Electronic Commerce Research (2023) 23:1621–1663
https://doi.org/10.1007/s10660-023-09675-8

# Solutions for the commercialization challenges of Horizon Europe and earth observation consortia: co-creation, innovation, decision-making, tech-transfer, and sustainability actions

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Accepted: 8 January 2023 / Published online: 6 March 2023


## Abstract

European Community (EC) Horizon-funded projects and Earth Observation-based Consortia aim to create sustainable value for Space, Land, and Oceans. They typically focus on addressing Sustainable Development Goals (SDGs). Many of these projects (e.g. Commercialization and Innovation Actions) have an ambitious challenge to ensure that partners share core competencies to simultaneously achieve technological and commercial success and sustainability after the end of the EC funds. To achieve this ambitious challenge, Horizon projects must have a proper governance model and a systematized process that can manage the existing paradoxical tensions involving numerous European partners and their respective agendas and stakeholders. This article presents the VCW-Value Creation Wheel (Lages in J Bus Res 69: 4849–4855, 2016), as a framework that has its roots back in 1995 and has been used since 2015 in the context of numerous Space Business, Earth Observation, and European Community (EC) projects, to address complex problems and paradoxical tensions. In this article, we discuss six of these paradoxical tensions that large Horizon Consortia face in commercialization, namely when managing innovation ecosystems, co-creating, taking digitalization, decision-making, tech-transfer, and sustainability actions. We discuss and evaluate how alliance partners could find the optimal balance between (1) cooperation, competition, and coopetition perspectives; (2) financial, environmental, and social value creation; (3) tech-push and market-pull orientations; (4) global and local market solutions; (5) functionality driven and human-centered design (UX/UI); (6) centralized and decentralized online store approaches. We discuss these challenges within the case of the EC H2020 NextLand project answering the call for greening the economy in line with the Sustainable Development Goals (SDGs). We analyze NextLand Online Store, and its Business and Innovation Ecosystem while considering the input of its different stakeholders, such as NextLand's commercial team, service providers, users, advisors, EC referees, and internal and external stakeholders. Preliminary insights from a twin project in the field of Blue Economy (EC H2020 NextOcean), are also used to support

our arguments. Partners, referees, and EC officers should address the tensions mentioned in this article during the referee and approval processes in the pre-grant and post-grant agreement stages. Moreover, we propose using the Value Creation Wheel (VCW) method and the VCW meta-framework as a systematized process that allows us to co-create and manage the innovation ecosystem while engaging all the stakeholders and presenting solutions to address these tensions. The article concludes with theoretical implications and limitations, managerial and public policy implications, and lessons for Horizon Europe, earth observation, remote sensing, and space business projects.

**Keywords** Innovation · VCW-Value Creation Wheel · Earth observation · Remote sensing · Satellite-based data · Horizon 2020 · Horizon Europe · B-DEDICATED · eCommerce · Online store · Digital · Sustainability · Strategic alliances · Business models

## 1 Introduction

The exceptional levels of technological evolution and the increasing need for global competitiveness in the space business and satellite-based Earth Observation (EO) sectors have been conducive to the development of inter-organizational collaborative arrangements (e.g., strategic alliances, joint ventures, mergers, and acquisitions) to leverage the opportunities introduced by innovative technologies and their impact across countries and all areas of society [8, 39]. However, despite their increasing popularity, they encompass complex and multifaceted inter-organizational relationships and multiphase processes [33, 64] and exhibit a relatively high rate of failure [34, 70].

The existing body of knowledge identifies several critical failure reasons associated with the pre-agreement and implementation phases, such as lack of communication [2], trust and control [13], identification and commitment [35], cultural clashes [82], poor partner selection and evaluation [14], human resources centralization [87] (for a comprehensive discussion see [34, 37]. However, some scholars suggest that the main reason why most M&A and alliances fail to create the expected individual and collective value for all the partners is not because of the failure to understand the main critical success factors but rather the inability to understand their interconnection during the pre-agreement and post-agreement phases [34, 54]). This is supported by our 8-year-old of experience in EC-funded and EO-based projects, which has revealed that critical reasons for failure include a lack of understanding about partners' teams, product/service development, market research, and improper competitor analysis.

In this paper, we investigate how the lack of clarity about the implications of the different types of collaborative arrangements during the pre-agreement and post-agreement phases can exacerbate challenging paradoxical tensions (e.g., cooperation versus competition, tech-push versus market-pull) during the implementation phase. We define paradox as "Contradictory yet interrelated elements (dualities) that exist

simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed" ([81]: 387).

We analyze paradoxes in the context of a type of strategic alliance, the consortium, typically involving organizations operating in related areas, which need to join complementary resources and competencies to achieve synergetic gains [36]. Similarly to joint ventures, they usually involve shareholding or an ownership and governance structure, sharing of specific capabilities, and distribution of benefits. Research and development (R&D) consortia are some of the most common types of consortia and tend to focus on basic or applied research. They can be instrumental during the early stages of more exploratory innovation processes and yield significant benefits to newly developing sectors. Usually, they are not seen as a threat in terms of monopoly creation because the relationship between the organizations involved is generally loose, as partners tend to work together on projects without sharing their core competencies. Consequently, this type of strategic alliance creates numerous challenges for EC projects (e.g., Innovation Actions of H2020 and Horizon Europe), where partners are expected to share core competencies to simultaneously achieve technological and commercial success and sustainability after the end of the EC funds.

This paper is structured as follows. We start by presenting the evolution of the space business and EO-based services sectors. This follows an introduction to Horizon Europe, Earth Observation, and remote sensing projects. Then we present the EC H2020 NextLand project and the importance of creating value for its stakeholders. This is followed by the method and data supporting the findings presented in this article. The following section addresses six paradoxical tensions currently affecting leaders (executives, managers, engineers, scientists, and public policymakers) in the space business and Earth Observation (EO) sectors. After presenting the six types of paradoxical tensions, we conclude the article with managerial and public policy implications.

## 2 Space business and earth observation based services: past, present, and future

Globally, governments invest in space capabilities for governance purposes, to develop innovation and research capacity, and to address several socio-environmental motivations aligned with the SDGs and the European Green Deal [, 17, 19]. Investment in space business and its activities have increased by 44% during the last decade, surpassing USD 75 billion in 2017, with public investments representing the bulk of the funding [68]. Although private investment in space companies is minor compared to public funds, it achieved a record of USD 14.5 billion in 2021 [79].

Significant evolutions in digitalization, science, and technological innovation have supported the space sector's development during the last century and led to different cycles of space development (see [66, 68]. The pre-space age was initiated during the first half of the twentieth century with the launch of the first Goddard and V-2 rockets. In 1957, the USSR launched Sputnik, the first satellite in orbit. During the first cycle of space development (1958–1972), we had the first humans in space

and the first military EO applications supported by spy satellites. During the second cycle of space development (1973–1986), major players (China, Europe, Japan) entered the space race, and the USA and USSR further developed their military applications and systems (GPS and Glonass). EO took its initial steps in civilian and commercial applications. During the third cycle (1987–2002), more actors entered the space market, and the number of space and satellite EO applications for military, civilian and commercial purposes increased exponentially [69]. During the fourth cycle (2003–2018), the EU introduced Galileo as Europe's global navigation satellite system, designed and developed by the European Space Agency (ESA). This is the first and only publicly owned satellite navigation system under civilian control. It is the most accurate satellite navigation system in the world, providing precise global position and timing accuracy, which can be used for complete governmental and commercial applications [27, 28].

We are in the fifth cycle of space development (2018–2033). Investment in space-related start-ups is supported mainly by public funding, while private investment is still in an early stage [23]. However, more than eighty countries have a registered satellite in orbit, representing an increase of 64% during the last decade. The EO value chains are becoming global, and numerous actors are entering the EO market, launching many applications for military, civilian, and commercial purposes. While some activities are mature (e.g., the first generation of satellites, space launchers, security projects), there are many emerging space activities (e.g., space tourism, in-orbit servicing, space mining, and resource extraction) that still need to prove their long-term sustainability [68].

## 3 Horizon Europe, earth observation and remote sensing projects

EU-funded projects (e.g., Horizon 2020, Horizon Europe) provide significant incentives for the creation of European consortia. A significant focus of these programs is for EU organizations to collaborate and develop long-term relationships with other organizations, including their competitors, to bring their services or products to global markets [18]. Organizations might benefit from participating in innovation and research grants at many different levels, such as increasing their impact and developing their knowledge base and collaboration networks [3]. This is the case with the EC Horizon 2020 (H2020) program, recently replaced by Horizon Europe, an EU Research and Innovation program with over €95 billion of funding available.

However, despite their various widely acknowledged benefits [3], H2020 and Horizon Europe projects are the basis for numerous paradoxical tensions between individual partners [47]. Multiple consortium players are expected to simultaneously validate the technical and economic viability of services or products in an operational environment while collaborating at the vertical and horizontal levels of the value chain [16]. Previously competing organizations are now encouraged to cooperate to access EC funds.

In space business, EO data, and remote sensing, the number of formal relationships has increased exponentially with EC support. There is recent pressure to change the focus from pure "technological orientation" to more "market-oriented" projects aiming

for long-term sustainable solutions that use interdisciplinary teams to bring added value to society by meeting user needs [88]. Research indicates that it is often beneficial for the platform to collect and analyze personal data [15].

Space business relates to all the economic activities conducted by public and private organizations towards the development, manufacturing, and commercialization of components that go into Earth's orbit or beyond, including ground stations and all the satellite-related activities used to provide EO enabled products and services to intermediary and final users [7, 66, 67]. Both incremental and radical EO-based innovations are highly financed by the EC and often result from collaborations across different partners across different countries and sectors. EO is used to support numerous remote sensing activities, which observe planet Earth's physical, chemical, and biological systems from platforms (e.g., satellites, drones). Satellite-based EO remote sensing data allows individuals and organizations to map, monitor, and help to manage critical resources across significant fields such as air quality management, coastal and marine, agriculture, forestry, natural disasters, urban areas, oil and gas, renewable energies, and security (see [10]. After being processed, EO images are used to develop an extensive range of market applications to assist decision-makers and public policy-makers. For example, they might be used to monitor fire and deforestation areas, manage the impact of agriculture, fishing, and aquaculture activities, help to establish urban settlements and housing, assess the potential for the development of transportation routes, discover and monitor the places for renewable energy installations (e.g., wind, solar, hydropower), for internet and communication purposes, defense uses, and for tracking the progress on the Sustainable Development Goals (SDGs). However, from a financial perspective, while some believe in the socio-economic value of EO data and applications [29], others believe that the socio-economic value of satellite-based EO services is yet to be measured [83].

Earth Observation Service Providers (EO-SPs) face several paradoxical tensions within this context. Organizational partnerships, including mergers and acquisitions, are becoming more common. The borders between industries, market segments, and players must be clarified. They are being asked to provide mass-customized solutions that can satisfy local markets and simultaneously, be used across the planet. Simultaneously, while there is an escalating saturation of technological solutions in most markets, end-users become increasingly demanding and sophisticated. EO-SPs often face the paradox of choice [78] due to having many options. They are confronted with an array of target markets and potential market applications, which can cause stress and complicate decision-making rather than making people happy and ensuring they get what they want. Technological and market choices are now strongly influenced by public money being injected into priorities to establish a more mature market and a self-sustaining industry.

## 4 Value creation in the EC H2020 NextLand project

The initial steps of the VCW Meta Framework in the Space Business and Earth Observation context were given in July 2015, two decades after VCW's earlier efforts. The first project resulting from a partnership between the VCW Lab @ Nova

School of Business and Economics and Elecnor Deimos was related to the identification of new market applications and new business models for Global Navigation Satellite System-reflectometry (GNSS-R). Since then, while some projects were published in the format of international case studies (e.g., [25], other projects with the VCW Framework received case-study awards from "FAE-Fórum de Administradores e Gestores de Empresa" and "EDP—Energias de Portugal" (FAE/EDP). More importantly, these initial projects made an impact inside and outside Elecnor Deimos. They led to organizational change and a mindset transformation. The tech-push mindset gradually became market-pull. Since 2015, Deimos hired people with a business background, namely an innovation manager, a marketing manager, a sales manager, and a project manager. Moreover, it received several interns from Nova School of Business of Economics (Lisbon, Portugal) who later became Deimos's employees.

### 4.1 The NextLand project

Although some recent theoretical works [47, 83] have discussed paradoxical tensions within the context of space business and EO-based services and organizations, this is the first study to do it from an empirical perspective. Our research setting is the EC H2020 project NextLand (Next generation Land management services for agriculture and forestry).

> NextLand's vision is to be the most customer-centric online store offering numerous impactful EO-based services in forestry and agriculture.

While the vision defines where we desire to go in the long term, the mission describes what we are currently doing to achieve the vision: our objectives and how we are reaching those objectives.

> NextLand's mission is to provide quick and easy online access for organizations with technological know-how to find individual and bundled high-quality EO-based services in forestry and agriculture through a partnership of many expert organizations.

The total costs of the NextLand project are € 3.42 million, of which the EC finances €2.806 million (82%). NextLand comprises 11 partners who collaborate to develop EO-based services, with the final aim to commercialize solutions in the forestry and agriculture markets. NextLand spans the European continent with partners in Belgium (BDB, Vito), Denmark (DHI Gras), Finland (European Forest Institute), Greece (Certh), Italy (Terradue), Norway (S&T), Spain (Deimos), Portugal (Nova), The Netherlands (Vandersat-Planet), and the UK (SoilEssentials). While Terradue and the 4 EO-SPs (Deimos, DHI Gras, Vandersat-Planet, and Vito) are responsible for defining the service requirements and developing the 15 EO-based services in partnership with alpha and beta-users, Nova will support them by implementing the commercial and sustainability strategies with the final goal of bringing these EO-based services to the market. The five remaining NextLand partners are alpha-users.

