating awareness, motivating this research community to find out more about NextGEOSS, and finally, convincing them to subscribe to the service. Thus, it was essential to answer the important question, "how to engage with the marine community?" The team realized that due to the lack of a well-defined marketing strategy, NextGEOSS' promotions had been based on *ad hoc* and spontaneous campaigns. However, to be effective, it was critical to design an Integrated Communication Campaign (see Exhibit 6). The VCW team organized a brainstorming session with Lilja Bye and Vânia Fonseca to understand how to use NextGEOSS' current communication channels to engage with the target community. Finally, the VCW team proposed an Integrated Marketing Communication Campaign with two initiatives: 1) "Discover how you can innovate your Marine Services with NextGEOSS," and 2) "Join the NextGEOSS network, and explore ideas for your Marine Services!". The first initiative focused on the educational aspect, for instance, offering free demos to showcase how the platform works. The second initiative focused on creating awareness and bringing the Marine community close to NextGEOSS, with activities such as attendance at international events. Finally, the team planned the 3Ms needed to implement the Integrated Marketing Campaign: Manpower, Minutes, and Money. In the end, the campaign key performance indicators would be evaluated, to measure the success of the campaigns and make strategic marketing adjustments.

Exhibit 6: Communication Mix elements

INITIATIVE 1
"Discover how you can innovate your Marine Services with NextGEOSS!"

INTERACTIVE MARKETING	Organize webinars with relevant content for the community, including a "How-to-use" guide for Marine Data Hub catalog and NextGEOSS platform. Use it to highlight NextGEOSS benefits for the community.
SALES PROMOTION	Provide customized demos as incentives to experiment with the service. Viewers should have the opportunity to rate and provide feedback about the demo, to get feedback on how to improve the customer, and induce positive Word of Mouth (WOM).
EMAIL MARKETING	Sending promotional mails in the database can be useful for this campaign to create awareness (pre-launch) and provide detailed information about the service and invite users for the other campaign activities.
PERSONAL SELLING	Personal selling may be carried out by a sales team who in advance should have been trained to be familiar with the NextGEOSS Marine service (dealership launch material, conferences) and its advantages and how to overcome objections. Personal selling will also be of major importance when targeting the corporate buying segment, because these users make a big investment, they expect to be given personalized offers. Moreover, it allows getting direct feedback regarding the potential customers' concerns about the service, and make improvements if necessary.

INITIATIVE 2
"Join NextGEOSS Network and explore ideas for your Marine Services!"

WORD-OF-MOUTH MARKETING	Induce positive word-of-mouth. For instance, NextGEOSS may create a LinkedIn group and invite all partners and contacts from NextGEOSS data base. Invite strategic players in the marine environment and climate change community to discuss relevant topics such as the marine environment and climate change.
PUBLIC RELATIONS	Attendance at Marine related public events to represent NextGEOSS. Use the events for Networking and promotional purposes. Organize events.

Final Meeting and Further Steps

The final VCW meeting took place on 21 December 2017, in which the results of the project were presented. The final report surpassed the KDM expectations. "I find it an extremely interesting approach, and the results are actually quite surprising", said Geoff Sawyer (NextGEOSS General Assembly Member, EARSC). Since the data hub was going to be populated with the marine data soon, and NextGEOSS still had no marine service applications being developed, the KDM believed that that the focus of the marketing efforts during the following six months should be on the marine community. However, Hervé Caumont (NextGEOSS WP 5 Task Leader, Terradue Srl) showed some concern that it might be too early to start a campaign for the marine service, due to the readiness level (TRL) of the Data Hub. Giving the overall positive feedback of the KDM, the VCW team presented the results to Euroconsult, from which Simon Scerri (NextGEOSS WP 8 Task Leader, Euroconsult) was responsible for developing the sustainability and business innovation reports for NextGEOSS. Scerri was very impressed with the methodology:

> *"You collected very interesting inputs (in the generation of filters and ideas) that may be used in further stages of NextGEOSS project, as the platform evolves".*

In January 2018, at the NextGEOSS Advisory Board Meeting, the KDMs reached the conclusion that they could overcome the limitations previously identified and implement VCW recommendations. Following the final decision, Lilja Bye coordinated the necessary resources to redefine NextGEOSS' strategy toward the value proposition suggested. Since NextGEOSS later identified an opportunity to include a Marine service in the platform through a pilot that one of the partners was developing, the scope of the marketing campaigns presented was changed, while keeping the methodologies and some of the ideas suggested. Overall, Deimos and the NextGEOSS team felt that they now had a more focused strategy that would allow them to be more competitive in the market. Deimos hired Sara Gomes to support Marketing and Innovation activities in the Data System Division, following her work with the implementation of the VCW. After concluding the project, Nuno Catarino who managed this 10M€ H2020 project, involving 27 partners across 13 countries, is considering the possibility of implementing a VCW Ecosystem in his business unit. According to Catarino:

> *"The VCW definitely helped to manage the consortium. In the Next-*

GEOSS, the most important part of the project was to be able to convey the message of the project to the client services. We wouldn't have such a targeted value proposition and public image for the project without the VCW. (...) The VCW had a huge impact."

Overall, the company was very satisfied with the successful implementation of the VCW to address NextGEOSS' marketing challenges and decided to implement the VCW to address more challenges in other H2020 projects. Nowadays, Deimos is working with the VCW Lab from Nova School of Business and Economics (Nova SBE) in the NextLand 3M€ H2020 project. This new project is in the field of Earth Observation (EO) applied to agriculture and forestry. Additionally, Deimos in partnership with the VCW Lab at Nova are finalists in two H2020 Tenders for R&D, innovation, and commercialization in the fields of Oceans/Fishing/Aquaculture and Security. All these EO projects are aligned with the UN Sustainable Development Goals (SDGs). Now NextGEOSS board, involving 27 members across 11 countries, would need to meet to discuss the findings of the VCW team. The cards were on the table and it was clear that there were three valid perspectives for the board: Shall we accept the VCW consultants' advice, shall we kill some of the proposals from the VCW team, or shall we conduct further research before acting? What should the Board decide?

Bibliography

Buchet, E. (2017). Introduction to Impact in Horizon 2020. In Webinar Jam.

Bingham, C. B., Furr, N. R., & Eisenhardt, K. M. (2014). The opportunity paradox. MIT Sloan Management Review, 56 (1), 29–35.

EARSC. (2015). A Taxonomy for the EO Services Market: enhancing the perception and performance of the EO Service Industry.

EARSC. (2017). A Survey into the State and Health of the European EO Services Industry. Retrieved from http://earsc.org/news/results-eo-industry-survey-september-2017

Elecnor Deimos (2017). Deimos Engineering. Retrieved from http://www.elecnor-deimos.com/delegacion/deimos-engenharia/

Euroconsult. (2012). Satellite-Based Earth Observation: Market Prospects to 2021.

European Commission: European data hub of the GEOSS information system. (2018). Cordis.europa.eu. Retrieved from http://cordis.europa.eu/programme/rcn/700756_en.html

European Commission: European data hub of the GEOSS information system. (2018). Cordis.europa.eu. Retrieved from http://cordis.europa.eu/programme/rcn/700756_en.html

Fonseca, Vânia; Lages, Luis Filipe; Kim, Philip H. (2018), "Deimos: Expanding to a New Market Using the

Value Creation Wheel", Case BAB370-PDF-ENG, Harvard Business Publishing.

Foust, J. (2017). Is the Earth-observation industry consolidating, or just evolving? Space News. Retrieved from http://spacenews.com/is-the-earth-observation-industry-consolidating-or-just-evolving/

Kaptein, A., Janoth, J., Lang, O., & Bernede, N. (2014). Trends in Commercial Radar Remote Sensing Industry. *IEEE Geoscience And Remote Sensing Magazine*. Retrieved from http://ieeexplore.ieee.org/stamp/stamp.jsp?reload=true&arnumber=6784418

Kotler, P; Keller, K,L; Ang, S,H; Tan, C,T; Leong, S,M. (2017). Marketing Management. Pearson.

Lages, Luis Filipe (2015), "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", Journal of Business Research, 69(11): pp. 4849-4855.

Lages, Luis Filipe et al. (2023). Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions. In *Electronic Commerce Research*. Springer, Cham. *Forthcoming*.

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Creation Wheel: A Framework for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279.

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem--solving, and lean", Strategic Change, 29(2), 195-213.

Narain, A. (2017). Open Earth Observation Data has a proven economic value! Geospatialworld. Retrieved from: https://www.geospatialworld.net/blogs/open-earth-observation-data/

Eomag (2018). NextGEOSS led by Deimos Portugal is selected by the European Commission as the hub for Earth Observation data. (2018). *Eomag! The number one newsletter of the European EO industry*. Retrieved 3 January 2018, from http://eomag.eu/articles/3770/nextgeoss-a-centralized-hub-for-eo-

NextGEOSS, Internal Documents

PwC (2016). Study to examine the socioeconomic impact of Copernicus in the EU. European Commission. Retrieved from: http://www.copernicus.eu/sites/default/files/library/Copernicus_SocioEconomic_Impact_October_2016.pdf

PwC. (2016). Copernicus - Market Report 2016. Retrieved from: http://www.copernicus.eu/sites/default/files/documents/Copernicus_Market_Report_11_2016.pdf

PwC. (2016). Space Tech and Services | Big Data in Earth Observation. European Union.

Sustainable Development Goals: Exploring Maritime Opportunities | SDG Business Hub. (2017). Sdghub.com. Retrieved from: http://sdghub.com/project/sustainable-development-goals-exploring-maritime-opportunities/

Vardhan, H. (2017). What is wrong with the Earth Observation Industry? Geospatialworld. Retrieved from https://www.geospatialworld.net/blogs/strategic-importance-geo-for-sdgs/

Watkins, M. (2007). From SWOT to TOWS: Answering a Reader's Strategy Question. *Harvard Business Review.*

What should be the positioning and go-to-market strategy for Marine-EO services?

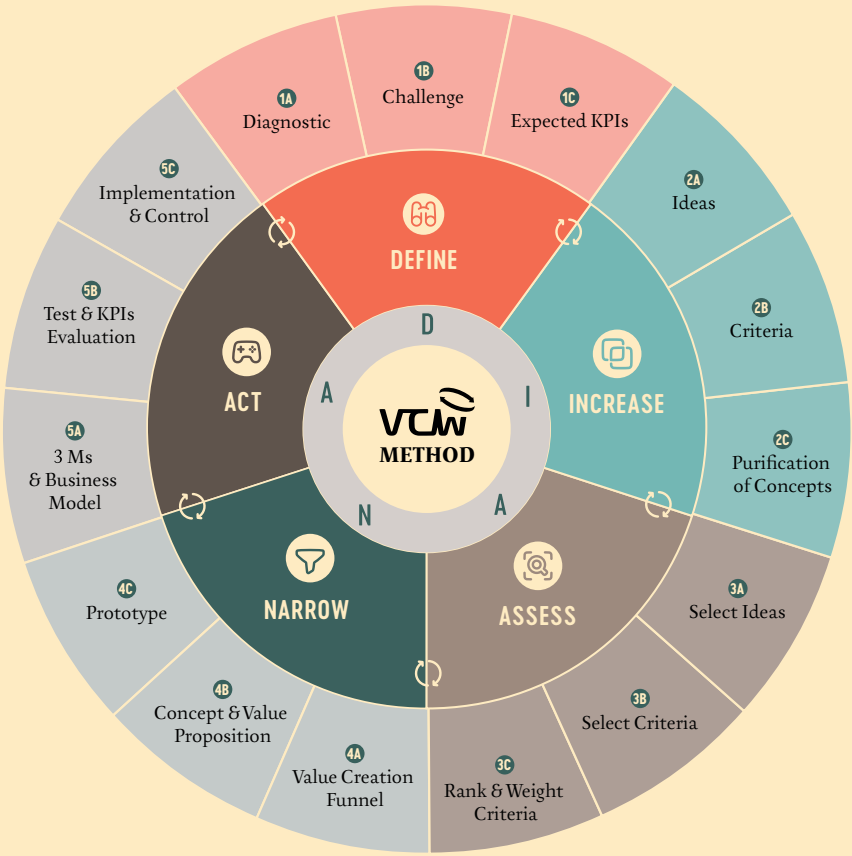
Case-study powered by VCW

Nina Margarido

DEIMOS' FIRST STEPS toward developing a commercial platform for marine services were taken when the company was awarded the second phase of the Horizon 2020 Marine-EO project in 2018. Since this was an activity in the company's strategic roadmap, it was crucial to ensure its financial sustainability, anchored to a solid marketing strategy, which reflected a strong positioning strategy. This would allow straying further away from the sole R&D focus the Data Systems Division once had.

Deimos is a space engineering company with limited resources in marketing and business areas, so there were some concerns regarding how it could create a self-sustained rendition of Marine-EO that would endure after funding ceased in September 2020. Since 2015, the company had been relying on external consultants using the Value Creation Wheel (VCW) methodology to solve related challenges and decided to pursue the same approach for this strategic project. Five Key Decision Makers (KDMs) were appointed to accompany the process and the VCW consultants were consequently invited to embark on a 4-month project at Deimos. In the following sections, findings concerning each of the VCW phases are presented.

Exhibit 1: VCW Method



Sources: Lages, 2016; Lages et al., 2023

Phase 1: Define

The consultants started by researching the project context and scope. MarineEO was a Pre-Commercial Procurement (PCP) funded by the European Commission's H2020 Program. Deimos was leading the consortium, having the role of platform provider in the PCP, in collaboration with three prospective service providers. As a platform provider, Deimos was responsible for creating a web platform where Earth Observation (EO) marine service providers could deploy and commercialize their operations, which would be accessed by

end-users such as marine authorities and public institutions. Deimos would outsource cloud infrastructure and public data for service providers to deploy their algorithms and generate their service output, but also provide other capabilities that would hopefully create a compelling offer for service providers to choose Marine-EO over competing platforms. The service providers were in turn acting as the platform's "early adopters", showcasing what the expected interaction between Deimos and its customers could be in a standard market scenario. The end-goal of Deimos was to attract additional service providers that would be willing to pay to operate their services in Marine-EO.

This was not the usual marketing challenge though. Since Marine-EO was a PCP, segmentation had already been performed and the target market was pre-established. Deimos was targeting European marine service providers looking to create innovative Value-Added Services (VAS) with EO data in the ocean monitoring sector. The real challenge was "what should Marine-EO's positioning strategy be?" Accordingly, it was understood that the main goals within the VCW framework would be to create Marine-EO's value proposition and its marketing mix, with the goal of attracting additional service providers to the platform in the coming years.

The consultants were provided access to industry and internal reports to assess the context of Marine-EO. The European EO market had a peculiarity: there was a strong dependence on institutional funding and political agendas, as well as imposed barriers to entry against non-EU companies. As such, networking with public institutions and other organizations is critical, since many projects are often developed collaboratively. The growing focus on the United Nations' Sustainable Development Goals (SDGs) and climate change issues created a favorable condition for EO as a solution. Initiatives like the European Commission's Copernicus data and services contributed greatly to the development of the industry, which consistently registered positive growth rates. Within the European EO market, the marine sector was an attractive one for new platform providers such as Marine-EO, representing 20% of the market share and one of the highest yearly growth rates when compared to other sectors, of approximately 7% (Brzycka et al., 2017). Moreover, the EO platform industry was expected to be the major source of growth for the European EO market in the future, which was, again, a great opportunity for an up-and-coming platform like Marine-EO (PwC, 2016).

The platform being developed by Deimos in the scope of Marine-EO would face two types of direct competitors: platforms that accommodated marine services that were already operating in the market - such as CloudEO

and SeaDataCloud; and other platform providers competing against Deimos in the Marine-EO PCP, namely consortia led by Telespazio and Planetek. Regarding the last subset, Deimos did not have access to their proposals for Marine-EO, as both organizations had chosen not to publicize the development of their platforms until then. Accordingly, it was not possible to compare the offerings and identify the key strengths of each one. For the first subset, however, there was one indisputable takeaway: all competitors scored similarly in terms of technical benefits. Consequently, differentiation could not be based on such benefits. Hence, the positioning strategy would have a preponderant role in finding untapped selling points that grabbed the attention of the targeted service providers.

Phase 2: Increase

Having the industry report developed internally, the consultants started to formulate ideas for the characteristics that best described the platform and the filters, i.e., criteria to filter out the said ideas. The consultants relied on one-on-one interviews with KDMs, surveys to relevant external stakeholders, and brainstorming and brainwriting sessions with internal and external stakeholders. These exercises enabled the collection of 173 ideas and 59 filters.

Phase 3: Assess

Deimos was responsible for the development of the platform and with its adoption by service providers. During a meeting between the consultants and the KDMs, there was one aspect that was critical to be clarified. Given the complexity of Marine-EO's context as a multi-layered service, there was some discussion regarding which benefits should be highlighted in the value proposition. Should it be the perceived benefits for service providers, including the consortium partners, or perhaps the advantages for end-users, as without them there would be no use in having a platform? It was agreed that Deimos should focus on listing benefits attractive to service providers, since they are the target of Marine-EO and it would be the service providers' responsibility to attract end-users by creating innovative EO services they wished to access.

Upon agreement, the consultants asked the key decision makers to apply the Poker Method, after which only 37 solutions remained.

Table: List of selected ideas by KDMs (VCW phase 3a)

web-based operational platform	user can integrate his private data with data provided by the services
web-based service for the marine community	dynamic display of user reviews
innovative marine services	dynamic visualizations and analytics for platform monitoring
platform tailored to services' needs	possibility to share data and results with other platforms
services tailored to users' needs	continuous data update
supporting the UN Sustainable Development goals 13 and 14	efficient access to diverse data sources
freemium service	secure platform
single access point for EO-based maritime services	tailored Customer Support instead of chatbot
quick and easy access to the services	answers the needs of policy makers with responsibilities in the marine area
PaaS	fully scalable platform with unlimited cloud resources close to the data
facilitate innovation of maritime-related EO services	no setup costs and upfront investment
ecosystem of marine services	cost-efficient
enables service providers to exploit data and deploy its services	displays simple overview of downstream services
reliable platform	Deimos' experience in 20 services on a Cloud Platform
competitive processing time of the requests	involvement of the consortium in several ESA TEP's
possible to order commercial, multi-mission imagery/services	failover system
more global, efficient, and accessible marine services	provides Public Marine Authorities easier and better access to ocean monitoring information
efficient data dissemination process	
software tools to properly exploit the data creating Value Added Information	
dynamic data visualization (animations)	

Source: Developed by the VCW team

While applying the Poker Method, the KDMs also selected the 27 most important filters and were thereafter asked to rank the filters from a range of 1 to 5 (from least to most important). This way, VCW consultants could have a hierarchical order to apply in the next phase of the VCW framework.

Table: Ranking process of the filters by KDMs

FILTERS	KP (15%)	NA (25%)	NC (25%)	NG (20%)	VF (15%)	FINAL SCORE	FINAL RANKING
High level of maturity of the technology/characteristic	2	5	4	4	3	**3,80**	**17th**
Characteristics that allow for geographical scalability	3	2	3	4	3	**2,95**	**25th**
Characteristics that reflect the functionality of the platform	4	4	4	3	5	**3,95**	**14th/13th**
Characteristics that reflect the diversity of the input data	3	5	2	4	3	**3,45**	**21st**
Characteristics that reflect the robustness of the platform	5	3	3	5	5	**4,00**	**12th**
Characteristics that reflect the availability of the platform	5	5	3	3	5	**4,10**	**11th**
Characteristics that reflect the customer service of the platform	5	4	3	4	4	**3,90**	**15th**
Characteristics that can be communicated in a market-oriented manner	5	4	5	3	5	**4,35**	**8th**
Characteristics that differentiate from other similar platforms	3	4	5	5	5	**4,45**	**6th**
Characteristics that reflect price competitiveness	4	4	3	5	4	**3,95**	**14th/13th**
Characteristics that are adaptable to future market trends	4	5	2	3	5	**3,70**	**19th**
Alignment with Deimos' overall strategy	5	5	4	4	4	**4,40**	**7th**
Alignment with Marine EO's strategy?	4	4	5	4	4	**4,25**	**10th**
Characteristics that give visibility to the platform	5	5	4	5	5	**4,75**	**2nd***
Characteristics that reflect the added-value of using Marine-EO	5	4	5	4	5	**4,55**	**5th**

FILTERS	KP (15%)	NA (25%)	NC (25%)	NG (20%)	VF (15%)	FINAL SCORE	FINAL RANKING
Characteristics that showcase platform credibility	4	5	2	2	5	**3,50**	**20th**
Characteristics that reflect EC/GEO/UN communities' directives/goals	3	3	4	4	5	**3,75**	**18th**
Characteristics that increase the ease-of-use of the platform to the end-user	4	5	4	5	3	**4,30**	**9th**
Characteristics that people beyond the buyers' group are familiar with	4	4	1	3	4	**3,05**	**24th/23rd**
Characteristic that can potentiate growth	4	3	2	3	3	**2,90**	**26th**
Characteristics that are applicable to all marine service providers	4	2	2	5	3	**3,05**	**24th/23rd**
Characteristics that limit the temporal coverage of the platform	1	1	1	1	2	**1,15**	**27th**
High Level of Attractiveness to service Providers	5	4	5	5	5	**4,75**	**1st***
Characteristics that give the idea of saving time to service providers and users	5	5	4	5	4	**4,60**	**5th***
Characteristics that service providers will be quick to acknowledge and appreciate	4	4	5	5	5	**4,60**	**4th***
Characteristics that emphasize scalability of ICT resources	3	4	4	4	4	**3,85**	**16th**
Alignment with Deimos' overall expertise and knowledge	2	5	2	4	3	**3,30**	**22nd**

*Final ranking after meeting with Board to untangle most relevant filters
Source: Developed by the VCW team

Phase 4: Narrow

While building on the selected ideas and the ranking of filters generated by the KDMs, the consultants were able to develop for Marine-EO's value proposition the Value Creation Funnel (VCF) using a Multi-Criteria Decision Analysis (MCDA) matrix.

Table: The VCF process through MCDA

RANKING OF FILTERS / SELECTED IDEAS BY KDMS	FILTER #1 High level of attractiveness to service providers	FILTER #2 Characteristics that give visibility to the platform	FILTER #3: Characteristics that service providers will be quick to acknowledge and appreciate
platform tailored to services' needs	1	1	1
supporting the UN Sustainable Development goals 13 and 14	1	1	1
single access point for EO-based maritime services	1	1	1
reliable platform	1	1	1
dynamic visualizations and analytics for platform monitoring	1	1	1
fully scalable platform with unlimited cloud resources close to the data	1	1	1
web-based service for the marine community	1	1	0
facilitate innovation of maritime-related EO services	1	1	0
ecosystem of marine services	1	1	0
enables service providers to exploit data and deploy its services	1	1	0
competitive processing time of the requests	1	1	0
more global, efficient and accessible marine services	1	1	0
Efficient access to diverse data sources	1	1	0
secure platform	1	1	0

no setup costs or upfront investment	1	1	0
cost-efficient	1	1	0
provides public marine authorities easier and better access to ocean monitoring information	1	1	0
services tailored to users' needs	1	0	
web-based operational platform	1	0	
PaaS	1	0	
continuous data update	1	0	
innovative marine services	0		
freemium service	0		
quick and easy access to the services	0		
possible to order commercial, multi-mission imagery/services	0		
efficient data dissemination process	0		
software tools to properly exploit the data creating Value Added Information	0		
dynamic data visualization (animations)	0		
user can integrate his private data with data provided by the services	0		
dynamic display of user reviews	0		
possibility to share data and results with other platforms	0		
tailored customer support instead of chatbot	0		
answers the needs of policy makers with responsibilities in the marine area	0		
displays simple overview of downstream services	0		
Deimos' experience in 50 services on a Cloud Platform	0		
involvement of the consortium in several ESA TEP's	0		
failover system	0		

Source: Developed by the VCW team

After the VCF, six ideas emerged as passing all the filters. The VCW team used these ideas as a basis to develop the three key statements that defined Marine-EO's value proposition:

- **Creating a single access point for marine services** – Building an ecosystem that enables easy access to multiple services integrated in the platform and to the marine community,
- **Platform tailored to EO services' needs** – Reliable and scalable platform on which marine service providers can monitor operations through dynamic visualizations and analytics,
- **Supporting UN Sustainable Development Goals** – Support marine Service Providers and Public Authorities to address SDGs through a cloud system, access to data, and dedicated tools.

Instead of focusing on features that even though critical were commonplace in the market, like access to data and cloud infrastructure, the team highlighted another key, intangible benefits that service providers looked for when searching for a platform. As an example, the platform's alignment with SDGs was a highly-valued characteristic: there was an increasing trend and incentives for service providers to develop SDG-focused EO services, as they were aware that many end-users were actively interested in the subject. As such, service providers would appreciate a platform that would support them in that regard.

Marine-EO was still far from officially launching as a fully commercial platform in September 2020, but it was decided that in order to raise awareness and build a network of high-potential contacts, marketing efforts would commence on 16 August 2019, right when the third and final phase of the PCP would begin. Hence, the consultants were asked to develop a marketing plan. The intention was to create a platform tailored to service providers' needs and an online community for services in the marine sector. Accordingly, the focus was on highlighting characteristics that benefited service providers directly, such as access to uniform, relevant, and non-scattered data, ability to monitor their operations, an expedited time and cost of integration of a new service, and the possibility for them to upload and make use of their private data – thereby complementing the data provided by the platform with high-value data that could not be found elsewhere, enriching their service offering to the end-user. Regarding pricing, a 1500€ monthly subscription was considered both the most palatable way to charge the service providers and the most beneficial option for Deimos due to its predictability in revenues when compared

to a pay-per-use model. Such predictability was key for the Marine-EO platform, which was just getting started and had as its main objective commercial sustainability. Regarding the promotional plan, starting the respective activities at such an early stage was essential to ensure that potential users were aware of the offer through the duration of the H2020 funding. With these factors in mind, the consultants conceived promotional activities encompassed in three distinct stages: the "awareness creation", in which the main focus would be to inform potential customers about the offering, update them on the main milestones, and assess their needs in order to preemptively enhance Marine-EO's performance as a platform. The "pre-launch" would announce the upcoming release date of the platform, enable service providers to experiment with its prototype through beta testing, and give them the opportunity to unlock a special discount by being guest listed. Last would be the "launch stage", during which the platform would be fully operable and available for integration of new services.

The consultants developed a comprehensive strategy that considered elementary channels such as social media and email marketing, as well as more demanding options: for instance, attendance at events or organization of hackathons. Each promotional channel was carefully identified and assigned to the most fitting stage of the promotion plan. While social media was present in all three stages, as it was deemed as a cost-effective way to get in contact with relevant communities, the hackathon was conceptualized for the awareness creation stage, since such an activity could be key in unlocking major improvements for the platform early on. Additionally, costlier activities such as attending relevant events for the community were expected to be more successful when performed before Marine-EO officially launched, rather than after, so they were considered mainly for the first two stages of the promotional plan.

Phase 5: Act

In December 2018 the consultants presented to the KDMs the final recommendations for Marine-EO's positioning strategy as well as the 3Ms: implications of the solutions recommended in terms of Manpower (Human Resources needed), Minute (Gantt chart of the project), and Money (costs associated).

The KDMs agreed that the pricing strategy would have to be reviewed close to the launch date and consider offering more diversified pricing options to the service providers, depending on the level of support and customization

the customers would want from the platform. Having a positioning strategy already developed allowed Deimos to focus on perfecting the platform technically, thereby increasing Deimos' chances of winning the PCP challenge and successfully attracting paying service providers thereafter. Nevertheless, nothing was guaranteed. For certain, the positioning strategy was taken care of, but all other relevant developments of Marine-EO remained mainly open-ended.

The cards were on the table and it was clear that there were three valid perspectives for the board: Shall we accept the VCW consultants' advice, shall we kill some of the proposals from the VCW team, or shall we conduct further research before acting? What should the Board decide?

Bibliography

Brzycka, Agnieska; Saraiva, Diogo; Panda, Koushik. 2017. "Market Study for NextGEOSS". Deimos' Internal Document.

Lages, Luis Filipe (2015), "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", Journal of Business Research, 69(11): pp. 4849-4855.

Lages, Luis Filipe et al. (2023). Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions. In *Electronic Commerce Research*. Springer, Cham. *Forthcoming*.

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Creation Wheel: A Framework for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279.

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem--solving, and lean", Strategic Change, 29(2), 195-213.

PwC. 2016. November. "Copernicus - Market Report 2016". Accessed September 18. http://www.copernicus.eu/sites/default/files/documents/Copernicus_Market_Report_11_2016.Pdf

What should be the best market application for SenSyF?

Case-study powered by VCW

Márcio Felizardo

IN JUNE 2015, Nuno Catarino, Head of the Data Systems Division at Deimos, was planning the future activities for the division. Catarino was mainly concerned about the new rules for H2020, the major European co-funding program for science, from which his division was obtaining most of its income. According to the EU, from 2014 on, the research project proposals that met European or global market needs had better chances of obtaining funding. Knowing that Deimos had no market orientation, he considered that its future was endangered if changes in the strategic roadmap were not made.

At July's Board Meeting, Catarino shared with Deimos' Key Decision Makers (KDMs) the importance of adapting to the new situation. The company's leadership agreed that as a first step it was time to consider identifying a market application for SenSyF – the most recent Earth Observation project of the Data Systems Division. But while the company was well-known in the European Space Engineering landscape, it was quite dependent on Public Funding to conduct research. On the other hand, shifting the company's focus from technology to a hybrid orientation comprising market and technology considerations would bring challenges at the management, marketing, and human resources levels. The leadership agreed to hire a team of consultants using the VCW-Value Creation Wheel method to help them in this project.

Exhibit 1: VCW Method

Sources: Lages, 2016; Lages et al., 2023

Phase 1: Define

Despite considering that the current context was threatening, the leadership preferred to interpret it as an opportunity for the company to reconsider diversifying its income. On 1 September 2015, Catarino met the consultants to explain SenSyF in detail – a €2.5m Earth Observation (EO) technology co-funded by the EC under the FP7 Research Program, and the difficulty in identifying the market with the highest potential for the technology.

To understand SenSyF's role in the EO landscape, the team interviewed

several stakeholders at Deimos. SenSyF was a Software Development Platform that would help programmers to overcome the main difficulties they were facing while working with EO data. They understood that it was difficult to gather the right data because satellites stored their data in different data centers 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.

