Managing collaborations within consortia for innovation

Rouyre Audrey
MBS School of Business
a.rouyre@mbs-education.com

Aleksios Gotsopoulos
SKK GSB, Sungkyunkwan University

Fernandez Anne-Sophie
Université de Montpellier
anne-sophie.fernandez@umontpellier.fr

Résumé :

Grand challenges demand collaboration through across diverse stakeholders to address complexity and uncertainty. This study explores multi-stakeholder dynamics in R&D consortia, focusing on the IRIS² project—a European satellite initiative emphasizing strategic autonomy. By examining the interplay of coopetition and client-supplier relationships, we uncover the challenges of managing conflicting interests, diverse priorities, and risk-sharing among public and private actors. Using a longitudinal qualitative case study approach, we reveal how governance structures and collaboration strategies evolved to address these challenges. Key findings highlight the necessity of redefining roles to mitigate tensions and enhance cooperation, particularly among competing firms. This research contributes to the inter-organizational relationship (IOR) literature by detailing the emergence and management of complexities in multi-stakeholder consortia. Practical insights suggest that early proactive strategies and adaptive governance are vital for fostering innovation in large-scale collaborative projects, especially in high-tech and strategically significant industries.

Mots-clés : Collaboration, coopetition, R&D consortia, challenges, management, space industry

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INTRODUCTION

Grand challenges are multi-faceted problems that require urgent solutions and are characterized by profound uncertainty, complexity, and evaluability (Ferraro et al., 2015). Tackling grand challenges efficiently requires bringing together and coordinating the actions of broad constellations of actors that often adhere to different or even contradictory institutional logics and might have conflicting interests and priorities (Callagher et al., 2022). Extant research has suggested that coordinators of consortia that aim to tackle grand challenges need to engage in robust action, that is, noncommittal actions that preserve long-term flexibility (Eccles & Nohria, 1992; Padgett & Powell, 2012; Ferraro et al., 2015). Because grand challenges are characterized by profound uncertainty regarding means-ends relationships and, even more, by variable ontologies (Callon, 1998) that can lead to frequent redefinitions of the very problem to be tackled (Ansell, 2011), robust action aims to keep future paths open so that actions can adapt to an emerging understanding and evaluation of the grand challenge's diagnostic and prognostic frames.

Yet, while the value or robust action and the need for multivocal coordination that accommodates different institutional perspectives and facilitates diverse stakeholders' participation (Furnari, 2014) are theoretically well-understood, we know less about how multiple coordinators can practically manage consortia comprising multiple and diverse stakeholders to tackle grand challenges efficiently. Indeed, while multi-stakeholders' collaborations within consortia have been studied in the literature and empirical examples, including initiatives like The Innovative Medicines Initiative (IMI) (focused on medicines) and the AVCC (Autonomous Vehicle Computing Consortium) (dedicated to autonomous vehicle technologies), highlight the growing prevalence of managing consortia. However, academic

research on this phenomenon remains relatively scarce. More specifically, in consortia initiated by several firms acting as coordinator, how are members chosen, how are conflicting institutional logics and competing interests managed, and how are the roles of different stakeholders adjusted in face of emerging challenges, changing needs, or redefined goals. Understanding how such large-scale collective efforts—encompassing collaborations among diverse partners such as competing firms (i.e., coopetition, Bengtsson & Kock, 2000; Chiambaretto et al., 2022), client-supplier networks, and public actors—emerge and are effectively managed within R&D consortia is crucial for advancing knowledge about IOR dynamics. Thus, we are wondering: how multi-stakeholders coordinators can interact and shape the management of R&D consortia?

We aim to answer these questions in the case of IRIS2 consortium, Europe's concerted response to Starlink (competing telecommunications satellite constellations from Space X). The IRIS² consortium was initiated by the urgent need for strategic autonomy for Europe. European Commission as part of its broader strategy for secure connectivity under the EU's 2023–2027 Secure Connectivity Program. It was driven by the geopolitical need for European sovereignty and autonomy in satellite communications, reducing reliance on non-European systems. This €2.4 billion project brings together public (European Space Agency, European Commission) and private (SES, EUTELSAT, Hispasat as competing satellites operators and Thales and Airbus as competing satellites manufacturers) stakeholders in a R&D consortium. IRIS² is not just a technological project; it is a strategic response to global challenges in the domains of sovereignty, security, and innovation. It represents Europe's ambition to lead in space technology and secure its future while navigating the complexities of multilateral collaboration and large-scale public-private projects.