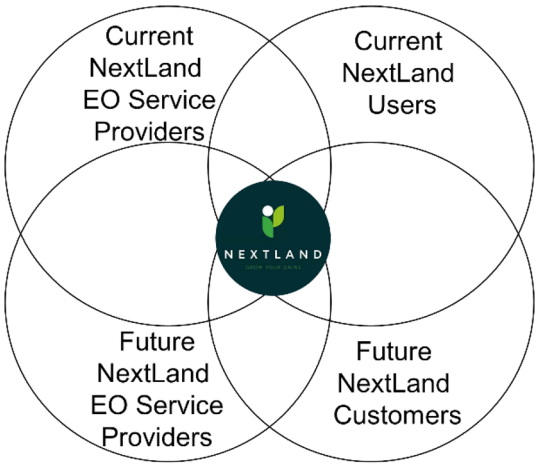


**Fig. 1** How and where to create value in NextLand?

Similarly to other EC projects conducted in the context of H2020 Innovation Actions, the EC emphasizes that Innovation Actions are not "pure research" projects. The EC often pushes for partners' collaboration, service commercialization, project sustainability, and cohesion during and after the project. It is critical to follow a pragmatic approach that allows the creation of short- and long-term value via the simultaneous validation of the technical and economic viability of the services developed among NextLand partners [21].

### 4.2 Value creation in the Nextland project for the different stakeholders

An excellent challenge for NextLand is to create individual and collective value to keep the NextLand consortium working together and becoming sustainable after the end of the EU funding. All eleven partners must think about their own organizations' interests as well as the common good of the consortium partners. The paradoxical tensions often evolve in function of several aspects, such as the manner teams coordinate, the value each team puts into individual vs collective goals, and how the different members of the consortium behave as a multi-team system [74]. In addition, partners need to consider the added value of NextLand for future EO-SPs and future customers (see Fig. 1).

To do so, NextLand had to engage different players of the EO value chain, many of whom are used to competing, and promote communication across different points of view. Partners needed to be willing to cooperate, communicate and disclose information and agree on sensitive topics such as Intellectual Property Rights (IPR) and a Collaboration Management Agreement (CMA), distribution of costs and revenues, agreeing on the business plan, defining the legal entity to run the consortium (e.g., an EEIG, one of the entities, a new association, or a European Cooperative) after the project, among others. More importantly, they needed to be open to exploring how to create value for themselves while considering the needs of other NextLand partners and future stakeholders. This considerable

challenge requires from the different consortium partners "a creative, both/and approach that leverages the benefits of each side separately, while also tapping into their synergistic potential" [58].

In the project's first year, an exploratory survey and discussions among NextLand partners were carried out to identify where and how to create value. The results revealed that by being together, partners would expect that NextLand could offer added value for EO-SPs across a wide range of dimensions, such as brand visibility, access to a new sales channel and new customers, lower costs (e.g., development, operations, and commercialization), and simplification of sales and financial processes. From a customer perspective, exploratory results indicated that a solid collaboration between NextLand partners could contribute to offering customers an added value one-stop-shop to save search time and money, which would include a broad range of individual and bundled EO-based services. Through the NextLand Online Store, it would become possible to offer both standardized and customized services, clearly defined service attributes and transparent pricing, more accessible and faster access to information ('on demand'), accurate, high resolution, and up-to-date information, as well as simple and trusted data access and payment.

At the end of the second year of the project, NextLand partners, as well as several new users (e.g., Arbonaut, BDB, Celpa, Forest Design, SoilEssentials) that had the opportunity to test the NextLand Online Store and NextLand services were invited to provide feedback during a two-day workshop held at Nova SBE in Lisbon (March 2022). Consequently, NextLand's value proposition was revisited. The current value proposition of NextLand is:

> NextLand offers a large variety of high-quality satellite-based earth observation services (EO-based services) from leading EO-SPs. NextLand EO-based services have high accuracy and up-to-date information, are rapid-on-demand, and are offered at competitive pricing. NextLand provides customers with a one-stop shop with individual and bundled EO-based services. It helps them reduce the time and money spent conducting in-situ sampling or surveys. Moreover, it reduces response time, improves service quality to end-users, and increases organizational efficiency. NextLand offers the EO-SPs brand visibility, access to a new sales channel and new customers, simplified operations (e.g., sales and finance), and lower costs (e.g., development, operations, and commercialization). It targets organizations with technological know-how in the agriculture and forestry markets, namely added value service providers and end-users.

A long-term sustainable relationship between all NextLand partners will only occur if the value proposition and its central assumptions become effective during this three-year project. Moreover, after the end of the EC H2020 project, a proper governance model and cooperation among NextLand partners will only occur if the value created and captured by the partners is superior to the value created by the individual entities. As such, there is an assumption that the formal signature of the IPR and CMA depends on having guarantees that the value proposition and both the customers' and service providers' benefits will be realized. Consequently, all

partners will become aligned when the whole becomes more significant than the sum of its parts.

## 5 The VCW-value creation wheel for co-creation, innovation, decision-making, tech-transfer, and sustainability actions

EC Horizon-funded projects frequently address the SDGs and aim to create sustainable value in space, land, and oceans. However, to achieve these goals, projects must have a proper governance model and a systematized process that can address the existing paradoxical tensions involving many European partners and their respective stakeholders. As we will discuss, there are six frequent paradoxical tensions in Horizon projects. These tensions are related to co-creating and managing the conflicting interests of the different partners while finding an optimal balance between (1) cooperation, competition, and coopetition perspectives; (2) financial, environmental, and social value creation; (3) tech-push and market-pull orientations; (4) global and local market solutions; (5) functionality driven and human-centered design (UX/UI); (6) centralized and decentralized online approaches.

### 5.1 Why the VCW?

To constantly address and manage these tensions, during the two and a half years of the NextLand project, we frequently applied the VCW-Value Creation Wheel [46]: [54]. The VCW allows the discovery of solutions for complex problems through creativity, co-creation, innovation, and decision-making. It has been frequently implemented in large European projects by the VCW Lab at Nova School of Business and Economics (VCW Lab at Nova SBE), Portugal. This is the case of the projects in earth observation, Blue Economy, and Green Economy areas (e.g., BETTER, MyFarm, SenSyF, and Marine-EO). The VCW method has been particularly appropriate to support WorkPackage activities of large Horizon projects (e.g., NextLand, NextOcean, NextGeoss), namely by helping coordinate the Innovation Ecosystem, Tech-Transfer, Commercialization & Sustainability actions. The creation and proper management of VCW innovation ecosystems are critical to managing complex tensions and paradoxes within the consortia, such as collaboration management agreements, competition versus cooperation, and tech-push versus market-pull challenges [47]. Moreover, the VCW can provide helpful input to the Executive Board, Work Packages in charge of Co-creation, Technology, and Dissemination actions.

### 5.2 What is the VCW?

The VCW moves from the diagnostic to the final solution with the support of the Key Decision Makers (e.g., executive board and critical decision-makers), while engaging the surrounding internal and external stakeholders. The VCW has the VCW-DIANA framework often used for very specific and concrete challenges, for which they are allocated limited resources. The VCW-TIAGO framework is often

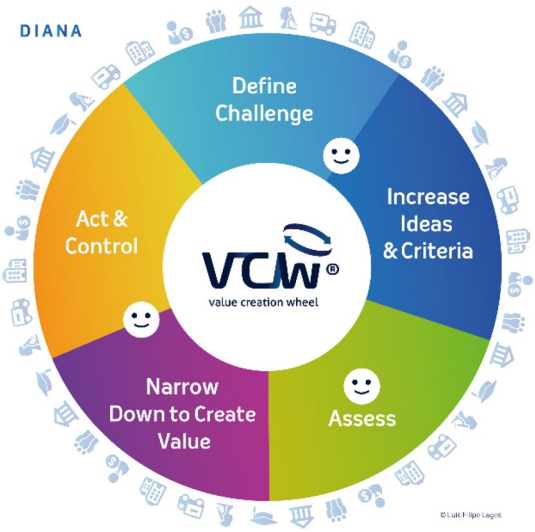


**Fig. 2** VCW Sprint (adapted from [46]

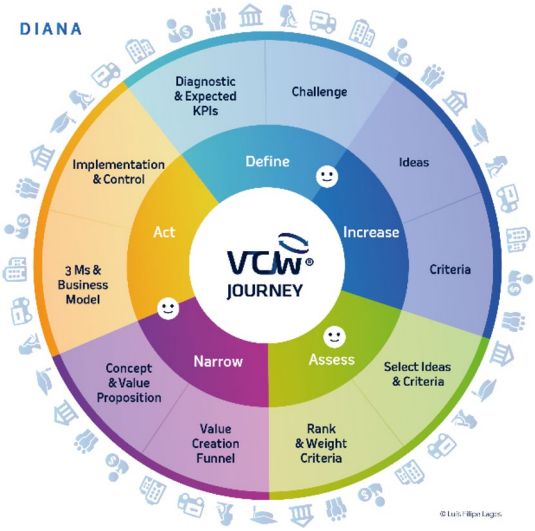


**Fig. 3** VCW Journey (adapted from [46]

used to address complex challenges, support Innovation Ecosystems, and is entirely customizable to each case and problem [46].

During the last decades, the VCW-DIANA was frequently applied in 2–4 h workshops using VCW Sprints (Fig. 2) and in 8 h workshops using VCW Journeys (Fig. 3).

The VCW-DIANA was also applied via the VCW Method, typically to more extensive educational, research and consultancy projects (Fig. 4). These projects

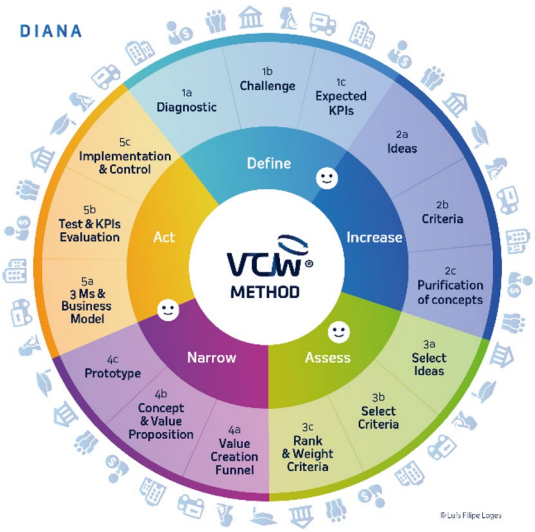


**Fig. 4** VCW Method (adapted from [46]

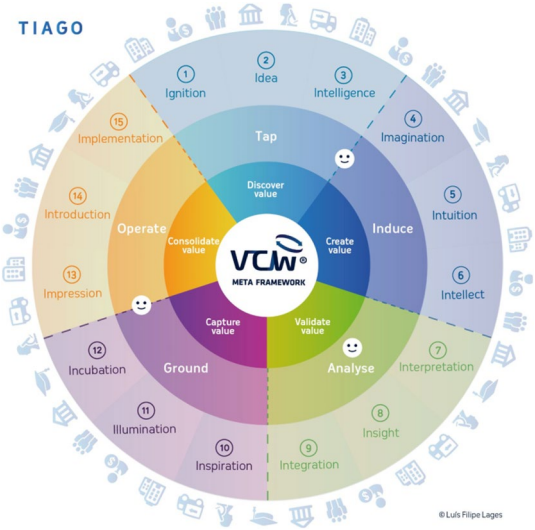


**Fig. 5** VCW Meta Framework (adapted from [46]

often range from three-full days to three months (see examples of projects at www.OpenVCW.com).

The VCW-TIAGO is supported by the VCW Meta Framework (Fig. 5) and the 15 Is ("eyes") of Innovation. It is used in very long and complex teaching programs (e.g., one-year programs), consultancy, and research projects (e.g., NextLand, NextOcean, NextGEOSS). The 3Ms of required resources (Manpower, Minutes, and Money) for this type of project are often quite large, lasting over

three years, involving numerous stakeholders (quite often international), and having budgets of several million euros.

The VCW has five phases (see Figs. 2, 3, 4, and 5). We now briefly summarize the key aspects of each phase. In the first phase, Discover Value (Define/Tap), Key Decision Makers (KDMs) present a diagnostic and the challenge/problem. They define the 3Ms available for the VCW project (Manpower, Minutes & Money) and establish the Key Performance Indicators (baseline KPIs & desired KPIs); different stakeholders might also be involved in the discussion. In the Second Phase, Create Value (Increase/Induce), stakeholders generate numerous ideas and criteria/filters to solve the challenge; KDMs might also generate ideas/filters. They should not influence the opinions of the different stakeholders. This phase has no good/bad ideas and criteria/filters. In the third phase, Validate Value (Assess/Analyze), KDMs select ideas, and select and rank the criteria/filters to solve the challenge; different stakeholders might be invited for the discussion. In the fourth phase, Capture Value (Narrow/Ground), the selected ideas go through a funnel of ranked filters (or MCDA- Multi-Criteria Decision Analysis) until finding the final solution(s), which will then be conceptualized and prototyped; KDMs and different stakeholders might be involved in the discussion. Finally, in the fifth phase, Consolidate Value (Act/Operate), KDMs validate the 3Ms and business model, implement the final solution(s), assess achieved KPIs, monitor the execution, and develop a sustainability plan. Different stakeholders might be involved in the discussion.