The Software Development Framework was designed by a consortium of eight partners under Deimos' leadership from 2012 to 2015. It was designed to allow programmers to create EO applications in common programming languages such as C++, Python, MatLab, and 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, which provided access to public cloud infrastructures such as Amazon Web Services, which offered flexible processing and storage power. This latter feature allowed users to have access to flexible processing and storage power. Overall, SenSyF's key benefits were a reduced time to market for new EO-based services and the limitless and affordable resource scalability. The increasing democratic access to EO inputs was triggering an expansion of demand for both raw data and EO-based value-adding services. The European commercial EO data sales were €220m in 2013, and Euroconsult expected this to grow to €410m by 2023. Most of the demand came from the defense industry – the most mature segment – which claimed nearly 70% of the overall market.

Phase 2: Increase

The VCW consultants proceeded with interviews and surveys to several industry and other stakeholders to gather primary and secondary data, collecting in total 54 potential applications and 49 potential filters, which were aggregated into four areas – Funding; Market & Macro Trends; Technology; and Team and Company.

Phase 3: Assess

To validate the final ideas and filters the VCW team applied the Poker Method (Lages 2015, 2016). All the potential market applications that emerged in the

previous stages were purified, analyzed, 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.

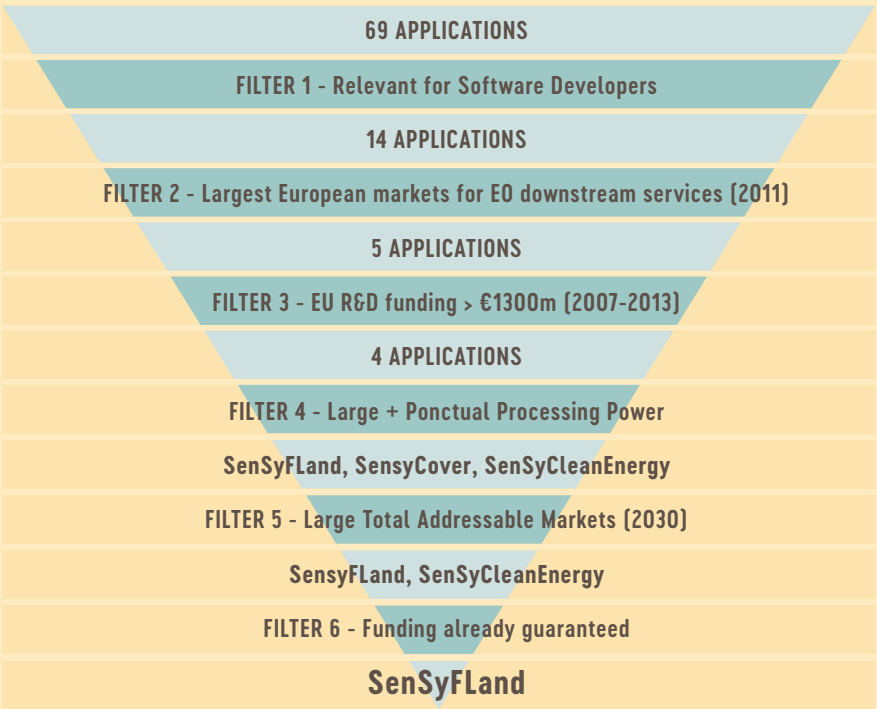
The VCW team understood that should focus on defining a midstream market for SenSyF. While understanding the perspective of the stakeholders, the VCW team argued that midstream market data was scarce and that studying the downstream applications' market was useful to estimate the potential of midstream 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 69 final applications.

To validate the filters the consultants asked the leadership to apply the Poker Method to the filters, from which 40 passed. At this point, the team had to reject 16 filters that were impossible to measure given the timeframe and company resources. Afterwards, the key decision makers prioritized the filters.

Phase 4: Narrow

As the pool of applications and the final filters were defined, the consultants built the Value Creation Funnel (VCF). (See Exhibit XX for VCF). Two of the market applications passed through all the filters and so the consultants presented both to Catarino, who mentioned that both were really promising and feasible. Hence, Catarino decided to be practical – "Deimos should select the option that is closer to the funding we have already obtained". Given the current funding and company expertise, the market application selected was SenSyFLand.

Exhibit XX – The Value Creation Funnel applied to SenSyF



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 – Five 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 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.

In addition to SenSyF's key attributes, SenSyFLand offered a Toolkit (set of processing tools) that would support the development of EO-based applications in three areas: Agriculture, Land Cover, and Coastal and Inland Waters (see Exhibit XXX for examples of value services which can be built with SenSyFLand). Bearing in mind that it was impossible to communicate with multiple targets at once, the consultants argued that Deimos should focus on one community. According to the research of the VCW team, agriculture was the area with the highest market potential for SenSyFLand.

Exhibit XXX– Examples of value-added services that can be built with SenSyFLand.

AGRICULTURE	LAND	COAST OR INLAND WATERS
Optimization of field inputs (water, fertiliser, pesticides)	Urban Planning	Erosion impact on coast
Optimization of seed density	Study land use (type of vegetation, soil parameters...)	Pollution
Deciding the crop type (based on type of soil)	Forest management (plan forest roads, assess fire impact...)	Quantity of Inland water
Assessment of growing crop	Measurement of the effects of natural disasters	Measure conditions for practicing water sports (sail, surf, kitesurf...)
Assessment of yield potential		
Relative Chlorophyll maps		
Forest vigour and health (fire insurance)		
Crop insurance apps		
Biomass Maps		

They identified software developers as potential customers, which they split into two segments: research institutions (Public Authorities and Academia) and private companies. The team perceived that private companies had high purchasing power and a more market-oriented perspective than research institutions. However, if there were private companies developing agricultural

services, they would most likely have already built their own agriculture Toolkit. 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 cost. However, it lacked funds to support SenSyFLand.

Deciding on the target market was one of the greatest challenges the team faced. After brainstorming with the KDMs, one thing was clear – only private companies could make SenSyFLand sustainable in the long run. But to reach this segment, Deimos needed to engage with students and recent graduates, who would be willing to ask their companies to pay for SenSyFLand's license in the future. Therefore, the stakeholders decided to target universities in a first stage until the service reached a mature level of development and acquired a robust customer base. In a later stage private companies would be SenSyFLand's target.

Despite being enthusiastic, Catarino was concerned about the resources needed to develop and sell SenSyFLand. Therefore, the consultants worked closely with the KDMs to design a business model that would ensure SenSyFLand's sustainable launch. It needed to comply with the service attributes, market conditions, and company specifications. The business model consisted of offering two license plans: The "Student-License", available at a reduced price for researchers who were 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-License" 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 the cost and revenue structures were clear, the team realized that further research should be conducted to estimate them more accurately.

Phase 5: Act

Besides planning the business model, the team used the 3 Ms (Money, Manpower, and Minute) Framework to define the key resources needed for the project. Starting with Money, the consultants realized that to carry revenue and cost estimates, Deimos would also have to analyze the size of the potential customer base and their willingness to pay. The revenue would come from license fees and from a share of final service sales in the case of being developed

under the "Student-License". The team perceived infrastructure, personnel, and marketing as the most important costs. Regarding Manpower, the company defined five major stakeholder profiles – a product coordinator, internal programmers, external programmers, a salesperson, and a marketer. A timeline was defined together with the KDMs and project team.

On 3 December 2015 the Board of Directors met to approve the business plan for 2016. 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 on whether Deimos should develop it or not. Nuno Catarino, Division Head Payload Data Ground Segment at Deimos Elecnor Group & Senior Project Manager at Deimos Engenharia, who was highly involved in this project mentioned:

> *"Using the VCW model made us look at our technology in a new light, focusing on our goals and identifying the core aspects for attaining them. It allowed us to quickly define priorities for our development, while taking into account inputs from all major stakeholders in a manageable way"*

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 believed the Board of Directors should go for a short-term solution and accept both projects that had been offered during the round of interviews conducted by the VCW team. They believed that 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 VCW consultants' advice and use this as a unique opportunity to start transforming the organization. What should the Board decide?

Bibliography

Lages, Luis Filipe (2015), "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", Journal of Business Research, 69(11): pp. 4849-4855.

Lages, Luis Filipe et al. (2023). Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions. In *Electronic Commerce Research*. Springer, Cham. *Forthcoming*.

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Creation Wheel: A Framework for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279.

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for Innovation, Collaboration, and Change: Value Creation Wheel, Design Thinking, Creative Problem--Solving, and Lean", Strategic Change, 29(2), 195-213.

What should be the most appropriate challenge promoter for BETTER?

Case-study powered by VCW

André Maia

IN NOVEMBER 2017, a Consortium led by Deimos was awarded the project Big-data Earth Observation Technology and Tools Enhancing Research and Development – BETTER – by the European Commission in the scope of the Horizon 2020 program. The Consortium was composed of eight institutions from six countries, and throughout 36 months they were working to implement an intermediate service layer focused on creating tailored services and tools, while addressing the full data lifecycle associated with Earth Observation (EO) data. These customized solutions, also known as Data Pipelines, were driven by the Challenge Promoters, entities whose activities are addressing key societal challenges.

By 2020 the Consortium had to include nine Challenge Promoters. However, by the end of 2018, few potential external Challenge Promoters were in sight, and none confirmed. For this reason, the Value Creation Wheel (VCW) was applied by a team of external consultants to identify one (or more) possible external Challenge Promoter(s) for the year of 2019 and develop a plan to engage them. The main advantage of using this framework was to have an unbiased and structured process to solve the challenge, as well as one that would enable its reutilization thereafter to identify further Challenge Promoters. We now present a summary of the five VCW phases.

Exhibit 1: VCW Method

Sources: Lages, 2016; Lages et al., 2023

Phase 1: Define

The first phase of the VCW framework grasped a better understanding of BETTER Project and its EO Context. The VCW consultants were given access to multiple market reports and internal documents with detailed information about the project and met with internal stakeholders to gain a more comprehensive view on BETTER and its target.

The main objective of the project was to facilitate the usage of large-volume and heterogeneous datasets by downstream users. To ensure this, the Consortium invited other private and public entities to become external Challenge Promoters and identify Data Challenges. Then, the technical development team, composed of Deimos and Terradue, worked on implementing Data Pipelines that deliver customized products to answer the needs defined in those Challenges. The external Challenge Promoters would later be involved to test the solution and provide feedback.

The European EO market had been steadily growing and was predicted to boom in the coming years, with a 9% growth rate in Europe from 2012 to 2022, while worldwide a growth of 11% was expected (Digital Transformation Monitor, 2017). Nevertheless, for a company to operate and be successful in the EO market, it needed to have high capital, access to accurate and reliable data sources, and the ability to process these data (which initially comes from satellites as "raw" data). This processing is only possible with technical expertise and know- how, and BETTER's specialized workforce, composed of Deimos' and Terradue's team, had proven to be crucial to stand out in the EO service industry. Since the volume of customers in the market was still low, the ability to build strategic partnerships (such as the BETTER consortium) was essential to reach potential users. The project's team, data providers and internal Challenge Promoters were another resource that allowed sustaining a competitive advantage.

The project already included three internal Challenge Promoters, namely the World Food Program (WFP), with challenges in the area of Food Security, the EU Satellite Centre (SatCen), in the area of Geospatial Intelligence, and the Swiss Federal Institute of Technology Zurich (ETHZ), covering the area of Geohazards. As an example, BETTER was supporting WFP challenges for precise humanitarian assistance. In 2018 the Data Pipelines developed enabled its staff to have quicker access to real time, accurate information on the extent and severity of the impact of natural hazards, land cover changes, and inter-annual vegetation performance, and EO indicators for global early warning and season monitoring, all of which will serve as fundamental inputs for WFP's timely response planning. The external Challenge Promoters could be non-governmental institutions, European agencies, academia, or commercial companies, with different experience and expertise in the use of EO and Big Data in their activities, and that aim to address key societal areas.

Phase 2: Increase

After contextualizing the problem, the second step of the VCW was dedicated to the generation of ideas, solutions, and filters (i.e., the criteria used to decide which ideas are valid or not). The consultants were able to gather inputs from more than 70 different stakeholders including EO specialists, industry-related experts, researchers in various fields, colleagues, and other Deimos collaborators who were not involved in the project, through online surveys, brainstorming and brainwriting sessions, and interviews. In parallel, the team would also leverage on Deimos' and Terradue's networks to extend the list of potential Challenge Promoters. The total number of different ideas collected was 227, including entities such as Greenpeace, Amazon, and Repsol, among others, while the filters amounted to 75.

Phase 3: Assess

The third phase of the VCW included validating the ideas and filters gathered in the previous step, and ranking the filters by the Key Decision Makers (KDMs). To validate the ideas, the KDMs of the project from Deimos and Terradue applied the Poker Method, a tool that allowed them to analyze each idea, and decide if it should be kept, reviewed, multiplied, or eliminated. After applying the method, 218 ideas remained out of 227.

Regarding the validation of filters, the KDMs were asked to rate each of the 75 filters from 1 (irrelevant) to 5 (extremely important). These filters were then presented to the KDMs for revision and approval. In the end, six final factors were selected to screen all of the ideas, namely: 1) thematic area not covered by current Challenge Promoters, 2) Focus on sectors with large size and/or high potential for EO, 3) Entity with high visibility in society and media, 4) Easy first engagement with potential Challenge Promoter, 5) Discard entities with own capabilities of EO data analysis, and 6) Organization with social impact and/or activities related to the Sustainable Development Goals.

Phase 4: Narrow

With the ranking complete, the Value Creation Funnel (VCF) was built, providing three potential final solutions, namely Direção-Geral de Política do Mar

(DGPM), International Maritime Organization (IMO), and Group on Earth Observations (GEO). DGPM is a Portuguese national service, whose functions include elaborating and proposing the national policy of the sea in its various aspects, planning and organizing the maritime space in its different uses and activities, and accompanying and participating in the development of the Integrated Maritime Policy of the European Union. IMO was a specialized agency of the United Nations with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution caused by ships. Its core function was to develop a regulatory framework for the shipping industry. GEO was an intergovernmental organization working to improve the availability, access to, and use of Earth observations for the benefit of society. It financed initiatives that promote coordinated and sustained data sharing.

However, there was an issue with the type of entities that were reached: they were final users, i.e., DGPM and IMO were regulatory entities that made use of the information that was already completely processed and analyzed, while GEO was mostly a facilitator of EO projects, and therefore not BETTER's target market. Since the VCW is a flexible framework, a meeting was conducted with the KDMs to review the filters and consequently identify that a filter had to be added: "Discard final users". While scanning for a second time through the list of filters, the key decision makers also agreed on adding a new filter: "Entities not previously engaged in the scope of the activities of the technical development team", in the sense of expanding the team's network, which could open doors to new contacts, projects, and business partnerships. These changes paved the way to a new ranking of filters and to a different final result, reaching four new potential Challenge Promoters: European Environment Agency (EEA), Intergovernmental Oceanographic Commission of UNESCO (IOC), Joint-Research Centre of the European Commission (JRC), and National Oceanic and Atmospheric Administration of the United States Department of Commerce (NOAA).

The key decision makers agreed on the potential of the outcome of the analysis, and thus the planning the engagement activities for each of the potential external Challenge Promoters could start. For that purpose, the consultants applied a tool developed internally at Deimos for engagement processes, the 4 Ds Framework, which had been used earlier in BETTER and other projects at Deimos, and was then used for each of the four potential Challenge Promoters.

The European Environment Agency (EEA) is an agency of the European Union, whose task is to provide timely, targeted, and independent informa-

tion on the environment to policy making agents and the public. EEA gathered high-quality data and produced assessments on a wide range of topics related to the environment, namely air and climate, nature, sustainability and well-being, and economic sectors such as agriculture, energy, industry, and transport. The potential areas of challenges identified by the consultants were water and marine ecosystems, soil and land-use, and forest monitoring and observation. Data Pipelines on these topics would allow EEA to continue its work in a more efficient manner, especially on the last one mentioned, since EEA had recently stated in a briefing that "there is a growing demand for forest products and ecosystem services" and that the "use of high-resolution satellite imagery from the EU's Earth Observation Programme Copernicus is a key method to overcome the current lack of data" (EEA, 2018). The VCW team also suggested a specific timeline for the engagement activities with EEA.

Intergovernmental Oceanographic Commission of UNESCO (IOC) is the only organization for marine science within the UN system. The purpose of this Commission is to promote international cooperation and to coordinate programs in research, services, and capacity-building, in order to learn more about the nature and resources of the ocean and coastal areas and to apply that knowledge for the improvement of sustainable development, the protection of the marine environment, and the decision-making processes of its Member States. During the diagnosis of potential areas of challenges, the consultants found that within IOC, the activities of the Ocean Observations and Services Section (OOS), the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), and the International Oceanographic Data and Information Exchange (IODE) would provide well-suited challenges in the scope of BETTER, being all related to ocean observation, monitoring, and data management.

JRC is the European Commission's science and knowledge service that employs scientists to carry out research to provide independent scientific advice and support to EU policy. JRC's responsibilities include managing and making sense of knowledge to support European policies with independent evidence, developing innovative tools, and making them available to policy makers, among others. The possible areas of challenges identified were agriculture and soil (in the scope of JRC's European Soil Data Centre activities), energy, and environment and climate change.

NOAA is the American scientific agency focused on the conditions of the oceans, major waterways, and the atmosphere. The areas of challenges identified by the consultants were oceans and freshwaters, and weather and at-

mosphere, as NOAA produces daily weather forecasts, severe storm warnings, climate monitoring, fisheries management, and coastal information using satellite data and others.

Phase 5: Act

The final VCW analysis was presented to the KDMs on 13 December 2018, including an overview of the whole process and its outcomes, a preliminary 3Ms analysis (money, manpower, and minute), and the validation of their willingness to implement the engagement models with the four stakeholders identified. The KDMs demonstrated that they were extremely satisfied with the results and decided to initiate the engagement contacts based on the timeline provided by the consultants. The main advantage of the process was the delivery of the structured approach that could be later reused over the next two years, and a list of potential prospects for the future. Now the board should decide which other steps should the conducted before advancing.

Bibliography

Digital Transformation Monitor (2017), https://ec.europa.eu/growth/tools-databases/dem/monitor/content/welcome

Lages, Luis Filipe (2015), "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", Journal of Business Research, 69(11): pp. 4849-4855.

Lages, Luis Filipe et al. (2023). Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions. In *Electronic Commerce Research*. Springer, Cham. *Forthcoming*.

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Creation Wheel: A Framework for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279.

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem--solving, and lean", Strategic Change, 29(2), 195-213.

Which geographic market has the greatest potential for ground stations?

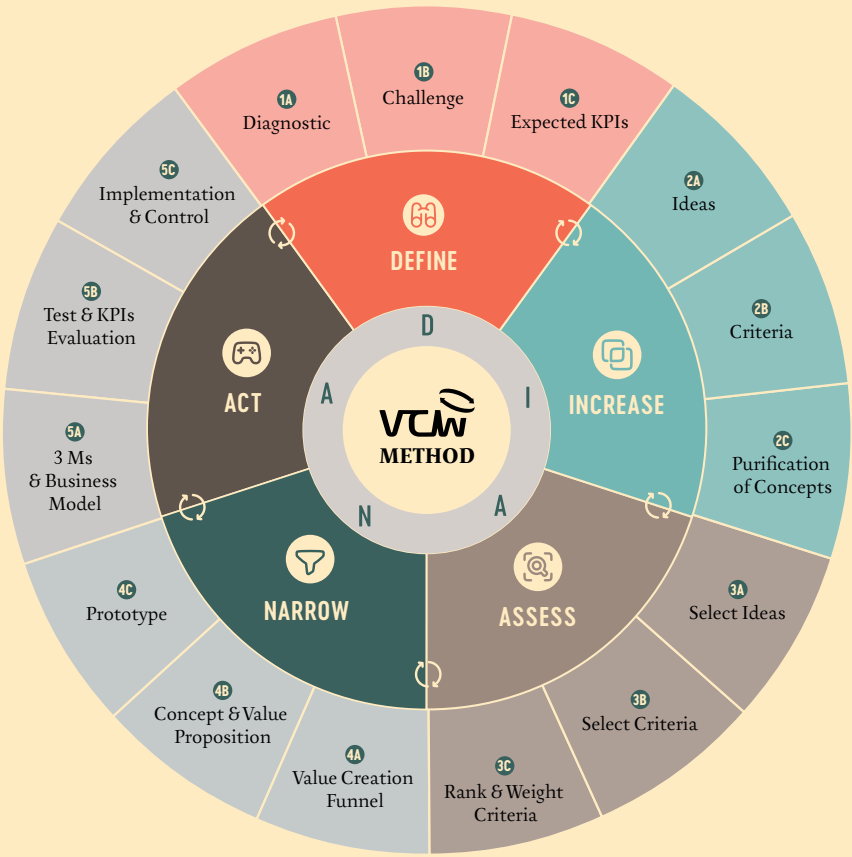
Case-study powered by VCW

Sara Soares

IN 2015 UrtheCast and Deimos Group announced a strategic partnership, which resulted in the sale of Deimos Imaging (DMI) to UrtheCast. Deimos Imaging was a former division of Deimos Space, which owned and operated two satellites (Deimos-1 and Deimos-2). With the purchase, UrtheCast took control of both satellites, building the pathway to accomplish its ambition of becoming a lower-cost alternative of Earth Observation (EO) services compared to the market leaders. Nonetheless, the strategic partnership also acknowledged Elecnor Deimos as the provider of ground systems, not only for both Deimos satellites but also for the projected UrtheCast's satellite constellation.

In 2017 the strategic roadmap for the partnership was being reviewed and those involved were facing the paradox of choice. One of the main discussion topics was which geographic market had the greatest potential to be the location(s) of the next ground stations. Ground stations are essentially a service to governments, as they are in large part utilized for defense purposes. It was therefore implicit that an extremely time-consuming analysis would have to be done, as well as business-related knowledge applied. Accordingly, on 21 December, Carlos Fernandez, Vice President of Global Ground Stations of UrtheCast, and Elsa Alexandrino, Business Developer of Deimos, decided to hire a team of consultants to apply the Value Creation Wheel (VCW) to support them to address this challenge. In the following sections, we explain how the five phases of the VCW were implemented.

Exhibit 1: VCW Method



Sources: Lages, 2016; Lages et al., 2023

Phase 1: Define

The first step was to understand the ground stations context. The team performed an extensive internal and external analysis to gain practical insights and knowledge. Furthermore, to understand the complex functioning of the ground stations and the respective marketplace, the team conducted several interviews with internal and external stakeholders.

A ground station is the infrastructure that connects the data collected by a satellite to the ground. It is composed of two elements: the Antenna and the Direct Receiving Station (DRS). The antenna acquires the data coming from the satellite, whereas the DRS downloads, processes, distributes, archives, and disseminates data, as from Deimos-1/Deimos-2. In fact, the main advantages of having one ground segment in situ is that it ensures immediate, secure, and private access to satellite data in real-time. Each ground segment can receive information only within their visibility circle and area of interest. As Deimos is responsible for the Ground Systems of Deimos-1/Deimos-2 satellites, the company designs and establishes customized Ground Stations for each client, in a specific location (generally at the client's site).

As Ground Stations are an infrastructure that delivers EO satellite data, they are part of this market, which has been growing consistently, reaching €2,75 billion in 2015.

Globally, North America has had the most significant market share. The trend appears to be changing, as it was projected that North America's share will fall to 41% in 2020, EMEA's rise to 29%, APAC to 24%, and Latin America to 7%, in 2020.

The potential of EO data is widely recognized, and is utilized for commercial (both governments and private companies) purposes. The government is the dominant client of the market, as the defense sector alone is responsible for over $1 billion in data sales, representing 36% of the market, and demands (mostly) very high-resolution data.

Deimos ground stations provide access to UrtheCast Deimos-1 and Deimos-2. The second is a very-high-resolution satellite, producing imagery of 75 cm per pixel. Regarding the main competitors, Alexandrino admitted that the competitive advantage of the company is to be a lower-cost alternative of very-high resolution data of EO imagery.

A positive projection is presented on a PWC report (2016), suggesting that the market size will reach €5.3 billion by 2020. Nonetheless, several trends were identified as potential game changers of the industry. First, there is a growing tendency for open and free data access, which may jeopardize private data providers while accelerating application developers. In fact, this trend emerged with the appearance of publicly owned EO programs, such as the Landsat program and the Copernicus initiative, which aims to achieve high quality and autonomous EO capacity, promoting competitiveness and cost efficiency in the industry. Another trend in the EO industry is the emergence of start-ups developing several constellations of nanosatellites. These are char-

acterized as a low-cost alternative to traditional satellites while providing a better service. In fact, large constellations enable a more powerful quality of the service delivered, as they allow for near-real-time images of all the planet's regions. The growth of these players is projected to cause the development of a mass market for very high-resolution imagery. Finally, Unmanned Aircraft Systems, namely drones, are increasingly utilized, especially concerning emergency situations. In fact, compared to traditional satellites, these instruments are very useful, fast to get to the location, and are also able to provide very-high-resolution imagery, being considered substitutes for satellite data.

Once the consultants had consolidated knowledge about the ground stations and respective market, they could continue to the next step of the methodology – Identifying ideas and filters to be used to select the geographical market with the greatest potential for the next ground station.

Phase 2: Increase

On 11 September, the team met again with the Key Decision Makers (KDMs), Alexandrino and Fernandez, to determine which countries should be considered for the project. As Deimos-2

Ground Stations do not have a limitation regarding geography, meaning the satellite can reach every country in the world, all the countries recognized by the United Nations could be part of the pool of ideas. Nonetheless, the team undertook a brainstorming with the KDMs, and both suggested that according to their expertise, knowledge, and strategic vision, some countries and geographical areas should be excluded from the outset, namely:

- countries in which a Ground Station to receive data from Deimos satellites has already been installed.
- countries belonging to Central Asia, Eastern Asia, and Southern Asia, as Chinese suppliers have great influence in this area, and the competition is too intense.
- countries belonging to Northern Europe, Southern Europe, and Western Europe, as the company works closely with ESA, and is already familiar to the potential of these countries.
- Saudi Arabia and United Arab Emirates, as the first announced a joint venture with DigitalGlobe (direct competitor of Deimos), while the second is making significant investment to develop its own space activities (including satellite and ground stations manufacturing).

Taking the above into consideration, the team came to a list of 114 countries, belonging to: Eastern Europe, Southeast Asia, Western Asia (Middle East), Middle Africa, Southern Africa, Western Africa, Northern Africa, Eastern Africa, Latin America, and North America.

With all the solutions generated, the consultants proceeded with the identification of the criteria that would be relevant when choosing a country to host a ground station. A diverse range of stakeholders was invited to participate in the generation of filters, so the information collected would be unbiased and heterogeneous. The data were collected through workshops, online surveys, and interviews. Altogether, 60 stakeholders were involved, namely: 7 of Deimos' stakeholders, 3 industry-related experts, 40 students of the masters in management program at Nova School of Business and Economics, 9 engineers from different backgrounds, and 1 external consultant. The collection of data led to the generation of 162 filters, which were organized into six different categories, namely business/ project related, demographic/ economic environment, natural/ physical environment, political/ legal environment, social/ cultural environment, and technological environment.

Phase 3: **Assess**

At the beginning of October the team met once again with the KDMs of the project to analyze all the information gathered in the previous phase. At this stage, and taking into consideration the solutions (countries) that were already defined, it was essential to understand which filters revealed to be relevant criteria in choosing the country in which to place a ground station. The Board was encouraged to play the Poker Method (Lages, 2015). The method allowed the KDMs to refine the information by validating, reviewing, multiplying, or eliminating the filters. Once this process was completed, the team arrived at a list of 51 potential filters. Following this, it was time to proceed with the ranking of the filters. The process was simple and clear: each of the participants should rate the filters on a scale of 1 (Lowest potential) to 5 (Highest potential). The ultimate potential of each filter was determined by applying a weighted average to the final attribution of each participant: Alexandrino and Fernandez shared 85% of the decision power, while Antonio Gutierrez, the person responsible for the Ground Segment Business Unit at Deimos, had 15%. A total of 22 filters were classified as "High Potential" (3), while 23 were considered to be "Medium Potential" (4), and five rated as "Low Potential" (5) . Arriving at 22

"High Potential" filters, it was still necessary to apply the SMART goals system, which states that any criterion must be Specific, Measurable, Achievable, Realistic, and Timely. As such, the KDMs and team together discussed the measures that would turn the filters into consistent ones, to correctly apply them in the next phase.

Phase 4: Narrow

After the proper ranking in the previous phase, the VCW team performed the funnel exercise that would lead to the final solution. The process was simple but demanded time and effort: to take all the 114 countries defined in phase two and to apply the High Potential filters, one by one, until the number of countries was reduced to 1.

During this process, two of the filters chosen and classified as "High Potential" could not be applied, namely the third filter ("Volume of Earth Observation data requested by the country, per year 300,000€") and the fifth filter ("Current use of satellite data from direct competitors"). The confidentiality demanded by the clients is one of the main specifications of this industry, especially when considering that the ground stations' business is conducted mainly between private firms and governments (B2G context), in which satellite imagery is mostly used for Defense purposes. To reach the final solution, only seven filters needed to be applied, which led to the Kingdom of Bahrain.

Alexandrino and Fernandez were "very happy and intrigued to hear the final solution", as this was a country they had never considered before, and agreed that the team should keep exploring if there were a real business opportunity there.

Further research was conducted, not only to get to know Bahrain but also to find out about the industry attractiveness in the country. The Kingdom of Bahrain is situated in the Persian Gulf, in the Middle East, located between the Qatar peninsula and Saudi Arabia's northeastern coast. It has predominantly clear skies throughout the year, an essential feature for optical satellites' clients, as cloudy weather influences the quality of the final imagery delivered to the client.

Regarding its government, the country is ruled by a Constitutional Monarchy in which the king rules with the support of the other members of the government, generally part of the royal family. The most important ministerial posts within Bahrain's political context are the Ministry of Defense, the

Ministry of Foreign Affairs, and the Ministry of the Interior. According to the research undertaken by the team, there were two potential candidates to take into consideration when selling the direct access to the Deimos-2 Satellite: the Ministry of the Interior and the Ministry of Defense. The first is responsible for monitoring emergency events and creating the respective emergency plans for the country. According to the World Risk Index 6, which measures the risk of exposure to natural hazards and respective coping capacity, the country rates "very low".