The IRIS² project revealed three key insights. First, it required a shift from traditional client-supplier dynamics to a partnership model, fostering cooperation and even coopetition

among satellite operators (Eutelsat, Hispasat, SES) and manufacturers (Airbus Defence and Space, Thales Alenia Space). Second, collaboration posed challenges, particularly in knowledge sharing, role definition, and shared risk management, which created tensions in task negotiations and relationships. Third, consortium governance evolved to address these challenges, restructuring to streamline operations by moving competing manufacturers from leadership roles to supplier positions, enabling better management of technological and financial risks.

With the study of IRIS², we thus aimed to contribute to the IOR literature in three main ways by explaining how the number and the type of partners can be contingency factors in the emergence and the management of challenges in R&D consortia. First, we highlight the specific challenges arising from the coexistence of coopetition (simultaneous collaboration and competition) and client-supplier relationships within R&D consortia. Existing academic research shows that the coexistence of coopetition and inter-organizational relationships with non-competing partners (such as clients-suppliers) can complicate the management of divergent interests (Zeng & Chen, 2003; Fonti et al., 2017; Gnyawali & Ryan-Charleton, 2018; Farazi et al., 2024). In this study, we show how differing institutional logics, priorities and trust levels inherent in multi-stakeholders' cooperation impacts the consortia's design. The paper thus contributes to the IOR literature by elaborating on the unique dynamics of multi-stakeholders' cooperation where cooperative and competitive elements coexist with hierarchical (client-supplier) dependencies. Second, we examine how consortium structures can be designed and adapted to accommodate the complexity of multi-stakeholders' cooperation. Particular attention is given to the evolution of the structure of coordinating team. This insight contributes to the literature on the management of R&D consortia, on the design and adaptation of organizational structures (Ring et al., 2005; Sakakibara, 1997). Third, while the early-formation stage is a crucial step in the designing of consortium structure, only few provide an in-depth

examination of the challenges arising from the creation of consortium that entails multi-stakeholders' cooperation. This stage is critical because the presence of multiple members in a consortium significantly alters inter-organizational dynamics (Majchrzak et al., 2015; Gotsopoulos, 2018). Understanding these dynamics is crucial for establishing an effective consortium design, which is essential for the value creation process (Hwang & Burger, 1997; Doz et al., 2000; Zeng & Chen, 2003) and, ultimately, for fostering innovation.

1. THEORETICAL BACKGROUND

1.1. R&D CONSORTIA: DEFINITIONS AND CHARACTERISTICS

To develop radical and revolutionary innovations, firms need access to new resources and new technological skills. This is why companies form R&D consortia (Browning et al., 1995; Olk, 1999; Sakakibara, 1997, 2000). an R&D consortium is a legal entity or cooperation agreements created by two or more organizations that pool their resources and share decision-making for cooperative research and development activities (Olk & Young, 1997; Doz et al., 2000). This agreement is signed between independent organizations which combine tangible and/or intangible resources to cooperate in R&D activities (Ingham & Mothe, 1998).

R&D consortia can bring a set of benefits for participating firms. For example, these collaborations reduce costs and risks (Sakakibara, 1997; Wincent et al., 2010) and enhance the access to complementary human, technological, and financial resources, further supporting innovation (Doz et al., 2000). Intensive knowledge sharing within consortia foster R&D, helping companies capture more value, enhancing their market position (Mothe & Quélin, 2001), and thus enabling firms to access global markets more effectively (Varamäki & Vesalainen, 2003). Consortia represent an interesting opportunity for external learning, improving the technological capacities of firms (Ingham & Mothe, 1998; Sakakibara 2002) and generating (radical) innovations (Mathews, 2002).

R&D consortia, while valuable for fostering innovation, come with their own set of challenges. These challenges often stem from the need to manage diverse organizational interests (Fonti et al., 2017; Zeng & Chen, 2003), coordinate between multiple stakeholders (Ring et al., 2005) and address the differences in perception and commitment levels among partners (Fonti et al., 2017). For example, R&D consortia are fertile ground for social dilemmas (Zeng & Chen, 2003). Partners entering an R&D consortium may balance between fully commit to collaborative behavior or competing for prioritizing their own interests (Zeng & Chen, 2003).