### 5.3 Where is the VCW being applied?

The VCW results from 25 years of Research & Development (see: www.OpenVCW.com; www.valuecreationwheel.com) in a wide range of contexts ranging from EC-funded projects to hundreds of organizations around the world (Fortune 500, large companies, SMEs, public institutions, universities, R&D projects, start-ups, and NGOs) to solve a range of simple to very complex challenges and manage a variety of tensions.

Over the decades, the VCW has been applied in hundreds of organizations in numerous countries worldwide in various scenarios and across all functions (from marketing and sales to operations and customer service). The VCW is commonly used to support technology-market transfer, go-to-market, international market selection, commercialization, growth, and sustainability actions, among others [54].

While supported by the VCW Sprint (Fig. 2), VCW Journey (Fig. 3), VCW Method (Fig. 4) and VCW Meta Framework (Fig. 5), the VCW Lab at Nova SBE engages the decision makers, executive board, consortium partners, and external stakeholders in generating, assessing, and selecting ideas and filters, commercialization, and sustainability actions. Additionally, it fully supports co-creation and dissemination actions, which aim to generate ideas and solve concrete challenges.

### 5.4 The VCW meta framework for creating and managing innovation ecosystems

Since 2015, the VCW-TIAGO Meta Framework has been applied in different EU projects, where the VCW played a critical role in helping to create and manage large

innovation ecosystems, while connecting all the partners within the consortium with its external stakeholders [54]. The creation and proper management of VCW innovation ecosystems are critical to managing complex tensions and paradoxes within the consortia, such as collaboration management agreements, competition versus cooperation, and tech-push versus market-pull challenges [47]. According to Nuno Catarino of the Elecnor Deimos Group, which oversaw a 10 M€ H2020 project, NextGEOSS, involving 27 partners across 13 countries:

> The VCW definitely helped to manage the consortium. In the NextGEOSS, the most important part of the project was to convey the project's message to the client services. We would not have such a targeted value proposition and public image for the project without the VCW. (…) The VCW had a huge impact.

It is particularly useful to manage vast innovation ecosystems, involving numerous internal and external worldwide stakeholders (e.g., NextGEOSS, NextLand, NextOcean), while connecting all the partners within the consortium with its internal and external stakeholders [54]. In addition to very large Consortia, the VCW was also used to create and manage innovation ecosystems of SMEs and large organizations (e.g., INCM-The Portuguese Mint and Official Printing Office).

## 6 Method and data

Previous work has stressed the importance of managers dealing with interdependent and persistent tensions and recognizing paradoxes to convert them into generative forces [5]. Since the discussion of tensions and paradoxes in an EO context is in a very early research stage, our objective is to gather preliminary managerial insights rather than obtain statistical generalization. Nevertheless, future EO studies are encouraged to build on our exploratory results to develop empirical research on these topics.

### 6.1 Data gathering

The findings presented in this paper about the six paradoxical tensions rely primarily on primary data collected during a NextLand international workshop held at Nova School of Business and Economics (Portugal). The workshop occurred at the end of the project's second year (21st and 22nd of March 2022) and involved the participation of 41 NextLand stakeholders. More specifically, the workshop involved the participation of 13 potential buyers of NextLand services, 5 NextLand Advisory Board members, and 23 individuals (representing Nova, Terradue, and the four EO-SPs: Deimos, DHI Gras, VanderSat-Planet, and VITO).

The thirteen potential buyers of NextLand services were alpha-users, beta-users, and future potential customers of NextLand services. They were from European countries such as Belgium, Denmark, Finland, Greece, Norway, The Netherlands, the UK, and Portugal. Forestry users attended the workshop because they expect to benefit from EO solutions that will address their needs in forest health and inventory,

clearcutting detection, and fire impact and risk assessment, among others. Agriculture users are expected to have access to a wide range of commercial services to address various challenges, such as support for irrigation, early stress and anomaly detection, and improved crop monitoring and yield prediction.

During the workshop, qualitative data were gathered from eight focus groups. The 41 participants were divided into eight focus groups (7 consisting of 5 participants and one composed of 6 participants). Each focus group was given six paradoxical tensions related to the NextLand online store and its services for analysis and further discussion. The results of the group debate were then presented to the other groups. The tensions analyzed and presented by the eight groups were:

Should NextLand's …

- Service providers follow a competitive and/or cooperative approach?
- Sustainability focus on the financial, environmental, and/or social dimensions?

Should NextLand's Online Store and its services …

- Follow a tech-push and/or market-pull orientation?
- Follow a functionality-driven and/or human-centered design?
- Address global and/or local needs?
- Follow a centralized and/or decentralized approach?

The profile of 41 participants within their organizations were directors (4), managers (19), marketing & sales (4), engineers (6), analysts (2), and researchers (6).

Additional data was collected from software tracking eye movements and facial expressions while using the NextLand Online Store. This way is possible to test the effect of any content, product, or service that is supposed to stimulate emotional arousal and facial responses. Particularly involuntary expressions and a subtle widening of the eyelids are of vital interest as they reflect differences in the emotional state triggered by actual external stimuli or mental images [44]. Humans process visual information to a much larger extent than other senses. A typical example is that humans might get just as thrilled by watching a video of a rollercoaster ride as they get by actually riding it. Different facial landmarks such as eyes and eye corners, brows, mouth corners, and nose tips, among others, are detected within the detected face [45]. Survey data were also gathered from workshop participants after using the NextLand Online Store.

### 6.2 Data analysis

During the workshop, several focus groups were created. Participants were initially introduced to the different tensions with an exploratory open-ended question and were asked: "How can NextLand find the right balance between X and Y?" The main objective was to gather exploratory data for the different paradoxical tensions. This open-ended approach is more appropriate than quantitative data because the researcher intends to answer 'what/which' and 'why' questions [94].

Regarding the coding procedure, all answers to these open-ended questions were recorded via Zoom, analyzed from the video, and entered into a Word document. When more than one word or expression was proposed as an explanation, all were considered equal weights, as no preference ranking could be inferred. Many of these answers were eventually collapsed, renamed, and reorganized under the research question, evolving into the format in the presented section. The best way to protect against interpretive bias is to be constantly aware that the respondent's perspective should guide interpretation and, whenever necessary, go back to the original video source [51]. An expert judge verified the exploratory findings with EO and space business knowledge who has a deep understanding of the NextLand project. Additional inputs from Work Package 5 (WP5) meetings organized by Nova SBE, in the context of the Business and Innovation Ecosystem (BIE), Memorandum of Understanding (MoU), Terms Sheet, Intellectual Property Rights (IPR), and Collaboration Management Agreement (CMA), were beneficial to enrich the findings presented in this paper. Finally, the content from some EC deliverables (e.g., marketing, business plan, sustainability, sales) and conclusions emerging during numerous NextLand meetings (e.g., Executive Board, Advisory Board) were also used to refine the workshop data. The significant findings offered in this paper were presented, discussed, and validated with 29 NextLand stakeholders in a two-hour Zoom workshop held on the 20th of June 2022.

## 7 Challenges, tensions, and paradoxes

The idea that tensions and paradoxes are intrinsic to organizations and consortiums is now well accepted. This article addresses six significant paradoxical tensions in the co-creation, innovation, commercialization, and sustainability of EO-based services.

How can leaders find an optimal balance between:

(1) Cooperation, competition, and coopetition perspectives?
(2) Financial, environmental, and social value creation?
(3) Tech-push and market-pull orientations?
(4) Global and local market solutions?
(5) Functionality-driven and human-centered design (UX/UI)?
(6) Centralized and decentralized online approaches?

### 7.1 Paradox 1: How to find the right balance between cooperation, competition, and coopetition perspectives?

#### 7.1.1 Context

Coopetition is defined as the collaboration between competing firms. Coopetition-based business models have been the focus of business practice during the last decades. There is a common agreement that in a platform ecosystem, the level of

coopetition balance and coopetition capability has an impact on relationship performance [95]. Moreover, there is also an agreement that there is tension between competition and cooperation [40] and that for coopetition to succeed, all the involved partners should develop a benefit-risk analysis.

Coopetition presents a wide range of benefits, such as (1) improving the efficiency in resource utilization (e.g., sharing costs related to distribution, marketing, and sales); (2) developing original technological solutions that are reliable; (3) developing innovations that are useful and successful for the market; (4) increasing the size of current markets (e.g., by combining the unique capabilities of each firm); (5) creating new markets (e.g., combining different services to create a new bundle of services); and (6) improving the firm's competitive position (e.g., alliances can be used as a means to control the dominance of major players) [75, 86]. However, coopetition might also lead to value destruction. Partners need to prove the previous assumptions in addition to joint value creation for all firms and individual firms [30].

As previously discussed in the literature, a successful coopetition-business model "is contingent on factors that enable collective value creation, and on those that facilitate the individual isolation of the innovations and any subsequent profits" [76]: 819). As such, for a coopetition model to present tangible results, it is critical to increase the benefits for the involved partners and decrease the risks.

From a public policy perspective, a significant challenge is developing a governance model advocating coopetition. In a wide range of EU-funded projects, it is common for organizations to simultaneously compete and cooperate to explore synergies and achieve a common goal (e.g., commercialization of EO joint services). To address this challenge, the EU created the legal entity of European Economic Interest Grouping (EEIG). This helps consortia to participate in EU-funded programs and makes it easier for companies in different countries to do business together. However, past experiences have revealed that quite often, the creation of a common legal entity is not feasible or desirable by the different partners of a consortium, who do not want to create dependencies between various competing institutions. Partners will only be ready to make those dependencies when the six assumptions previously presented are proven to create individual and collective value.

### 7.1.2 The case of the EC H2020 NextLand project

Collaboration is more straightforward when organizations belong to different levels of the value chain. This is the case of cooperation between EO-SPs and users regarding services development and data sharing that might be of interest to both. For example, a user might decide to share in-situ data with an EO-SP to help co-create services of their interest or to validate their in-situ data. Similarly, an EO-SP that operates globally might collaborate with a service provider that offers local consultancy solutions. Collaboration is also more straightforward when EO-SPs work in different regions or use different methods. Moreover, they are more likely to collaborate when partners provide complementary services that combined (e.g., "improved crop monitoring and yield prediction") can satisfy primary user needs and bring added value to the market.

The collaboration and governance of NextLand among different partners are much simpler during the project because a significant part of the costs is currently being covered by Horizon 2020. However, after the end of the project period, significant revenue needs to be generated to cover costs and generate profits. NextLand partners have worked on a governance model with three progressive scenarios to address this issue. The focus of Scenario A, during the H2020 project, is mainly to grow fast and compensate both the service providers and agents selling more. Scenario B is expected to emerge in the first phase after the end of the project once H2020 funds are finished. Scenario B focuses on covering costs and promoting NextLand's cooperation among partners while compensating all the service providers and agents selling more. The fees previously covered by H2020 (e.g., service management activities, NextLand Online Store provision, business development, dissemination and marketing, and sales actions) will need to be covered by a small percentage of sales revenue. In a later stage of maturity of the consortium, the focus of Scenario C (the second phase after the end of the project) will be to achieve more significant commitment, collaboration, and coopetition among partners. The NextLand Online Store is expected to have several service providers in the fields of Agriculture and Forestry while compensating the individual performance of each seller. Moreover, Scenario C also proposes to reserve a percentage of the revenue for R&D (i.e., the future development of NextLand bundled services from different service providers) as well as for a fund to attract new EO-SPs aligned with the NextLand vision.

Currently, significant coopetition challenges and competition restrictions have already been established. While some entities are open to a joint business venture, other NextLand EO-SPs prefer not to participate in creating a joint entity. For some non-commercial organizations, there needs to be more alignment in terms of vision and naturally, there is a reluctance to become part of a legal entity with commercial ambitions.

While some partners are willing to collaborate in some dimensions, they are not open to negotiation with others. As mentioned by one of the partners, while in NextLand, they are collaborating with their EO-services K and X, and other partners are offering EO-services Y and W, in other projects they are providing EO-services Y and W, while the other partners are providing K and L. This explains why partners might be less open to collaboration in sharing contacts, lists of customers, or algorithms used during service development. Nevertheless, they might be available for collaboration in providing helpful input for co-creation sessions involving solutions that they don't currently offer.

Some argue that to become attractive to customers, the NextLand Online Store should be closed to competition to protect the interests of NextLand EO-SPs. Others believe that the NextLand one-stop-shop for customers should invite direct competitors. As mentioned by workshop participant #1:

> From a Service Provider perspective, (some argue that) it should not be an open marketplace due to competition risks. However, from a user perspective, if the marketplace is not truly open, the NextLand Online Store won't

be the favored provider because some better options exist outside of this store. A marketplace needs control but can offer large variety.

The main rationale for NextLand partners to follow a coopetition model is that the market is huge and there is no need to focus on competition. For example, just in the field of Forestry, Europe counts about 16 million private forest owners [85, 92]. Most of the estates are small estates of a few hectares to medium-sized estates of tens of hectares. A problem is that due to urbanization and (agricultural) land abandonment, an increasing number of forest owners are located too remote from their forest properties to be actively involved in forest management. Forest properties are often passed from one generation to the other through inheritance, which through the increasing urbanization of society, further explains an increasing disconnect between forest owners and properties. In the particular case of Finland, it is being demonstrated how forest information can help owners to get or remain in touch with their forests, through the inclusion of a service brokerage platform (see e.g. https://www.metsaan.fi) or a wood sales function (see e.g. https://www.storaensometsa.fi/palvelut/emetsa/). While authorities are seeking and enforcing legal compliance, forest owners are motivated to market their forests for wood, carbon or other services, and the forest industries see these platforms to effectually impact sustainable forest management. By enhancing the communication between forest owners, and authorities, these platforms can even assist in effectually impacting sustainable forest management. While these platforms currently exist only in a few countries and regions, a huge potential exists in the development of digital outreach to private forest owners. The development of digital forest information platforms can also boost marketplaces for (i) forest information such as growing stock, species composition, disturbance vulnerability and impact, forest management requirements, (ii) forest management services, as well as for (iii) marketing of wood, carbon, non-wood forest products and ecosystem services.