On the contrary, the Ministry of Defense revealed to be a truly interesting target to focus on. In fact, the Bahraini government spends approximately 4.59% of its GDP on military purposes, making it one of the biggest spenders on defense in the world, in relative terms (World Bank, 2016). Furthermore, the EO commercial data market is expected to grow 15% until 2022 in the Middle East, with a particular focus on Defense, which is expected to remain the most important and considerable application area. (Euroconsult, 2012).

Another critical fact to consider is the recently created National Space Science Agency. The agency is under the control of the Ministry of Defense, and one of its advertised goals is to establish infrastructure for earth observation, demonstrating considerable interest in this subject. Until then, no activities on this topic had been publicly disclosed, nor partnerships announced.

The Ministry of Defense demonstrated to be a stronger candidate across all the indicators studied through the application of the filters and further analysis, and did not show any evidence of having business with competitors. Now it was time to derive a plan on how to sell the Ground Station to the target.

Phase 5: Act

Approaching the government of the Kingdom of Bahrain can be challenging, as the country is geographically distant and very distinct in cultural terms. Nonetheless, the country's regulatory environment for business operations is friendly, ranking 66/190 in the Ease of Doing Business Index 7 (World Bank, 2017). Acknowledging this, two options to approach the Bahraini government were identified: either through a public tender or through the company's initiative. As the government did not have any public tender open regarding Ground Stations/Earth Observation projects at the time of research, the only way to reach the final target was through the initiative of the company. It was

evident that this approach would be a considerable challenge, not only due to the natural complexity of targeting a foreign government but also because of the importance and sensitivity that the Defense area poses to countries. Moreover, due to its complexity, ground stations' Promotion is done mostly through Direct Marketing, in which the initial contact and the subsequent establishment of relations with the government are critical, as the creation of networks and long-term relationships with customers are fundamental for a successful promotion of this kind. Consequently, to make the product known, it would be important to find a point of contact close to the government. The company should start by developing a relationship with governmental institutions within the country. Furthermore, the Economic Development Board of Bahrain (EDB) can also be a relevant facilitator for the project, as it is a public agency working directly with the government, and seeks to promote foreign investment and the establishment of foreign business in the country. The first contact with each entity can be made directly to the offices, by phone or email. Last, to make all the essential elements of the project clear, the team developed a Business Model Canvas, as well as a preliminary 3Ms Analysis to present to the board in the final meeting.

On the 21 of December the final meeting of the project took place. The primary purposes were to present the final output of the project, receive feedback from the KDMs, and validate the willingness of the company to pursue the given business model. The KDMs acknowledged the importance of the VCW in the scope of the project. In fact, Alexandrino disclosed her thoughts on the framework, stating that she now had "a more clear and structured view of the market selection process". Relevant outputs and lessons learned were obtained from the project. In order to accomplish a successful internationalization, the company must take into consideration several fundamental aspects: to ensure that no direct competitor supplies the same product, or a substitute, to the country; to validate the willingness of the government to consider the product offered; to design a fully customized business and technical proposal; and finally, to determine a realistic cost structure, revenue stream, and timeline for the project.

Although the board members were already aware of the final solution, an interesting discussion about Bahrain was generated regarding the analysis performed by the team in the country. The future for the internationalization of the Ground Segment's activities looked promising. Both members of the board showed willingness to establish contact with Bahrain's institutions, to explore potential business opportunities in the country. As the KDM consid-

ered the Kingdom of Bahrain to be an attractive target to explore, now they would need to decide: shall we accept the VCW consultants' advice or shall we conduct further research before acting? What should the Board decide?

Bibliography

Fonseca, Vânia; Lages, Luis Filipe; Kim, Philip H. (2018), "Deimos: Expanding to a New Market Using the Value Creation Wheel", Case BAB370-PDF-ENG, Harvard Business Publishing.

Lages, Luis Filipe (2015), "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", Journal of Business Research, 69(11): pp. 4849-4855.

Lages, Luis Filipe et al. (2023). Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions. In *Electronic Commerce Research*. Springer, Cham. *Forthcoming*.

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Creation Wheel: A Framework for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279.

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem--solving, and lean", Strategic Change, 29(2), 195-213.

How to improve employee retention and job satisfaction in space business?

Case-study powered by VCW

Anders Bach Rasmussen

ON THE DAY BEFORE Christmas holidays in 2018, Tânia Marques, Human Resources Manager (HRM) at Deimos Engineering (Deimos), could not stop thinking about the challenges that 2019 would bring. The turnover of collaborators had increased steeply over the last two years and attracting new talent was more difficult than ever. This trend was connected to the shortage of software engineers in Portugal, which in fact represented half of Deimos' workforce, and the fact that the company was not fully prepared to deal with HR-related issues. A general decrease in job satisfaction was visible in the most recent working climate surveys, and retaining people was key to the organization. Deimos had to prepare for the change of paradigm.

With these concerns, Marques knew 2019 HR-activities would have to be focused on tackling the retention and job satisfaction issues. Vânia Fonseca, Innovation and Sustainability Specialist, who had been working with Marques in different HR-related projects, shared her concerns and in early 2019 they did a brainstorming session on how to proceed. Marques was the only team member of the HR department based in Portugal – the other members were based in the headquarters in Madrid – and as the conversation flowed, both realized that it was necessary to hire an external consultant to develop the project on how to retain collaborators while ensuring job satisfaction. Both had previously worked with the Value Creation Wheel (see Exhibit 1: VCW), and considering the complexity of the problem, they were sure that the problem-solving framework could provide well-supported solutions for the HR challenge.

Exhibit 1: VCW Method

SOURCES: Lages, 2016; Lages et al., 2023

Deimos: The company and culture

Deimos was founded in 2002, was composed mainly by engineers delivering cutting edge space software systems and turnkey solutions. The space engineering company was part of Deimos Group, which in turn was the technological branch of Elecnor. Contracts from the European Space Agency (ESA) and EUMETSAT allowed the company to grow up to 70% within the first 5 years of its existence. The accelerated growth unveiled the need to have a local human resources department to deal with aspects such as recruiting and

onboarding new collaborators, retaining them, performance management, training, organization development and culture. Marques was hired in 2015 for this position.

The company offered collaborators and especially engineers a chance to be a part of cutting-edge solutions while working at a key player of the space industry, which represented a quite different and rewarding purpose when compared with many other companies. Nevertheless, since Deimos was focusing more on R&D projects rather than commercial ones, some pressures emerged on the company to provide the opportunities to ensure career growth and attractive compensation to the collaborators. Marques believed it was time to consider the culture and the experience of the collaborators at the company and put in place employer branding strategies. Therefore, the scope of the new project was agreed upon – how to improve employee satisfaction to secure better retention of Deimos' collaborators.

The Value Creation Wheel (VCW)

The Value Creation Wheel framework is an innovative approach to identifying, analyzing, and tackling problems of all natures to overcome any challenge one may be facing. The creator of the VCW, Luis Filipe Lages has constantly been developing and perfecting the methodology for the past two decades. The VCW known today is a result of constant cooperation and development with companies, executives, scientists, universities, and students from all around the world. What makes the VCW unique is that it is not limited throughout the generation of ideas but also through the generation of criteria to select the best solutions. Moreover, the VCW involves both internal and external stakeholders to generate solutions and filters, as well as the key decision makers throughout different stages of the framework. These elements are paramount to a successful VCW. The VCW has 5 phases which will now be applied in this case.

How to Improve Employee Experience at Deimos using the VCW

Phase 1: Define

The first VCW phase is concerned with discovering value. In this phase the VCW aims to help the key decision makers define both the context and the main challenge(s) which is(are) to be addressed.

Marques and Fonseca knew that at the core of the company were the people, environment, and the culture. With this in mind, they faced two overall challenges: the first of which was retaining the collaborators in order for the company to keep growing in a sustainable way; the second was to maintain the environment of the company and to nurture the culture, while improving on current challenges. Since many technological companies opened offices in Portugal, and had been recruiting engineers, mainly those with background and experience in computer science, Marques conducted a study in 2018 to understand major trends and what do people nowadays appreciate at their working place.

Early findings revealed that people value the work environment, culture, challenging and interesting projects, and compensation. The latter was a pressure point for Deimos, since it was quite difficult to compete with technological companies with commercial products sold internationally, but also because this aspect was not dependent on Deimos only, but on the Group policies and the approval of the shareholders. So, tackling the issue of retaining based on compensation was not a short-term possibility. Therefore, the objective became to ensure that the first two challenges were approached in a financially sustainable way for Deimos. With the scope agreed upon, Marques identified that the key decision makers of the project would have to be herself and Nuno Ávila, General Manager, who in turn agreed to appoint Fonseca as project manager. It was decided to have this project as a pilot for the whole group and depending on the outcome, possible synergies and learned lessons would be shared with the other Deimos' companies spread across Europe and potentially tailored for them.

The VCW consultant was invited to support Deimos in pursuing this challenge and developing a 5-month VCW project aligned with the Deimos's culture and the vision of Ávila and Marques. The main goal of the project was to improve

retention of collaborators as well as securing job satisfaction. The project was meant to transform the organization, while including the employees as the main stakeholders and involving them throughout the whole process.

In February 2019, the project's Kick-off meeting took place at Deimos. The meeting enabled to create a better understanding of human resources related challenges, as well as to create a first impression of Deimos from a HRM perspective. In this meeting, the two main challenges of increasing retention while securing job satisfaction were presented along with the company structure and culture. The two challenges were then combined into an all-encompassing challenge aimed at addressing simultaneously both challenges: "How to improve the Employee Experience at Deimos?"

To delve deeper into Deimos' reality, the VCW consultant interviewed several collaborators and directors, had access to internal documentations and to the intranet. According to the resignation questionnaires that the VCW consultant examined, collaborators had been leaving Deimos due to job unsatisfaction, lack of motivation and/or due to career stagnation. Salary was also considered one of the causes, but it was clear that they had to face the challenge in an alternative way at least in the short-term. Retaining the current talent was paramount to the success of the company in such a specialized industry. Therefore, the years following 2019 had to bring change internally which meant not only convincing Deimos's Boards of Directors to address the challenge but also the collaborators to engage in the change. As such, it was critical to engage the employees as well as the directors in the project right from the start.

To perform an in-depth diagnosis, Fonseca and the VCW consultant scheduled four workshops – three groups of employees and one group with the local Directors – in which they used the LEGO SERIOUS PLAY Methodology. The methodology enabled a facilitated meeting and communication technique for the groups, while challenging the participants to use creativity to build three-dimensional LEGO models to answer to the questions posed to them. These 3D models serve as the basis for group discussion, knowledge sharing and problem solving. By doing so, they created a safe, creative, and hands-on environment for all participants to contribute to the understanding of the company as well as the challenges at hand. (see Exhibit 2: Key Findings of the LEGO SERIOUS PLAY workshops).

Exhibit 2: Key Findings of the LEGO SERIOUS PLAY workshops

IDENTIFIED GAINS	IDENTIFIED PAINS	SUGGESTED SOLUTIONS
Flexibility	People Leaving	Improve communication
People	Lack of Resources	Improve transparency
Purpose	Lack of Communication	Retain people
Interesting job	Training	More Training
Kitchen	Reinventing the wheel	Attract more people
Environment	Recruitment issues	Better Salary
Top level of science/ tech/future	Salary & promotion transparency	Free time to help others
Flat company	Not enough support	More and better HR support
Opportunities to be creative	Lack of career opportunities	More people working on projects/less overload
Innovation	Lack of women	Explain projects to co-workers
Teleworking	Elecnor	Promotion based on skills, not time
Diversity in work force	Lack of well defined processes	Equal rights
Financial stability	Lack of transparency	Communicate to the outside
Open-minded	No sharing of information on projects	New vision
Exciting projects		

The workshops mainly focused on explaining and understanding the Pains and Gains that the employees encounter as well as the possible solutions to these. The workshops helped to create a full image of Deimos, both the strengths and the current challenges regarding the employee experience. The purpose as well as the people and the environment were pointed to as the clear strengths from both directors and collaborators. However, when it came to the pains, the collaborators identified lack of transparency and communication as the first major pressure point. Whereas lack of support and training was pointed to as the second major challenge. This did not only help shape the understanding of the company, but later also shaped the actual concept that would be suggested by the end of the project.

Phase 2: Increase

In the second phase, the VCW helped to create value by generating ideas and filters to address the challenge. This phase included a brainstorming session at Nova School of Business and Economics as well as inspiration from case studies, internal documentation, and interviews with employees from other companies. Furthermore, the VCW consultant prepared the "Idea Wall" – a wall at Deimos where collaborators could write anonymously ideas on the wall. The Idea Wall played a critical role, as it allowed the employees to play a vital role in the project, to ensure the most suitable outcome. Therefore, the employees were given the full scope of the project to further encourage them, and to ensure transparency. This proved to be a huge success as it resulted in a total of 306 ideas throughout that week. The week after, the same exercise was used to generate the filters to select the best ideas, which resulted in 82 filters.

Phase 3: Assess

During the third phase, the key decision makers (KDMs) played a critical role because they had to select which ideas would be analyzed in more detail. Additionally, the KDMs should select and rank the filters/criteria to select the best ideas. For this purpose, the VCW consultant, KDMs and Fonseca applied the Poker Method, framework developed by Luis Filipe Lages & Richard Hartmann. The Poker Method aims to validate, refine, multiply and/or eliminate ideas and filters based on a discussion of each idea and filter. All the 306 ideas and 82 filters were qualified into one of four categories: Keep, Multiply, Review and Kill. In the following tables, we present numerous examples of ideas and filters, which were kept for the next VCW stages.

Table 1: Example of Selected Ideas to Answer the Challenge (VCW Phase 3a)

Access to stock options or participations on company capital "be partner"
Add more plants / flowers
Add plant-based products/food to food offer (e.g. Soy milk)
Advance training programs (masters, MBA, Ph.D.)
All staff should have laptops
Allow for each employee to be informed of (approximately) how much profit one brings the company
Annual Christmas Party
Balance between professional- and personal life
BBQ during summer
Benefits (mobile phone, gas, etc)
Better and guided training
Better communication of Deimos' benefits (e.g. Flexible hours, teleworking, etc.)
Better management of Copa
Bonus based on performance
Busy indicator outside meeting rooms
Busy indicator outside restrooms
Car rent opportunities
Catering subsidized by the company
Centralized communication channels on confluence
Certificates paid by Deimos (e.g., PMI, PMP...)
Change of the offices to another part of town, and begin an open space office
Chill out areas
Chocolate should never run out
Clear career track opportunity
Clear sense of direction
Clear sense of purpose
Clear Strategy
Clearly map-out Career Ladders
Coaching
Co-creation workshops
Collaborators should not open main door to visitors, or answer phones
Communicate the company at schools
Communicate the purpose of the work, not in technical terms, but as a larger than life way.
Communication transparency
Competitive salary
Compliment more
Coupon / Benefits (Cars, Trips....)
Creative innovation ecosystem
Design talent management strategies
Develop team building activities for teams (not necessarily with all Deimos staff)
Diet foods
Directors should better protect the interests of its staff when negotiation/talking with Deimos Space and/or Elecnor
Ekstra bonus depending on career time at Deimos
Employee Quizzes Who's who
Empower the staff by formally delegating responsibilities
Encourage employees to recommend their peers
Encourage everyone to break routine
Encourage flexible working
Ensure that corporate tools (Jira, Confluence, etc) are not constantly down without prior notice.
Ensuring important and relevant knowledge reach all employees

- Flexibility
- Flexibility on work hours and places
- Flexible choice of Deimos' days (11 days)
- Forbid overtime
- Free accounts of spotify (e.g. spotify family)
- Free parking lot/spaces for collaborators than bring their cars
- Freedom to choose training
- Game Tournaments at office
- Gaming Console - xbox one (xxx) with FIFA (xxx)
- Get partnership with catering company to offer employees better prices
- Get partnership with different shops/ restaurants close to Deimos (and communicate to the employees)
- Get partnerships with companies for special promotions on travels, radial activities, etc.
- Give employees a voice through pulse surveys
- Have a secretary at the door
- Have frequent unit/division meetings
- Have yearly/semesterly BU-meeting to share results, objectives and give visibility to strategy. Also, to collect issues/complaints and work on mitigation strategies
- Health insurance
- Help for HR to ensure the motivation and engagement for the full staff
- Holidays' market (Sell/Buy)
- Home office opportunities
- Hours' Bank
- Improve corporate Communication
- Improve facilities of meeting rooms
- Improve leadership skills of team leaders and directors
- Improve office Feng-Shui
- Improve recognition of collaborators to ensure motivation and rewarded
- Improve salaries
- Improve sense of progress through -> i.e. training /mentorship programs
- Improve support services
- Improve the performance appraisal process (its structure and communication)
- Improve the way teams are managed
- Include change management tool when preparing for changes at the company
- Increase social events budget -> leading to more company events (not only Deimos anniversary and Christmas lunch)
- Innovative and interesting names for the roles of the employees
- Internal social platform to meet other colleagues
- International mobility
- Invest in your employees (and they will invest in you)
- Invite shareholder for yearly company debate
- Involvement in strategy -> inform with public announcement
- IPR sharing
- Leadership should be more actively concerned with the moral of Deimos' staff
- Learn how to give proper positive and negative feedback
- Learning programs
- Leisure space for coffee break/lunch time with balcony and comfortable furniture
- Less overtime
- Marketing for the company (advertise the company and why Deimos is a great place to work)
- Marketing the company at conferences
- Master students should have an access card to enter Deimos

- Mentoring programs
- More bananas
- More different Chocolate
- More diversified fruit
- More external training
- More LEGO Serious play
- More matlab licenses
- More matlab-pro licenses
- More MS-Visio licenses
- More salary transparency
- Musical activities
- Networking Events
- Offer formal training
- Open office in Coimbra
- Open space working environment
- One afternoon a month - inspirational talk with a guest
- Paint the meeting rooms
- Partnership with schools
- Partnering with companies for training
- Platform where employees can write their ideas, monthly challenges, get points and have a prize
- Pointers available in meeting room (all of them)
- Power Nap Infrastructure
- Proper instructions/guidelines for Timesheets
- Proper internal communication channels
- Proper SW for timesheets
- Proper SW for travels (ovs + bookng)
- Proper technical training
- Quiet silent concentration room (+1)
- Reduce working hours
- Reduce salary differences compared to DMS and other locations
- Reverse Mentoring
- Show results of working climate survey and mitigation strategies
- Social transportation pass paid by the company
- Systematic innovation process
- Take the performance appraisal process seriously
- Take things seriously at work
- Team dedicated to monitor if culture is respected
- Teleworking not pending on level
- Theme parties
- To have a meeting in the beginning of the project between everyone that will participate in the project and the head of division ***
- To have all employees more involved and aware of other projects
- Tours to different places
- Tracking device on LUGS during working hours
- Training on aerospace and theoretical concepts (related to projects) for increased engagement and motivation
- Transparency in working climate survey
- Transparency of benefits
- Transportation for employees from specific places
- Use idea wall for event or other ideas
- We should have Office 365
- Web-based SW + sensor for busy indicator outside meeting rooms
- Web-based SW + sensor for busy indicator outside restrooms
- Weekend “getaway” yearly or two a year
- Weekly breakfast with team
- Wii with Maro Kart
- Yammer (company Socialmedia), connect people and make people feel a connection.

Table 2: Example of Selected Filters to Select the Best Ideas (VCW Phase 3b)

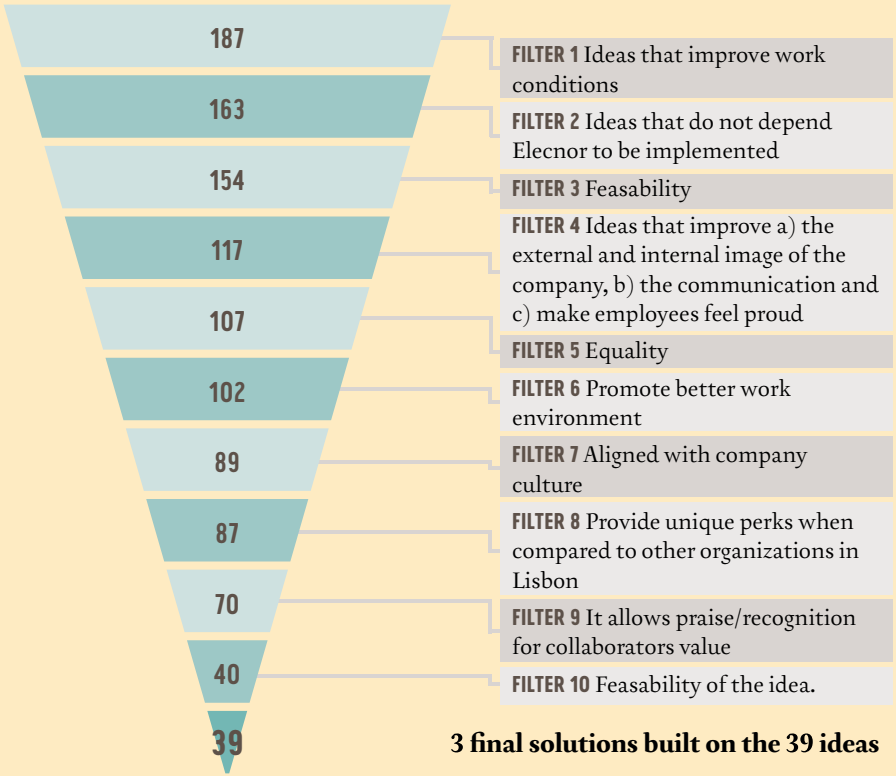
100% acceptance	Improves knowledge of the staff on the projects they are working on
Ability to free time for workers	Popular demand (Let people vote on the initiatives)
Adds social value	Provide unique perks when compared to other organizations in Lisbon
Cost to implement	Scalability
Cost/benefit ratio	Shareholder needs
Costs	Short term
DNA	Short/mid/long term goal
Does not diminish current productivity	Should not disturb workflow
Does not reduce company margins	Sustainable over time
Employee's consensus	Time (one pr. Month, e.g.)
Equality (Equal for everyone)	Time frame to implementation
Feasibility	Transversal to all company departments
Has measurable impact	Viability of the project
Ideas that contribute to increase in productivity	Work life balance
Ideas that improve work/life Balance	
Ideas that make everyone feel involved	
Improves communication between administration and staff	

Ensuring the support of the main stakeholders was a key to the success of the project. To ensure that the employees were deeply involved in the project, they were also included in the decision-making process. Thus, the VCW approach included the directors and collaborators alongside the KDM's in the ranking process of the filters. A total of 10 filters were selected and ranked from the most to the least important (VCW Phase 3c). This was a decisive step of the project, since the Directors and employees were given a key role to ensure that they had an impact on the changes that were about to happen.

Phase 4: Narrow

In this phase, the VCW applied the Value Creation Funnel (VCF). The VCF is made up of the filters which were selected and ranked through phase 3. The funnel aims to narrow the number of ideas/solutions to answer the challenge in a dynamic way. After this process, the remaining solution(s) will be drawn up as a concept and/or prototype as a solution to answer the original challenge(s). In this phase, the VCW consultant used the 10 selected filters to build a funnel for the remaining 187 ideas (See Exhibit 3: Value Creation Funnel).

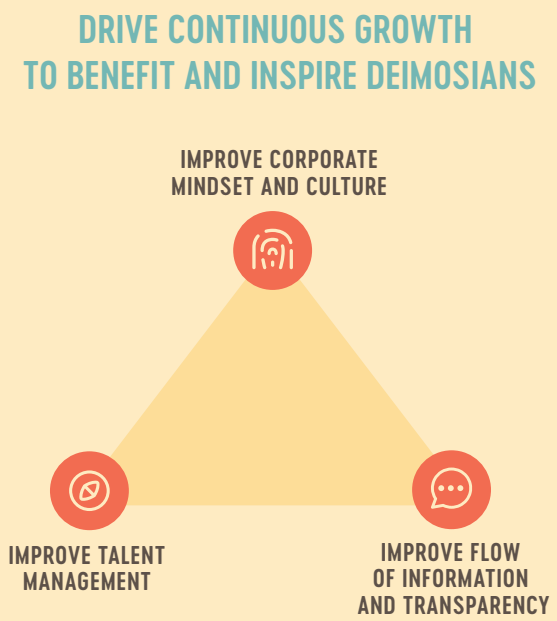
Exhibit 3: Value Creation Funnel



The 187 proposed solutions were narrowed down to 39 ideas that would improve the employee experience at Deimos. Instead of further narrowing those 39 ideas, the 39 ideas were clustered as the foundation for a full concept built on 3 pillars. The 3 pillars were supported by 3 solutions "Improve corporate mindset and culture", "Improve talent management" and "Improve flow of information and transparency". Each one of these solutions would result from a combination of different ideas, which previously emerged during the different VCW stages.

The VCW team proposed a package of different solutions supported by three main pillars (See Exhibit 4: The 3 Pillars).

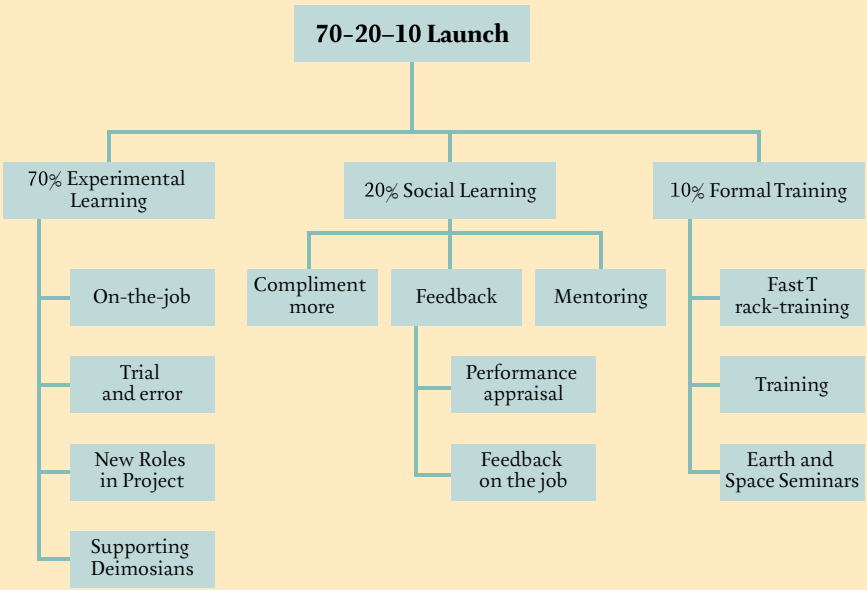
Exhibit 4: Concept: The 3 Pillars



The first pillar of solutions was to improve corporate culture and mindset. Deimos' corporate culture was thriving and was indeed one of the company's biggest strengths. However, there was room for improvement, namely when it comes to leadership and development of soft skills. Several leadership aspects are based on soft skills rather than hard skills. There is a misconception that engineers often lack soft skills; however, complex problem solving, critical thinking and creativity are all soft skills, which can be paramount to complement the variety of hard skills used in an engineer's line of work. These are three examples of soft skills that engineers often develop and master through their line of work and education. However, other soft skills are also important for leaders, such as communication or emotional intelligence, which very often are taught on management or human-related studies. In the idea generation phase two "solutions" surfaced; "Collaborators need to feel empathy from leaders", "Collaborators needs to feel significant/relevant". The quotes did not suggest that these soft skills are missing, but rather that there is room for improvement. Therefore, it was suggested that the leaders took specific training on soft skills to develop and improve these, and then further develop them through their daily work by using them when applicable.

The second proposed pillar of solutions is to improve talent management. The talent management pillar was built on the desire for development and recognition of the collaborators, but also touch upon the idea of creating a culture of collaboration. Throughout the interviews and the Lego Serious Play workshops it was revealed that collaborators' desire to develop was halted by a lack of talent management measures. Employees would struggle for more training, or not having the time to support each other in their development. It was necessary that leaders support employees' development more often through mentoring, feedback, and recognition. This would help improve talent management and the overall employee experience at Deimos. In order to be able to create a full talent management approach for Deimos as well as ensuring that collaborators development would not stagnate, a 70-20-10 model was created, which has been adapted to Deimos to support the development and recognition of collaborators. This iteration is called 70-20-10 Launch! inspired by Deimos's activities regarding space. (See Exhibit 5: 70-20-10 Launch!)

Exhibit 5: 70-20-10 Launch!



Furthermore, the 70-20-10 Launch can be adapted to the individual collaborators and their needs and in the future for change in paradigms. For example, nowadays more junior people may need more social learning and formal training to best ensure their development; whereas more senior collaborators may see more development from a higher allocation to experimental learning, and leaders may need to focus more on the social learning to develop their soft skills further. In the long-term, this paradigm might change, and the model gives the flexibility to do so.

The third pillar of solutions was to improve information flow and transparency. Although implementing these initiatives requires a limited budget, it does require 20% of the HRM manager time. Furthermore, it requires 10% of one of the IT employee's time to transfer the current IT-page and Ticket system to Confluence and JIRA platforms. It requires an hour of the project managers' time to create the project and may require extra time when certain updates are made to specific projects. Lastly, the Annual General meeting requires at least

one day of preparation for the presenters, as well as the manpower of everyone attending the meeting.

Phase 5: Act

During the final VCW phase, Consolidate Value, KDMs had to decide upon the implementation model and on whether to "Go", "No-Go" or "Go-Back". Marques knew that change was inevitable to address the challenge ahead. She had therefore often been thinking of what was most important to change and how to drive the desired change. The overload at Deimos did not leave much time for Deimos' leaders to help her drive change. However, she knew that one of the most common threats in change management is not driving change as a leader. But also, that the lack of soft skills, especially poor communication as well as insufficient leadership and support often have been highlighted as one of the main reasons that changes fail to have an impact. Marques knew that it was important for everyone to understand what the changes would be, why they were happening and how it would affect collaborators, directors, and the company. It was clear that the project needed to transparent for everyone from the start and that once the project was developed it would needed to be presented in detail, namely regarding what the change had to be and how it would affect collaborators, directors and the company.