1.2. MULTI-STAKEHOLDERS' COOPERATION DYNAMICS IN R&D CONSORTIA

R&D consortia entail multi-stakeholders' cooperation involving different type and number of organizations that come together to conduct innovation activities, that have their own (opposing) interests (Browning et al., 1995; Das & Teng, 2002; Majchrzak et al., 2015). In practice, R&D consortia often entail multi-stakeholders' cooperation where multiple companies collaborate toward shared and individual goals (Castiglioni et al., 2015; Fonti et al., 2017).

The large number of stakeholders involved in R&D consortia poses specific challenges. With more firms involved, the potential for opportunism grows (García-Canal et al., 2003; Zeng & Chen, 2003; Wincent et al., 2010), as the larger number of partners makes it easier for firms to act as free riders without being easily detected (Fonti et al., 2017). Such behaviors drive partners to prioritize individual gains over shared value creation (Browning et al., 1995; Das & Teng, 2002; Majchrzak et al., 2015). Additionally, the increased number of participants may lead to the formation of subgroups or coalitions within the alliance, as firms seek to gain influence (Madhavan et al., 2004; Fonti et al., 2017). This behavioral uncertainty intense collaboration complexity (Dagnino & Ferrigno, 2015), often breeding distrust among partners (Davis, 2016). Combined with the challenge of monitoring more interactions, these dynamics increase coordination costs (Lavie et al., 2007; Gong et al., 2007; Mishra et al., 2015).

However, number is not the only important variable in their specificities. Indeed, the type of partners also need to be diverse. Consortia diversity is linked to higher R&D spending by participating firms, leveraging industry characteristics and firm-specific traits like R&D capabilities and network connections (Sakakibara, 2003). Among the diverse type of partners, existing research on R&D consortia have shown that it facilitates cooperation across small and medium-sized enterprises (SMEs) and public research institutes (Mathews, 2002), and among SMEs (Lin et al., 2009). While R&D consortia can be a nurturing environment for such public-private collaboration (Rouyre et al., 2024), they also act as an interplay between cooperation and competition (Fernandez et al., 2014; Hoffman et al., 2018) and thus harbor collaboration with competitors, named coopetition (Chiambaretto et al., 2022; Farazi et al., 2024).

Coopetition refers to the simultaneous cooperation and competition between firms, where partnering companies compete intensely in certain markets while collaborating closely in others (Bengtsson & Kock, 2000). Through coopetition, firms gain access to similar and complementary resources, which can enhance value creation (Gnyawali & Ryan Charleton, 2018). Indeed, Competitors' resource complementarity and similarity create powerful synergies, as the knowledge each firm shares generates value that might not be achievable with non-competing partners (Khanna et al., 1998; Silverman & Baum, 2002; Das & Teng, 2002). However, the competitive aspect of coopetition introduces unique risks and tensions that may limit value creation and potentially hinder innovation development (Ritala & Hurmelinna-Laukkanen, 2009; Fernandez et al., 2014; Bagherzadeh et al., 2021). Indeed, it exposes companies to high risks of opportunism and potential knowledge misappropriation (Park & Russo, 1996), which can ultimately lead to value destruction rather than creation (Gnyawali & Ryan-Charleton, 2018; Farazi et al., 2024).

All in all, different type and nature of inter-organizational relationships can emerge and influence each other in multi-stakeholders' cooperation setting. For example, relationships

between clients-suppliers are often prominent, and cooperation between competitors can also be emergent in such large-scale setting. The co-existence of such different relationships can alter group dynamics (Majchrzak et al., 2015; Gotsopoulos, 2018). To align the dynamic to value creation and enhancing innovation, stakeholders need to manage their collaborations.

1.3. How to manage these multi-stakeholders' cooperation to achieve innovation?

R&D consortiums' design is important for its innovative success (Schwartz et al., 2012). Designing R&D consortium from scratch is thus a complex task where multi-stakeholders' cooperation is necessary (Ring et al., 2005). Due to the multiplicity and diversity of stakeholders for innovation purposes, R&D consortium entails complex organizational configurations (Sakakibara, 1997; Olk, 1999) that need to be managed to reach innovation (Ring et al., 2005).

Diversity - whether in terms of resources, expertise or strategies – is essential for fostering innovations in such context (Doz et al., 2000; Mothe & Quélin, 2001). For doing so, firms will need to create joint value. The creation of value is based on collective efforts, where shared skills and resources enable new solutions to be developed. However, as economic actors, firms will also try to capture most of the value jointly created (Fonti et al., 2017; Zeng & Chen, 2003). Indeed, the capture of the value is important for firms to support their own individual strategy and justify its investment in the consortium.