If we use Amazon.com as a coopetition benchmark (see [75], this organization decided to invite high-quality competitors to the online store to increase the number of EO-based services. In addition to expanding the product portfolio, this brings the quality of EO-based services up and the prices down. If NextLand follows a similar model, then this would make the NextLand Online Store more attractive to customers. It will become more accessible for the customers to select the best individual and bundle of services from a large and dispersed range of quality services. Otherwise, customers will look for better options outside the NextLand Online Store. For EO-SPs, it will also become possible to become part of “a larger pie” and increase their sales. A small piece of a big pie might be better than a large piece of a small pie.

## 7.2 Paradox 2: How to find the right balance between financial, environmental, and social value creation?

### 7.2.1 Context

Organizations often have to deal with profit, people and planet tension [62]. The EO sector has a significant social and environmental impact and is very much associated with the SDGs. From an EC perspective, it is aligned with all the 6 [17]-24 priorities, namely the ones regarding a Europe fit for the digital age, European Green Deal (EGD) [19], and corporate social responsibility (see, e.g., Directive 2014/95/EU—NFRD & 2021 CSRD). However, numerous EO-based services are still in an early stage of technological development (i.e., low TRLs- Technology Readiness Levels) and far from go-to-market. This justifies why organizations in the EO sector are primarily funded by public funds.

Nowadays, the EC's EGD and EU citizens focus strongly on these social and environmental challenges. The EGD is a critical component of the European Commission's strategy to implement the United Nation's 2030 Agenda and the SDGs [17]. EO-based services are often associated with the social perspective of the EGD, which "aims to transform the EU into a fair and prosperous society. (…) It must put people first and pay attention to the regions, industries, and workers who will face the greatest challenges" [17]: 2). These practices provide value to society and "give back" to the community. Similarly, EO-based services are often aligned with the EGD environmental perspective. The EGD "(must) protect the health and well-being of citizens from environment-related risks and impacts. (…) It aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use" [17]: 2). A strategic security question for Europe's EGD ambition is safeguarding the supply of critical resources and raw materials required for "clean technologies, digital, space and defense applications" [17]: 8). Similarly, the Triple Bottom Line (TBL) refers to the need for engaging in practices that do not compromise environmental resources for future generations, such as the appropriate use of forestry and energy resources, reducing greenhouse gas emissions, and minimizing the ecological footprint [31].

### 7.2.2 The case of the EC H2020 NextLand project

Findings revealed a joint agreement among NextLand stakeholders that NextLand should address sustainability from a TBL perspective [22] aligned with the holistic EU viewpoint. EO projects using this term often refer to three sustainability lines: social, environment, and economy. These lines are also known as the 3Ps- People (social), Planet (environment), and Profit (economy). In essence, the TBL perspective tries to manage the tensions between these three lines and works as a framework for measuring performance.

The NextLand consortium aims to create value and be sustainable in the long term. In addition to the traditional "pure" profit/economic approach, NextLand aims for social and environmental sustainability. Questioning the different

partners revealed that at the social level, NextLand services aim to contribute to the following SDG targets: Goal 2 (2.1; 2.3; 2.4), Goal 4 (4.4.; 4.7), Goal 8 (8.3; 8.4), Goal 9 (9.5), Goal 17 (17.7; 17.16; 17.17). At the environmental level, NextLand services aim to contribute to the following SDGs targets: Goal 6 (6.4; 6.6), Goal 11 (11.4), Goal 12 (12.2; 12.8; 12a), Goal 13 (13.1; 13.3), Goal 15 (15.1; 15.2; 15.3; 15.9). Nonetheless, a direct challenge is monetizing its social and environmental contributions in addition to conventional public funds.

The NextLand project aims to generate revenue from the commercialization of its services. It is our understanding that it has potential from a financial perspective. At the end of the project's second year, an exploratory survey revealed that the most desirable service for customer subscriptions was forest classification, followed by vegetation indices and forest change detection. A total of 8 users showed interest in subscribing to 10 NextLand services soon. To address these potential buyers, we organized different sales meetings supported by our own "Customer Relationship Management" (CRM) system and developed our own Business to Business (B2B) sales methodology. Within this process, it became critical to identify the individual inside each organization that was the Key Decision Maker (KDM) and the individual that could give access to the KDM. Once these individuals were identified we applied the B2B sales methodology, which has the acronym "B-DEDICATED":

- Budget: How much money could be allocated for this service? How much are you spending on similar solutions?
- Decision process: How does your organization decide? Are you involved in those decisions?
- Establish pain: What are your pains or primary needs (e.g., complexity, high costs, slow production)? How often do you run into these problems?
- Decision criteria: What are the top filters that you use to select the best options (e.g., simplicity of use and integration, budget, potential ROI)?
- Identity competitors: Are you aware of any competitors? What other services/vendors have you used or are you evaluating? What are their attributes (e.g., added value, prices)? Do you have any contracts already signed? If yes, what is their duration?
- Champion: Who will benefit the most from our services in your organization? What do they value, and what are their obstacles? How did you find out about our services?
- Authority: Who can make decisions about allocating people, time, and money, for the implementation of our service in your organization?
- Timing: What are your time constraints to find a solution? Is it urgent? Considering the deadline, would it be possible to finalize the contract by X. Would that be possible?
- Economic impact (metrics): What are the economic benefits of our service for your organization? How much do you think our services could optimize your production, efficacy, and efficiency (e.g., X % increase)?
- Delivered value (subjective): What are the benefits of our solution for you? What is the added value of our services versus existing solutions?

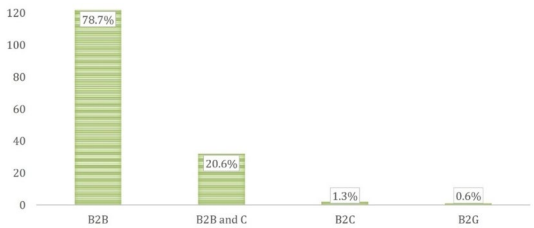


**Fig. 6** Customer Segments in EO

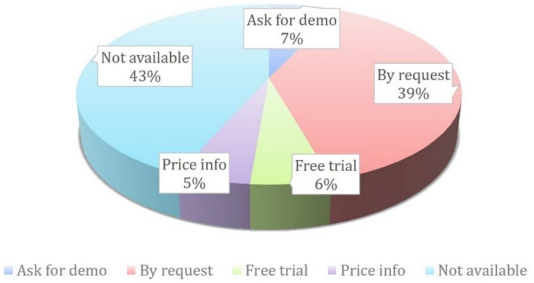


**Fig. 7** Price Information in EO

The ten topics presented above were used to build a conversation with the potential buyer and collect data for the CRM system (not necessarily in the given order). The "B-DEDICATED" sales methodology was formed based on previous well-established sales methodologies (e.g., BANT and MEDDIC) for B2B markets.

To become financially sustainable, NextLand services must keep satisfying the needs of the target markets, namely organizations operating in the EO downstream market (e.g., value-added service providers, consultants) and end-users with technological know-how in forestry/agriculture (e.g., associations, public institutions, agriculture/forestry companies with R&D capabilities, NGO's & R&D organizations). An analysis of 155 websites of EO companies, over a period of 3 months (July until September 2020), revealed that the commercial EO market is immature. In terms of customer segments in EO, the majority of companies (78.7%) are focused on doing business exclusively B2B. Only 20% focused on both B2B and B2C and a minority of companies concentrated on B2C (about 1.3%) and only less than 1% (0.6%) concentrate exclusively on B2C. (See Fig. 6).

Only 5% have specific information related to their pricing practices. Surprisingly, 43% of the companies do not have any information regarding the price, and 39% only offer prices provided by request. A small percentage (7%) of companies are willing to offer a demo in order to provide a price information strategy. Only 6% of companies offer a free trial (See Fig. 7).

Most companies (58%) offer a subscription model. While 17% of the companies have as a revenue model service acquisition and 17% credit acquisition, 8% offered customized price (see Fig. 8).

Regarding the communication strategy, almost all companies have online information. A total of 78% are using videos presenting their solutions and/or

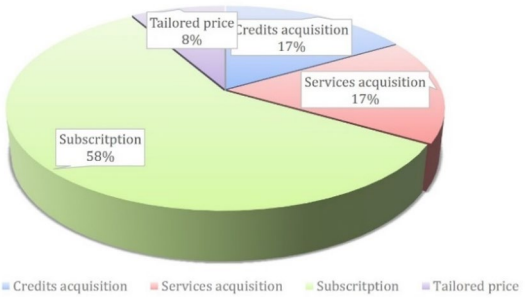


**Fig. 8** Revenue Model in EO


**Fig. 9** Communication Strategy in EO

clients' cases. Only 31% have explicit information regarding their client portfolio. Additionally, 99.1% of companies have information available online (see Fig. 9).

Financial sustainability is hard for this sector for numerous reasons. First, users are often unwilling to pay for EO-based services because existing platforms primarily rely on free public data. Then prices are not transparent, and SPs do not have a price model defining the prices on a case-by-case basis.

Second, several EO-based services have a low Technology Readiness Level (TRL) and are far from being commercialized. Quite often EU-funded projects finish, and services never reach the market. Third, numerous EO-based service providers (e.g., OneSoil) offer free EO-based services to users and potential buyers (e.g., firms and associations) in exchange for access to free data. Similarly, other organizations (e.g., banks and insurance companies) recommend free EO-based products to help address their challenges (e.g., evaluating the impact of natural disasters). Fourth, despite some notable initiatives and efforts (e.g., by EC, ESA), there is still no tradition in exporting EO-based services. Initiatives such as the one developed by ERSC regarding the creation of Internationalization Cluster Members should be replicated. Fifth, the EO sector should incorporate ideas from technology late adopters and devil's advocates [42, 43]. However, with rare exceptions (e.g., EMSA and AMN in the maritime-safety sector and Portuguese Criminal Police in security), regional authorities do not believe in open innovation and often do not have the openness, compromise, and incentives to test new EO-based services. Finally, EO-based players don't have a tradition of open innovation, collaboration, and coopetition.

Overall, all these challenges create several obstacles to the financial sustainability of NextLand. To address these financial challenges, a marketing and sales strategy was developed supported by a large Summit. NextLand's WP5 decided to organize the "Sustainable Value Creation Summit for Space, Land, and Ocean" (www.SustainableValueCreationSummit.com). This will be an event covering numerous topics across industries, where innovation, leaders, and society meet. Additionally, clear guiding principles regarding the distribution of revenues, roles, and responsibilities for the NextLand project (during and after the project) have already been discussed by the Executive Board, as well as the "Business and Innovation Ecosystem meetings" where all the 11 partners were present.

## 7.3 Paradox 3: How to find the right balance between tech-push and market-pull orientations?

### 7.3.1 Context

From 2008 to 2020, the EU invested over EUR 8 billion through its Copernicus program to support the whole EO value chain. The EO value chain has three levels [10]. First, the EO upstream industry includes infrastructure manufacturing (the satellites and sensors), launching operations, and the ground segment for managing satellite operations. Second, the EO midstream industry (or "higher-downstream") consists of EO-SPs, which are EO experts working with data acquisition, storage, modeling, and processing. Finally, there is the EO downstream industry (or "lower-downstream") which includes consultants, intermediary users, and service providers that create value-added services from EO-based data for the "non-EO expert." They often advise the end-users on EO-based and non-EO competing solutions (e.g., drone-based data, software, apps, and in-situ solutions). Typically, EO tech-oriented people tend to work in organizations that operate higher in the value chain. The closer they are to the end-users and non-EO-experts, the more they tend to be market pull because end-users demand an explanation of the benefits generated by the EO value-chain. Most end-users and non-EO experts look at EO-based services for value creation, typically comparing them with many other possibilities to solve their current challenges (e.g., as a possible solution to reduce manual work). This is the case for governments, regulatory authorities, and organizations that might be interested in having access to EO added-value solutions to monitor and manage their activities in different fields.

Due to the large amount of financial and human resources required to develop these solutions, there is a reduced number of organizations that operate across the whole EO value chain. Few can hire highly qualified people that are simultaneously tech-push and market-pull (exceptions include Airbus Defence and Space, Maxar, and Planet Labs). As such, most companies focus on just one of the three main parts of the EO value chain and tend to be just tech-push, ignoring the market-pull orientation. This explains why most EO websites are tech-oriented and present a vague and incomplete description of EO-based service attributes. Additionally, the lack of market vision and customer orientation of EO-based teams explain why often

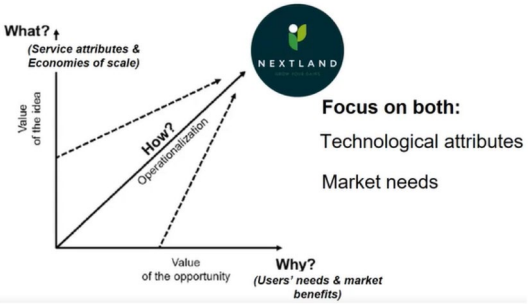


**Fig. 10** The bridge between tech-push and market-pull (Adapted from [46])

consortium projects are not being sold and have low TRLs once EC funds finish. Consequently, after the end of a project, new applications for funds are requested for the development or improvements of existing services.