Preparing for change

A last meeting was scheduled with the Deimos' KDMs who were very interested in the outcome of the project. The directors were very happy with the results. According to Nuno Ávila, Country Manager of Deimos Engineering, who was highly involved in this and three other VCW projects,

> *"VCW is a very sound methodology for dealing with issues that are sometimes not sufficiently structured. A great VCW end-result is that it provides a very solid foundation for building and promoting the solutions that come out of it. It has a great advantage of involving a large number of stakeholders in a natural way, without creating chaos in the process, because they participate in the formulation of ideas, in the formulation of the filters, and it incorporates their inputs in a transparent and rational way, until we reach outputs which*

have their contribution. The VCW process is very democratic. (...) We are taking rational options which are completely agnostic to hierarchical positions, positions of influence, and preconceptions. We can come up with solutions that are real. Everyone accepts them because they have been engaged in a very balanced process. At the time of implementation, the VCW makes the supported solutions very robust. (...) We have every interest in continuing to use the VCW."

As such, demonstrated its commitment in improving job satisfaction through the employee experience. Following the meeting with the board of directors in Lisbon, the VCW consultant and Fonseca were invited for a presentation to the Deimos' group headquarters in Madrid. Similarly, the board expressed were happy with the results and expressed interest in hearing more details about the project as well as about the concept from Tânia Marques, HRM Manager of Deimos Engineering, who was highly involved in this project. According to Marques:

"The VCW value comes from the reasoning; now we have great arguments to support our recruiting decision."

Now, Marques had in her hands an implementation plan for the VCW project to improve the employee experience at Deimos. Where to start? How to prioritize? Which measures could be quick wins? Marques knew the implementation would not only depend on her. Should Marques drive the implementation of this project through or should she delay it for further thought and/or development?

Bibliography

Fonseca, Vânia; Lages, Luis Filipe; Kim, Philip H. (2018), "Deimos: Expanding to a New Market Using the Value Creation Wheel", Case BAB370-PDF-ENG, Harvard Business Publishing.

Lages, Luis Filipe (2015), "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", Journal of Business Research, 69(11): pp. 4849-4855.

Lages, Luis Filipe et al. (2023). Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions. In Electronic Commerce Research. Springer, Cham. Forthcoming.

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Creation Wheel: A Framework

for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279.

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem--solving, and lean", Strategic Change, 29(2), 195-213.

Piercy, Sally (2019), https://www.forbes.com/sites/sallypercy/2019/03/13/why-do-change-programs-fail/?sf212739481=1&fbclid=IwAR2yoBr5s0UwvnLkMiBGwFzUX9aZe-SsHhnT5uzYDByn7C6NwyH5ysz0Pbk#191e93952e48

A COLLECTION OF CASE-STUDIES ABOUT NEXTOCEAN

CHAPTER 3

Edited by Luis Filipe Lages and Peter Toh

Introduction

Project Overview

NEXTOCEAN AIMS at developing (co-designing) 6 commercially-oriented, operational Earth Observation-based services for the public and private sectors in sustainable fisheries and aquaculture under a common service delivery platform leveraging on Copernicus and GEOSS data and resources, complemented by other EO and in-situ data streams. It envisages delivering economic, social, and policy value to European citizens by developing a new market of products and services, targeting 1) fisheries authorities wishing to have improved control over marine resources; 2) responsible fishing companies willing to certify their compliance to sustainability by ecolabeling fish provenance; 3) the fast-growing aquaculture industry, for assessing their risks and potential revenues; and 4) aquaculture regulators in understanding the impact of fish farms, in order to decide based on bespoke scientific solutions.

It builds on past activities, proposing an integrated solution and the services will address 4 User Scenarios: Monitoring Fishing Activities and Impact; Minimization of Bycatch and Ecolabeling; Monitoring Aquaculture Impacts; and New Fish Farms. The involvement of potential clients is done progressively, with an initial group of Alpha Users already engaged, supporting co-design of solutions. The buyers' group is then enlarged to a wider group of Beta testers and potential clients, who will define further developments and the path to integration into their decision-making processes. NextOcean will define clear KPIs and success criteria for the services, including the integration in the value chain. Dedicated workshops and training sessions will be held with the larger community, where the services will be advertised, explained, and assessed considering the interests and knowledge of the communities.

Table 1: Project information

GENERAL INFORMATION	
Project Title	NextOcean - Next Generation Fishing and Aquaculture services
Starting Date	1st May 2021
Duration in Months	36
Call (part) Identifier	Greening the economy in line with the Sustainable Development Goals (SDGs) (H2020-SC5-2018-2019-2020)
Topic	SC5-16-2019 Development of commercial activities and services through the use of GEOSS and Copernicus data
Fixed EC Keywords	Visual analytics | Intelligent data understanding | Earth Observation | Services and applications | Space data exploitation | Data mining and searching techniques | Downstream industry | Big Data Challenges | EO Big Data | Fisheries | Aquaculture

This project has received funding from the European Union's Horizon 2020 Research and Innovation framework programme under grant agreement No 101004362.

Scope

The fishing and aquaculture sectors need to address several challenges when facing increasing technological developments, market demand, competition, and changing climate conditions. One emerging practice to address these challenges is the use of satellite technology. In Europe, the Copernicus program allows free access to satellite images. NextOcean, an expert consortium of eleven institutions, uses these data to provide several services that bring innovation to the fishing and aquaculture sectors and address sustainable development goals.

NextOcean aims to co-design services with Users, considering their needs for new or improved EO-based services. These users are representative of the target markets and will help us to validate NextOcean sales potential.

This chapter describes the market assessment, identification of applications, benefits and target markets, competitor analysis and identification of geographic markets. Once NextOcean co-design is concluded and NextOcean has mature services and a solid online store, the first sales will emerge via alpha and beta users. After these initial sales, a natural question will emerge: Now that NextOcean has proven its sales potential, which geographical markets are the most attractive to find new buyers? This is the main focus of this case-study.

Some of the sections listed above are supported by primary and secondary data collected via two different sources:

- Ten co-creation workshops of 3 hours were conducted at Nova SBE over a period of four months. These workshops had 8 teams (a total of 35 participants) from different backgrounds and nationalities.
- A survey of NextOcean partners to capture the demands and expectations of the alpha users and the intentions of the service providers in the context of EO applications, benefits and target markets for fisheries and aquaculture.
- An in-depth qualitative analysis of 153 sites in the field of Earth Observation.
- An additional more targeted qualitative analysis of NextOcean competitor companies.

Background

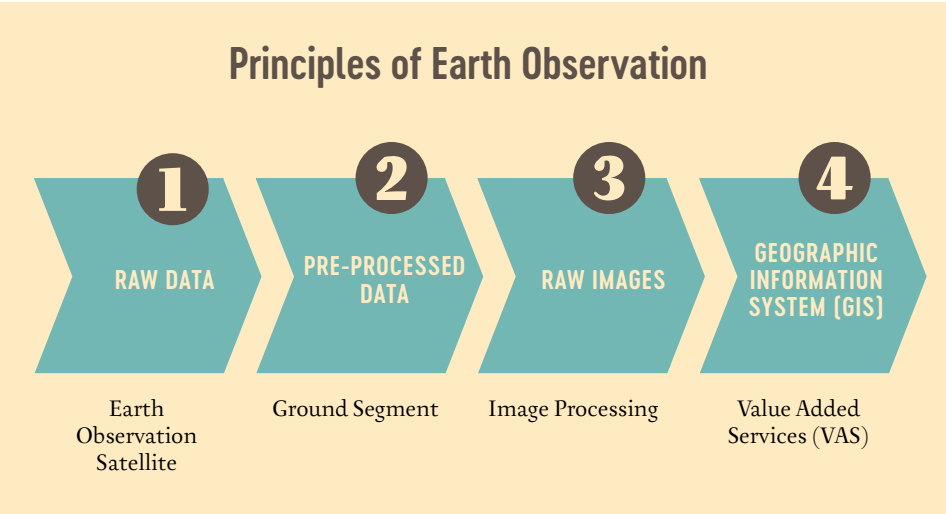
EO Industry

ACCORDING to the European Commission (2019), Earth Observation (EO) refers to the application of remote sensing technologies to monitor land, marine (oceans, rivers, lakes), and atmosphere. Satellite-based EO relies on satellite positioned payloads to gather imaging data about the Earth's properties. The images are then processed and examined to obtain different information types to assist an extensive range of applications and industries.

In 2017 the global EO market was between EUR 9.6 and 9.8 billion, distributed between EO satellite sales (the upstream section of the supply chain) and the EO data procurement, processing, and transformation into information products for end-users (the downstream area). The global market is principally driven by upstream demand, which constitutes about 70% of the total revenues. The global EO downstream market is estimated to be between EUR 2.6 and 2.8 billion, mainly driven by governmental applications representing between 50% and 60% of the revenues (European Commission, 2019). The downstream market exhibits constant growth at an anticipated CAGR of seven percent until 2022.

The EO downstream business is experiencing strong trends like changes in business models towards near-real-time applications, more and more integrated solutions, cloud computing, and computer science to enhance analytics' value. EO 2.0 players are joining the market with innovative models. These stakeholders, vertically integrated, have in-house capabilities to manufacture satellites, handle the information, and develop and offer services (European Commission, 2019).

Figure 1. Principles of Earth Observation (European Commission, 2019).



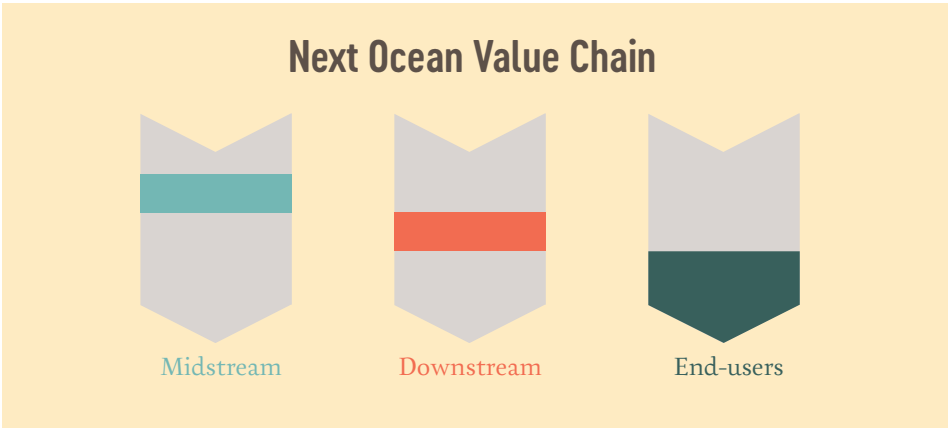
The term "value chain" is associated with a set of interdependent economic activities creating added value around a product, process, or service and a group of interlinked economic actors, operating in a strategic network across firms of different sizes, sectors, and borders. To better understand the Value Chain in which NextOcean operates, the Earth Observation (EO) market was divided into three categories of EO industry players plus the final EO end-users:

- EO Upstream Industry - simply composed of satellite data, providing the infrastructure and input for any services.
- EO Midstream Industry - EO experts or intermediary users gathering, storing, and processing EO data, partly already creating value-added services (VAS).
- EO Downstream Industry - service providers or consultants that create VAS from EO-based data (data transformation) advises the end-users on EO-based products for their business addressing their tailored needs.
- EO End-Users in Fishing/Aquaculture.

EO end-users include all businesses and institutional players (e.g., large companies with R&D capabilities, interface associations, public entities) for which EO-derived products are input, but whose core activity is not centered

on EO. Thus, they typically rely on experts to access relevant input information and products (European Commission, 2019). Figure 2 below shows the three main categories which are the focus of the EO NextOcean Value Chain.

Figure 2. NextOcean Value Chain



NextOcean has no partners associated with Upstream Industry. However, satellite and in-situ data providers are clearly crucial elements in the value created by NextOcean since they form the basis upon which the analysis and insight tools can be built.

Table 2 below presents the NextOcean partners and their place within the EO Value Chain (EO Midstream, EO Downstream, and End-Users):

Table 2. NextOcean Partners present in the NextOcean Value Chain

EO MIDSTREAM INDUSTRY	EO DOWNSTREAM INDUSTRY (WITH EO KNOW-HOW)	END-USERS (WITHOUT EO KNOW-HOW)
DEIMOS	IPMA- Instituto Portugues do Mar e da Atmosfera	Integrated Information Systems (i2S)
PML- Plymouth Marine Laboratory Limited	AIR Centre- Atlantic International Research Centre	Direção Regional das Pescas, Governo dos Açores (DRPA)
CLS- Collecte Localisation Satellites	Sintef Ocean AS	
	Sintef Nord AS	

The midstream and downstream organizations add value by processing the EO data and applying their expertise and knowledge to develop new capabilities in niche markets with specific needs. They are able to blend multiple data sources to derive measures and indicators that support decision making by the end users. In turn, the end users will generate value by optimizing decisions or taking action quicker.

In addition, Nova will support the value chain in different dimensions, namely by implementing the go-to-market, sales and sustainability strategies which will cross the different levels of the value chain. Terradue will define the service requirements and will contribute to developing EO services.

EO Competitive analysis: Porter's 5 Forces

A PORTER'S FIVE FORCES analysis was conducted for a better understanding of the market.

Competitive Rivalry: High

We consider the intensity of rivalry is high due to existing global and local players. For example, the European Association of Remote Sensing has a database of up to 713 companies participating in their 2021 survey about EO services. Even though 92% of those have less than 50 employees and 65% have no more than ten employees, the survey's growth rate revealed an increase of 24% over the last 12 months (EARSC, 2021). Overall, the EO industry is composed of relatively small and equally balanced companies, which represents a source of intense rivalry between competitors. There are also high similarities in the services offered by the different companies, which intensifies the rivalry among competitors. Additionally, the fact that there is demand from commercial entities and governmental bodies with divergent goals causes the market to constantly search for lower prices and better products, intensifying competition within the industry.

Threat of New Entrants: Medium

Within the EO market, the threat of new entrants is considered medium. The demand for EO solutions is increasing across various industries and so do private and public investments (Arthur D Little, 2021). The global EO market will grow from $4.6 billion in 2019 to $8 billion by 2029. For instance, in 2019, a fundraising record of more than $800 million was issued (Euroconsult, 2021). New entrants will likely follow.

The investments required to start a new midstream or downstream service provider are relatively low compared to the upstream industry. Nevertheless, it requires time, qualified human resources, and R&D costs for developing EO technologies. Additionally, product differentiation represents a barrier to entry for new players. The service provided is very similar to existing competitors and differentiation is difficult to achieve. On the other hand, knowledge is essential in the EO market having a significant impact on the development of midstream and downstream services. Overall, there are several barriers to entry on the EO market, but this is an attractive industry. It has high growth, there is a "low-cost entry strategy", and there is significant EU funding to the space sector. Overall, the threat of new entrants is medium.

Threat of Substitutes: Medium

Due to already existing complements to satellites (e.g., in-situ sensors, UAVs, and drones), threats of substitutes are evaluated medium in the EO market (Mapa Gobernio Espanol, 2019; Commercial UAV News, 2018). For example, Drones and UAVs usually have in situ payload consisting of sensors for ozone greenhouse gases and tracers with a spectrum of atmospheric lifetimes (Montgomery, 2020). The drone industry is overgrowing, representing a cheaper alternative for the customer. Currently, drones and other technologies only partially complement satellite data since they cannot collect images on a large scale, where satellites have the superior advantage. Nevertheless, satellite monitoring cannot yet be replaced entirely. Therefore, the threat of substitutes can be classified as a medium level.

Bargaining Power of Buyers: High

The buyer's bargaining power is considered high. According to Euroconsult (2021), the maritime market is still in an early stage. Government agencies are often the dominant buyers in numerous EO projects based on environmental problems and this can result in putting pressure for lower prices for EO services. Moreover, free EO data might be used by the end-user service industry, which places companies in a weak bargaining position. The existence of free satellite data and the similarity of services between competitors can increase the bargaining power of buyers and decrease the switching costs between services.

Bargaining Power of Suppliers: Low

The supplier's bargaining power is regarded at a low level. Many players started implementing a vertical integration strategy due to manufacturers' scale and low-cost solutions (Arthur D Little, 2021). Further, there is currently a new trend within the commercial satellites market, using rather large numbers of smaller and lighter satellites, significantly increasing the number of EO data suppliers (European Commission Services, 2020). The midstream supplier industry is also relatively concentrated as certain data types can only be obtained from a few suppliers. Although free data made available by the Copernicus program could potentially be an asset for companies in the midstream and downstream industry, this is reducing the bargaining power of suppliers. Also, the switching costs between different EO data providers are relatively low. Overall, the bargaining position of the suppliers is low.

EO in Coastal, Marine Exploitation and Preservation

Market Needs and Trends

There is a broad range of potential applications of EO data in the coastal and marine context, but it is important to understand and predict the market needs and seek to satisfy growing demand for EO services. It is anticipated that the majority of end users will come from the public sector, but as noted in the Copernicus Market Report (2019), there should be growth from the private

sector since there are "more and more public-private interactions on marine and maritime activities". Another key trend is the increasing focus on climate change and the impact on oceans and coastlines. This should result in growing demand for information in this domain. Indeed, the number of users of Copernicus Marine Environment Monitoring Service (CMEMS) tripled in the two years to 2018 (c.f Copernicus Market Report, 2019).

According to the European Association of Remote Sensing Companies (EARSC) 2017 industry survey, the ocean and marine sector accounted for 20% of sales. This appears to have reduced to below 10% in the 2021 industry survey, but this may be due in part to the bias in survey responses from larger organizations that focus on defense and security, the largest market sector.

Market Challenges

The market for EO services in the field of coastal and marine exploitation and preservation has a broad range of potential applications across a wide user audience. Demand for services may be as diverse as optimal ship navigation, climate change impact on coastal areas, site selection for aquaculture and regulation of fishing activity. Each of these different use cases would require different input data, different models and different forms of output. The challenge is therefore to try to cater for several niche markets within one single NextOcean platform. It may not be easy to quickly scale up the product offering because each product or service is quite unique.

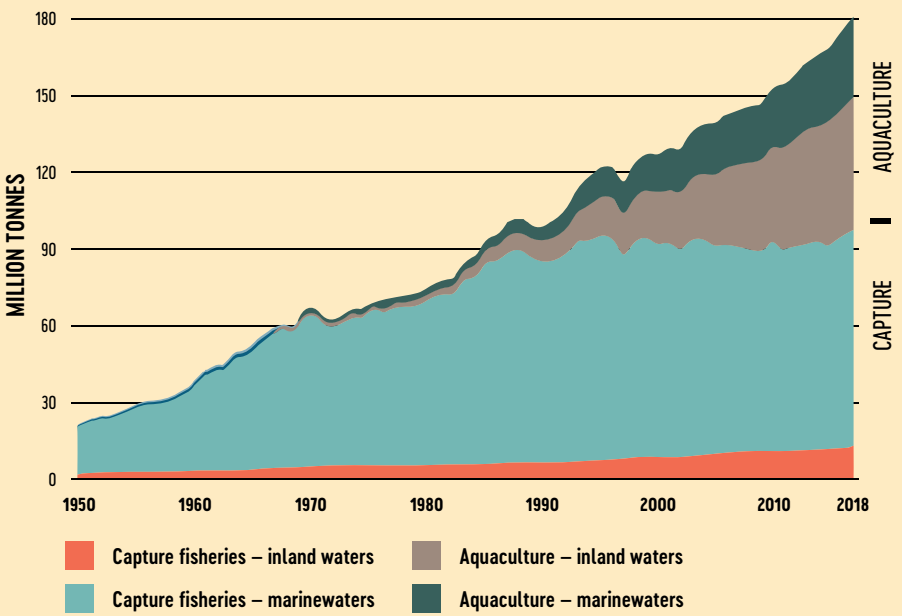
An additional challenge is the sheer volume of data required to successfully build these many different models, using long time series, real-time measurements and forecasts as well as combining different types of EO and in-situ data (c.f Copernicus Market Report, 2019). There may also be access issues retrieving large amounts of data from Copernicus, while for some applications the available resolution may not be sufficient. Such technical challenges, however, should be resolved in the future.

EO in Fishing and Aquaculture

Market Diagnosis

According to FAO (2021) data, both the fisheries and aquaculture sectors are major sources of employment. In 2018, approximately 60 million people were employed in these sectors, about 20.5 million people in aquaculture and 39 million in fisheries. The total fish production (both inland and marine waters) corresponds approximately to 54% from capture fisheries and 46% from aquaculture. As seen in Figure 3, global fish production in 2018 is estimated to have reached 179 million tons, with a record of 96.4 million tons coming from fisheries and 82.1 million tons from aquaculture (FAO, 2021). In simple terms, the global production of fish and seafood has quadrupled over the past 50 years due to the doubling of the world population but also because people are eating twice as much now (Ritchie & Roser, 2019).

Figure 3: World Capture Fisheries and Aquaculture Production, excluding aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants (source: FAO, 2020a).



In 2018, while about 88% of the global fish production was used for direct human consumption, 12% was used for non-food purposes, mainly to produce fishmeal and fish oil for the aquaculture industry. While capture fisheries have always been responsible for the majority of total global fish production, since 2016 aquaculture has become the main source of fish available for human consumption, with a share of 52% in 2018. Growth in the amount of fish produced from aquaculture has been 5.7 percent annually since the mid-1990s whereas wild sources have actually declined by about 0.6 percent over the same period (McKinsey 2019). This occurred because of depleting fish stocks but also because aquaculture has been expanding fish availability to regions with limited access to the cultured species, often at cheaper prices (FAO 2020a). It should be noted, however, that the majority of aquaculture occurs inland. Therefore, in the marine context, capture fisheries remain by far the biggest source of fish production.

On the supply side of the market, the fishing, aquaculture and marine ecosystem domains are well established target industries for the application of EO data. Copernicus provides a lot of relevant information within its CMEMS products and Sentinel-1, Sentinel-2 and Sentinel-3 data. There is a good provision of continuous near real time data which is particularly useful. End users are also aware of the reliability of Copernicus data and therefore have trust in its products (PwC, 2019).

Fishing industry

According to WWF (2020), 3 billion of the world population depends on fish as their primary source of protein. A single European consumes approximately 20 kilograms of fish products per year, making the EU fishing industry the fourth largest in the world (ESA, 2013). Nevertheless, humans are taking far more fish from the ocean than the oceans can naturally replace (Savitz 2013). Demand for fish consumption has been significantly growing since the 1980s and marine species have decreased by approximately 40%. This is induced by the world population growth which is increasing and will reach 11 billion by the end of the century and will ask for an additional 85 million tons to meet demand, in the next 35 years, which is 1,5 times as much as what humans catch globally out of our oceans (Allied Market Research, 2017).

The fishing industry has a significant impact in most country's economies and consequently their GDP. The top 7 major producers of marine capture

production account for approximately 50% of the global production. The main exporter countries are China, Norway, Vietnam, and India, whereas the main importer countries are in the European Union. Overall, 120.4 million workers are in this sector, from which 94% of them operate in small-scale fishermen (FAO, 2022).

The fishing industry has been facing various problems. Of the 600 marine fish stocks monitored by FAO, 76% of fish stocks are overexploited, fully exploited, or depleted (FAO 2021a). There is an urgent market need for monitoring fishing activities and analysing their impact on society and the environment since unsustainable fishing activities are threatening fish populations, destroying underwater ecosystems, and causing the unfair distribution of fish as a food source. Illegal and unregulated fishing constitutes 12-28% of the total fishing activities (Wong, 2020). It is urgent to change the ocean´s overexploitation, improve transparency and accountability in fishing activities, protect biodiversity, and have a perfect coexistence between fishing resources and economic fishing activities. EO services supporting the fishing industry, public authorities, and governmental agencies in charge of maritime management, will provide the opportunity to boost the sustainable development of the fishing methods by preserving maritime areas and diffusing clear guidelines. NextOcean's Fisheries Monitoring and Surveillance (FMS) service will address the urgent market need for controlling Illegal, Unreported and Unregulated (IUU) fishing, while conservation efforts may be aided by NextOcean's Characterization of Fishing Areas (CFA).

EO solutions are increasingly involving the use of advanced analytics and artificial intelligence to process very large amounts of data and automatically derive inferences and critical insights that were not previously possible. McKinsey (2019) claim that these tools and technologies can lead to 'precision fishing' which could optimize the operations of large-scale fishing companies, cutting costs and growing profits. However, while fishing industry profits may grow by as much as $53 billion by 2050, such optimised fishing management can also increase total fish biomass to at least twice the 2016 level, reversing the alarming decline in global fish stocks that would happen without major change. This might sound like a dream scenario but with access to new information and insights, major change can happen. The fishing industry can become more efficient and responsible, while regulators can better monitor and enforce their rules. From the regulatory perspective, combining catch data with insights into fishing activities in near real-time could enable quicker response measures such as dynamic fishing quotas or adapting to external pres-

sures such as climate change (McKinsey, 2019). NextOcean's CFA service offers a precision fishing solution and will help minimise bycatch, while Fish Provenance and Ecolabelling (FPE) will provide information on aggregated potential fishing effort (highlighting areas of intensive fishing), thereby helping to address these critical issues facing the global fishing industry.

A major initiative designed to support fisheries management is product ecolabelling. According to the UN Food and Agriculture Organization (FAO, 2001), "the principal objective of an ecolabelling scheme is to create a market-based incentive for better management of fisheries by creating consumer demand for seafood products from well-managed stocks". Given the increasing magnitude of publicity about fish stock depletion and the challenge of sustainable fishing, the general public now have a greater awareness of the problem and may be willing to pay more for a certified product. For example, a recent study in Italy found that consumers' willingness to pay could increase 16-24 percent for ecolabelled products (Vitale et al, 2020). Consumers have a growing interest in the quality, traceability, and sustainability of food products due to health and environmental concerns (McKinsey, 2019). Private companies who are interested in ecolabelling and sustainable practices in their value chain, as well as non-profit certification organizations, might benefit from EO solutions such as NextOcean's FPE service, which uses EO data to help verify the origin of catches.

Overall, it is critical to develop EO solutions that might solve the market pains of private companies, governments, authorities, R&D organizations, and international associations. Some obvious market pains include for example monitoring fishing activities, combating illegal fishing, and promoting sustainable fishing. Through the usage of accurate data and imagery, it becomes possible to act upon existing threats in the industry. More importantly, there exists a significant opportunity for organizations and countries to align the environmental and economic needs using data provided by EO tools. This way, to maintain a healthy ocean ecosystem the desired results can be achieved in a more efficient and optimised way, leading to an increase in production and profit, while ensuring long-term species protection, by capturing the right species at the right time while protecting others.

Aquaculture industry

The aquaculture industry has been enjoying a long period of growth and has become a critically important sector for three key reasons; supply and demand for seafood, and economic value. First, as mentioned above, global fish stocks were being fully or overexploited, resulting in the loss of biodiversity and other ecological functions, and aquaculture grew as an alternative for fish production. Aquaculture now represents a very large percentage of the total fish used for human consumption, representing over 600 species produced in 2018 (FAO, 2020b) and 46 % of the total production of fish (FAO, 2022). Second, since the world population is growing, there is a growing demand for seafood. Seafood offers a rich source of protein and offers a nutritious diet (Boivin et al., 2005). Due to the increased demand for fish in recent decades, sustainable fish stocks declined from around 90% in the 1970s to 66% in 2017 (FAO, 2022). This led to the creation of major opportunities for aquaculture production. Finally, the aquaculture industry has a significant impact on many country's economies and consequently their GDP. The value of fish sourced from aquaculture is above 250 billion US dollars annually (McKinsey, 2019). In 2015, the world had produced 106M metric tons of cultured fish (World Bank, 2021). The top seven producing countries are all Asian: China, Indonesia, India, Vietnam, Bangladesh, and the Philippines. The first European country is Norway, which appears in eighth place after Egypt, with a total of 1,4M metric tons (World Bank, 2021). Norway is a major producer of salmon and rainbow trout. After Norway, the European countries producing the most aquaculture products between 2000 and 2018 and their principal species farmed are: Spain (mussels), France (shellfish), Turkey (rainbow trout, seabass and seabream), United Kingdom (Scottish salmon), Italy (shellfish), Russia (salmon and trout), Greece (seabass and seabream), Faroe Islands (salmon) and Netherlands (mussels) (FAO, 2020b).

Despite its positive impact, aquaculture farms that are not being managed sustainably impose serious negative externalities on the fish that are farmed and pollution of surrounding ecosystems. Many coastal areas have been affected by the growth of aquaculture. These impacts might be caused by chemicals such as nitrogen, phosphorus, as well as antibiotics, pesticides, uneaten food, faeces, and dead fish (Bourne 2021). In addition, there are concerns and opposition due to sea lice infestations and competition for coastal space with tourism and fishing (FAO, 2020b). This has led to an increasing trend for offshore or open ocean aquaculture sites. However, placing facilities

in more exposed locations increases the risk of storm damage and loss of infrastructure. NextOcean's Monitoring Aquaculture Structures service can help aquaculture companies manage this risk and recover lost materials. The FAO also notes the challenges of allocating licences where there is competition for space in coastal areas, which limits growth of the aquaculture industry. The problem is compounded by inadequate national policies and licensing processes. The European Aquaculture Technology and Innovation Platform (EATIP) proposes an evidence-based approach to licensing. NextOcean's Monitoring Aquaculture Structures service may help in this context by verifying information about existing farms, while both Fish Farm Impacts and Site Risk Assessment products may offer valuable data to identify risks when considering the siting of new farms. Therefore, unique data generated by EO might be used to optimise aquacultural impacts. Public authorities and governments might benefit from EO solutions to promote more sustainable aquaculture, conduct risk assessments, promote sustainable open water fish farming, cleaner waters, and healthier fish. Similarly, aquaculture firms might use EO services to analyse the suitability of specific areas for aquaculture activities and monitoring of their existing ones, produce healthier fish and optimise production.

In the aquaculture industry there are numerous downstream value-added service providers who may be consultancies or developers of software and management tools. These companies exist to support and optimise the complex operations of a fish farm, by using data and advanced analytics to monitor for threats and assist with decision making. The continued growth of the aquaculture industry is expected to lead to a growth in demand for management solutions. This may be compounded by greater regulation from authorities and greater external risks such as climate change, whereby increasing water temperatures can lead to more pathogen activity and increased harmful algal and jellyfish blooms (EY, 2021). Consequently, these value-added service providers are likely to be demanding a wider range of solutions including innovative ones, as well as cost-effective data feeds that can contribute to their models and tools. NextOcean will be well placed to serve this need. Finally, universities and research organizations in need of information on aquaculture for educational purposes and research can also benefit from these services.