This duality between collective creation and individual capture of value underlines the importance of collaborative dynamics in R&D consortia (Gnyawali & Ryan-Charleton, 2018). It is not enough for the partners to pool their resources; they must also coordinate their efforts effectively, establish appropriate governance and build mutual trust (Ring et al., 2005). Indeed, the differences between the partners necessitated adjustments to the management of inter-

organizational collaboration (Majchrzak et al., 2015). The question then becomes how multi-stakeholder coordinators can interact and shape the management of R&D consortia?

2. METHOD

2.1. RESEARCH DESIGN

To answer our research question, we conducted an exploratory qualitative study utilizing a longitudinal, single-case study approach. This design is well-suited to addressing "how" questions (Eisenhardt, 1989; Eisenhardt & Graebner, 2007), particularly for exploring how multi-stakeholder collaboration dynamics are managed in innovation consortium (Siggelkow, 2007; Yin, 2009). Single case studies offer an illustrative framework, providing nuanced insights into specific contexts that refine theoretical precision (Yin, 2013). By employing this approach, we gained a comprehensive understanding of the phenomenon and its context through diverse evidence sources (Gruca et al., 2021).

Our research approach is designed as qualitative and exploratory to capture the complexities of multi-stakeholder inter-organizational collaborations in R&D consortia (Stake, 1995; Yin, 2015). This design provided insight into the challenges of collaborating an innovation consortium gathering a plethora of stakeholders that are competing but still need to collaborate, notably in the early stage of an innovation project.

2.2. RESEARCH SETTING

Our study focuses on the European space industry, which spans sectors such as telecommunication, navigation, and observation satellites. We specifically focused our analysis on the first with the IRIS² (Infrastructure for Resilience, Interconnectivity, and Security by Satellite) project. The IRIS² project is the European Union's new satellite constellation under its 2023-2027 secure connectivity program, with a budget of €2.4 billion. Its mission is to strengthen Europe's sovereignty and digital resilience by providing secure, autonomous satellite communications. For doing so, the project relies on a public-private partnership with

established space companies (satellites operators (SES, EUTELSAT, Hispasat) and manufacturers (Airbus Defence and Space, Thales Alenia Space)) and public actors (European Space Agency (hereafter ESA) and European Commission) (see Table 1).

Table 1. Overview of industrial actors

NAME	CORE BUSINESS	ACTIVITIES	REVENUES 2024	NACE CODE	DATE
EUTELSAT	Eutelsat is a major satellite operator providing capacity for television broadcasting, radio, data, and broadband services across Europe, the Middle East, Africa, Asia, and the Americas	The company operates a fleet of satellites in geostationary orbit, offering services such as direct-to-home broadcasting, video distribution, and broadband connectivity. Eutelsat has also expanded into low Earth orbit (LEO) services through its merger with OneWeb.	€1.2 billion	C61.30 (satellite telecommunications activities and operations)	1977
SES	SES is a leading satellite telecommunications network provider, offering video and data connectivity worldwide to broadcasters, content and internet service providers, mobile and fixed network operators, governments, and institutions.	SES operates a fleet of over 70 satellites in geostationary (GEO) and medium Earth orbits (MEO). The company provides services such as direct-to-home broadcasting, broadband connectivity, and managed data services.	€1.807 billion	C61.30 (satellite telecommunications activities and operations)	1985
HISPASAT	Hispasat is a Spanish satellite operator providing communication services in the commercial and government sectors, including internet, television, radio, and mobile services across the Americas, Europe, and North Africa.	Operating satellites positioned at 30.0° West and 61.0° West, Hispasat offers services such as broadband connectivity, corporate networks, and advanced telecommunications services.	€235 million.	C61.30 (satellite telecommunications activities and operations)	1989
Thales Alenia Space	A joint venture between Thales (67%) and Leonardo (33%), Thales Alenia Space specializes in satellite-based systems.	The company provides high-tech solutions for satellite communication, weather forecasting, environmental monitoring, and space exploration. They are involved in major projects such as the European Space Agency's Meteosat weather satellites, Galileo navigation system, and NASA's Artemis missions. Thales Alenia Space is also a leader in building satellite constellations and space stations	€2.2 billions	C30.30 (Manufacture of air and spacecraft and related machinery)	2005
Airbus Defence and Space	Airbus Defence and Space is a division of Airbus SE, specializing in the development and manufacturing of military aircraft, space systems, and related services.	The division's activities include producing military aircraft, launch vehicles, satellites, and providing cybersecurity and military intelligence services.	€11.2 billion	C30.30 (Manufacture of air and spacecraft and related machinery)	2014