Nevertheless, despite existing organizational constraints and inertia [25], EO organizations are gradually understanding that customers are interested in "buying benefits" (rather than technologies). As such, they face a trade-off between technology and customer orientation [41]. Because of several EC initiatives and the emergence of new EC funds more commercially oriented, they already understand they should also start thinking as a customer rather than being exclusively focused on R&D, technology, and having a supplier mindset [55]. Very slowly, they are being required to change their tech-positioning speech, which was previously focused on the "what" (i.e., the technology), to bring on board "the why?" (i.e., the benefits) to their unique selling propositions (USPs). For example, some EO organizations are gradually understanding that customers see the price from an added-value perspective and not from a cost-plus perspective. Moreover, SPs are learning that competitors are not only other EO-based companies, but also all the solutions solving the same challenges (e.g., drones, in-situ solutions).

When developing EC H2020 and Horizon Europe-funded applications, there is a tendency to have projects with teams that are strong in R&D, science, and technology but with insignificant resources (budget, time, people) allocated to business and sales. This is also observed within the organizations composing the different consortiums that often have less than 5% of their teams with a commercial orientation (e.g., Innovation Actions).

### 7.3.2 The case of the EC H2020 NextLand project

Similarly, the majority of NextLand resources have been assigned to R&D and tech-push actions. However, since this project has been financed in the context of an H2020 Innovation Action, there is a need "to validate the technical and economic viability of a new or improved technology, product, process, service or solution in an operational (or near to operational) environment" [21]. As such, a significant challenge is bridging technological attributes and market needs (see Fig. 10).

To address this challenge, in the first developmental phase of NextLand, co-creation workshops and surveys were initiated with the five alpha-users, which were part

of the NextLand consortium (CERTH, European Forest Institute, SoilEssentials, Soil Service of Belgium, S&T) and three new alpha-users (Metsäkeskus, Forest Design, and Junta de Castilla y León). More recently, when the EO-based services were more mature, we added 11 potential buyers representative of different target markets (5 in agriculture and 6 in forestry). Sales actions are now being implemented in this advanced stage of technical development. After receiving contacts from different NextLand partners and collecting a list of additional potential buyers, we arrived at a final list of potential buyers. This final list was segmented, and the sales team targeted the key decision-maker within each likely buying organization. Since EO-based services and the EO sector are in an early stage of development, our experience demonstrates that EO sales are a "numbers game." The more organizations we engage the more we will get. We need to target numerous organizations based on the principle that "if you throw enough mud on the wall, some will stick." This is one of the major goals of the "Sustainable Value Creation Summit" organized by NextLand's WP5 at Nova School of Business and Economics.

During the NextLand journey, it became clear that it is critical to developing an online store and services that are aligned with customer needs. It is required to constantly search for the proper bridge between technology and the market. For example, several user requirements were identified during the international workshop. First, improve the search functionality (e.g., make it easier to find thematic services, and search for geographical areas). Second, ensure that the Application Programming Interface (API) functions, procedures, and methods in the NextLand Online Store are user-friendly and can adequately manage, integrate, and make the services available from different service providers. Third, since the platform only supports traditional payment systems, it offers more technological options for the payment system (e.g., tendering process, international bank transfer). Finally, develop a video showing how to use the platform.

The international workshop provided several inputs from a market user perspective. First, in small companies, it is easier to access the Key Decision Maker (KDM). In larger organizations, it is critical to persuade the person that will influence the KDM. What will convince the decision-maker to commit and buy? Some actions include user testimonials for the different services (e.g., statements, usefulness evaluation) and providing a PDF report with information about the services being downloaded (e.g., use cases, tables, maps, graphs). Videos and images are precious when there is too little and too much textual information because adding images increases trust and purchase intention [97]. Second, customers like to test before buying a service. It is also essential to have demo data aligned with the specific needs of the potential buyer (e.g., area of interest, size of the area, period). Third, improve services terminology. The name of the services should be less tech-oriented (e.g., evapotranspiration) and become more customer-oriented (e.g., water loss to the atmosphere from a land surface). Fourth, offer more service information such as a product sheet, update level, data accuracy, and customer reviews. This last point is critical as customers expect to share on e-commerce websites their views on a wide range of topics [73]. Fifth, open the platform to a wider range of non-NextLand services in agriculture and forestry (e.g., winter images, inventory in silviculture). Finally,

ensure constant customer interaction and customer reviews to identify market needs and benefits to be offered. Online reviews play a critical role in customer decision-making. Considering the rapid growth of online information that is now available, online reviews benefit from deeper textual analysis compared to traditional methods that rely solely on numerical ratings [84].

### 7.4 Paradox 4: How to find the right balance between global and local solutions?

#### 7.4.1 Context

Buyers of EO-based services (often treated as "local users" by EO experts) are becoming more global, dynamic, demanding, proactive, and sophisticated in looking for solutions to their problems. This occurs in Business to Business (B2B), Business to Government (B2G), and Business to Consumer (B2C) markets. As such, EO companies must excel simultaneously at the global and local levels while aligning international technological development with local market needs. Despite the digital and technological advancements, to our knowledge, no EO platforms are prepared for mass customization. Similarly to what is happening in many other areas (e.g., financial services, retail companies, software), mass customization allows the discovery of multiple opportunities, combining personalization of custom-made products/services through flexible processes with the low unit costs associated with high volumes [12, 26]. Although there are several IT challenges related to the mass customization of services (see [71], EO organizations should consider overcoming these challenges to explore the benefits of mass customization and remain competitive.

Cross-border e-commerce management has become a hot topic recently as it brought new opportunities to traditional enterprises [9, 38]. E-commerce allows bringing together sellers and buyers from multiple countries without intermediaries [80]. As such, nowadays, EO organizations are expected "to 'Go GloCal' that is how to think and act both globally and locally, which is very different from 'think global and act local (the traditional definition of a GloCal approach)" [53]: 2607). To 'Go GloCal', EO organizations must be simultaneously global and local and manage the commonalities across regions without ignoring regional differences [49, 52]. They should consider customers' needs while considering technological capabilities. This is well demonstrated by the MyFarm case study, where Elecnor-Deimos faced the GloCal paradox (see [25]. The Value Creation Wheel (VCW) team applied the VCW method, using a wide range of global and local criteria to identify the geographical market with the highest potential for the MyFarm EO-based service. To do so, it generated different Value Creation Funnels (VCFs). The initial global VCF started with 193 United Nations countries and resulted in the USA after the application of 6 selection criteria. Then, the first local VCF began with 50 states, and after applying six selection criteria, the VCW team narrowed it down to Kansas. Finally, the second local VCF started with 105 US counties and, after four selection criteria, arrived at Stevens, USA.

### 7.4.2 The case of the EC H2020 NextLand project

The extent to which the services and the NextLand Online Store should be more global and/or local needs to be defined while considering market pains and technological attributes.

From a market perspective, NextLand must focus on what the customer wants and what could bring added value (e.g., cost savings and production growth). Additionally, it should consider whether the customer is a global or a local player and the implications. Can the customer access trained data to approve data accuracy at the international and regional levels? If the customer is working globally, what is the level of data accuracy that they require? Can it be a low level of accuracy? Is global data good enough for what the customer wants? If the customer is working locally, does it require high data accuracy?

From a technological perspective, the extent to which the data can be more global or local also defines to what extent the services might be more standardized or customized. According to workshop participant #2:

> While bigger customers require bespoke services to fit their IT/processes, standardized services may only be appropriate for smaller organizations.

Initial interaction with NextLand EO-SPs revealed that while some services might be international and offered in an automatized and standard manner (e.g., vegetation indices, vegetation water indices, tree health indices), others need to be more local and offered with lower levels (e.g., soil moisture, change detection, forest fire burn scare) or medium/high-levels of customization (e.g., biomass production, crop phenology, anomaly detection). In some rare cases, the EO-SPs are also willing to offer solutions ranging from very low customization to very high customization (e.g., forest classification, crop type classification).

In the EO-based services sector, there is a frequent need for customized solutions.

Some argue that EO-based services are only validated for the area where they have been tested, and they are not 100% accurate and validated in other regions. As mentioned by workshop participant #3:

> The customer could provide training dataset to adapt the model for their use.

NextLand EO-SPs and users often need to work together and present a mix of data in the area. For example, if the goal is to identify local species accurately, it is critical to have accurate metrics and in-situ data to develop these customized services. This will imply customization and new set-up costs associated with different requirements (e.g., new learning datasets). Similarly, in the case of institutional users, they often have open competitions to acquire tailored services offering the best value for money. They expect to receive customized proposals coming directly from EO-SPs. As mentioned by workshop participant #4:

> The user should be able to control some settings, assumptions, and parameters to tailor the model to their use case (e.g., part of the world). (It would be important to) create different layers of the model/process, so users can

select combinations of components to generate a bespoke solution – see UP42 as an example.

At the same time, a GloCal approach ("think and act both global and local") is demanded. GloCalization and mass customization challenges occur because, like most online stores and e-marketplaces, it is critical to develop an offer of global standardized solutions to grow and benefit from economies of scale. Hence, the main challenge is automating the process as much as possible via mass customization. While some aspects might be standardized (e.g., terms and conditions, purchase order, invoice, message form, date input, service review), others might require more support and customization (e.g., helpdesk, info and communication, service design, and price quotation).

## 7.5 Paradox 5: How to find the right balance between functionality-driven and human-centered design (UX/UI)?

### 7.5.1 Context

In Business to Consumers (B2C) markets, the development of online stores typically starts from the design. The EO-based market is more Business to Business (B2B) oriented. Like the evolution of computer technology, EO-based services, online stores, and e-marketplaces are going through different phases. Initially, they were expected to be functional, and the main goal was to make them work. Then, we moved to a reliability phase where the main goal was ensuring they would function without breaking down. Nowadays, we are in the performance phase, where they are expected to have quality, work quickly enough and be user-friendly enough to become competitive in the marketplace.

It is critical that the designers of EO online stores and e-marketplaces focus on developing solutions that fit users' needs, namely from the perspectives of UX-User Experience (how it works) and UI-User Interface (how it looks). As previously discussed, EO organizations face the challenge of moving from purely tech-focused to more market-driven. This slow transition is observed on their websites and online stores. An extensive review of over 150 EO websites performed by the NextLand and NextOcean teams revealed that they tend to be tech-push, are not user-friendly, and present numerous barriers for intermediaries- and end-users. For example, although the Copernicus website presents 233 use cases [11], EO websites rarely give successful use cases or examples demonstrating the added value of EO solutions from a buyer's perspective.. There are only a few catalogs of selected services, and there is a lack of price transparency. While numerous EO-based companies don't know how to calculate the prices, others might not want to disclose information to competitors, while others might assume that their strong brands and their place of origin can justify price premiums in the competitive online market (Li 2021).

**Table 1** UX and UI aspects critical to improving the online store for its current stakeholders. The top improvement priorities are presented in italic

| | All stakeholders (n = 20) | EO based-service providers (n = 7) | alpha-users & beta-users (n = 12) |
|---|---|---|---|
| *General characteristics of the online store:* | | | |
| Consistency | 4.1 | 4.1 | 4.0 |
| Readability | 3.9 | 3.8 | 4.0 |
| Communication | 3.9 | 3.8 | 3.9 |
| Honesty | 3.8 | 4.1 | 3.6 |
| Usability | 3.7 | 3.5 | 3.8 |
| Navigability | 3.7 | 3.6 | 3.6 |
| *Simplicity* | *3.5* | 3.7 | *3.4* |
| *Content relevance* | *3.4* | *3.5* | *3.4* |
| *Supportability* | *3.0* | *2.6* | *3.3* |
| *Performance of the online store:* | | | |
| Appearance | 4.3 | 4.1 | 4.4 |
| Learnability | 4.0 | 4.3 | 3.8 |
| Loyalty | 3.8 | 3.7 | 3.9 |
| Benefits | 3.6 | 3.6 | 3.7 |
| *Credibility* | *3.5* | *3.5* | *3.5* |
| *Satisfaction* | *3.2* | *3.0* | *3.4* |
| *Trust* | *3.2* | *2.9* | *3.5* |

The values presented in italic are equal or below 3.5

### 7.5.2 The case of the EC H2020 NextLand project

After trying the NextLand Online Store, all workshop participants were asked six open questions: (1) which parts of the tasks were harder to complete (41 answers), (2) which parts did they like better (37 answers), (3) what they disliked (40 answers), (4) if something was surprising or unexpected (31 answers), (5) which new functions should be added (32 answers), and (6) to present adjectives to describe the Online Store (38 answers). Their answers helped to understand better the UX and UI of the NextLand Online Store.

Additionally, the UX and UI of the NextLand Online Store were evaluated through a survey conducted amongst 20 workshop participants (12 representing end-users, 7 representing EO-SPs, and 1 representing Nova SBE). While building on the UX and UI literature [24, 56, 57, 77, 90], we developed an exploratory survey with a total of 44 questions (scale: 1 = strongly disagree to 5 strongly agree) spread across 16 topics (see Table 1). Although not statistically representative, these exploratory results provide essential guidelines to identify key UX and UI aspects critical to improving the Online Store for its current stakeholders. The priority aspects requiring significant attention are presented in italics in Table 1.

Naturally, the average evaluation scores varied between end-users and EO-SPs because they have different expectations. Overall, the strongest UX and UI

dimension of the online store is consistency (4.1). The lowest dimensions were simplicity (3.5), content relevance (3.4), and supportability (3.0). The highest-rated performance constructs were perceived appearance (4.3) and learnability (4.0). The lowest ones were credibility (3.5), satisfaction (3.2), and trust (3.2).