NextOcean Applications, Benefits, and Targets

IN THIS SECTION, we analyse NextOcean applications, benefits and targets. An application is the "what", the description of a product/service (e.g. "mapping of marine protected areas"). A benefit is the "why" i.e. the explanation of why a product/service is useful (e.g. "saves fuel"). The target market identifies the "who", i.e. the market segment that we aim to address. These are the three critical components of where NextOcean will position itself in the market for EO services in fishing and aquaculture. What will NextOcean offer? Why will people buy it? Who will be the customers of NextOcean?

Before answering these questions, however, it is important to assess the broadest range of answers to these questions so that we can validate whether the NextOcean Business Plan is compatible with the whole market assessment. For example, we must consider whether NextOcean will be addressing market needs or simply creating products because of novel technology and research interest. In other words, will NextOcean be market-pull or tech-push?

PwC's 2019 Copernicus Market Report (page 75) outlines several applications and benefits from employing EO in the broader context of coastal and marine exploitation and preservation. In addition to these lists, Nova's market research identified others of interest and relevance, which were also combined with those identified by project partners for NextOcean services, thereby creating a more comprehensive list. Since NextOcean is specifically focused on fishery and aquaculture, we surveyed the different partners to better understand which applications, benefits, and targets NextOcean should address within the broader coastal and marine context.

In the following sections, we asked our partners (service providers and alpha users) to identify expected applications and benefits. This analysis helped us to identify what the alpha users expect to be offered and what the service providers are intending to offer, hence making the bridge between tech-push (service provider) and market-pull (user) orientations.

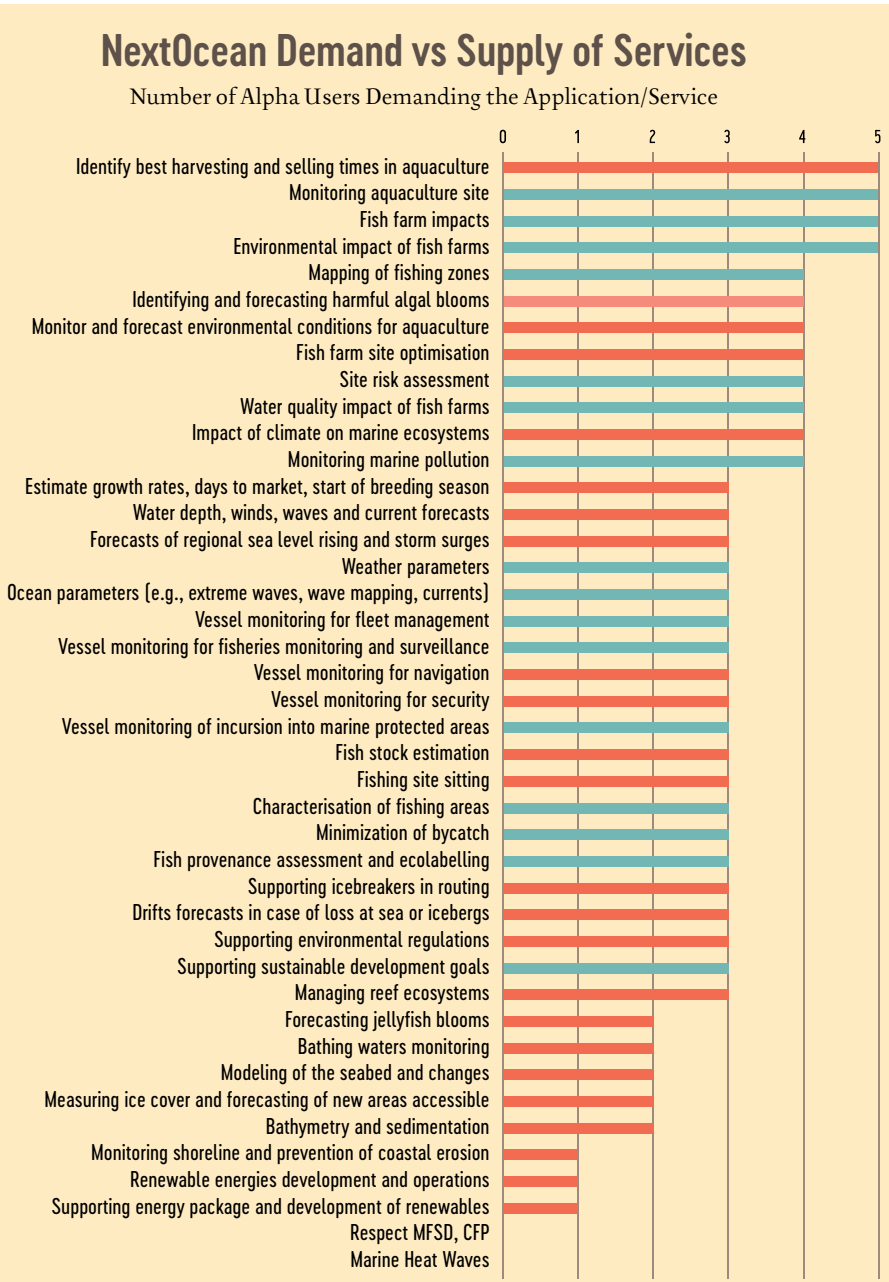
Overall, this diagnostic allowed us to set the boundaries for the NextOcean project, regarding its applications, benefits, and targets.

Applications

In the following pages we present the results of the survey on EO applications that could be offered in the coastal and maritime fields. Alpha users were asked to identify applications that NextOcean should be offering, representing demand from the user community, while service providers were asked to note which ones were going to be offered by their organization as part of the project, representing supply from the providers selling their services. This therefore enabled the analysis of demand against supply among the consortium members, which offers an interesting assessment of how well market needs will be met.

The chart in Figure 4 shows the list of potential applications with the length of the bars illustrating the amount of alpha user demand for them. The colours indicate whether or not NextOcean service providers intend to offer that application, with blue bars meaning that they do, red bars meaning that they don't and orange bars meaning that they might. Bearing in mind that it is not feasible to expect a large number of these applications to be addressed by this one project, the outcome is reassuring because several of the most popular applications will indeed be addressed by NextOcean. There appears to be interest and demand from the alpha users for the NextOcean services.

Figure 4: Demand vs Supply of NextOcean Services



There are, however, some notable exceptions to this broad conclusion. One of the top applications, identifying the best harvesting and selling times in aquaculture, is not planned for inclusion among the initial services developed during the project. When this was raised in a Business and Innovation Ecosystem meeting, the explanation was that this is a step beyond the scope of the project, since it would require a customized solution involving in-situ data measurements taken at the client's site. There are several aquaculture consultancy companies offering this type of service, which does not fit well with the NextOcean business model of focusing on standardised automated solutions that can be sold online with limited human involvement. A similar explanation also applied to fish farm site optimization and monitoring and forecast environmental conditions for aquaculture.

The extent to which in-situ data should be included within NextOcean products and services was debated between partners on a few occasions. Whilst it was acknowledged that in-situ data was formally part of the scope of the project and to many is part of the definition of 'Earth Observation', the concern was also voiced that some of the consortium participants are experts in satellite data, not in-situ data. If the project incorporated large amounts or particular forms of in-situ data, it would require significant resources that were not foreseen at the project proposal stage and there is simply not the capacity to research and develop new in-situ solutions. The conclusion of these discussions was that in-situ data should be included within the project where feasible, in other words, where it is readily available, without resource or cost impediments. There are two ways that in-situ data can be included; first, by supplementing satellite data with in-situ data to improve the quality, accuracy, or richness of the output, and second, by offering in-situ data as a standalone data service. Examples of the latter could be weather or ocean parameters, both of which were mentioned for possible inclusion within the project.

Another of the more popular applications, *identifying and forecasting harmful algal blooms (HABs)*, was another topic discussed between consortium members because it is debatable whether HABs can be accurately identified and forecast using satellite data alone. The service provider responsible for the Site Risk Assessment (SRA) service, CLS, decided to focus on developing monitoring of marine heat waves instead. As the chart shows, there were no alpha users declaring an interest in marine heat waves as a result of the survey, but this is in contrast to positive feedback from end users participating in the co-design workshop in January 2022. It can certainly be concluded that demand for HAB detection is higher than for marine heat waves, but the decision from

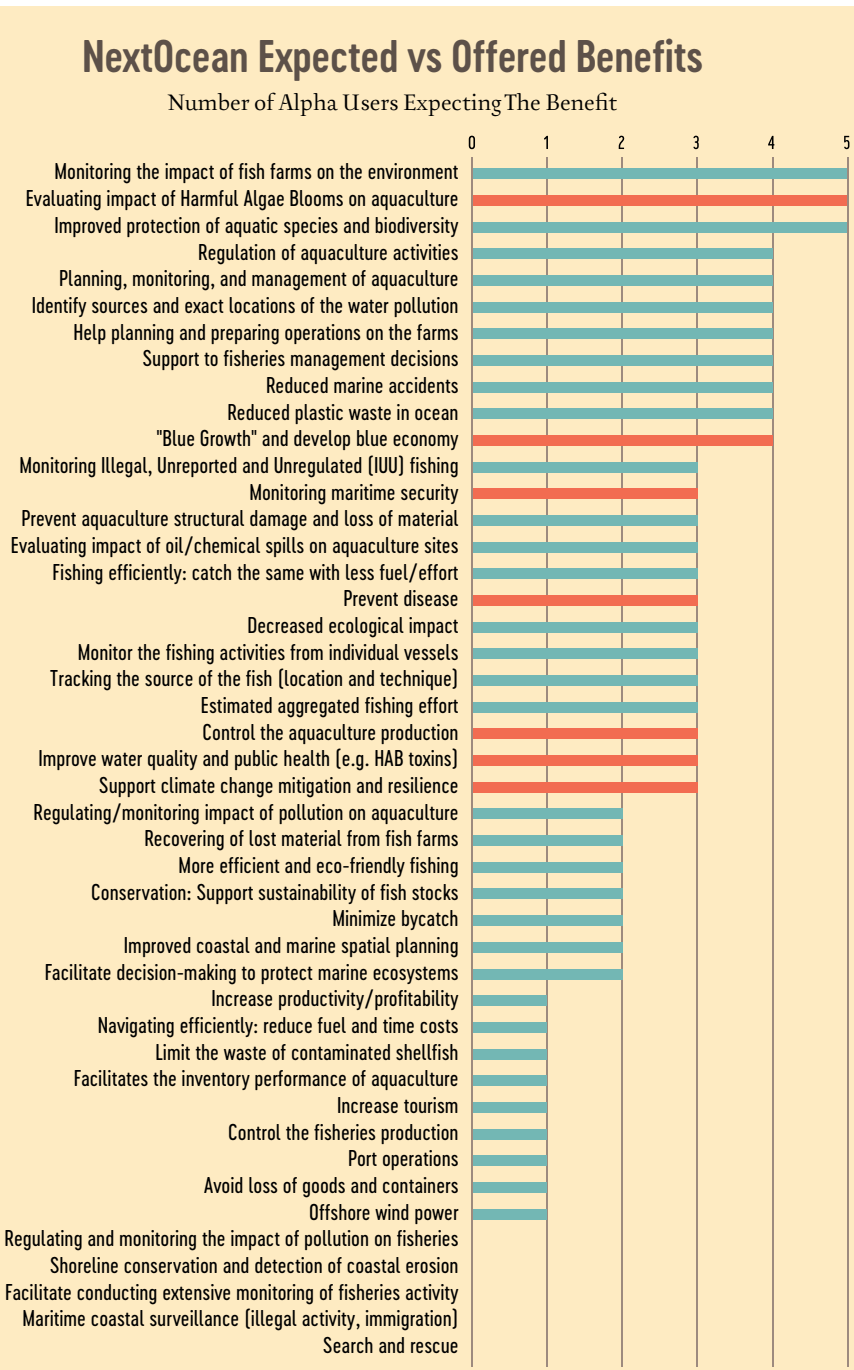
CLS is one driven by technical limitations rather than market demand. In fact, marine heat waves can be a precursor to HABs so they can be seen as a risk factor. This means while HAB detection may be too difficult, an achievable alternative is to identify risks of HABs forming. A HAB detection product could still be progressed within NextOcean, either by another partner or following R&D developments after the project. It is acknowledged as a highly desirable product but one that cannot yet reliably satisfy customer needs.

Benefits

Similarly to the applications above, an equivalent exercise was conducted for the benefits provided in the coastal and maritime fields. Alpha users were asked to identify which benefits NextOcean should be offering, while service providers were asked to note which ones were going to be offered by their organization as part of the project.

Since benefits are the results of the applications, we would expect a close correlation between the two exercises and this is generally the case as shown in Figure 5. Several of the most popular benefits are expected to be offered by NextOcean.

Figure 5: Expected vs Offered Benefits of NextOcean Services



Developing the blue economy was a popular benefit that was not specifically being offered by NextOcean but it was suggested that this is a broad term that could actually cover some of the services being proposed. A similar argument applied to supporting climate change mitigation and resilience; there are no services being offered that directly offer this benefit, but it is another broad topic that NextOcean services may in some way contribute towards. At the bottom of the list there are two benefits intended to be offered which do not appear to be demanded; regulating and monitoring the negative impact of pollution on fisheries and facilitating conducting extensive monitoring of fisheries activity. It was surprising that no alpha users expressed interest in these benefits, especially given that the application vessel monitoring for fisheries monitoring and surveillance was demanded by three alpha users. In order to validate and gauge the level of demand for the different services, it is planned to survey the broader group of both alpha and beta users later in the project.

Target Customers

The third part of this survey was looking at target markets for NextOcean services, i.e. who we expect to buy from us. In this case, only the service providers were asked to identify relevant target customers for their services and the results are presented in Figure 6.

Figure 6: NextOcean Target Markets.

The results show a clear top three set of organizations involved with management and conservation activities. Looking further down the list and following discussions with the consortium partners, the top targets can be summarized by the following five groups:

1. Marine management, provenance, monitoring, regulating, environmental and conservation organizations
2. Fisheries management organizations
3. Fishermen, fish farmers, and aquaculture companies
4. Value-added service providers in fishery and aquaculture with IT and EO know-how
5. Maritime authorities (e.g. police, coast guard patrol, customs)

This exercise generated a lot of thoughts and discussion between partners. Past experiences of consortium members have been really valuable in tak-

ing this list a step further and clarifying a strategy for targeting customers of NextOcean. One of the main points agreed was that public institutions are difficult to sell to. As a generalisation, they don't want to change the way they do things, there doesn't tend to be a continuous improvement culture, and their focus is on being compliant with the law. If, however, there are new demands on them, for example new environmental regulations, there may be a window of opportunity for NextOcean to step in and help them meet those requirements. So these entities cannot be disregarded, especially if NextOcean has a unique service that satisfies a need, but it could take a lot of time and effort to achieve sales, particularly because of their slow procurement processes involving calls for tenders and long decision-making timescales. It would likely be necessary to develop relationships, negotiate prices and submit proposals for offline sales contracts. It was also suggested that they prefer to buy from major well-established companies, which NextOcean would not be. The conclusion was that target groups 1, 2 and 5 above were longer-term sales objectives. NextOcean would need to focus on the others for initial sales, certainly within the time frame of the project.

The other critical aspect of identifying target markets is the level of IT and EO knowledge and expertise of potential customer groups. It is important for NextOcean to design services for people without a background in IT and EO, such that they may easily utilise the services and understand the output without assistance. This is particularly true for target group 3, fishermen, fish farmers and aquaculture companies. The question with this market is whether NextOcean can achieve that objective and engage these end users. It was concluded that while possible, it may be challenging to do this during the project. Therefore, customer group 3 is seen as a medium-term target for sales.

In the short-term, and in particular to achieve sales during the project, NextOcean will target group 4, value-added service providers with IT and EO know-how. These consultants and software companies will be able to work with early versions of NextOcean services, possibly develop them further in-house, and then sell them to their existing clients.

A Selection of NextOcean Competitors

IN ORDER to better understand the competitive landscape in the fishing and aquaculture industries, the Nova team conducted two major studies. The first analyzed 153 randomly selected EO company websites of non-NextOcean partners. Surprisingly, our qualitative analysis of these sites revealed that only 10 out of 153 EO organizations (6.5%) offer EO maritime services. This number is much smaller when looking at the number of players focused on fishing and/or aquaculture. Given that this exercise did not identify many competitors, a second study was later conducted which explicitly attempted to identify EO companies offering services in the fields of fishing and aquaculture. The combination of studies found a total of 30 such organizations. In order to consider them true competitors (and therefore of greater interest), these companies were assessed in terms of the services they provide and it was found that 18 of them offer one or more services that directly compete with the services being developed by NextOcean.

The intention of this competitive market analysis was to identify the levels of competition for different services (understand which were the more saturated markets and where there are really gaps to fill), and to define some service benchmarks set by the best competitors. The first objective was straightforward to meet. The number of competitors was found to vary considerably by service. Figure 7 shows how this is the case. The FMS and SRA services are the most competed, with 12 and 8 competitors respectively. Without investigating deeper, it appears these services might be the most difficult to sell, although a lot depends on the quality and price of the competition. Certainly there is some customer choice when it comes to monitoring fishing activity and assessing aquaculture site risks. On the more positive side, the CFA service had only 4 potential competitors identified, while FPE had just two, one of which is actually more of a project rather than a commercial entity. Interestingly, two of the aquaculture services, FFI and MAS, do not appear to have any competition and could tentatively be called unique services. Naturally, this does raise the question of whether there is market demand for these services, or if Nex-

tOcean is really the first to address a commercial opportunity. As seen in the survey of applications above, the alpha users suggest that there is demand for all 6 services, but it is of course a limited sample to draw such conclusions. The level of interest in each service will become clearer once beta users have joined the project and early pre-sales activity has commenced.

Figure 7: Competitors of NextOcean services.

CFA - CHARACTERISATION OF FISHING AREAS	4	Terrasigna | Maxar | Roffs | HeraSpace
FPE - FISH PROVENANCE AND ECOLABELING	2	Global Fishing Watch | HeraSpace
FMS - FISHERIES MONITORING AND SURVEILLANCE	12	Global Fishing Watch | Skylight Airbus Defence & Space |Maxar | Planet Spire (SMS project) | EOS e-geos (ASI/Telespazio) | KSAT Orbital EOS | Vake | OPT/NET
SRA - SITE RISK ASSESSMENT	8	Maxar | DHI Gras | Waterinsight Hidromod/Argans (HiSea) | EOS e-geos (ASI/Telespazio) | KSAT | Orbital EOS
FFI - FISH FARM IMPACTS	0	
MAS - MONITORING OF AQUACULTURE STRUCTURES	0	

The second objective of defining service benchmarks was reliant on competitor companies disclosing sufficient information to enable a full assessment of the attributes and quality of their offerings. In some cases this was possible but for others there was a real lack of information which made it impossible to judge the competition and learn how NextOcean services would compare. With this in mind, each of the 20 direct competitors are now considered in turn, with key findings shared. In most cases NextOcean, as a supplier of EO services in fishing and aquaculture, can compete by offering rapid on-demand purchase and delivery of data via an innovative platform offering a range of

specialist services (see NextOcean's customer value proposition in the Business Plan deliverable). However, we need to consider how NextOcean services compare against directly competing equivalent services; why would customers choose the NextOcean product?

Global Fishing Watch

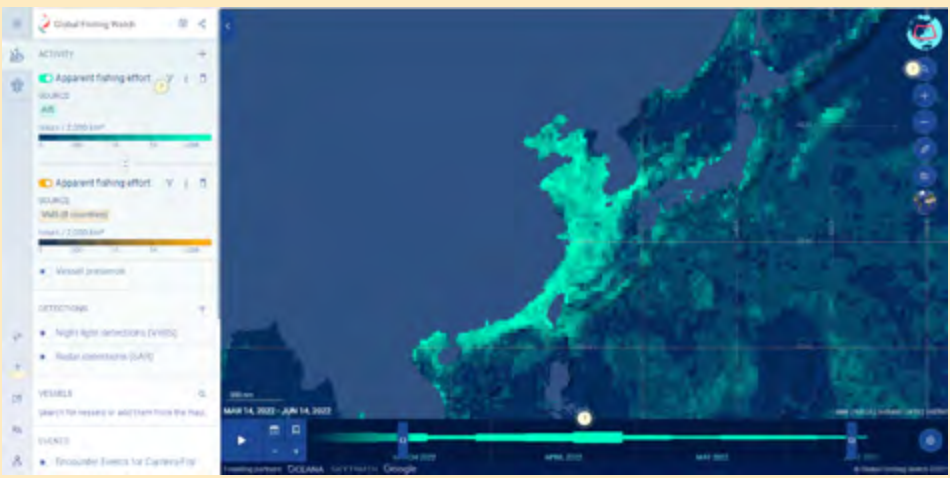
Global Fishing Watch (GFW) was founded in 2015 by three partner organizations: Oceana, an international ocean conservation organization; SkyTruth, a technology company exposing environmental harm through satellite imagery; and tech giant Google, assisting with the processing of data. Their purpose is to "to create and publicly share knowledge about human activity at sea to enable fair and sustainable use of our ocean" and much of the GFW data is publicly and freely available. The service represents significant competition for NextOcean's FMS and FPE services because GFW tracks approximately 65,000 industrial fishing vessels worldwide, in near-real time. It uses Automatic Identification System (AIS) data supplemented with Vessel Monitoring System (VMS) data provided by governments that have agreed to share this data in the public interest (including Indonesia, Peru, Panama, Costa Rica, Ecuador, Brazil and Belize). In addition, GFW uses National Oceanic and Atmospheric Administration of USA (NOAA) satellites (Visible Infrared Imaging Radiometer Suite) and optical satellites (such as Sentinel-2) to identify vessels that cannot be detected via AIS or VMS. GFW is currently developing the use of Synthetic Aperture Radar (SAR) satellites for detection in dark or cloudy situations. Machine learning is used to identify 40 types of vessels based on their movement behaviour, which enables fishing boats to be specifically recognised. This approach is not dissimilar to that followed by NextOcean. Indeed, GFW holds an advantage that VMS data is employed, which is difficult to get hold of. GFW appears to have gained traction with a number of governments around the world and can be expected to add to the number of countries covered by this type of data. It's a well established and impressive tool. Furthermore, and most significantly, it is free.

So, can NextOcean expect to sell their similar products? How can NextOcean add value and offer something fundamentally better than GFW? One way is to take it a step further. The major drawback with attempting to track fish catches is that you cannot currently connect catch data with location (AIS) data. There may be developments in future that enable this to be done

(for example declaring catches via smartphone) but in the meantime there may be other ways to more accurately link catches to vessels using environmental parameters. This is something that NextOcean should explore, in order to offer a better, more informative product.

The other advantage that can keep NextOcean ahead of GFW is that during these early stages of development, NextOcean can customize a solution to a customer's requirements. Although technically possible, given GFW's purpose, business model and direction, it seems unlikely that they would tailor their product to individual customers. Of course, we must remember that NextOcean is focused on providing standardised 'off the shelf' products as much as possible, but through collaboration and co-design, some early customers (including beta users) will have the opportunity to shape the product to better meet their needs, even if the final product is still somewhat standard. Or NextOcean might decide to offer some fully customized variations of the central standard version, if it was commercially viable to do so. This option is of course available for all six of NextOcean's co-designed services, and feedback from alpha and beta users must be taken seriously, with open and frank conversations about whether customer needs are expected to be satisfied and if there is willingness to pay for the services.

Figure 8: Example output from Global Fishing Watch (source: globalfishingwatch.org)

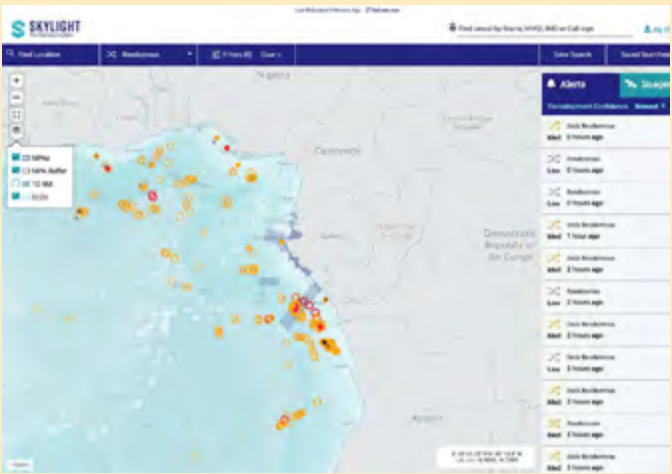


that users will pay for, in the face of well-established competition that is available for free. Global Fishing Watch is regarded as the toughest competition for any of NextOcean's services and must be treated as such during the project.

Skylight

Skylight is a similar vessel tracking tool developed by the Allen Institute for Artificial Intelligence along with partners including the Blue Nature Alliance and Oceans5. With a similar transparency objective, Skylight aims to identify Illegal, Unreported and Unregulated (IUU) fishing and other suspicious activity such as transshipments, refuelling at sea, and incursions into Marine Protected Areas. The tool uses artificial intelligence to flag highly suspect events to the user, rather than the user having to piece information together themselves. In terms of data ingested, Skylight uses AIS and SAR, which is equivalent to NextOcean's FMS service. As might be expected, SAR images are not routinely captured, so customers need to request this. Similarly to GFW, there is no fee, but access appears to be controlled; it is not publicly available. Since November 2020, GFW and Skylight have been collaborating and sharing data, which presumably makes both of their products even stronger.

Figure 9: Example output from Skylight (source: skylight.global)



Given the similarities with GFW, Skylight is another major NextOcean competitor and the same conclusions apply; NextOcean must strive to add value beyond what is freely available by these competitors.

Airbus Defence and Space

Airbus Defence and Space is a major player in the field of EO in the maritime context. Their product, OceanFinder, is a vessel detection and identification web-based tool used for a range of applications including fleet management, search and rescue, locating hijacked boats and detecting illegal activities. Airbus combines its own optical and radar satellites with real-time AIS data, so it appears to use the same approach as NextOcean's FMS service. OceanFinder is accessible through Airbus' OneAtlas web portal, where customers can order products 24/7 and in this way is similar to NextOcean's online store.

Information on OceanFinder is somewhat limited, and the fact that Airbus is addressing so many different EO applications puts them at risk of being perceived as the master of none. Certainly Airbus does not seem to be an expert in IUU identification and this is how NextOcean can best compete with these big companies. Being specialised in the fishery and aquaculture markets, with a range of service providers each with their own areas of expertise, NextOcean should convey trust and reliability despite being a new and unknown brand.

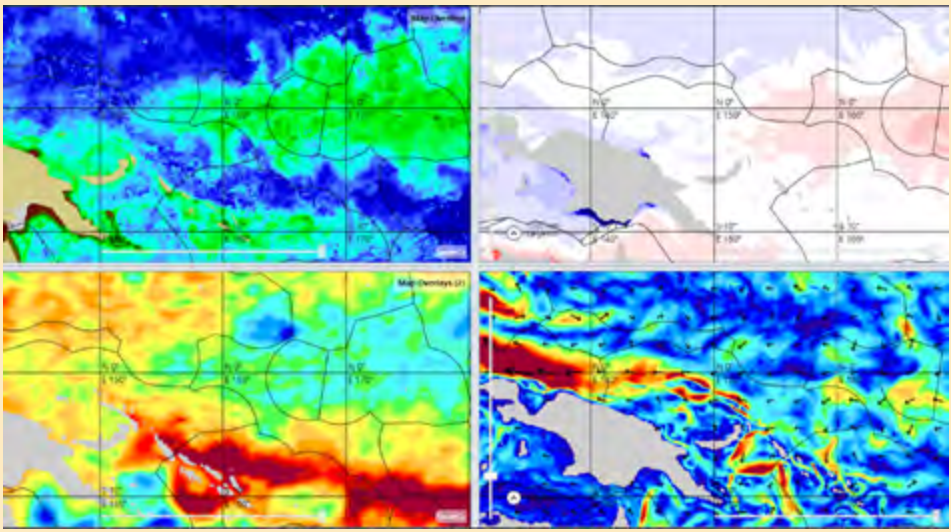
Maxar

One of the biggest names in the world of satellite imaging, Maxar also offers analytical services based on their satellite data. They offer services that are similar to NextOcean's CFA, SRA and FMS services. Maxar's SeaStar claims to "find fish faster" with daily maps showing ocean conditions covering plankton concentrations, sea surface and subsurface temperatures, sea surface and subsurface currents, thermocline depth, seas surface height, dissolved oxygen, primary production and marine weather forecasts. This is a wealth of information in one tool, but it is not clear whether Maxar's product assesses all of these data points and recommends the most productive fishing grounds, or if the user is expected to analyse this information and make their own conclusions. The example displays of the individual features suggests the latter, in which case this is a very basic product. NextOcean's CFA service will forecast

ocean fronts and in combination with other data, recommend the optimal areas to fish. On this basis, NextOcean should have a superior product.

SeaStar also helps to "protect aquaculture assets" by near real-time monitoring for red tide algae based on ocean colour measurements. There is limited information on this application, but it appears to have been used during an outbreak on the Florida coast in 2018 and 2019. As an early warning system, it enables fish farm managers to make quick and informed decisions that can help mitigate economic losses. NextOcean's SRA solution is unlikely to include HAB detection, but it could be worth considering the development of red tide algae detection if this is technically relatively easy to implement. It will be seen that there are other companies offering red tide detection and in some parts of the world it is a significant risk for aquaculture. On the other hand, not all red tide is harmful and it is difficult to identify whether it is harmful from satellite images, so it is not a perfect solution. It most likely depends on customer expectations. If there is demand for red tide detection (harmful or not) then it may be worth considering for SRA, even if it is a future development after the end of the project.

Figure 10: Example output from Maxar's SeaStar Information Service (source: maxar.com)



Maxar's Crow's Nest product is their equivalent to NextOcean's FMS service, detecting and validating vessel activity to "protect legal fishing operations", among other similar applications in maritime security. Their approach for detecting IUU fishing is consistent with others but perhaps uses a slightly different process. From the limited description, it appears that SAR images are used in the first instance to detect 'dark vessels' not reporting with AIS. According to their product brochure, "if vessels of interest are observed, Maxar automatically captures high resolution optical satellite images that provide more clarity on the type of vessel, the activity the vessel is engaged in and the vessel identity". Similarly to Airbus, however, their Crow's Nest solution seems to address multiple problems and doesn't convincingly portray specific expertise in IUU fishing detection. Maxar might have the edge when it comes to the quality and resolution of optical imaging, but their approach is unlikely to be offering anything that other providers, including NextOcean, are unable to offer.