The IRIS² project is ideal for studying the management of multilateral collaborations within R&D consortia in innovation projects for three main reasons. First, the project is just stammering. In November 2022, the IRIS² consortium was initiated by the European Commission (EC) as part of its broader strategy for secure connectivity under the EU's 2023–2027 Secure Connectivity Program. For supporting the consortium, a public-private partnerships have been put in place. From the public side, EC and the European Space Agency (ESA) are implicated. For the private side, leading and competing satellite operators such as SES, EUTELSAT and Hispasat and satellite manufacturers such as Airbus Defence and Space, and Thales Alenia Space, were also involved in the formation of the project. The public-private partnership model ensures shared financial risks and resources while leveraging innovation from the private sector. Second, the consortium gathers a large set of diverse actors that have multiple interactions, helping us to illustrate multi-stakeholder cooperation and dynamics in innovation contexts. Stakeholders were brought together to balance technical expertise, operational experience, and policy alignment with EU goals. In October 2024, the European Commission awarded the concession contract for the IRIS² satellite constellation to SpaceRISE, a consortium comprising European satellite operators SES, Eutelsat, and Hispasat. This consortium will collaborate with a core team composed eight European space and telecommunications companies as subcontractors: Thales Alenia Space (hereafter TAS), OHB, Airbus Defence and Space (hereafter ADS), Telespazio, Deutsche Telekom, Orange, Hisdesat, and Thales SIX[1].

2.3. Data Collection

Our data collection approach followed case study quality standards (Eisenhardt, 1989; Siggelkow, 2007), using multiple informants to mitigate bias (Eisenhardt, 1989) and collecting

[1] https://defence-industry-space.ec.europa.eu/iris2-european-commission-awards-concession-contract-spacerise-consortium-2024-10-31_en

secondary data for triangulation (Yin, 2009) (see Table 2). Data collection occurred in two waves. During the first wave (November 2017–May 2018), we conducted 15 semi-structured interviews with industry leaders to understand multilateral inter-organizational collaborations in innovation consortium, confirming IRIS² as a pertinent case. Key informants included directors and managers from leading companies (TAS and Airbus Defense and Space), industry clusters (Aerospace Valley), associations (GIFAS), the French Space Agency (CNES), and governmental institutions. This phase established an overview of the complexities of integration in competitive innovation projects.

The second wave (February 2024–to date[2]) used snowball sampling (Miles & Huberman, 1994) to interview 14 additional directors and project managers from SES, ADS, TAS, Eutelsat, European Commission, deepening our understanding of IRIS² collaborative relationships. Interviews, lasting 30-60 minutes, followed a structured guide, were recorded, and transcribed. Where necessary, transcripts were translated to English.

[2] The collection of primary data is still on-going

Table 2. Data collection

PRIMARY DATA				
	Company	**Job**	**Format**	**Duration (min)**
Exploration of the industry (2017-2021)				
Inteviewee 1	GIFAS	Director	Face to face	60
Inteviewee 2	MBDA	Director	Face to face	60
Inteviewee 3	University Center	Director	Face to face	55
Inteviewee 4	Thales Alenia Space	Director	Face to face	230
Inteviewee 5	Airbus Defence and Space	Program Manager	Face to face	60
Inteviewee 6	Aerspace Valley	Program Manager	Face to face	85
Inteviewee 7	-	Expert	Face to face	70
Inteviewee 8	University Center	Director	Face to face	70
Inteviewee 9	Thales Alenia Space	Director	Visio	80
Inteviewee 10	University Center	Engineer	Face to face	80
Inteviewee 11	University Center	Project manager		
Inteviewee 12	Thales Alenia Space	Program Manager	Visio	70
Inteviewee 13	Thales Alenia Space	Project manager	Visio	60
Inteviewee 14	European Space Agency	Project manager	Visio	50
Inteviewee 15	Thales Alenia Space	Project manager	Face to face	85
Inteviewee 16	Thales Alenia Space	Program manager	Visio	15
Inteviewee 17	Thales Alenia Space	Program Manager	Face to face	100
Inteviewee 18	Thales Alenia Space	Project manager	Visio	60
Inteviewee 19	Thales Alenia Space	Project manager	Visio	25
Inteviewee 20	European Space Agency	Project manager	Visio	95