During the qualitative part of this survey, stakeholders were asked to provide improvement suggestions for the online store. Some of them had the opportunity to reinforce some of the improvement suggestions also discussed during the focus groups. The mentioned improvements were at three levels. First, revisions in the content, namely information on product accuracy, previsualization of the product supported with demo data, user tutorials, and user testimonials. Second, improvements to the user interface include streamlined language, straightforward order interface, service location coverage, and period of interest. Finally, they requested improvements to features, including a more user-friendly API infrastructure, consolidated invoicing, and improved customer service.

Finally, during 3 min, we collected preliminary data from eye-tracking and facial expressions from 15 workshop participants, who had to order one of NextLand's services from the online store. Eye-tracking helps monitor visual attention and understand users' behavior, namely where users are looking when using the website, how they consume content, and discover which elements distract their attention. Facial expression analysis helps to understand a wide range of emotions in the user journey (e.g., delight, surprise, skepticism, sadness, fear, disgust, anger). This knowledge empowers the design team to create emotionally engaging designs [91].

Overall, during the test of the online store, within the 3 min, on average, there were 38 clicks, and the completion rate for ordering a service was about 36%. Facial expression revealed that 83% of testers had negative emotions about the platform, and just 17% had positive emotions. Preliminary findings about engagement levels revealed that participants paid good visual attention (64%) and were highly engaged in the ordering process (79%). The average usability score (navigation, naming, user flow efficiency, confidence, design) was 54%. The average perception score (intention of use, recommendation, relevance, overall evaluation) was 52%. Overall, these findings, together with the survey's preliminary results, indicate that the design team should keep improving both the UX and UI of the online store to better support the future commercial operations and sales of NextLand services.

## 7.6 Paradox 6: How to find the right balance between centralized and decentralized approaches?

### 7.6.1 Context

Due to ever-increasing globalization and digitalization, the creation of value-added services from EO data has increased significantly. EO-SPs must constantly develop new services and commercial operations, supported by new EO e-marketplaces and online stores. The existing ones could be more user-friendly and have several limitations (e.g., price transparency, unclear EO-based service attributes, and catalog format). These platforms follow more centralized business models, such as

cost-per-click or agency models, in terms of control and process. In the cost-per-click model, the EO platform is a catalog and aggregates EO-based services. In the initial stage, they might be invited for free to develop the platform and increase the number of EO-SPs. Once it becomes well-known, the EO-SP will start paying the NextLand Online Store every time their listing is clicked by a potential buyer, regardless of whether a sale is made. In the agency model, the platform charges buyers directly for the service when it is bought and pays back to the EO-SP while retaining a commission.

Although these two models are the simplest ones to implement, we expect that similarly to what has already occurred in a wide range of mature sectors (e.g., finance, tourism), the more decentralized Peer-to-Peer (P2P) business model will become established in the EO sector during this decade. However, to our knowledge, there are no P2P EO e-marketplaces or online stores where buyers might communicate directly with EO-SPs and downstream service providers (and vice-versa). The existing ones are centralized and require the involvement of an intermediary contact point.

Because of the increasing importance of the sharing economy, the optimization of P2P models is becoming increasingly important [59, 61, 93]. Zopa launched one of the first P2P financial platforms in the financial sector in 2005. At that time, many users were unhappy with the traditional brick-and-mortar financial players (e.g., the young digital generation and people without a fixed income who could not get loans). To address this challenge, Zopa's P2P platform enabled individuals to obtain loans directly from other individuals, cutting out the financial institution as the middleman. There are numerous P2P financial platforms globally (e.g., USA, UK, Germany, France, and Baltic countries), and this market is already saturated and very segmented. For example, while some P2P platforms operate in the B2B market (e.g., Funding Circle), others work in the B2C local market (e.g., Upstart, Prosper), and others were developed for international non-residents (e.g., Bondora, Kutflink). Similarly to the financial sector, in the mature Online Travel Agents (OTAs) sector, P2P became a common digital eCommerce practice with well-established players (e.g., Airbnb, Couchsurfing). Numerous P2P companies were created in the mid and late 1990s (see [89]. More recently, many start-ups and well-known companies (e.g., Booking.com) have added P2P accommodation to their offerings, and the matching issue of P2P sharing accommodation has become a hot topic [93].

### 7.6.2 The case of the EC H2020 NextLand project

NextLand aims to invest significantly in service development (individual, bundled, and customized services) for future commercialization. To support future market exploitation, NextLand seeks to develop a P2P platform where customers might communicate directly with service providers without the "visible" intervention of a NextLand entity. In addition, it would be recommendable that the suppliers could communicate among themselves (e.g., to satisfy customer needs and develop bundled solutions jointly). Among others, the role of the NextLand entity is to harmonize procedures, workflows, support mechanisms, and service level agreements (SLAs) to simplify this process.

A P2P model presents several advantages for customers, EO-SPs, and the platform owner(s). First, for customers, a P2P platform enables quick and easy access to EO-based services, interactions with multiple EO-SPs in a single place, access to more options than the ones offered by individual EO-SPs, lower prices due to competition, and simplified research and buying process.

Second, for EO-SPs, although it might bring on board more competition, it will allow us to have faster growth, increased sales, and market share through a new channel. It is better to have visibility in the presence of numerous competitors rather than being alone and having little or no visibility. Moreover, it allows higher margins for EO-SPs because there are no intermediary middlemen; consequently, the P2P owner typically charges lower commissions than the traditional models. It will also simplify the operations as well as lower the operating and commercialization costs.

Third, for the platform owner, it facilitates faster scalability while sharing risks. It reduces the number of interactions and struggles with EO-SPs and customers. An automatized P2P process ensures that the services have a high TRL and are operational. P2P allows a better EO offering by aggregating more EO-SPs and users in the same place. Because it gets lower commissions from EO-SPs and users, it gets more competitive with existing alternatives.

The long-term goal of NextLand is to significantly increase the number of EO-SPs and buyers while developing a solid P2P EO platform. Evidence revealed that many sectors (e.g., financial, insurance, travel agents), which in the past were offering brick-and-mortar customized solutions to achieve this goal, nowadays are offering successful P2P solutions for both B2C and B2B operations. However, the implementation of a P2P platform supported by a network between EO-SPs, and between EO-SPs and users present more challenges than the traditional models (e.g., cost-per-click or agency models), both from technological and market perspectives. First, a significant challenge will be to deal with the coopetition tension among EO-SPs to increase the number of service providers on the platform (in addition to the original ones of NextLand) to become more attractive from a buyer's perspective. Buyers expect to have several competing answers for each service search. Second, EO-SPs need to be incentivized to provide global standard EO online services rather than offering exclusively customized, high-accuracy, and local services, which require frequent interaction between service providers and users. Customers expect fast and relevant answers, such as discovering if the service is available in their geographical areas of interest within a brief period. Finally, the platform needs to be user-friendly. To understand EO-based benefits, clients should not need to have technical knowledge or be remote sensing specialists.

## 8 Next ocean: the twin project

The above-mentioned six challenges have been analyzed in the specific context of the EC H2020 NextLand project in the context of the Green Economy. Are these six tensions common to other EC projects? In the case of the NextOcean H2020 project in the context of the Blue Economy, there are eleven partners working with a

wide range of users interested in fishing, aquaculture, and marine management. The NextOcean project expects to support trade sustainability, minimize bycatch, identify fish provenance, provide early warning of pollution events, and help to monitor the locations of fish cages and the environmental impact of fish farms. The primary goal is to transfer EO data across the value chain to solve the real challenges of intermediate and end-users. Many of these users don't have any technological know-how. After completing the initial 20 months of this H2020 project, we can conclude that the same six tensions are also very pertinent in this different context. Moreover, these tensions might be even more accentuated because significant players (e.g., Global Fishing Watch, BarentsWatch) are offering high-quality services for free to the end-users in the context of the Blue Economy.

## 9 Theoretical implications and limitations

Future e-commerce research is encouraged to explore how e-marketplaces could improve sales performance by incorporating the aspects identified during our exploratory findings as well as a wide range of functions discussed by past research (e.g., repertoire, volume, complexity, heterogeneity, seller reputation, customer rating) (see [60]. Future research should also address the tensions presented in this article while building on the paradox theory. A trade-off looks for "an either/or decision as leaders strive to select between alternatives—A and B—that each pose advantages and disadvantages." A compromise implies finding common ground between different options. It tries to find a "blended solution," where "A and B are combined to form a new option, C." Finally, paradoxical management seeks a "both/and" solution and "to engage competing demands simultaneously rather than focus on one side or develop a blended solution." [58]: 61, 62). To address these tensions in Horizon Europe projects, we propose to adopt a "paradox lens" and follow a dynamic equilibrium approach [81]. The research suggests that leaders must manage and satisfy both sides of the paradoxical tensions. They should accept and tackle these paradoxical tensions rather than dismissing or ignoring them. Adopting a paradoxical leadership style allows leaders to be agile and adopt practices that help manage "both/and" solutions for the various EO challenges. Further research addressing these topics is urged in the context of strategic alliances and other types of international partnerships.

Past research on strategic alliances identifies an extensive array of collaborative arrangements ranging from equity to contract-based alliances, such as joint ventures, franchising, licensing, and consortia. In general, strategic alliances can be defined as collaborative agreements "between two or more organizations to achieve their strategic objectives while remaining independent entities" [32]: 146). As such, though resources and competencies may be shared with partners, they remain under separate ownership [36]. Yet, strategic alliances can vary across a broad range of relationships depending on their nature, the size of the venture, design and ownership structure, equity investment, organizational functions, and ultimately the partners involved. Such a variety increases the complexity and difficulty of understanding and selecting the correct type of strategic alliance, especially in managing it.

## 10 Managerial recommendations

Considering the most recent "Innovation Actions" promoted by the EC, which aim to achieve simultaneous technological and commercial success, organizations need to develop their skills across various areas. There is constant pressure for partners to become sustainable across three dimensions (Profit, People, Planet). Moreover, while service providers are expected to achieve high standard levels in terms of e-service quality, e-marketplace owners must offer a fantastic online store UX/UI experience [1]. Competing with complementors and coopetition are now hot topics in e-commerce. While platform owners might affect their complementors' welfare, complementors might defend themselves in different forms (e.g., by aggregating non-blockbuster products and building new product development capabilities) [96]. Additionally, the digital transformation along the value chain is leading to the creation of new digital business models across several industries. Surprisingly, although a P2P model presents several advantages for customers, EO-SPs, and the platform owner(s), this business model does not exist in the EO-based sector.

We focus on a type of strategic alliance, the consortium, where partners expect to work on specific projects to join complementary resources and competencies to achieve synergetic gains [36] but without sharing their core competencies. This model expects to have a clear governance structure, share specific capabilities, and distribute benefits. In the short term, the consortium is not seen as a risk for monopoly creation because the relationships between the involved organizations typically require lower levels of investment, resource commitment, flexibility, risk, trust, and control. Future research is strongly encouraged to explore how to manage and negotiate these aspects before the creation of the consortium (e.g., during the tender process) and during the post-agreement phase. Moreover, future research should focus on identifying how to make consortia sustainable long-term from financial, social, and environmental perspectives. Nowadays, consortia involve team members with different profiles (e.g., executives, managers, engineers, scientists, and public policy makers) who must make sustainable decisions regarding a wide range of aspects such as management of teams, EO-based services, online stores, e-marketplaces, and eCommerce, as well as business and governance models. To succeed across all these fronts, leaders must trust each other, be committed, and cooperate [55] while managing a wide range of paradoxical tensions, as previously discussed. Paul Polman, ex-CEO of Unilever (2009–2019), mentioned that "the difference between average and outstanding firms is an 'AND Mentality.' We must find and create tensions—force people into different spaces for thinking… This is not just a performance issue but a survival issue because managing paradox helps foster creativity and high performance." [58]: 62.

To address these tensions in formal relationships, executives must overcome significant obstacles. First, they must overcome their inertia and the lack of embedded routines to manage constant organizational change and changing customer needs. Second, they must overcome the dulled motivation associated with

changing previously successful practices for operating in the EO market, such as excessive dependency on public funds for large consortia for collaborative technological development without any post-agreement for joint-commercialization output. Third, they must overcome the distorted perception associated with EO technological myopia, limited knowledge of market orientation and management principles, and the importance of managing tensions and paradoxes. Fourth, they must deal with the political impasses related to the change of organizational priorities and reallocation of resources to those priorities, such as more commercialization and market focus. Fifth, decision-makers must overcome their inability to manage the opportunity paradox, where "focus may be just as important as flexibility, and, counterintuitively, a company's focus may even influence its flexibility and vice versa." [6]: 29).

Finally, they need to address the paradox of choice [78]. In the EO and space sectors, it has been demonstrated that the large number of options that an EO-SP must face (e.g., number of international markets, number of potential customers) can lead to paralysis and poor choice and decrease satisfaction with the final choice. In an internationalization context, the paradox of choice is aligned with the GloCal paradox. We strongly recommend managing the choice and GloCal paradoxes using the VCW-Value Creation Wheel method [46, 54] supported by the Value Creation Funnel [25] and Multi-Criteria Decision Analysis [63]. The impact of the VCW method in these and other projects can be confirmed in previous articles by Lages and colleagues [46, 48, 54].

## 11 Public policy recommendations

The EC is putting serious efforts into addressing some of the innovation and commercial challenges discussed in this paper through different actions (e.g., Copernicus Masters). Just very recently, there was an open call to identify past, current, and future challenges as well as possible solutions to overcome the challenges of EC projects. It is also clear that the EC supports actions that create synergies and are transversal to different projects. This is the case of the Sustainable Value Creation Summit to be held at Nova SBE where there will be a bundle of four conferences; two of them in the field of Earth Observation (NextLand and NextOcean conferences) and two of them in the field of Value Creation (5th VCW and Global Creating Value Conferences). Nevertheless, much more can be done.