Planet

One of the biggest manufacturers of imaging satellites, Planet has successfully deployed 450 satellites and sets its sights on imaging the entire planet every day. Planet also transforms images into insights, and their vessel detection service is another competitor for FMS in what is becoming a saturated market with several big players. It's a familiar offering of AIS data validation, detection of maritime vessels including dark activity, detection of transshipments and tracking of vessels used for illegal fishing.

It is, however, another example of a slick website that fails to detail their approach, the data used, and what the customer can expect to receive. There is no mention of AI, machine learning or anything describing how dark fishing vessels may be identified. It's another big name with a far from convincing customer proposition but perhaps the 'contact sales' button is somehow doing a great job. The learning for NextOcean is to provide rich information and user stories to bring the product to life and demonstrate the expertise that gives customers confidence.

Planet also briefly mentions oil spill detection at sea, so they might also have a product that rivals SRA for aquaculture purposes, but there is so little information on it that it has not been considered as a competitor for that service.

Spire

Like Planet, Spire also produces and operates satellites for earth observation. They also acquired exactEarth, a major provider of AIS data. This is a great recipe for another vessel detection service and it appears they do offer one. Spire's ShipView product is a ship tracking web application but one that seems to only display vessels that have AIS enabled. It is therefore simply a user-friendly viewer of AIS data and nothing more sophisticated. However, the use of satellite imagery to fill in the AIS gaps may be currently in development via an ESA-funded project called SMS, Safer Maritime Services. The project description clearly states that AIS data will be fused with SAR data for the purpose of dark vessel detection. The method seems to be similar to the others mentioned above, but there is no mention of optical satellite imagery to aid the identification of dark vessels. Clearly, as a work in progress, this offering is not currently an established competitor, but it might be by the time NextOcean's FMS service is ready for commercialization. The main added benefit from Spire's SMS product appears to be improving weather forecasts using weather data transmitted via AIS, but this feature is somewhat separate and unrelated from the main objective of identifying illegal activity at sea.

EOS

Earth Observing System (EOS) is a data and analytics company combining geospatial data and custom algorithms to provide solutions across several industries. They are in the process of launching their own constellation of EO satellites, but focused on agriculture applications. According to their website they provide several solutions for fisheries but with very limited information. It is clear that EOS addresses the problem of detection and monitoring of illegal fishing but there is no detail to understand how their FMS-equivalent service works and whether it is strong competition for NextOcean.

EOS also offers solutions for aquaculture, including a product that would rival NextOcean's SRA service. There is mention of oil spill detection and monitoring, but again a lack of detail about their offering. They also mention extreme wave forecasting in the context of aquaculture, and this might be an additional feature that could be included in NextOcean's SRA solution to offer a more complete range of threat alerts.

e-GEOS

Italian-based Telespazio is a spaceflight and satellite company that has an 80-20 share with the Italian Space Agency (ASI) in e-GEOS, a service provider in EO and geospatial information. They use ASI's COSMO-SkyMed constellation of EO satellites. In terms of product offering, they have developed Smart Eyes on Seas (SEonSE) which is a broad maritime situational awareness service which uses SAR and optical satellite data as well as AIS for near real-time ship detection. The same service also includes oil spill detection in the list of applications, "supporting routine control of sensitive areas, emergency response activities and, if needed, supporting the identification of the potential polluter". There is no further detail on how these services work, but they can be assumed to be alternatives to NextOcean's FMS and SRA offerings. In the case of FMS, SEonSE is for a broader purpose including maritime intelligence and infrastructure monitoring, and doesn't explicitly mention illegal fishing. Again, NextOcean's service is more specific and targeted, while most of the competition is trying to do a bit of everything. In the case of SRA, it is perhaps the opposite situation, where SEonSE clearly describes oil spill detection within its offering, whereas NextOcean is trying to cover multiple different aquaculture risks under one service. With this in mind, the individual components of SRA, such as oil spill detection and marine heat waves, should be clearly identified and described as separate offerings, but with the potential of packaging, or bundling together with other similar services for the same target customer. The criticism with Airbus, Maxar, and now e-GEOS is that they have developed single all-in-one tools targeting many different customers which is a muddled and confused approach from the customer's perspective. A potential buyer may be deterred because it is not clearly aimed at them and they may be afraid of paying for many features that they do not need.

As an apparent rival to NextOcean's Online Store, e-GEOS have launched CLEOS (Cloud Earth Observation Services) with the website cleos.earth acting as a digital marketplace for self-service access to EO data and applications. It currently offers satellite imagery, radar processing, and a small number of information products, mostly from Copernicus Land. The design and information content of the website are suited to a more technical audience and there appears to be no particular target industries or types of customer. NextOcean must be mindful of the growth of similar marketplaces, but as has already been highlighted, the industry focus should help to target

a well-defined user group with specialised products. It is also critical that the NextOcean Online Store is user-friendly and easy to understand for customers with different levels of technical knowledge.

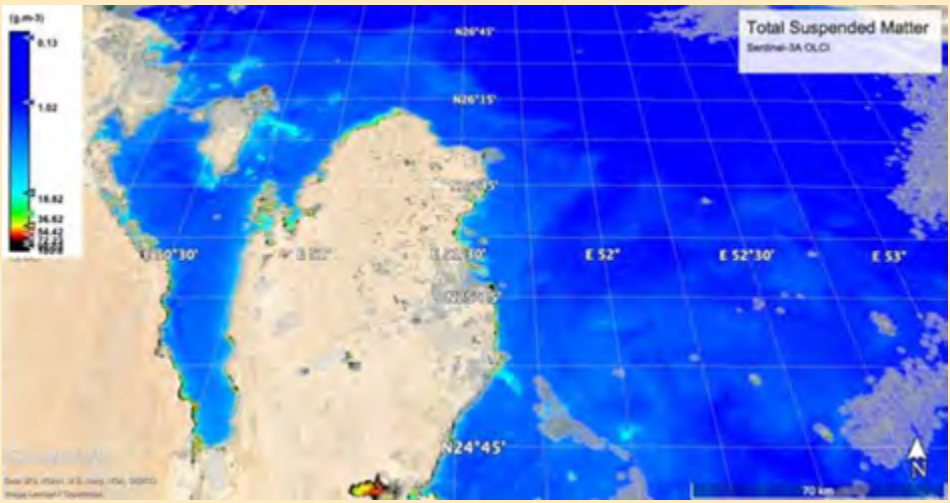
KSAT

Norwegian company Kongsberg Satellite Services (KSAT) is another competitor in the fisheries monitoring marketplace, with another version of FMS, utilising radar and optical satellites combined with machine learning techniques. There is a lack of detail and no mention of AIS data being used, so this offering is difficult to evaluate but it is unlikely to be more advanced than NextOcean's FMS service.

Perhaps more interesting is KSAT's equivalent services to NextOcean's SRA. Here, KSAT provides two applications; oil spill detection and red tide algae detection. The oil spill service uses SAR imagery which is automatically processed and then quality checked by a human analyst. As KSAT explains, "spills detected in SAR images are then correlated with Automatic Identification System (AIS) data used by vessels and many oil and gas installations to help pinpoint the source of the spill". KSAT's advantage here might be the "fastest delivery time in the industry" of 20 to 120 minutes after the satellite acquired the image.

Their red tide algae detection uses water quality parameters (Chlorophyll-A, Total Suspended Matter, Colored Dissolved Organic Matter and Light Extinction Coefficient). Then algorithms are applied to determine the presence of red tide. As mentioned previously, NextOcean might consider including this within SRA.

Figure 11: Example output from KSAT red tide algae detection (source: ksat.no)



Orbital EOS

Orbital EOS is a remote sensing analytics company with a series of maritime and land applications. They offer ship detection for the purpose of monitoring illegal fishing, an apparent rival to FMS, but there is no detail provided on their website to understand how they compare. There is, however, much more information provided about their oil spill monitoring and measurement service. Based on their own description, they sound like market leaders in oil spill monitoring, with the "most advanced AI analytics engine" using both radar and optical imagery, delivering "accurate characterisation" of the spill and source identification using AIS data. They also employ drift models to forecast the trajectory of the spill to assist with risk assessments and the response efforts. Perhaps their greatest strength, though, is their measurement of thickness and quantity of oil, which is not seen in other similar services. This might be an attribute for NextOcean to investigate for inclusion within SRA, in order to compete better in terms of product features. However, it is clear that Orbital EOS are targeting a range of uses and customers with their product, whereas NextOcean is specifically targeting aquaculture. Therefore, the nature of the product and desirable features will be different. Oil thickness and quantity

may not be of much interest to fish farmers, who are more concerned with the possibility of the spill impacting on their farms and the predicted timescales. There is no reason to believe that Orbital EOS could not serve this interest, but they do not mention their target customers so it is unclear whether their product is well suited to an aquaculture context.

Figure 12: Example output from Orbital EOS oil spill monitoring (source: orbitaleos.com)

Vake

Vake is a Norwegian company specialised in using machine learning to detect ships in satellite images. By focusing exclusively on this, they claim to be experts, "uncovering information no current system can" with a solution that is "proven to efficiently, affordably and automatically detect vessels in any area of interest". Vake uses ESAs two Sentinel satellites for their images. They have been developing the integration of AIS data to cross-reference ship locations; this appears to be a new feature. They also state that SAR data is not currently used but is in their development plans. It would seem, therefore, that the Vake product is very much in the developmental stage, just like NextOcean. Interestingly, though, Vake is selling a Minimum Viable Product (MVP) which is essentially just the AI ship detection from optical images, just one of the

components from the established vessel detection services seen above. It is not known whether Vake has achieved any sales of its MVP but NextOcean could also start trying to sell an unfinished product.

Almost none of the 20 competitors analysed provide pricing on their websites. Vake is one of only two that do. They offer three service levels: report (from 500 EUR), API (from 5000 EUR/month) and integration (price on appraisal). This provides a rare pricing benchmark for NextOcean's FMS service.

OPT/NET

Dutch company OPT/NET is a specialist in building AI products and in 2020 was granted ESA funding to identify how space technology can help address the problem of illegal fishing. The solution, named MONITORED AI integrates SAR satellite imagery and AIS data to automatically detect dark vessels. There is nothing new about this approach, though the quality of the AI could be a point of differentiation between all of these competitors. The OPT/NET solution uses human checking to verify the automated alerts, and results can be easily accessed via a web dashboard. It appears to be at MVP stage so it may not yet be commercially available.

DHI GRAS

DHI GRAS is a Danish EO service provider which appears to be rebranding as EOatDHI, since DHI group is the parent company. Water quality is one of their specialisms and they offer a service to aquaculture farmers to "monitor water condition and its variability in space and time or support site selection decisions". They do this using satellite imagery and complex algorithms but there is not much detail beyond that. They state the need to manage risks such as algal blooms and red tides, so it's possible they offer early warning systems for those threats. Overall, it is not a convincing sell but certainly it is a competitor for NextOcean's SRA service.

WaterInsight

Another water quality expert, WaterInsight also competes with SRA with an early warning system for blooms in aquaculture areas. It has been developed for shellfish farmers in South Africa but does not achieve this purely with satellite data. They mention the use of "in situ optical measurements and handheld measurements for validation". It is therefore perhaps not a direct competitor in terms of technical approach but ultimately, they offer a service with the same objective as SRA and target the same customer group. There are many other companies like this one, offering in-situ based monitoring of fish farms. They are likely to be much more expensive due to the equipment required and physical labour to set up and maintain it, so for that reason alone it is arguably not a fair comparison with satellite-only solutions. NextOcean is not in the market for implementing in-situ monitoring on client sites, but can certainly produce and sell the satellite component to value-added downstream service providers who may then combine it with localised measurements.

Hidromod/Argans (HiSea)

Hidromod is a Portuguese specialist in water-based modelling and analysis. They have been delivering consultancy work for aquaculture companies and offer risk evaluations in relation to oil spills and other pollutants. Argans are based in the UK and France and are EO service providers. They offer a range of marine, atmospheric and terrestrial monitoring solutions.

Both companies participated in an H2020 funded project which created the HiSea tool for assessing water quality at sea. In the aquaculture context, HiSea offers wave and wind forecast alerts, early warning of jellyfish invasions and harmful algal blooms, real-time and forecasted water quality information, and support for optimising fish cage settlement. The platform also provides forecasts of oil spill trajectories. It uses Copernicus satellite data but also "locally placed sensors" to "verify the accuracy of remotely collected data". It is unclear whether the in-situ measurements are an ongoing requirement or just used at the set-up stage to give confidence to the satellite-based results. Examples of available data include Chlorophyll-A, sea surface temperature, turbidity, coloured dissolved matter absorption, Secchi disk depth (water transparency), size distribution of plankton, significant wave heights, current and temperature.

The HiSea tool does appear to offer a good package of information to support fish farmers, with a broader set of applications than NextOcean is planning with the SRA service. Some of these applications might, however, be reliant on local on-site measurements, which as mentioned previously changes the type of product and the cost. To ensure SRA offers aquaculture customers what they need, feedback from alpha and beta users should determine what kinds of information and decision support would be most valued. The service could be expanded in future to provide other farm operations management support.

Terrasigna

Terrasigna is a Romanian EO data processing company, offering services in fisheries and aquaculture. They have developed a solution called SkyFISH that rivals NextOcean's CFA service. The objective was to develop a user-friendly platform based mainly on satellite derived and modelled information, suitable for identification of the most favourable fishing and aquaculture areas. They have developed two indices to support decision-making. The *whiting suitability index* identifies areas that are favourable or not for fishing (other species may be implemented in future). As described by Terrasigna, "the current index is provided as a forecast product, thus enabling fishermen to use it as a predictive tool to better prepare their fishing campaigns". It is based on three primary parameters: temperature, salinity, and bathymetry. This indicator is therefore a similar product to CFA but produced in a different way. NextOcean is also starting with a particular species in a particular location (tuna in the North Atlantic) but should also expand to other species and areas. The question for both service providers is how easily the models can be re-used for other use cases.

SkyFISH has been implemented as a Copernicus Marine Environment Monitoring Service (CMEMS) product, and as such it is free to use. However, the geographic scope is limited to the Black Sea, so it is only really a competitor for this specific region. Whilst Terrasigna may be able to offer similar tools for other geographical markets, they are clearly not readily available 'off the shelf' products and in the case of tuna in the North Atlantic their approach may not be suitable.

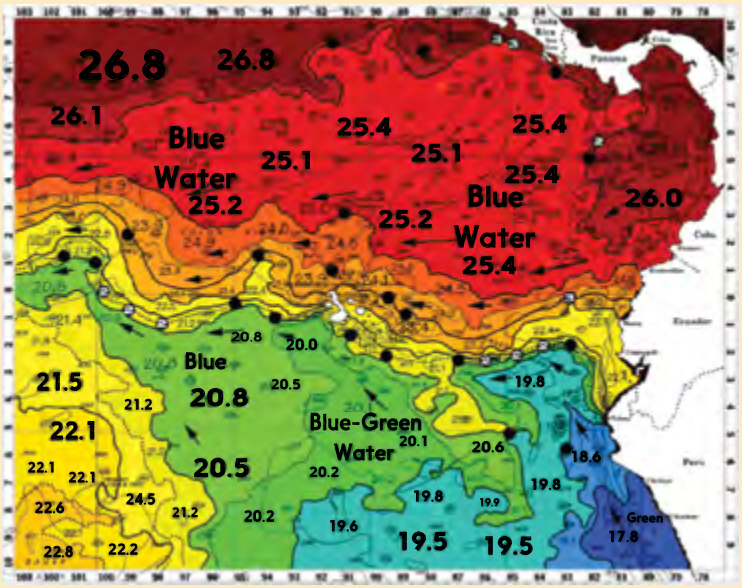
SkyFISH also offers the *mussels aquaculture suitability index*, which uses temperature, salinity, bathymetry, chlorophyll concentration and water turbidity to determine the areas with the highest chance of success for growing

mussels. Again, this is a specific use case, but it could be useful information for identifying new aquaculture sites. NextOcean should consider whether a product like this should be developed and whether it can be standardised across regions.

Roffs

Roffs is a Florida-based scientific consulting company whose principal business is to identify the most productive waters for both leisure and commercial fishing. With over 30 years of experience, it is the most established source of such information and their analysis incorporates a long list of parameters: "water temperature, water colour, orientation of local currents, history of ocean fronts, bottom topography, biological quality of the water (chlorophyll, plankton, clarity, colored dissolved organic matter, etc.), forage preference of the target species, availability of forage, as well as, bio-geochemical habitat preferences of the forage and target species". They also list 16 species that they provide information on: tuna, marlin, sailfish, swordfish, mahi, wahoo, shark, mackerel, sardine, anchovy, pilchard, herring, bluefish, squid, cod and hake. Roffs added value is in the interpretation of large amounts of source information to generate clear recommendations. The maps are easy to use, with dots showing the best areas and numbers showing how many days conditions are expected to remain favourable. There is accompanying text and the small files can be received via satellite e-mail.

Figure 13: Sample output from Roffs Fishing Forecasting Analysis (source: roffs.com)



The major disadvantage with Roffs is the coverage. It is focused on the US market, so the available regions are along the eastern US coastline, the Gulf of Mexico, Hawaii, Bermuda and Cabo San Lucas. This would be a challenge for NextOcean as well, since different regions may require different models to be developed and maintained.

The Roffs solution is certainly a strong competitor for NextOcean's CFA service in the North American market. It is clear that they have successfully commercialised their analysis but it is not evident what proportion of sales are from commercial fishermen. NextOcean is not targeting recreational fishing with its product so it will be important to understand the level of demand from fishing companies. Given the regional focus of Roffs, NextOcean can build its customer base and reputation initially in the European region (e.g. North Atlantic, North Sea, Baltic Sea and the Mediterranean) where Roffs would not be competing.

Heraspace

The final competing service that has been identified is a potential rival to NextOcean's CFA and FPE services, although this is an ESA-funded project and does not appear to have reached the commercialization stage. Heraspace claims that by combining Copernicus data with "vessel positioning data, regulatory data and actual fishing data, the identification of illegal and unregulated fishing activities can be drastically improved". By using parameters such as temperature, ocean colour, altimetry and currents, Heraspace aims to "build correlations with biological indicators of the fish species with the final aim to determine the likelihood that the declared information in the catch labelling match the realistic back tracked conditions for fish presence". So this is a similar approach to CFA, using environmental indicators to predict the presence of fish species, but then they attempt to link that with catch data to validate the origin, equivalent to the objective of FPE.

The main observation with this project is that it must be targeting specific public authorities as the customer for this analysis. First, because they mention the use of VMS data, not AIS, so their positioning data is reliant on gaining access to it from a national government. Second, it should be noted that catch data is highly sensitive and very hard to get access to, but again they might have it if they are working for the public authority that controls this data. This is perhaps the main difference compared with NextOcean's solution, because NextOcean is using more widely available data and intends to target a wider set of customers, including certification organizations. It will be interesting to keep an eye on Heraspace to see if they start to sell their services openly or not.

Selection of Geographical Target Markets

Research Process

ONE OF THE MAJOR goals of NextOcean was to develop dedicated workshops and training sessions with the larger community, where the business cases will be explained, advertised, and discussed considering the interests and knowledge of the communities. After EC approval of the NextOcean project, from February to May 2021, Nova organised a total of 10 co-creation workshops (3 hours each), to go through the different phases of the VCW-Value Creation Wheel framework (Lages, 2016; Lages et al, 2020) applied to EO services for fisheries and aquaculture.

Due to the Covid-19 situation and corresponding travel restrictions, we decided to conduct all the workshops in the same institution (Nova SBE), benefiting from the fact of having a wide range of students from different nationalities interested in exploring these topics.

As a kick-off to the workshops, there was a session (Figure 14) to make:

1. an introduction to the process and structure of the 10 workshops by Luis Filipe Lages, Professor at Nova School of Business and Economics and Coordinator of NextOcean WP5.
2. an introduction to the topics of Aquaculture and Fishing by Ana Paula Queiroga, ex-Director of Innovation and Marketing at Docapescas. This state-owned organization provides the public service on mainland Portugal of organising the first sale of fish and supports the fishing and fishing ports sector.
3. an introduction to the topic of EO Applications for Fisheries and Aquaculture by Nuno Catarino, Coordinator of the NextOcean project and Head of Data Systems at Deimos Elecnor Group.

Figure 14: Screenshot of Kick-Off Meeting for WP5 NextOcean Workshops

To bring innovative and multicultural perspectives to the projects, teams were mixed in background, gender, and nationality. Overall, the ten workshops were closely supervised by Luis Filipe Lages from WP5 and Carlos Reis-Marques. The workshops had 35 participants (54,2% women and 45,7% men) from 6 different nationalities: Portugal (16), Germany (8), Italy (5), France (3), India (2), and Spain (1) (Figure 15).

Figure 15: Photos of WP5 NextOcean Workshops

Each workshop had eight teams, one team per business case (four teams in aquaculture and four fishing teams). After concluding the ten workshops, each group defended its own business case (Figure 16). A short summary of each business case's results is presented in this report.

Figure 16: Photos of the final presentations of the 8 business cases

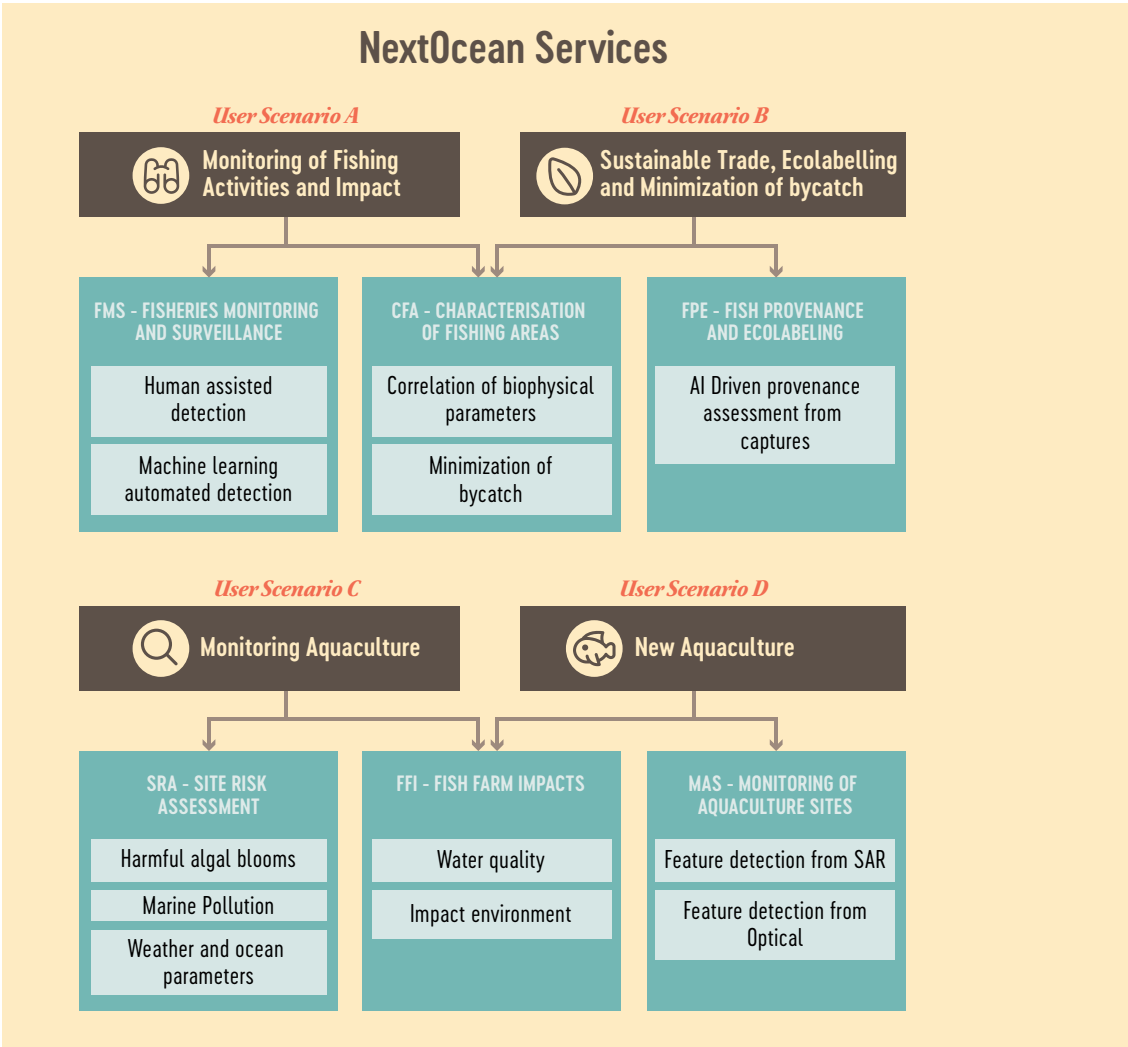
Strategy for Geographical Target Market Analysis

WHILE BUILDING on the four NextOcean user scenarios, eight business cases (two business cases per user scenario) were developed to identify the most attractive geographical markets for each scenario.

User scenarios selection

The selection of the user scenarios was supported by the initial user scenarios submitted in the original proposal to the EC (Figure 17).

Figure 17: Initial NextOcean User Scenarios and Services



More specifically, the "selected" NextOcean User Scenarios to support the business cases were:

In Aquaculture:

- **New Aquaculture**
  - Site Risk Assessment (SRA)
  - Fish Farm Impacts on Water and Environment (FFI)

- **Monitoring Aquaculture Impact**
    - Fish Farm Impacts on Water and Environment (FFI)
    - Monitoring Aquaculture Site (MAS)
    - In Fishing:
- **Sustainable trade, ecolabelling, and minimization of bycatch**
    - Characterization of Fishing Areas (CFA)
    - Fish Provenance and Ecolabelling (FPE)
- **Monitoring of Fishing Activities and Impact**
    - Characterization of Fishing Areas (CFA)
    - Fisheries Monitoring & Surveillance (FMS)

Business cases definition

While building on the analysis of the competing EO organizations operating in aquaculture and fishing industries, it became simpler to better understand the type of target market that could become more appropriate for each user scenario.

The result was a set of 8 business cases, 4 in aquaculture and 4 in fishing, which represent potential market opportunities to be explored by NextOcean to sell its services. For each business case, the most attractive geographical market to transfer NextOcean technology was identified. Table 3 presents the 8 business cases and the user scenario used in each business case.

Table 3: The 8 Business Cases.

INDUSTRY	USER SCENARIO	BUSINESS CASE
Aquaculture	**New Aquaculture** Site Risk Assessment (SRA) Fish Farm Impacts on Water and Environment (FFI) Monitoring Aquaculture Site (MAS)	#1a
		#1b
	Monitoring Aquaculture Impact Fish Farm Impacts on Water and Environment (FFI) Monitoring Aquaculture Site (MAS)	#2a
		#2b
Fishing	**Sustainable trade, ecolabelling and minimization of bycatch** Characterization of Fishing Areas (CFA) Fish Provenance and Ecolabelling (FPE)	#3a
		#3b
	Monitoring of Fishing Activities and Impact Characterization of Fishing Areas (CFA) Fisheries Monitoring & Surveillance (FMS)	#4a
		#4b

Identification of Geographical Markets for EO Aquaculture Services

THIS SECTION PRESENTS a summary of the identified geographical target markets and potential clients for the four business cases in Aquaculture. Each business case presents an in-depth market assessment of critical variables for 193 Nations across the world.

Business-Case 1a: Target Market for User Scenario "New Aquaculture"

The original business case summarized in this section was developed by Afonso Maria Baptista Rebelo de Sousa Morgado, Franziska Luise Lang, Inês da Silva Oliveira, and Pierluigi Cuna under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. It was decided to randomly start looking for organizations in all these countries that can partner with NextOcean and/or implement the offered service. Special attention was given to Norway, the final target market of this business case. A list of the initial identified potential stakeholders for business case #1a across the globe is presented in Table 4.

Table 4: Business Case #1a - Potential Stakeholders

N.o	POTENTIAL STAKEHOLDERS	LINK
1	TERRASIGNA	http://www.terrasigna.com/?ref=logo
2	European Space Imaging	https://www.euspaceimaging.com/
3	MAXAR	https://www.maxar.com/industries/earth-observation
4	The Center for Marine Biofouling and corrosion	https://biofoulingcorrosion.co.uk/Services_for/Aquaculture
5	INNOVASEA	https://www.innovasea.com/about-us/
6	Global Maritime	https://www.globalmaritime.com/aquaculture
7	Orbitaleos	https://www.orbitaleos.com/
8	Nordlaks	https://www.nordlaks.no/
9	SalMar	https://www.salmar.no/en/offshore-fish-farming-a-new-era/
10	Norway Royal Salmon	https://norwayroyalsalmon.com/en
11	MNH	https://www.mnh.no/
12	MOWI	https://mowi.com/
13	The Directorate of Fisheries Norway	https://www.regjeringen.no/en/dep/nfd/organization/etater-og-virksomheter-under-narings--og-fiskeridepartementet/Subordinate-agencies-and-institutions/The-Directorate-of-Fisheries/id1507/
14	Norwegian Ministry of Fisheries and Coastal Affairs	https://www.regjeringen.no/en/the-government/previous-governments/ks/ministries-since-1814/ministry-of-fisheries-and-coastal-affair/id426274/
15	Institute of Marine Research	https://www.hi.no/en
16	Leroy Seafood	https://www.leroyseafood.com/en/

N.o	POTENTIAL STAKEHOLDERS	LINK
17	CERMAQ	https://www.cermaq.com/
18	Grieg Seafood	https://griegseafood.com/
19	Alsaker	https://alsaker.no/
20	Nova Sea	https://novasea.no/en
21	Sinkaberghansen	https://sinkaberghansen.no/english/
22	Eid	https://www.efb.no/

Market Assessment and Final Target Markets

To find the most attractive geographical market, 10 filters were applied to 193 countries worldwide. After filter 1, where the country needs to have 2M tons of aquaculture production, 25 countries remained for further consideration. With the introduction of filter 2, international trade of fisheries products (US Dollar) was considered. By doing so, more countries became irrelevant. Hence, the list of countries declined to 13. Filter 3, fisheries technology development, further eliminated many countries. Only 3 countries remained after the application of filter 3. Moreover, filter 10 lead to the exclusion of two additional countries. Eventually, **Norway**, passed all filters, including the last filters' thresholds foreign direct investment, net inflows (% of GDP).

After having 193 countries running through 10 filters, **Norway** was identified to have the most suitable and attractive geographical target market for business case 1a (Figure 18).

Figure 18: The final solution for business case #1a

Based on the Multi-Criteria Decision Analysis (MCDA) & Value Creation Funnel (VCF) analyses and on the filters presented in the following section, we underline below the final solution for business case #1a and present in bold other highly attractive markets.

1. **Norway**
2. **United States**
3. **Japan**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Aquaculture production higher than 2M (metric tons) (https://data.worldbank.org/indicator/ER.FSH.AQUA.MT)
2. **Filter G2:** International trade of fisheries products higher than 1M (US dollar) (https://stats.oecd.org/)
3. **Filter G3:** Fisheries technology development (patents) higher than 30 (https://stats.oecd.org/)

4. **Filter G4:** Ease of doing business index (small is good) higher than 80 (https://data.worldbank.org/indicator/IC.BUS.EASE.XQ)
5. **Filter G5:** Research & development expenditure higher than 0.7 (% of GDP) (https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS)
6. **Filter G6:** Cost of business start-up procedures (% of GNI per capita) higher than 14(https://data.worldbank.org/indicator/IC.REG.COST.PC.ZS)
7. **Filter G7:** Time required to start a business (small is good) less than 5 (days) (https://data.worldbank.org/indicator/IC.REG.DURS)
8. **Filter G8:** Marine landings species higher than 2M (Tons) (https://stats.oecd.org/)
9. **Filter G9:** Marine protection areas higher than 0.8 (% of territorial waters) (https://datatopics.worldbank.org/world-development-indicators/)
10. **Filter G10:** Foreign direct investment, net inflows higher than 2 (% of GDP) (https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS)

Business-Case 1b: Target Market for User Scenario "New Aquaculture"

The original business case summarized in this section was developed by Allocio Guillaume, Beatriz Machado Pereira, Maria Helena Pais Banito, and Riccardo Piovesan under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. It was decided to randomly start looking for organizations in all these countries that can partner with NextOcean and/or implement the offered service. A list of the initial identified potential stakeholders for business case #1b across the globe is presented in Table 5.

Table 5: Business Case #1b Potential Stakeholders

N.o	POTENTIAL STAKEHOLDERS	LINK
1	TERRASIGNA	http://www.terrasigna.com/?ref=logo
2	Hexagon	https://hexagon.com/
3	Seonse	https://www.e-geos.it/#/hub/hubPlatforms/platform/platform-sense
4	Maxar	https://www.maxar.com/
5	Planet	https://www.planet.com/
6	Savitri Aquamonk	https://www.savitriaquamonk.com/
7	MicroSynbiotiX	http://www.microsynbiotix.com/
8	Hatch	https://www.hatch.com/
9	Aquabyte	http://www.aquabyte.ai/index.html
10	Aquacloud	https://aquacloud.ai/
11	Blue Lion Labs	https://bluelionlabs.com/
12	Satcom Global	http://www.satcomglobal.com/
13	Orbitaleos	https://www.orbitaleos.com/
14	European Space Imaging	https://www.euspaceimaging.com/
15	VakSea	https://www.f6s.com/vaksea
16	eFishery	https://www.efishery.com/
17	Novonutrients	https://www.novonutrients.com/
18	HydroNeo	https://hydroneo.net/
19	Ambrotechs	https://www.ambrotechs.com/
20	PML	https://www.pml.ac.uk/Modelling_at_PML/Research_sectors/Resource_management
21	Sea Warden	https://seawarden.io/
22	Sofar Ocean	https://www.sofarocean.com/
23	Wittaya Aqua	https://wittaya-aqua.ca/

Market Assessment and Final Target Markets

To find the most attractive geographical market, 10 filters were applied to 193 countries worldwide, and most countries passed through the first filter. With the introduction of filter 3, aquaculture production (USD) by country was considered. By doing so, more countries became irrelevant. Hence, the list of countries of interest declined to 13. Another filter that purified many countries was filter 7, ease of doing business. Only 3 countries (Spain, China, and Japan) remained after the application of filter 7. Moreover, filter 8 led to the exclusion of two additional countries. Eventually, **Spain**, passed all filters, including the last filters' thresholds data protection index.

After having 193 countries running through 10 filters, **Spain** was identified to have the most suitable and attractive geographical target market for business case 1b. In addition, having 10 regions in Spain running through 5 local filters **Andalucía** was identified. Lastly, 5 provinces ran through 3 filters, and **Malaga** was identified to have the most suitable and attractive geographical target market at the province level (Figure 19).

Figure 19: The final solution for business case #1b

Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #1b and present in bold other highly attractive markets.

1. **Spain- Andalucía, Malaga**
2. **China**
3. **Japan**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Countries with coast/area ratio (m/km2) higher than 2510 (https://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline)
2. **Filter G2:** The illegal, unreported, and unregulated fishing higher than 2.6 (https://globalinitiative.net/wp-content/uploads/219/2/IUU-Fishing-Index-Report-web-version.pdf)
3. **Filter G3:** Aquaculture production (USD) by country higher than 250.000 (https://data.worldbank.org/indicator/ER.FSH.AQUA.MT)
4. **Filter G4:** Aquaculture productivity by country – marine waters (US$) higher than 50000 (http://www.fao.org/figis/servlet/TabSelector)
5. **Filter G5:** Marine protected areas (% of territorial waters) minimum ≥ 2 (https://data.worldbank.org/indicator/ER.MRN.PTMR.ZS)
6. **Filter G6:** International Innovation index ≥ 33 (https://www.globalinnovationindex.org/analysis-indicator)
7. **Filter G7:** Ease of Doing Business ≥ 65(https://data.worldbank.org/indicator/IC.BUS.DFRN.XQ)
8. **Filter G8:** Data Protection Index ≥ 1 (https://unctad.org/fr/node/27563)
9. **Filter G9:** # of endangered water species in the territory ≥ 38 (https://www.portal.euromonitor.com/portal/StatisticsEvolution/index)
10. **Filter G10:** Fish and seafood consumption per person (kg/year) ≥ 19 (https://ourworldindata.org/seafood-production#aquaculture-production)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Regions with a coastal area (km) ≥ 250 (https://discomap.eea.europa.eu/map/Data/Milieu/OURCOAST_225_ES/OURCOAST_225_ES_Doc_Strategy.pdf)
2. **Filter L2:** Aquaculture production by coastal region (Tons) ≥ 7000 (https://www.mapa.gob.es/app/jacumar/datos_produccion/datos_produccion.aspx)
3. **Filter L3:** Annual Labor Unit by region ≥ 300 (https://confluence.elecnor-deimos.com/observatorio-acuicultura.es/sites/default/files/images/adjuntos/libros/indicadores_seguimiento_sostenibilidad_acuicultura_03.pdf)

4. **Filter L4:** Fish consumption in Spanish households (in millions kg) ≥ 73 (https://es.statista.com/estadisticas/641916/consumo-de-pescado-en-distintas-comunidades-autonomas-espana/)
5. **Filter L5:** Average time in months to open marine aquaculture centers by region ≤ 26 (https://confluence.elecnor-deimos.com/observatorio-acuicultura.es/sites/default/files/images/adjuntos/libros/indicadores_seguimiento_sostenibilidad_acuicultura_03.pdf)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter P1:** Marine aquaculture Production (tons) ≥ 800 (https://www.juntadeandalucia.es/export/drupaljda/informe_acuicultura_andalucia_2019_corregido.pdf)
2. **Filter P2:** An authorised area for marine aquaculture (m2) ≥ 2500000 (https://www.juntadeandalucia.es/export/drupaljda/informe_acuicultura_andalucia_2019_corregido.pdf)
3. **Filter P3:** Number of marine aquaculture companies per region ≥ 7 (https://www.juntadeandalucia.es/export/drupaljda/informe_acuicultura_andalucia_2019_corregido.pdf)

Business-Case 2a: Target Market for User Scenario "Monitoring Aquaculture Impact"

The original business case summarized in this section was developed by Maja Eymer, Cecilia Gonzalez, Marco Weber, Ana Cunha, and Bernardo Martins under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. It was decided to randomly start looking for organizations in all these countries that can partner with NextOcean and/or implement the offered service. A list of the initial identified potential stakeholders for business case #2a across the globe is presented in Table 6.

Table 6: Business Case #2a Potential Stakeholders.

N.o	POTENTIAL STAKEHOLDERS	LINK
1	TERRASIGNA	http://www.terrasigna.com/?ref=logo
2	Innovasea	https://www.innovasea.com/about-us/
3	Global Maritime	https://www.globalmaritime.com/aquaculture
4	Maxar	https://www.maxar.com/
5	Orbitaleos	https://www.orbitaleos.com/
6	European Space Imaging	https://www.euspaceimaging.com/
7	Blue Bridge	https://www.bluebridge-vres.eu
8	SINAPS CONSULT	https://www.sinaps-consult.com/en/
9	CERMAQ	https://www.cermaq.com/
10	Truearctic	https://truearctic.cermaq.com/
11	Nordlaks	https://www.nordlaks.no/English%E2%80%8B
12	Novasea	https://novasea.no/en/

To find the most attractive geographical market, 9 filters were applied to 193 countries worldwide, and most countries passed through the first filter. With the introduction of filter 7, aquaculture production volume in tons was considered. By doing so, numerous countries became irrelevant and the list of countries of interest declined to 13. Another filter that purified many countries was filter 8, aquaculture production value. Only 3 countries (**Norway, Chile, and Japan**) remained after the application of filter 8. Moreover, filter 9 led to the exclusion of two additional countries. Eventually, **Norway**, passed all filters, including the last filters' thresholds data protection index.

After having 193 countries running through 9 filters, **Norway** was identified to have the most suitable and attractive geographical target market for business case 2a. Additionally, after having 18 local regions running through 5 filters, **Nordland** was identified to have the most suitable and attractive geographical target market for business case 2a (Figure 20).

Figure 20: The final solution for business case #2a.

Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #2a and present in bold other highly attractive markets.

1. **Norway**
2. **Chile**
3. **Japan**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Member of FAO (YES/NO) = YES (http://www.fao.org/legal-services/membership-of-fao/en/#:~:text=As%20of%201%20May%202020,forth%20in%20the%20FAO%20Constitution.)
2. **Filter G2:** Total Coastline Coverage ≥ 563.5 km (https://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline)
3. **Filter G3:** Ease of doing business ≥ 65.5 (https://data.worldbank.org/indicator/IC.BUS.EASE.XQ)

4. **Filter G4:** Environmental Performance Index 2020 EPI Score ≥ 50 (https://epi.yale.edu/epi-results/2020/component/epi)
5. **Filter G5:** Global Innovation Index ≥ 31.2 (https://www.globalinnovationindex.org/analysis-indicator)
6. **Filter G6:** Digital Competitiveness Index ≥ 55.1 (https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2020/)
7. **Filter G7:** Aquaculture production volume in tons ≥ 50.000 (https://data.oecd.org/fish/aquaculture-production.htm)
8. **Filter G8:** Aquaculture production value ≥ 1500000000 USD (https://data.oecd.org/fish/aquaculture-production.htm)
9. **Filter G9:** Water Pollution ≤ 37.1 (https://www.nationmaster.com/country-info/stats/Environment/Pollution-perceptions/Water-pollution)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Coastal Area Available ≥ 2528.5 (https://www.ssb.no/303334/total-area-distribution-of-area-and-length-of-coastline-by-county.2017-sy-19)
2. **Filter L2:** Natural Reserve/Protected Maritime Areas ≤ 1.0 (https://www.ssb.no/en/statbank/table/08936/tableViewLayout1/)
3. **Filter L3:** Aquaculture Production Volume ≥ 117805 (tons) (https://www.ssb.no/en/statbank/table/07326/tableViewLayout1/)
4. **Filter L4:** Aquaculture Production Value (USD) ≥ 9304964.5 (https://www.ssb.no/en/statbank/table/07326/tableViewLayout1/)
5. **Filter L5:** Number of Aquaculture Licenses ≥ 289.8 (https://www.ssb.no/en/statbank/table/08967/)

Business-Case 2b: Target Market for User Scenario "Monitoring Aquaculture Impact"

The original business case summarized in this section was developed by Ahmed Hasan, Gabriele Mongodi, Christina Koch, Raquel Fernandes, and Bernardo Martins under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

It was decided to randomly start looking for organizations that can partner with NextOcean and/or implement the offered service in the UK, namely Scot-

land (the final target market for this business case). A list of the initial identified potential stakeholders for business case #2b is presented in Table 7.

Table 7: Business Case #2b Potential Stakeholders.

N.o	POTENTIAL STAKEHOLDERS	LINK
1	Scottish Salmon Producers Organization	https://www.scottishsalmon.co.uk/
2	The Association of Salmon Fishery Boards (ASFB)	http://fms.scot/association-of-salmon-fishery-boards-welcome-scottish-governments-salmon-conservation-proposals/
3	Seafood Scotland	https://www.seafoodscotland.org/
4	The Scottish Association for Marine Science	https://www.sams.ac.uk/
5	Scottish Fishermen's Federation (SFF)	https://www.sff.co.uk/
6	Stirling University Institute of Aquaculture	https://www.stir.ac.uk/about/faculties/natural-sciences/aquaculture/
7	University of St Andrews	https://soi.st-andrews.ac.uk/
8	Marine Alliance for Science and Technology in Scotland (MASTS)	https://masts.ac.uk/
9	Scottish Aquaculture Research Forum (SARF)	http://www.sarf.org.uk/
10	The Scottish Association for Marine Sciences (SAMS)	https://www.sams.ac.uk/
11	The NAFC Marine Centre	https://www.nafc.uhi.ac.uk/
12	Marine Scotland Science (MSS)	https://www.gov.scot/collections/marine-scotland-science/
13	Gael Force Group	https://www.gaelforcegroup.co.uk/
14	Benchmark Group	https://www.benchmarkplc.com/
15	Hendrix Genetics	https://www.hendrix-genetics.com/en/
16	AquaGen	https://aquagen.no/en/
17	Johnson Marine	https://www.johnsonmarine.co.uk/
18	The Scottish Salmon Company	https://www.scottishsalmon.com/
19	Loch Duart	https://lochduart.com/

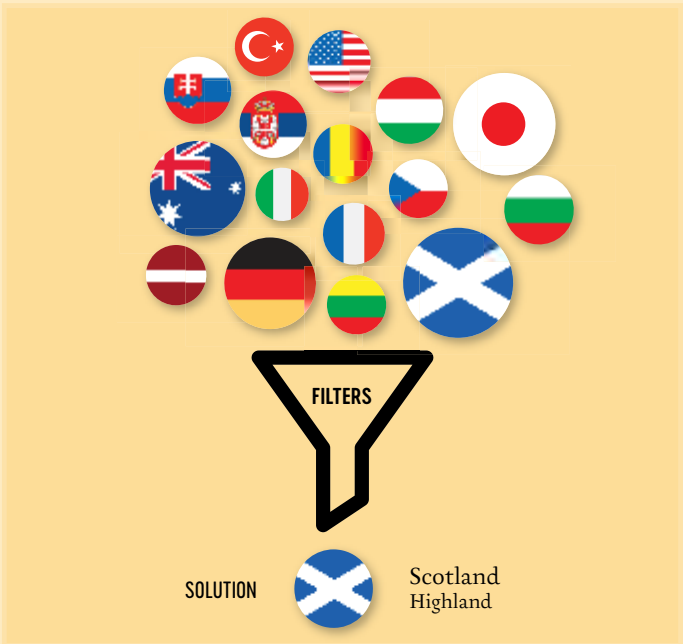
N.o	POTENTIAL STAKEHOLDERS	LINK
20	Mowi Scotland	https://mowi.com/uk/
21	Scottish Sea Farmers	https://www.scottishseafarms.com/
22	Cooke Aquaculture	https://www.cookeseafood.com/
23	Centre for environment, fisheries, and aquaculture science (CEFAS)	https://www.cefas.co.uk/
24	Highlands and islands enterprise (HIE)	https://www.hie.co.uk/
25	Scottish aquaculture innovation centre (SAIC)	https://www.sustainableaquaculture.com/
26	NAFC marine center - university of the highlands and islands	https://www.nafc.uhi.ac.uk/
27	Naturescot	https://www.nature.scot/
28	Scottish environmental protection agency	https://www.sepa.org.uk/
29	Marine Scotland	https://marine.gov.scot/

Market Assessment and Final Target Markets

To find the most attractive geographical market, 21 filters were applied to 193 countries worldwide, and most countries passed through the first filter. After filter 6, where marine protected areas (% of territorial waters) in 2018 score should be minimum 7.98, the number of countries was reduced to 9. With the introduction of filter 11, the global competitiveness index rank (2017-2018) was considered. By doing so, more countries became irrelevant. Hence, the list of countries of interest declined to 5 (**Scotland, Australia, France, Japan, and Spain**). Moreover, filter 12 led to the exclusion of four additional countries. Eventually, **Scotland**, passed all filters, including the last filters' thresholds data protection index.

After having 193 countries running through 21 filters, **Scotland** was identified to have the most suitable and attractive geographical target market for business case 2b. Additionally, after having 9 local regions running through 3 filters, **Highland** was identified to have the most suitable and attractive geographical target market for business case #2b (Figure 21).

Figure 21: The final solution for business case #2b.



Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #2a and present in bold other highly attractive markets.

1. **Scotland- Highland**
2. **Australia**
3. **France**
4. **Japan**
5. **Spain**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Volume of aquaculture production tones ≥ 4000 (https://data.worldbank.org/indicator/ER.FSH.AQUA.MT)
2. **Filter G2:** Amount of aquaculture business ≥ 276(https://www.dnb.com/business-directory/industry-analysis.aquaculture.html)
3. **Filter G3:** EZZ in the country (km2) ≥ 209200.5 (http://www.seaaroundus.org/data/#/eez)

4. **Filter G4:** Coast length (km) ≥ 2500 (https://web.archive.org/web/20120419075053/http:/earthtrends.wri.org/text/coastal-marine/variable-61.html)
5. **Filter G5:** Exports (FOB) of Fish, Crustaceans, Mollusks and Aquatic Invertebrates ≥ 300 (https://wits.worldbank.org/trade/comtrade/en/country/ALL/year/2018/tradeflow/Exports/partner/WLD/product/051191)
6. **Filter G6:** Marine protected areas (% of territorial waters) 2018 ≥ 7.98 (https://data.worldbank.org/indicator/ER.MRN.PTMR.ZS)
7. **Filter G7:** Political Stability ≥ 0 (https://www.theglobaleconomy.com/rankings/wb_political_stability/#:~:text=Political%20stability%20index%20(%2D2.5,available%20from%201996%20to%202019)
8. **Filter G8:** Network Coverage % of the population (2016-2019) ≥ 80 (https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx)
9. **Filter G9:** Ocean health index and water pollution 2020 ≥ 60 (http://www.oceanhealthindex.org/region-scores)
10. **Filter G10:** Global competitiveness index rank (2017-2018) ≥ 60 (https://confluence.elecnor-deimos.com/weforum.org)
11. **Filter G11:** Global climate risk index (2019) ≥ 70 (https://germanwatch.org/en/cri)
12. **Filter G12:** GDP per capita Growth % ≥0 and ≤1 (https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?name_desc=false)
13. **Filter G13:** Global Innovation Index ≥ 33.60 (https://www.globalinnovationindex.org/analysis-indicator)
14. **Filter G14:** ICT & Data Infrastructure ≥ 60 (https://networkreadinessindex.org/nri-2020-countries/)
15. **Filter G15:** SDG index for Goal 8 (Decent growth and economic growth) (>red) = YES (https://dashboards.sdgindex.org/downloads)
16. **Filter G16:** SDG index for Goal 9 (Industry, innovation, and infrastructure) (>red) = YES (https://dashboards.sdgindex.org/downloads)
17. **Filter G17:** SDG index for Goal 14 (Life below water) (>red) = YES (https://dashboards.sdgindex.org/downloads)
18. **Filter G18:** Global Data Restrictions ≥ 40 (https://opendatabarometer.org/2ndEdition/analysis/rankings.html)
19. **Filter G19:** FAO Membership = YES (http://www.fao.org/legal-services/membership-of-fao/en/#:~:text=As%20of%201%20May%202020,forth%20in%20the%20FAO%20Constitution)
20. **Filter G20:** 2020 SDG Index Score ≥ 74.47 (https://dashboards.sdgindex.org/downloads)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Number of sites ≥ 15
2. **Filter L2:** Number of active sites (=production within the last 3 years) ≥ 15
3. **Filter L3:** Number of companies ≥ 10

A qualitative analysis of the different regions in Scotland revealed that the most attractive region is Highland (FL1= 20; FL2= 16; FL3= 13). Highland is followed by Argyll and Bute (FL1= 16; FL2= 16; FL3= 8), Shetland (FL1= 15; FL2= 12; FL3= 9), Orkney (FL1= 6; FL2=4; FL3= 3) and Fife (FL1= 4; FL2= 3; FL3= 4).

Identification of Geographical Markets for EO Fishing Services

THIS SECTION PRESENTS a summary of the identified geographical target markets and potential clients for the four business cases in Fishing. Each business case presents an in-depth market assessment of critical variables for 193 Nations across the world.

Business-Case 3a: Target Market for User Scenario "Sustainable trade, ecolabeling and minimization of bycatch"

The original business case summarized in this section was developed by Inês Madaleno Cruz, Manuel Tomás Fontoura, Rahul Clive Fernandes, and Valentine Dosne under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. It was decided to randomly start looking for organizations in all these countries that can partner with NextOcean and/or implement the offered service. A list of the initial identified potential stakeholders for business case #3a across the globe is presented in Table 8.

Table 8: Business Case #3a Potential Stakeholders

N.o	POTENTIAL STAKEHOLDERS	LINK
1	Planet	https://www.planet.com/markets/maritime/
2	Orbitaleos	https://www.orbitaleos.com/coastal-monitoring/
3	European Space Imaging	https://www.euspaceimaging.com/maritime
4	Cybele	https://cybele.space
5	Earthi	https://earthi.space/industries/maritime-monitoring-and-observation/
6	Region of Brittany	https://www.bretagne.bzh/
7	Ministry of Higher Education, Research and Innovation	https://www.enseignementsup-recherche.gouv.fr/
8	Department of Finistère	https://www.finistere.fr/
9	Metropol of Brest	https://www.brest.fr/
10	IMT of Atlantic	https://www.imt-atlantique.fr/fr
11	Fishing in Finistère	https://www.peche-en-finistere.fr/actualites/
12	Environment in Britany	https://bretagneenvironnement.fr/
13	The Great West Fishery Association	https://www.toutcommenceenfinistere.com
14	Brittany fishermen Association	https://www.ehgo.fr/
15	Pecheursdebretagne	https://www.pecheursdebretagne.eu/
16	CFTO, Sustainable and Responsible Fishing	https://www.cfto.fr/

Market Assessment and Final Target Markets

To find the most attractive geographical market, 10 filters were applied to 193 countries worldwide, and most countries passed through the first filter. After filter 2, where Capture Fisheries Production (metric tons) should be at least 7.98, the number of countries was reduced to 44. With the introduction of filter 5, satellites by countries were considered. By doing so, more countries became irrelevant. Hence, the list of countries of interest declined to 21. Only 3

countries (**France, Japan, and the USA**) remained after the application of filter 6 of R&D Expenditure (% of GDP). Eventually, **France**, passed all filters, including the last filters' thresholds data protection index.

After having 193 countries running through 10 filters, **France** was identified to have the most suitable and attractive geographical target market for business case 3a. Additionally, after having 7 local regions running through 4 filters, **Brittany** was identified to have the most suitable and attractive geographical target market for business case 3a (Figure 22).

Figure 22: The final solution for business case #3a.

Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #3a and present in bold other highly attractive markets.

1. **France- Brittany**
2. **Japan**
3. **USA**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Length of coastal areas ≥ 370 (https://www.cia.gov/library/publications/the-world-factbook/index.html)
2. **Filter G2:** Capture Fisheries Production (metric tons) ≥ 300.000 (https://data.worldbank.org/indicator/ER.FSH.CAPT.MT)
3. **Filter G3:** Illegal, Unreported, and Unregulated (IUU) Fishing ≥ 2.2 (https://www.iuufishingindex.net/ranking)
4. **Filter G4:** Number of Endangered species level (Maritime species only) ≥ 36 (https://www.iucnredlist.org/resources/summary-statistics#Summary%20Tables)
5. **Filter G5:** Satellites by countries ≥ 2 (https://www.n2yo.com/satellites/?c=&t=country)
6. **Filter G6:** R&D Expenditure (% of GDP) ≥ 2 (https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS)
7. **Filter G7:** Ease of Doing Business Index ≥ 67 (https://data.worldbank.org/indicator/IC.BUS.EASE.XQ)
8. **Filter G8:** Employment (Number of fishers) ≥ 15000 (http://www.fao.org/fishery/static/Yearbook/YB2018_USBcard/root/fleet/fleet_&_employment.pdf)
9. **Filter G9:** Marine protected areas (% of territorial waters) ≥ 20% (https://data.worldbank.org/indicator/ER.MRN.PTMR.ZS)
10. **Filter G10:** Data Protection Index ≥ 1 (https://unctad.org/page/data-protection-and-privacy-legislation-worldwide)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Lengths of coastal areas ≥ 670 km (https://fr.wikipedia.org/wiki/Littoral_fran%C3%A7ais)
2. **Filter L2:** Volume of fresh and frozen fishery products sold in French regions ≥ 20.000 (https://www-statista-com.eu1.proxy.openathens.net/statistics/1149254/fresh-frozen-fishery-products-sales-volume-france/)
3. **Filter L3:** Number of fish in the 'red list' by regions ≥ 4 (https://inpn.mnhn.fr/collTerr/region/31/tab/especesmenacees)
4. **Filter L4:** Employment in fishing industry ≥ 45 (https://www.insee.fr/fr/statistiques/1560263#tableau-figure5)

Business-Case 3b: Target Market for User Scenario "Sustainable trade, ecolabeling and minimization of bycatch"

The original business case summarized in this section was developed by Andrea Garbaganti, Filipa Sampaio, and Tomás Barreto under the supervision of Luis Filipe Lages and Carlos Reis-Marques

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. It was decided to randomly start looking for organizations in all these countries that can partner with NextOcean and/or implement the offered service. Special attention was also given to Portugal, the selected target market. A list of the initial identified potential stakeholders for business case #3b across the globe is presented in Table 9.

Table 9: Business Case #3b Potential Stakeholders.

N.o	POTENTIAL STAKEHOLDERS	LINK
1	INTERMUNICIPAL COMMUNITY OF OESTE	http://www.oestecim.pt/
2	DOCAPESCA	http://www.docapesca.pt/index.php
3	GRUPO AÇÃO LOCAL PESCA OESTE	http://oestesustentavel.pt/?/eixo/67
4	DHI Group	http://seastatus.dhigroup.com/
5	e-geos	https://www.e-geos.it/#/hub/hubPlatforms/platform/platform-sense
6	European Space Imaging	https://www.euspaceimaging.com/industries/maritime/
7	Hexagon AB	https://www.hexagongeospatial.com/
8	MAXAR	https://www.maxar.com/
9	Orbitaleos	https://www.orbitaleos.com/
10	Planet	https://www.planet.com/products/monitoring/
11	Planetek	https://www.planetek.gr/
12	PML	https://www.pml-applications.co.uk/
13	Sat Global	https://www.satcomglobal.com/
14	TERRA SIGNA	http://www.terrasigna.com/fisheries-and-aquaculture.html

To find the most attractive geographical market, 13 filters were applied to 193 countries worldwide. Most countries passed through the first filter. After filter 2, where the length of the coastal line (km) should be at least 459 km, the number of countries was reduced to 42.

With the introduction of filter 4, the ease of doing business index was considered. By doing so, more countries became irrelevant. Hence, the list of countries of interest declined to 14. Only 2 countries (**Portugal and Italy**) remained after the application of filter 5 (Regulatory Quality Index). Eventually, **Portugal**, passed all filters.

After having 193 countries running through 13 filters, **Portugal** was identified to have the most suitable and attractive geographical target market for business case 3b. Additionally, after having 25 local regions running through 7 filters, **West** was identified to have the most suitable and attractive geographical target market for business case 3b (Figure 23).

Figure 23: The final solution for business case #3b.

Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #3a and present in bold other highly attractive markets.

1. **Portugal- West**
2. **Italy**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Exclusive Economic Zone (EEZ) Size by country (km2) ≥ 532658 (https://en.wikipedia.org/wiki/Exclusive_economic_zone#By_country)
2. **Filter G2:** Length of the coastal line ≥ 459 (https://www.citypopulation.de/en/world/bymap/coastlines/)
3. **Filter G3:** IUU fishing index (1 - best 5 - worst) ≥ 2.3 (https://iuufishingindex.net/ranking)
4. **Filter G4:** Ease of doing business index ≥ 35 (https://data.worldbank.org/indicator/IC.BUS.EASE.XQ)
5. **Filter G5:** Regulatory Quality Index ≥ 0.0 (https://info.worldbank.org/governance/wgi/)
6. **Filter G6:** Global Innovation Index ≥ 42 (https://www.globalinnovationindex.org/Home)
7. **Filter G7:** R&D expenditure (% of GDP) ≥ 1.2% (https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS)
8. **Filter G8:** Number of satellites per country ≥ 20 (https://www.ucsusa.org/resources/satellite-database)
9. **Filter G9:** SDGs Performance Score ≥ 70 (https://dashboards.sdgindex.org/rankings)
10. **Filter G10:** Protected Areas (% total territorial waters) ≥ 10% (https://data.worldbank.org/indicator/ER.MRN.PTMR.ZS)
11. **Filter G11:** Capture fisheries production (% of total production) ≥ 80% (https://data.worldbank.org/indicator/ER.FSH.PROD.MT)
12. **Filter G12:** Threatened species (% of total species) ≥ 7% (https://data.worldbank.org/indicator/EN.FSH.THRD.NO)
13. **Filter G13:** Agriculture, forestry, and fishing value added (% of GDP) ≥ 2% (https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?name_desc=false)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Nominal catch landed in the region (in tons) ≥ 8100(https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_doc_municipios)

2. **Filter L2:** Enterprises with innovation activities in fishing (% of total enterprises) ≥ 459 (https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_doc_municipios)
3. **Filter L3:** Number of fishing vessels of national fleet ≥ 615 (https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_doc_municipios)
4. **Filter L4:** Covered length of coastline (km) ≥ 30 (https://www.google.pt/maps/@39.6410434,-9.0890377,8.64z)
5. **Filter L5:** Nominal catches of coastal trawling (bycatch per thousand €) ≥ 6000 (https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=435690295&PUBLICACOESmodo=2)
6. **Filter L6:** Expenditure of municipalities on environmental management and protection (thousands €) ≥ 15500 (https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_doc_municipios)
7. **Filter L7:** Number of fishing companies (as a proxy for local IUU) ≥ 250 (https://infoempresas.jn.pt/A031_PESCA.html)

Business-Case 4a: Target Market for User Scenario "Monitoring of Fishing Activities and Impact"

The original business case summarized in this section was developed by Francisca Serejo, Leona Decker, Max Hartmann, João Bica, and Lucile Tréguilly under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. After applying the filters mentioned in the following section, we arrived at France as a potential geographical target market for this EO Fishing service. We have looked for organizations in France that can partner with NextOcean and/or implement the offered service. A list of the initial identified potential stakeholders for business case #4a in France is presented in Table 10.