We now present some recommendations. First, the great majority of EC frameworks do not have commercialization as a final goal. Although R&D and Technology are critical, if they stay in the lab or on the shelf, the impact on society will be very limited. There is a long tradition of various decades of pure Research and Development (R&D) projects, billions of euros invested in well-trained technological people, and the development of technologies with low TRLs. This explains why it is still incredibly challenging for the complex space ecosystem to become more commercially oriented [47]. There are immense obstacles in overcoming the dependency of large consortia on public funds for interconnected collaborative development, without any post-agreement for joint-commercialization output after

the end of the EC projects. During the last decades, when compared to R&D and technological calls, there has been a very limited number of Open Calls for EC tenders with a market focus. Proportionally, the business resources (people, time, and money) allocated for go-to-market and sales actions are very scarce when compared to those allocated for science, R&D, and technology. Surprisingly, even in the case of EC Innovation Actions, where large consortia are expected to have commercial success, in the great majority of cases, consortia allocate the most significant percentage of resources to technological development and a tiny percentage of their total budget to commercial actions and sales. Much more should be done in this area.

Second, public policymakers should reward EC-funded alpha users that become buyers as well as projects that are able to sell their EO services in the market. The different commercial actions leading to sales outcomes should be supported. In addition to the popular technology readiness level (TRL), other critical readiness levels should be monitored (e.g., business, customer, human resources, funding). In the case of EC projects that are expected to have commercial outputs (e.g., Innovations Actions), during the pre-grant and post- grant-agreement it should become a rule that around half of the resources (budget, people, and time) should be allocated for business/sales actions and the other half for technological/R&D actions.

Third, public policymakers should support even more firms to enhance their technological and management know-how to become agile, develop manufacturing flexibility and succeed [72]. Many leaders and decision-makers with science and engineering background lack management know-how in the EO, remote sensing, and space business sectors. This might also explain why proportionally so few resources are allocated to management.

Fourth, to address this business gap, public policymakers are encouraged to support technology-transfer projects. It is now possible to see university consortia, such as the Space Business Program, which results from a partnership between Nova SBE Executive Education, Rotterdam School of Management, the University of St. Gallen, and the European Space Agency (EAS). Moreover, there is a wide range of space business programs offered by leading institutions in the sector (e.g., Copernicus Academy, European Space Agency, International Space University) and by top universities across the globe (e.g., MIT).

Fifth, we encourage the future usage of scorecards (e.g., [49, 50]) and decision-making tools (e.g., [46, 54] during the referee and approval processes in the pre-grant and post-grant agreement stages. The EC is currently using valuable tools (e.g., Innovation Radar) to develop a diagnostic and evaluate the innovation capability of consortia funded by H2020 and Horizon Europe. However, the Innovation Radar needs to be complemented because it also has limitations. It depends on the unit of analysis. For example, if a project has ten service innovations, it would be appropriate to submit ten innovations to the Innovation Radar to be 100% accurate.

Sixth, public policymakers must be aware that to foster successful innovation and develop commercial services in the EO sector, it is critical to manage the six tensions presented in this article while embracing an "AND Mentality." Public policymakers are strongly encouraged to create a scorecard that evaluates to what extent there is an optimal balance between (1) cooperation, competition, and coopetition

perspectives; (2) financial, environmental, and social value creation; (3) tech-push and market-pull orientations; (4) global and local market solutions; (5) functionality driven and human-centered design (UX/UI); (6) centralized and decentralized online approaches.

Nevertheless, there are also positive signals that public policymakers operating in the space business and EO sectors are gradually moving from a pure tech push to a more balanced approach between technology and market needs. A notable exception is the CASSINI Business Accelerator, focusing on reinforcing business development, go-to-market competencies, access to risk financing, increased market networks, and access to larger companies [20].

## 12 Conclusion

This article addresses a series of paradoxical challenges related to the commercialization and governance of a H2020 consortium created with the final goal of developing an online store for commercializing earth observation-based services. In the digital world and space business, and EO sectors, paradoxical tensions are constantly emerging due to increasing globalization and competitiveness. The capability of transparently accepting, rather than rejecting, the existence of these contradictory tensions is essential in achieving sustainable outcomes in formal relationships and within consortia [81]. Organizations that accept and manage these tensions reveal superior innovation and performance [65]. It is critical to aim for the simultaneous creation of individual and collective value for all the organizations composing the formal relationship and for external stakeholders to avoid value destruction.

Through its H2020 Research and Innovation Actions (recently replaced by RIA Horizon Europe), the EC is starting to put pressure on partners of the different consortia to simultaneously validate the technical and economic viability of the developed solutions [21]. At the same time, formal relationships between organizations operating across different levels of the value chain are leading to fascinating paradoxical tensions in the space business and EO sectors. Organizations are constantly faced with agreeing versus going alone [4]. We propose that organizations should accept and manage the existing tensions while looking for "both/and" solutions and "engage competing demands simultaneously, rather than focus on one side or develop a blended solution" [58]: 62). More specifically, we argue that to create shared value, organizations and future joint projects should have a simultaneous competition AND cooperation-mindset (i.e., coopetition). Organizations must support actions that are sustainable across different dimensions (financial, environmental, AND social), find the right balance between technology orientation AND market needs, benefit from economies of scale while satisfying users' needs (global AND local solutions,mass customization), take into consideration functionality design AND UX/UI, and take advantage of centralized AND decentralized approaches (i.e., Peer2Peer). Similarly to what has been done in the H2020 NextLand EO project, we strongly encourage EO organizations and future joint projects to address these paradoxical tensions by following an "AND Mentality" and engaging different stakeholders. Our experience reveals that cooperation with internal and external

stakeholders can generate more and better ideas rather than following a self-centered approach. There will always be constructive friction within consortia organizations and stakeholders about idea generation and the criteria to select the best ideas. To properly engage these stakeholders, we encourage the application of the VCW method [25, 46, 54] previously discussed in this article.

In the case of the EC H2020 NextLand project, the six paradoxical tensions mentioned in this article are being addressed by frequent meetings with all NextLand stakeholders (e.g., EO-SPs, alpha- and beta-users) to build trust and cooperation. In the Business and Innovation Ecosystem (BIE) meetings, we often apply the VCW method, where stakeholders are frequently exposed to the state of the project, invited to provide ideas and filters for the different challenges, and engaged in evaluating NextLand solutions and acting. This method helps to promote cohesion and transparency. In addition to the recurrent tensions, in the BIE meetings, we also address sensitive challenges such as the definition of the appropriate joint business model and business plan for NextLand services and the NextLand Online Store, memorandum of understanding, terms sheet, intellectual property rights, collaboration management agreement, among others.

To conclude, although the creation of formal collaborative arrangements between organizations is critical for long-term sustainability, it can lead to numerous paradoxical tensions in Horizon 2020, Horizon Europe, and other consortia. Such tensions normally emerge during the implementation phase of the international consortia and tend to be exacerbated when stakeholder expectations and the alliance type are not adequately defined during the tender. The capability to identify and manage such tensions during the pre-, current-, and post-grant agreement stages helps to lead to individual and collective value creation and long-term sustainability. In digital- and tech-led sectors, such as space business and satellite-EO services, the ability to accept and manage these tensions influences the desired innovation, commercialization, and sustainability outcomes. Moreover, it affects partnership relationships when jointly developing online commercial applications for companies, institutions, and governments across a wide range of fields (e.g., monitoring land, ocean, atmosphere, and climate change, sustainable management of natural resources, and gathering intelligence for defense).

**Acknowledgements** We acknowledge the feedback on early versions of this work during presentations at Nova SBE (Portugal), St. Andrews University (Scotland), 2022 Digital Marketing & eCommerce Conference (Spain), EuroGEO Workshop 2022 (Athens), and the 5th Global Conference on Creating Value (Japan), where it was a recipient of the "Best Competitive Paper Award". The initial outline of this paper was published as a Springer book chapter [47]. The authors acknowledge all the members of Elecnor Deimos and over 300 Master students that collaborated with the VCW Lab at Nova SBE during the last eight years. We also acknowledge the feedback from all the NextLand and NextOcean partners, the Business and Innovation Ecosystem (BIE) of NextLand and NextOcean, Advisory Board members, EC referees for their input during numerous project meetings, and Hermen M. Westerbeeke and Miguel Pina e Cunha. The opinions expressed in this publication are only those of the authors and they do not purport to reflect the opinions or views of their own organizations.

**Funding** Open access funding provided by FCT|FCCN (b-on). This work was funded by the European Union's Horizon 2020 program [H2020-SC5-2019–2]—869520 NextLand, [H2020-SPACE-202]—101004362 NextOcean, Fundação para a Ciência e a Tecnologia (UIDB/00124/2020 and

Social Sciences DataLab, PINFRA/22209/2016), POR Lisboa and POR Norte (Social Sciences DataLab, PINFRA/22209/2016).

## Declarations

**Conflict of interest** Although the organizations to whom the co-authors of this article are affiliated have received research support from European Union's Horizon 2020 program for [H2020-SC5-2019–2]—869520 NextLand and [H2020-SPACE-202]—101004362 NextOcean, the opinions expressed in this publication are only those of the co-authors. They do not purport to reflect the opinions or views of their organizations.



## References

1. Agrawal, V., Seth, N., & Dixit, J. K. (2022). A combined AHP–TOPSIS–DEMATEL approach for evaluating success factors of e-service quality: An experience from the Indian banking industry. *Electronic Commerce Research, 22*(Sep), 715–747.
2. Angwin, D. N., Mellahi, K., Gomes, E., & Peter, E. (2016). How communication approaches impact mergers and acquisitions outcomes. *The International Journal of Human Resource Management, 27*(20), 2370–2397.
3. Ayoubi, C., Pezzoni, M., & Visentin, F. (2019). The important thing is not to win, it is to take part: What if scientists benefit from participating in research grant competitions? *Research Policy, 48*(1), 84–97.
4. Beamish, P. W., & Lupton, N. C. (2016). Cooperative strategies in international business and management: Reflections on the past 50 years and future directions. *Journal of World Business, 51*(1), 163–175.
5. Berti, M., & Simpson, A. V. (2021). The dark side of organizational paradoxes: The dynamics of disempowerment. *Academy of Management Review, 46*(2), 252–274.
6. Bingham, C. B., Furr, N. R., & Eisenhardt, K. M. (2014). The opportunity paradox. *MIT Sloan Management Review, 56*(1), 29–35.
7. Bromberg, J. L. (2000). *NASA and the space industry*. JHU Press.
8. Bustinza, O. F., Gomes, E., Vendrell-Herrero, F., & Baines, T. (2019). Product–service innovation and performance: The role of collaborative partnerships and R&D intensity. *R&D Management, 49*(1), 33–45.
9. Chen, S., He, Q., & Xiao, H. (2022). A study on cross-border e-commerce partner selection in B2B mode. *Electronic Commerce Research, 22*(Jun), 1–21.
10. Copernicus (2019). Copernicus Market Report, Prepared by PwC for the EC.
11. Copernicus (2022). List of Copernicus Use Cases, Retrieved Feb 28, 2022, from https://www.copernicus.eu/en/use-cases.
12. Da Silveira, G., Borenstein, D., & Fogliatto, F. S. (2001). Mass customization: Literature review and research directions. *International Journal of Production Economics, 72*(1), 1–13.
13. Das, T. K., & Teng, B. S. (1998). Between trust and control: developing confidence in partner cooperation in alliances. *Academy of Management Review, 23*, 491–512.
14. Dorobantu, S., Lindner, T., & Müllner, J. (2020). Political risk and alliance diversity: A two-stage model of partner selection in multi-partner alliances. *Academy of Management Journal, 63*(6), 1775–1806.

15. Duan, Y., Ge, Y., & Feng, Y. (2022). Pricing and personal data collection strategies of online platforms in the face of privacy concerns. *Electronic Commerce Research, 22*(Jun), 539–559.
16. EC (2018). Horizon 2020—Work Programme 2018-2020 General Annexes, Retrieved Feb 28, 2022, from https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-d-ia_en.pdf.
17. EC (2019). The European Green Deal. Retrieved Feb 28, 2022, from https://ec.europa.eu/info/sites/default/files/european-green-deal-communication_en.pdf.
18. EC (2020). Horizon 2020. Retrieved Feb 28, 2022, from https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en.
19. EC (2022a). 6 Commission Priorities for 2019–24. Retrieved Feb 28, 2022, from https://ec.europa.eu/info/strategy/priorities-2019-2024_en.
20. EC (2022b). Open Call for Tender for CASSINI Business Accelerator. Retrieved May 13, 2022, from https://defence-industry-space.ec.europa.eu/open-call-tender-cassini-business-accelerator-2022-04-13_en.
21. EC (2022c). Horizon 2020—Work Programme 2018-2020. General Annexes. Retrieved May 31, 2022, from https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-d-ia_en.pdf.
22. Elkington, J. (1997). *Cannibals with forks—Triple bottom line of 21st century business*. New Society Publishers.
23. European Investment Bank (2019). The Future of The European Space Sector: How to Leverage Europe's Technological Leadership and Boost Investments for Space Ventures. Prepared for the EC by A. de Concini and J. Toth.
24. Flavián, C., Guinalíu, M., & Gurrea, R. (2006). The role played by perceived usability, satisfaction, and consumer trust on website loyalty. *Information & Management, 43*(1), 1–14.
25. Fonseca, V., Lages, L. F., & Kim, P. H. (2018). *Deimos: Expanding to a new market using the value creation wheel (case BAB370-PDF-ENG, Babson College)*. Harvard Business Publishing.
26. Franke, N., Schreier, M., & Kaiser, U. (2010). The "I designed it myself" effect in mass customization. *Management Science, 56*(1), 125–140.
27. Galileo (2021). Galileo General Introduction, Retrieved Feb 28, 2022, from https://gssc.esa.int/navipedia/index.php/Galileo_General_Introduction.
28. Galileo (2022). Galileo: En Route to Full Operational Capability, Retrieved Feb 28, 2022, from https://www.youtube.com/watch?v=k5DG7HCoKVE.
29. GEOValue (2018). 2018 June–December ESIP hosted webinars—socioeconomic value of Earth Science data, information, and applications Retrieved Sep 08, 2022, from https://geovalue.org/?events=2018-june-december-esip-hosted-webinars-socioeconomic-value-of-earth-science-data-information-and-applications.
30. Gnyawali, D. R., & Ryan Charleton, T. (2018). Nuances in the interplay of competition and cooperation: Towards a theory of coopetition. *Journal of Management, 44*(7), 2511–2534.
31. Goel, P. (2010). Triple bottom line reporting: An analytical approach for corporate sustainability. *Journal of Finance, Accounting, and Management, 1*(1), 27–42.
32. Gomes, E. (2020). Mergers, acquisitions, and strategic alliances as collaborative methods of strategic development and change. *Strategic Change, 29*(2), 145–148.
33. Gomes, E., Angwin, D., Weber, Y., & Tarba, S. Y. (2013). Critical success alliances through the mergers and acquisitions process: Revealing pre- and post- M&A connections for improved performance. *Thunderbird International Business Review, 55*(1), 13–35.
34. Gomes, E., Barnes, B. R., & Mahmood, T. (2016). A 22 year review of strategic alliance research in the leading management journals. *International Business Review, 25*(1), 15–27.
35. Gomes, E., Mellahi, K., Sahadev, S., & Harvey, A. (2017). Perceptions of justice and organizational commitment in international mergers and acquisitions. *International Marketing Review., 34*(5), 582–605.
36. Gomes, E., Weber, Y., Brown, C., & Tarba, S. Y. (2011). *Mergers, acquisitions and strategic alliances: Understanding the process*. Palgrave Macmillan.
37. Gomes, E., Alam, S., & He, Q. (2021). Chapter 8. Looking at the Other Side of the Fence: A Comparative Review of the Mergers and Acquisitions, and Strategic Alliances Literatures. in Advances in Mergers and Acquisitions, Volume 20, 99–119.
38. He, P., Wang, T. Y., Shang, Q., Zhang, J., & Xu, H. (2022). Knowledge mapping of e-commerce supply chain management: a bibliometric analysis. Electronic Commerce Research.In print.

39. He, Q., Meadows, M., Angwin, D., Gomes, E., & Child, J. (2020). Strategic alliance research in the era of digital transformation: Perspectives on future research. *British Journal of Management, 31*(3), 589–617.
40. Hoffmann, W., Lavie, D., Reuer, J. J., & Shipilov, A. (2018). The interplay of competition and cooperation. *Strategic Management Journal, 39*(12), 3033–3052.
41. Hortinha, P., Lages, C., & Lages, L. F. (2011). The trade-off between customer and technology orientations: Impact on innovation capabilities and export performance. *Journal of International Marketing, 19*(3), 36–58.
42. 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*(Jul–Sep), 65–77.
43. 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.
44. Kodra, E., Senechal, T., McDuff, D., el Kaliouby, R. (2014). From Dials to Facial Coding: Automated Detection of Spontaneous Facial Expressions for Media Research. http://www.affectiva.com/wp-content/uploads/2014/09/From_Dials_to_Facial_Coding_Automated_Detection_of_Spontaneous_Facial_Expressions_fo.pdf.
45. Littlewort, G., Whitehill, J., Wu, T., Fasel, I., Frank, M., Movellan, J., & Bartlett, M. (2011). The computer expression recognition toolbox (CERT). In Face and Gesture 2011 (pp. 298–305).
46. Lages, L. F. (2016). VCW-value creation wheel: Innovation, technology, business, and society. *Journal of Business Research, 69*(11), 4849–4855.
47. Lages, L. F. (2022), Innovation, commercialization, and sustainability of earth observation in space business: Tensions and paradoxes. In Martínez-López, F. J. & Martinez, L. F. (eds.) Advances in Digital Marketing and eCommerce. Cham: Springer (pp. 289–299).
48. Lages, L. F., Fonseca, V., & Paulino, M. (2018). The VCW-value creation wheel: a framework for market selection and global growth. In Advances in Global Marketing. Springer, Cham. (pp. 253–279)
49. 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*(2), 304–325.
50. Lages, L. F., Lages, C., & Lages, C. R. (2005). Bringing export performance metrics into annual reports: The APEV scale and the PERFEX scorecard. *Journal of International Marketing, 13*(3), 79–104.
51. Lages, L. F., Lages, C., & Lages, C. R. (2006). Main consequences of prior export performance results: An exploratory study of European exporters. *Journal of Euromarketing, 15*(4), 57–75.
52. Lages, L. F., Lancastre, A., & Lages, C. (2008). The B2B-RELPERF scale and scorecard: Bringing relationship marketing theory into business-to-business practice. *Industrial Marketing Management, 37*(6), 686–697.
53. Lages, L. F., Mata, J., & Griffith, D. A. (2013). Change in international market strategy as a reaction to performance decline. *Journal of Business Research, 66*(12), 2600–2611.
54. Lages, L. F., Ricard, A., Hemonnet-Goujot, A., & Guerin, A. M. (2020). Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem-solving, and lean. *Strategic Change, 29*(2), 195–213.
55. Lancastre, A., & Lages, L. F. (2006). The relationship between buyer and a B2B e-marketplace: Cooperation determinants in an electronic market context. *Industrial Marketing Management, 35*(6), 774–789.
56. Lee, Y., & Kozar, K. A. (2012). Understanding of website usability: Specifying and measuring constructs and their relationships. *Decision Support Systems, 52*(2), 450–463.
57. Lewis, J. R. (2018). Measuring perceived usability: The CSUQ, SUS, and UMUX. *International Journal of Human-Computer Interaction, 34*(12), 1148–1156.
58. Lewis, M. W., Andriopoulos, C., & Smith, W. K. (2014). Paradoxical leadership to enable strategic agility. *California Management Review, 56*(3), 58–77.
59. Li, L., Zheng, H., Chen, D., & Zhu, B. (2022). Whose reviews are most valuable for predicting the default risk of peer-to-peer lending platforms? Evidence from China. Electronic Commerce Research, in print.
60. Li, H., Fang, Y., Lim, K. H., & Wang, Y. (2019). Platform-based function repertoire, reputation, and sales performance of e-marketplace sellers. *MIS Quarterly, 43*(1), 207–236.
61. Li, X. (2022). The impact of place-of-origin on price premium for agricultural products: Empirical evidence from Taobao.com. *Electronic Commerce Research, 22*(Jun), 561–584.

62. Margolis, J. D., & Walsh, J. (2003). Misery loves company: Rethinking social initiatives by business. *Administrative Science Quarterly, 48*, 268–305.
63. Marttunen, M., Lienert, J., & Belton, V. (2017). Structuring problems for multi-criteria decision analysis in practice: A literature review of method combinations. *European Journal of Operational Research, 263*(1), 1–17.
64. Meglio, O., & Risberg, A. (2010). Mergers and acquisitions—Time for a methodological rejuvenation of the field? *Scandinavian Journal of Management, 26*(1), 87–95.
65. Miron-Spektor, E., Ingram, A., Keller, J., Smith, W. K., & Lewis, M. W. (2018). Microfoundations of organizational paradox: The problem is how we think about the problem. *Academy of Management Journal, 61*(1), 26–45.
66. OECD. (2016). *Space and innovation*. OECD Publishing.
67. OECD. (2019). *The space economy in figures: How space contributes to the global economy*. OECD Publishing.
68. OECD. (2019). *Chapter 1—The ongoing transformation of the global space sector in the space economy in figures: How space contributes to the global economy*. OECD Publishing.
69. OECD (2019c). Chapter 4. Digital (r)evolution in manufacturing and the production of space systems in The Space Economy in Figures: How Space Contributes to the Global Economy. Paris: OECD Publishing.
70. Papadakis, V., & Thanos, I. (2010). Measuring the performance of acquisitions: An empirical investigation using multiple criteria. *British Journal of Management, 21*(4), 859–873.
71. Peters, L., & Saidin, H. (2000). IT and the mass customization of services: The challenge of implementation. *International Journal of Information Management, 20*(2), 103–119.
72. Pinheiro, J., Silva, G. M., Dias, Á. L., Lages, L. F., & Preto, M. T. (2020). Fostering knowledge creation to improve performance: The mediation role of manufacturing flexibility. *Business Process Management Journal, 26*(7), 1871–1892.
73. Kundu, S., & Chakraborti, S. (2022). A comparative study of online consumer reviews of Apple iPhone across Amazon, Twitter, and MouthShut platforms. *Electronic Commerce Research, 22*(Sep), 925–950.
74. Rico, R., Hinsz, V. B., Davison, R. B., & Salas, E. (2018). Structural influences upon coordination and performance in multiteam systems. *Human Resource Management Review, 28*(4), 332–346.
75. Ritala, P., Golnam, A., & Wegmann, A. (2014). Coopetition-based business models: The case of Amazon.com. *Industrial Marketing Management, 43*(2), 236–249.
76. Ritala, P., & Hurmelinna-Laukkanen, P. (2009). What's in it for me? Creating and appropriating value in innovation-related coopetition. *Technovation, 29*, 819–828.
77. Sauro, J. (2015). SUPR-Q: A comprehensive measure of the quality of the website user experience. *Journal of Usability Studies, 10*(2), 68–86.
78. Schwartz, B., & Schwartz, B. (2004). *The paradox of choice: Why more is less*. Ecco.
79. Sheetz, M. (2022). Investing in space: Investment in space companies hit a record of $14.5 billion in 2021, report says, 22 Jan, CNBC.
80. Sleuwaegen, L., & Smith, P. M. (2022). Who purchases cross-border? Individual and country level determinants of the decision to purchase cross-border in the European Single Market. *Electronic Commerce Research, 22*(Sep), 749–785.
81. Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review, 36*(2), 381–403.
82. Stahl, G. K., Angwin, D. N., Very, P., Gomes, E., Weber, Y., Tarba, S. Y., Noorderhaven, N., Benyamini, H., Bouckenooghe, D., Chreim, S., Durand, M., & Yildiz, H. E. (2013). Sociocultural integration in mergers and acquisitions: Unresolved paradoxes and directions for future research. *Thunderbird International Business Review, 55*(4), 333–356.
83. Tassa, A. (2020). The socio-economic value of satellite earth observations: Huge, yet to be measured. *Journal of Economic Policy Reform, 23*(1), 34–48.
84. Topaloglu, O., & Dass, M. (2021). The impact of online review content and linguistic style matching on new product sales: The moderating role of review helpfulness. *Decision Sciences, 52*(3), 749–775.
85. UNECE/FAO (2020). Who owns our forests? Forest ownership in the ECE region. ECE/TIM/SP/43. United Nations and the Food and Agriculture Organization of the United Nations, New York and Rome. eISBN 978–92–1–004828–6. pp. 183.
86. Vanhaverbeke, W., & Noordehaven, N. G. (2001). Competition between alliance blocks: The case of the RISC microprocessor technology. *Organization Studies, 22*, 1–30.

87. Vendrell-Herrero, F., Gomes, E., Bustinza, O. F., & Mellahi, K. (2018). Uncovering the role of cross-border strategic alliances and expertise decision centralization in enhancing product-service innovation in MNEs. *International Business Review, 27*(4), 814–825.
88. Virapongse, A., Pearlman, F., Pearlman, J., Murambadoro, M. D., Kuwayama, Y., & Glasscoe, M. T. (2020). Ten rules to increase the societal value of earth observations. *Earth Science Informatics, 13*(2), 233–247.
89. von Briel, D. & Dolnicar, S. (2021). Chapter 3—The evolution of Airbnb's competitive landscape. in Airbnb: Before, During and After Covid-19. Queensland: University of Queensland.
90. Wang, J., & Senecal, S. (2007). Measuring perceived website usability. *Journal of Internet Commerce, 6*(4), 97–112.
91. Wedel, M., & Pieters, R. (2017). A review of eye-tracking research in marketing. Review of Marketing Research, 123–147.
92. Weiss, G., Wolfslehner, B., Zivojinovic, I. (2021). Who owns the forests and how are they managed? In: Key questions on forests in the EU. https://efi.int/forestquestions.
93. Xiong, L., Wang, C., & Xu, Z. (2022). Supply and demand matching model of P2P sharing accommodation platforms considering fairness. *Electronic Commerce Research, 22*(Sep), 951–978.
94. Yin, R. K. (1994). *Case study research—Design and methods* (2nd ed.). Sage Publications.
95. Yoo, D.K., Roh, J.J., Cho, S., & Yang, M. M. (2022) Coopetition in a platform ecosystem: from the complementors' perspective. Electronic Commerce Research. in print.
96. Zhu, F., & Liu, Q. (2018). Competing with complementors: an empirical look at Amazon.com. *Strategic Management Journal, 39*(10), 2618–2642.
97. Zinko, R., Stolk, P., Furner, Z., & Almond, B. (2020). A picture is worth a thousand words: how images influence information quality and information load in online reviews. *Electronic Markets, 30*(4), 775–789.

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