Table 10: Business Case #4a Potential Stakeholders.

N.o	POTENTIAL STAKEHOLDERS	LINK
1	Ministry of Agriculture, Fisheries, and Forestry Resources	https://agriculture.gouv.fr/french-ministry-agriculture-and-food
2	Ministry of Environment	https://www.gouvernement.fr/en/france-sustainable-development
3	Department Directorate General of Maritime and Aquaculture Fishing	https://agriculture.gouv.fr/french-ministry-agriculture-and-food
4	Ministry of Health and Solidarities	https://solidarites-sante.gouv.fr/
5	CNRS (National Centre for Scientific Research)	http://www.cnrs.fr/en
6	ADEME (Executive Agency for Environment Management)	https://www.ademe.fr/en/about-ademe
7	ANVAR (Agency Innovative Research)	https://uk.ambafrance.org/Public-research-agencies-in-France
8	INRA (Agency Agriculture Production)	https://www.inrae.fr/en
9	CIRAD (R&D overseas territories)	https://www.cirad.fr/en
10	Smidap	https://www.smidap.fr/

Market Assessment and Final Target Markets

To find the most attractive geographical market, 8 filters were applied to 193 countries worldwide. A total of 55 countries passed through the first filter (countries with sufficient fishing territory). After filter 2, where the number of endangered species should be at least 50, the number of countries was reduced to 27.

With the introduction of filter 3, Cisco Digital Readiness Index, the list of countries of interest declined to 15. Of these, only 3 countries (**France, Japan, and Australia**) remained after the application of filter 4 (control on corruption). Eventually, **France**, passed all filters, including the last filter's thresholds Global Innovation Index.

France was identified to have the most suitable and attractive geographical target market for business case 4a. After having 13 local regions in France running through 4 filters, **Brittany** was identified to be the most suitable and attractive geographical target market for business case 4a (Figure 24).

Figure 24: The final solution for business case #4a.

Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #4a and present in bold other highly attractive markets.

1. **France, Brittany**
2. **Japan**
3. **Australia**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** Countries with sufficient fishing territory (Km2) ≥ 400.000 (https://www.liquisearch.com/exclusive_economic_zone/rankings_by_area)

2. **Filter G2:** Nº of endangered species ≥ 50 (https://www.indexmundi.com/facts/indicators/EN.FSH.THRD.NO/rankings)
3. **Filter G3:** Cisco Digital Readiness Index ≥ 11.9 (https://www.cisco.com/c/m/en_us/about/corporate-social-responsibility/research-resources/digital-readiness-index.html#/)
4. **Filter G4:** Control on Corruption ≥ 1.3 (http://info.worldbank.org/governance/wgi/)
5. **Filter G5:** Ocean Health Index ≥ 75 (http://www.oceanhealthindex.org/region-scores/annual-scores-and-rankings)
6. **Filter G6:** IUU Index Score ≥ 2.2 (https://www.iuufishingindex.net/ranking)
7. **Filter G7:** Capture fisheries production (metric tons) ≥ 53.697 (https://data.worldbank.org/indicator/ER.FSH.CAPT.MT)
8. **Filter G8:** Global Innovation Index ≥ 53 (https://www.globalinnovationindex.org/analysis-indicator)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Regions with Coastline/Access to the sea = (YES) (https://en.wikipedia.org/wiki/Regions_of_France)
2. **Filter L2:** Sales of fishery products ≥ 96.500.000 (https://www.franceagrimer.fr/fam/content/download/65441/document/CC%20p%C3%AAche%20aqua%20ANG%20web.pdf?version=1)
3. **Filter L3:** Regional GDP (M$) ≥110.000 (https://stats.oecd.org/Index.aspx?DataSetCode=REGION_ECONOM)
4. **Filter L4:** Regional Innovation Index ≥ 0.46 (https://ec.europa.eu/growth/industry/policy/innovation/regional_en)

Business-Case 4b: Target Market for User Scenario "Monitoring of Fishing Activities and Impact"

The original business case summarized in this section was developed by Joana Ramos, Romil Rane, Maria Luisa Rebelo, Matilde Gazzaniga and João Rodrigues under the supervision of Luis Filipe Lages and Carlos Reis-Marques.

Potential Stakeholders

The UN officially acknowledged 193 countries in the world. It was decided to randomly start looking for organizations in all these countries that can partner with NextOcean and/or implement the offered service. Then we provided special attention to Japan, which was the outcome market for the VCF and MCDA applied in the Business Case.

A list of the initial identified potential stakeholders for business case #4b across the globe is presented in Table 11.

Table 11: Business Case #4b Potential Stakeholders.

N.o	POTENTIAL STAKEHOLDERS	LINK
1	Eomap	https://www.eomap.com/
2	BMT	https://www.bmt.org/industries/water-and-environment/
3	Fugro	https://www.fugro.com/
4	TimeZero	https://solidarites-sante.gouv.fr/
5	Ministry of Agriculture, Forestry and Fisheries of Japan	https://www.maff.go.jp/e/
6	Japan Fisheries Research and Education Agency	https://www.fra.affrc.go.jp/english/eindex.html
7	Maruha Nichiro	https://www.maruha-nichiro.com/
8	Nippon Suisan Kaisha (Nissui)	https://www.nissui.co.jp/english/index.html
9	Regional Government of Kyushu	https://www.japan.go.jp/regions/kyushu.html
10	Fisheries Engineering Co.	http://www.fishengn.co.jp/index_e.html
11	Environmental Simulation Laboratory Co.	https://www.osram.com/am/services/environment-simulation-laboratory/index.jsp
12	Japan Fisheries Information Service Center (JAFIC)	https://www.jafic.or.jp/

Market Assessment and Final Target Markets

To find the most attractive geographical market, 10 filters were applied to 193 countries worldwide. A total of 146 countries passed through the first filter of having a coastline. After filter 3, where total fisheries production (metric tons) should be at least 75600 (Tons), the number of countries was reduced to 55.

With the introduction of filter 6, SDG Index was considered. By doing so, the list of countries of interest declined to 8. Only 3 countries (**Italy, Japan, and Spain**) remained after the application of filter 9. Eventually, **Japan**, passed all

filters, including the last filters' thresholds corruption perception Index.

After having 193 countries running through 10 filters, Japan was identified to be the most suitable and attractive geographical target market for business case 4b.

Additionally, after having 8 local regions in **Japan** running through 4 filters, **Kyushu (Okinawa) and Hokkaido** were identified to be the most suitable and attractive geographical target markets for business case 4b (Figure 25).

Figure 25: The final solution for business case #4b.

Based on the MCDA & VCF analyses and on the filters presented in the following section, we underline below the final solution for business case #4a and present in bold other highly attractive markets.

1. **Japan- Kyushu (Okinawa) and Hokkaido**
2. **Italy**
3. **Spain**

Countries Assessment and Filters to Select the Final Target Market(s)

1. **Filter G1:** List of countries by length of coastline ≥ 0 (https://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline)
2. **Filter G2:** Existence of a marine exclusive economic zone (km2) ≥ 216462 (https://en.wikipedia.org/wiki/Exclusive_economic_zone#Algeria)
3. **Filter G3:** Total fisheries production (metric tons) ≥ 75600 (https://data.worldbank.org/indicator/ER.FSH.PROD.MT)
4. **Filter G4:** Illegal, Unreported and Unregulated (IUU) Fishing Index ≥ 2.5 (https://www.iuufishingindex.net/ranking)
5. **Filter G5:** Ease of doing business index ≥ 96.7 (https://data.worldbank.org/indicator/IC.BUS.EASE.XQ)
6. **Filter G6:** SDG Index ≥ 67.6 (https://www.sdgindex.org/reports/sustainable-development-report-2019/)
7. **Filter G7:** % of Protected Maritime Area (%) ≥ 1.65 (https://data.worldbank.org/indicator/ER.MRN.PTMR.ZS?end=2018&name_desc=false&start=2016&view=chart)
8. **Filter G8:** Network Readiness Index (NRI) ≥ 50.1 (https://www.transparency.org/en/cpi/2019/index/)
9. **Filter G9:** Corruption Perception Index ≥ 42.9 (https://www.transparency.org/en/cpi/2019/index/)
10. **Filter G10:** Tax regulation ≥ 30 (https://taxfoundation.org/corporate-tax-rates-around-the-world-2019/)

Local Market Assessment and Filters to Select the Final Target Market(s)

1. **Filter L1:** Length of Coastline (m) ≥ 2.900.395 (https://stats-japan.com/t/kiji/22187)
2. **Filter L2:** Population with an occupation in fishing industry ≥ 18962.6 (https://www.e-stat.go.jp/en/stat-search/files?page=1&layout=datalist&toukei=00500210&tstat=000001033844&cycle=0&tclass1=000001132724&tclass2=000001149187&tclass3val=0)
3. **Filter L3:** Total fisheries production (metric tons) ≥ 447057 (https://stats-japan.com/t/kiji/10658)

Business cases: Summary of findings

This deliverable presents a global market assessment of the aquaculture and fishing industries in an EO context. This global market assessment was developed with the aim of finding critical aquaculture and fishing target markets across the globe to launch NextOcean services in a later stage.

Two parallel in-depth analyses were conducted, one targeted at the EO aquaculture market and the other at the EO fishing market. This phase was critical to gain market, technical, and practical knowledge about both sectors. An assessment was made of the market potential and potential stakeholders within both sectors.

Each of the eight business cases (4 in Aquaculture and 4 in Fishing) presents a worldwide market assessment in 193 UN countries. First, we arrived at a list of criteria/filters to select the best geographical markets while using different primary and secondary research sources. Then, while applying Multi-Criteria Decision Analysis (MCDA) and the Value Creation Funnel (VCF), we crossed the 193 potential target markets with the ranked criteria, leading to the final targets with the highest potential for NextOcean services (Table 12).

Table 12: Results for the 8 business cases.

INDUSTRY	USER SCENARIO	BUSINESS CASE	MOST ATTRACTIVE COUNTRY (REGION)	OTHER KEY COUNTRIES
Aquaculture	**New Aquaculture** Site Risk Assessment (SRA) Fish Farm Impacts on Water and Environment (FFI) Monitoring Aquaculture Site (MAS)	#1a	Norway	Japan USA
		#1b	Spain (Andalucía, Malaga)	Japan China
	Monitoring Aquaculture Impact Fish Farm Impacts on Water and Environment (FFI) Monitoring Aquaculture Site (MAS)	#2a	Norway (Nordland)	Japan Chile
		#2b	Scotland (Highland)	Japan Australia France Spain
Fishing	**Sustainable trade, ecolabelling, and minimization of bycatch** Characterization of Fishing Areas (CFA) Fish Provenance and Ecolabelling (FPE)	#3a	France (Brittany)	Japan USA
		#3b	Portugal (West)	Italy
	Monitoring of Fishing Activities and Impact Characterization of Fishing Areas (CFA) Fisheries Monitoring & Surveillance (FMS)	#4a	France (Brittany)	Japan Australia
		#4b	Japan (Kyushu -Okinawa- & Hokkaido	Italy Spain

Spain are very attractive markets for EO services in aquaculture. France and Italy are highly attractive markets for EO services in fishing. Outside Europe, Japan appears as the most attractive geographical market for EO services in aquaculture and fishing. These inputs will help to feed the future development of the tasks and deliverables related to marketing and commercial strategy, sales, and the business plan.

Conclusion

This chapter covers an extensive look at the industry background, a review of the applications, benefits and target customers across the whole market, a thorough investigation of competitor service providers. It also presents a major study to define the geographical target markets.

With this information, NextOcean is well informed about the current market situation and competitive landscape for the services being developed. The intelligence provided here can support the design of services to better compete with other available offerings. The identification of ideal customer types and geographic markets forms the basis for the sales strategy, recruitment of beta users and early pre-sales activities.

References

Allied Market Research. (2017). Allied Market Research. Available at: https://www.alliedmarketresearch.com/seafood-market

Arthur, J. R., Bondad-Reantaso, M. G., Campbell, M. L., Hewitt, C. L., Phillips, M. J., & Subasinghe, R. P. (2009). Understanding and applying risk analysis in aquaculture: a manual for decision-makers. In FAO Fisheries and Aquaculture Technical Paper.

Boivin, T., Werle, D., Johnston, E., & Tsui, O. (2005). Earth Observation Opportunities in the Fisheries and Aquaculture Sectors. Proceedings of the 2004 Envisat & ERS Symposium (ESA SP-572). 6-10 September 2004, Salzburg, Austria. Edited by H. Lacoste and L. Ouwehand. Published on CD-Rom., Id.114.1, 114.

Bourne, J. (2021). National Geographic. Retrieved March 16, 2021, from How to Farm a Better Fish: https://www.nationalgeographic.com/foodfeatures/aquaculture/

Commercial UAV News. (2018). Drones vs Satellites: Competitive or Complementary? https://www.commercialuavnews.com/infrastructure/drones-vs-satellites-competitive-complimentary

(2021). Industry Facts & Figures - EARSC. https://earsc.org/industry-facts-figures/

Elkington, J. (1997). Cannibals with forks – Triple bottom line of 21st century business. Stoney Creek, CT: New Society Publishers.

(2013). Safer shipping through sea ice. Available at: http://esamulti-media.esa.int/docs/EarthObservation/Copernicus_Brief_SeaIce_Issue5_Septem-ber2013.pdf

(2021). Earth Observation Expertise. https://www.euroconsult-ec.com/earth-observation-expertise/

European Commission Services. (2020). European Partnership under Horizon Europe Processes4Planet. June, 1–41.

European Commission. (2019). Copernicus Market Report - February 2019. https://doi.org/10.2873/011961

(2021). Norwegian aquaculture analysis. https://assets.ey.com/content/dam/ey-sites/ey-com/en_no/noindex/ey-report-the-norwegian-aquaculture-analysis-2021.pdf

(2001). Product certification and ecolabelling for fisheries sustainability.

(2018). Document card | FAO | Food and Agriculture Organization of the United Nations. Food and Agriculture Organization of the United Nations. http://www.fao.org/documents/card/en/c/I9540EN

(2020a). The State of World Fisheries and Aquaculture 2020. Sustainability in Action. Rome. https://doi.org/10.4060/ca9229en.

(2020b). Regional review on status and trends in aquaculture development in Europe. https://www.fao.org/3/cb7809en/cb7809en.pdf

(2021a). https://www.fao.org/Newsroom/common/ecg/1000505/en/stocks.pdf

(2021b). Fisheries and aquaculture production in Latin America and the Caribbean | FAO Regional Office for Latin America and the Caribbean | Food and Agriculture Organization of the United Nations. http://www.fao.org/americas/priorities/pesca-y-acuicultura/en/

(2022). https://www.fao.org/policy-support/policy-themes/sustainable-small-scale-fisheries/en/

George, H. (2009). Progress and poverty. Cambridge: Cambridge University Press. (Original work published 1879). http://dx.doi.org/10.1017/CBO9780511693687

Goel, P. (2010). Triple bottom line reporting: An analytical approach for corporate sustainability. Journal of Finance, Accounting, and Management, 1(1), 27-42.

Goméz, S. (2020). Aquaculture: Challenges on the road to sustainability | HydroHeart. https://hydroheart.org/2020/09/13/aquaculture-principles-history-and-current-challenges-on-the-road-to-sustainability/

Government, A. (2020). Aquaculture industry in Australia - Department of Agriculture. https://www.agriculture.gov.au/fisheries/aquaculture/aquaculture-industry-in-australia

Hu, S. (2018). Innovation as the threat? The evolution of the Earth observation industry within the era of New Space. 35.

Kamsvåg, F. (2021). Offshore aquaculture: Setting out to feed the world - DNV. https://www.dnv.com/expert-story/maritime-impact/Offshore-aquaculture-Setting-out-to-feed-the-world.html

Lages, L.F. (2016), "VCW—Value Creation Wheel: Innovation, technology, business, and society", Journal of Business Research, 69 (11), 4849–4855.

Lages, L.F., A. Ricard, A. Hemonnet-Goujot & A.-M. Guerin (2020) "Frameworks for innovation, collaboration and change: Value Creation Wheel, Design Thinking, Creative Problem Solving, and Lean", Strategic Change, 29(2), 195-213.

Little, Arthur D . (2021). Capturing value from earth observation analytics. https://www.adlittle.com/en/insights/viewpoints/capturing-value-earth-observation-analytics

Mapa Gobernio Espanol. (2019). [Aquaculture production data] - Fishing - gob.es. https://www.mapa.gob.es/app/jacumar/datos_produccion/datos_produccion.aspx

McKinsey and Company (2019). Precision fisheries: Navigating a sea of troubles with advanced analytics.

Montgomery, K. (2020). Opportunities and Barriers Facing Offshore Finfish Aquaculture in the United States.

(2019). Copernicus Market Report. Retrieved from: https://www.copernicus.eu/sites/default/files/PwC_Copernicus_Market_Report_2019.pdf

Ritchie, H., & Roser, M. (2019). Seafood Production. Our World in Data. Retrieved from Seafood Production: https://ourworldindata.org/seafood-production

Santos, R., Pabon, A., Silva, W., Silva, H., & Pinho, M. (2020). Population structure and movement patterns of blackbelly rosefish in the NE Atlantic Ocean (Azores archipelago). In Fisheries Oceanography (Vol. 29, Issue 3). https://doi.org/10.1111/fog.12466

Savitz, J. (2013). Ted Talk: Save the oceans, feed the world! ted.com. Available at: https://www.ted.com/talks/jackie_sa-vitz_save_the_oceans_feed_the_world

Vitale, S et al. (2020). Consumers' Perception and Willingness to Pay for Eco-Labeled Seafood in Italian Hypermarkets

Wong, E. (2020, October 22). Earth Org. Retrieved from Earth Org: https://earth.org/facts-overfishing/

World Bank. (2021). The World Bank. Retrieved March 25, 2021, from Aquaculture Production (metric tons): https://data.worldbank.org/indicator/ER.FSH.AQUA.MT?most_recent_value_desc=false

WWF (2021). World Wide Fund For Nature. Why is our ocean at risk? Available at: https://wwf.panda.org/discover/our_focus/oceans_practice/ocean_risk/

Yale. (2020). United Nations. https://www.un.org/en/about-us/member-states

Summary

THE FIRST CHAPTER in this book presents an introduction to the VCW Method. The second chapter presents six VCW cases-studies in the context of Earth Observation and Space Business. In the third chapter we present a collection of case-studies about NextOcean project.

The case studies presented in this book demonstrate how the VCW can be used across different fields and in a wide range of contexts. According to Nuno Grosso, Project Engineer at Deimos Engineering, who was involved in six VCW projects, "I like the way the VCW framework structures the information. (...) it goes through different stages until you funnel the ideas and get the more relevant information out of it."

The VCW is an agile and structured framework for innovation and guiding decision making. The application of the VCW across different areas and a wide range of challenges demonstrates how transversal this tool is. In the words of Peter Villax, Chairman of Hovione Capital, "the Value Creation Wheel model is very useful to understand reality, to model it, and then to use it for policies and policy making." Overall, the VCW method is very useful to innovate, take decisions and solve challenges.

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The VCW has been offered at different educational (undergraduate, master, MBA, PhD, executive) for several years. Nova University is one of many leading European universities where the VCW being offered in undergraduate, Masters, executives, post-graduates, PhD, and other research programs. Some of the Nova schools/programs who worked with the VCW include Nova SBE, Nova Executive Education, Nova Medical School, Nova Law School, ITQB, Nova FCT, Lisbon MBA, Nova Doctoral School, among others. Students doing their VCW projects have a unique opportunity to receive feedback from the VCW Lab and from many other students interested in the VCW Method.

Second, we acknowledge all the organizations which have applied the VCW to solve their challenges and were willing to share their findings. Examples of organizations highly experienced with the VCW include Elecnor-Deimos, which has developed in a period of 4 years (Set 2015-June 2019) a total of eleven VCW projects (lasting in average 4-5 months). Examples of other organizations which benefited from multiple VCW projects include Airbus, Eurocopter / Airbus Helicopters, Gemalto, GirlMove, Jerónimo Martins, Liga Portugal, Lufthansa Technik, Marseille University, MIT, Montepio Acredita Portugal, Nova University of Lisbon, and Refood. Additional organizations which have implemented solutions emerging from a VCW project include: Aga Khan Foundation, Altran, AstraZeneca / Santis, AXA, Bank of Cyprus, Babson College, Bébécar, Casa Menino Jesus de Praga, Cathay Pacific Airways, Claranet, Cyta-Vodafone, Credit Suisse, Crowne Plaza, DNS.pt, Eurolife Insurance, Everis-NTT Data, Fundação Ageas & Impact Hub, Flying Tiger, Forbach

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About the editors

Luis Filipe Lages

LUIS FILIPE LAGES (Ph.D., Warwick University) created the VCW-Value Creation Wheel (www.ValueCreationWheel.com), which was applied in numerous projects and across a wide range of firms, from award-winning start-ups to Fortune 500 companies (www.openVCW.com) to solve their daily challenges.

He is a Full Professor at Nova School of Business and Economics, Portugal. He was a Visiting Scholar at Stanford University, London Business School, and MIT Engineering School and a Visiting Faculty at MIT Sloan School of Management. He is the Director of the VCW Lab at Nova SBE (powered by the VCW method) who was the recipient of over 1M € in EC funds and has been involved in the development of numerous projects in the fields of Innovation, Decision Making, Value Creation, Sustainability, Space Business, and Earth Observation.

He received several awards including the "2018 American Marketing Association Research in Excellence Award". This AMA Award recognized his JIBS paper as "an outstanding article published in a widely recognized and highly respected refereed journal that has made a significant contribution to the literature on global marketing in previous 10 years".

His work received global media coverage from renowned outlets such as the Wall Street Journal and Time. Among many others, he has published in the Journal of International Business Studies, Journal of Retailing, International Journal of Operations & Production Management, European Journal of Marketing, Journal of Business Research, Industrial Marketing Management, International Business Review, Journal of International Marketing, International Marketing Review, Journal of International Management, and Tourism Management.

He teaches the Value Creation Wheel, Innovation, Decision Making, Value Creation, Marketing Strategy, International Marketing, and New Product Development. He served as Academic Director of the Undergraduate Program, Director of the Ph.D. program in Tropical Management, and Co-director of the Ph.D. Program in Management at Nova School of Business and Economics.

Vânia Fonseca

VÂNIA FONSECA is a Transformation Associate at Mercer. Portugal and a guest speaker at Nova SBE Executive Education, Portugal. Previously she worked at Deimos, Portugal as an Innovation Specialist and at New York Business Consultants as a Business Consultant. She has experience working with clients in Portugal, Spain, Italy, Belgium, the USA, and Brazil.

Vânia holds a Masters in Management from the Nova School of Business and Economics. She started working with the Value Creation Wheel in 2015. She has been a VCW Ambassador since 2017, holding several VCW-related publications and applying the VCW in several projects across different business and HR challenges.

Peter Toh

PETER TOH is the Commercial Project Manager of the NextOcean consortium for the duration of the project, leading and directing the efforts across all partners on technology-to-market transfer. Working for Nova School of Business and Economics, he is applying his wealth of commercial and management experience to develop the NextOcean business plan and sales strategy, as well as delivering the market assessment study and leading the sales efforts to find buyers for the Earth observation services. This includes generating a good understanding of market needs, potential customers, and the most relevant geographical markets.

Holding a first-class Batchelor's degree in Mathematical Economics from the University of Birmingham, UK, and a Masters in Management Science from Warwick Business School, UK, Peter began his career as an analyst in the field of Operational Research. He spent over 15 years as an internal management consultant at British Airways, applying data analysis and decision-making tools to answer critical business questions and guide senior management decisions.

Further info about the VCW

Lages, Luis Filipe (2015), **"How to Grow, Create and Capture Value in Domestic and International Markets"**, *Nova SBE Working Paper*, nr. 599. ***Main topics**: POKER method; GloCalization*.

Lages, Luis Filipe (2016), "VCW—Value Creation Wheel: Innovation, Technology, Business, and Society", *Journal of Business Research*, 69(11): pp. 4849-4855. ***Main topics:** VCW Model; Decision making; Case-studies; DIANA theoretical framework; TIAGO customized framework.*

Lages, Luis Filipe; Fonseca, Vânia; Paulino, Miguel (2018), "The VCW-Value Cr eation Wheel: A Framework for Market Selection and Global Growth", In: Leonidou L., Katsikeas C., Samiee S., Aykol B. (eds) Advances in Global Marketing. Springer, Cham.: pp 253-279. ***Main topics:** VCW Case-Studies: Market selection; Global growth; Strategy; Innovation; Decision Making; Healthcare; Technology; Retailing; Start-Ups*

Lages, Luis Filipe; Ricard, Antonin; Hemonnet-Goujot, Aurélie; Guerin, Anne-Marie (2020), "Frameworks for Innovation, Collaboration, and Change: Value Creation Wheel, Design Thinking, Creative Problem--Solving, and Lean", Strategic Change, 29(2), 195-213. ***Main topics:** Value creation wheel; Design thinking; Creative problem-solving; Lean*

Lages, Luis Filipe et al. (2023), "Solutions for the Commercialization Challenges of Horizon Europe and Earth Observation Consortia: Co-Creation, Innovation, Decision-Making, Tech-Transfer, and Sustainability Actions". Electronic Commerce Research. Forthcoming. ***Main topics:** VCW Sprint; VCW Journey; VCW Method; VCW Meta Framework; VCW Case-Studies; Innovation; Innovation Ecosystem; Decision Making; Space Business; Earth Observation; Paradoxes.*

Fonseca, Vânia; Lages, Luis Filipe; Kim, Philip H. (2018), "Deimos: Expanding to a New Market Using the Value Creation Wheel", Case BAB370-PDF-ENG, Harvard Business Publishing. ***Main topics:** VCW Case-Study and Teaching Note; Technology transfer; Innovation; International market selection; Decision-making; Aerospace; Farming*

Reis-Marques, Carlos; Lages, Luis Filipe; Caminati, V.V. (2019), "VCW for Social Impact in a Developing Country: Personal Development and Entrepreneurship in a Leadership Academy", In: Basil D., Diaz-Meneses G., Basil M. (eds). Social Marketing in Action. Springer Texts in Business and Economics. Springer, Cham. pp 141-162. ***Main topics:** VCW Case-Study and Teaching Note: Training in leadership and entrepreneurship; Social impact; Decision making; Personal development*

VCW site: www.ValueCreationWheel.com

VCW YouTube channel: www.OpenVCW.com

VCW history and selection of papers critical for the development of today's VCW framework:

- Jahanmir, S. F., & Lages, L. F. (2015). The lag-user method: Using laggards as a source of innovative ideas. *Journal of Engineering and Technology Management*, 37, 65-77.
- Jahanmir, S. F., & Lages, L. F. (2016). The late-adopter scale: A measure of late adopters of technological innovations. *Journal of Business Research*, 69(5), 1701-1706.
- Lages, L. F. (1999). Marketing lessons from Portuguese wine exporters: The development and application of a conceptual framework. *Journal of Wine Research*, 10(2), 123-132.
- Lages, L. F. (2000). A conceptual framework of the determinants of export performance: Reorganizing key variables and shifting contingencies in export marketing. *Journal of Global Marketing*, 13(3), 29-51.
- Lages, L. F., & Montgomery, D. B. (2004). Export performance as an antecedent of export commitment and marketing strategy adaptation: Evidence from small and medium-sized exporters. *European Journal of Marketing*, 38(9/10), 1186-1214.
- Lages, L. F., Jap, S. D., & Griffith, D. A. (2008). The role of past performance in export ventures: a short-term reactive approach. *Journal of International Business Studies*, 39, 304-325.

Would you like to learn more about the Value Creation Wheel?

The VCW (Value Creation Wheel) Certification aims to equip individuals and organizations with the skills and knowledge to effectively use the VCW methodology for innovation, decision-making, problem-solving, transformation, and value creation. While the specific certification levels can vary, they generally follow a structured approach to ensure a comprehensive understanding and application of the VCW. Here's an overview of the different levels of VCW certification:

VCW Certification Level	VCW Certification	Requires to solve	Total Hours	VCW Application	VCW Study	VCW Trainer Certification (requires exam)
1 FOUNDATION	**VCW Sprint**	1 VCW Jorney	28	08h-16h	20h-12h	**VCW Sprint Trainer**
2 INTERMEDIATE	**VCW Jorney**	1 VCW Method	98	24h-64h	74h-34h	**VCW Journey Trainer**
3 ADVANCED	**VCW Method**	1 VCWMeta Framework	196	48h-128h	148h-68h	**VCW Method Trainer**
4 EXPERT	**VCWMeta Framework**	1 VCW Innovation Ecosystem	392	96h-256h	296h-136h	**VCW Meta Framework Trainer**
5 MASTER	**VCW Innovation Ecosystem**	> 1 VCW Innovation Ecosystem	784	192h-512h	592h-272h	**VCW Innovation Ecosystem Trainer**

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