Inteviewee 21	Thales Alenia Space	Project manager	Visio	35
Exploration of IRIS 2 (2024-to date)				
Inteviewee 1	Thales Alenia Space	Project manager	Visio	30
Inteviewee 2	CNES	Program Manager	Face to face	45
Inteviewee 3	EUTELSAT	Program Manager	Phone	30
Inteviewee 4	EUTELSAT	Program Manager	Phone	30
Inteviewee 5	CNES	Engineer	Phone	40
Inteviewee 6	European Commission	Director	Visio	50
Inteviewee 7	CNES	Director	Visio	60
Inteviewee 8	CNES	Director	Visio	60
Inteviewee 9	Thales Alenia Space	Director	Visio	90
Inteviewee 10	Thales Alenia Space	Project manager	Visio	90
Inteviewee 11	Airbus Defence and Space	Bid manager	Viso	40
Inteviewee 12	SES	Engineer	Viso	50
Inteviewee 13	European Commission	Program Manager	Viso	30

SECONDARY DATA

Type of data	Source	Nombre de documents
Scientific academic articles and industry press releases	General and specialist press articles such as Air & Cosmos, L'Usine Nouvelle SpaceNews, Aerospatium	+ 200
Project presentation	Airbus Defence and Space, Thales Alenia Space, OHB Systems, French space agency Aerospace Valley	+ 50
Industry activity reports	European Space Agency, GIFAS, Aerospace Valley	+ 40
Company financial and activity reports	Airbus Defence and Space, Thales Alenia Space, OHB Systems	+ 30

2.4. DATA ANALYSIS AND RESEARCH QUALITY

Data were coded using NVivo software, following the coding practices of Miles and Huberman (1994) and Gioia et al. (2013). This coding strategy allowed us to create a dynamic framework for understanding *how multi-stakeholder can interact and shape the management of R&D consortia?* We followed best practices to ensure quality, validity, and reliability in our study (Gibbert et al., 2008; Hayashi et al., 2019; Gruca et al., 2021; Rouyre et al., 2024). To validate findings, we applied triangulation to contextualize interviews, enhancing descriptive and interpretative accuracy (Hayashi et al., 2019). We iteratively refined our analysis through empirical and theoretical discussion among coauthors, employing a "devil's advocate" strategy to challenge and strengthen interpretations (Nemeth et al., 2001; Rerup & Feldman, 2011).

4. FINDINGS

The IRIS² consortium was initiated by the European Commission (EC) as part of its broader strategy for secure connectivity under the EU's 2023–2027 Secure Connectivity Program. It was driven by the geopolitical need for European sovereignty and autonomy in satellite communications, reducing reliance on non-European systems. The consortium includes public institutions (EC, ESA) and private sector players (satellite operators and manufacturers) chosen for their expertise and resources, with the project's objectives (see Table 3).

Table 3. Overview the implications of IRIS 2 stakeholders

NAME	TYPE OF STAKEHOLDERS	WHY IMPLICATION IN IRIS 2	PRIORITIES AND INTERESTS	INSTITUTIONAL LOGIC
European Commission (EC)	Public body	Leading policymaker for European sovereignty and secure connectivity.	Achieve European sovereignty in digital communications; ensure strategic autonomy.	Public governance, regulatory oversight, ensuring alignment with EU policies and funding priorities.
European Space Agency (ESA)	Public body	Expertise in space systems, coordination of R&D in the European space sector.	Support technological advancement in Europe's space sector; contribute to global competitiveness.	Public governance, regulatory oversight. Focused on enabling innovation, fostering international collaboration, and ensuring alignment with EU space policy.
SES	Private satellite operator	Established expertise in satellite operations, especially multi-orbit systems.	Strengthen technological capabilities, secure European governmental clients and new markets, maintain expertise in communication	Market-driven, focusing on operational excellence and commercialization opportunities.
Eutelsat	Private satellite operator	Expertise in satellite telecommunications operations; involvement in low Earth orbit (LEO) via OneWeb.	Strengthen technological capabilities, secure European governmental clients and new markets, maintain expertise in communication	Balances public-private interests, seeking both financial returns and strategic innovation.
Hispasat	Private satellite operator	Regional leader in satellite telecommunications operations	Collaborate with European partners for broader market access; support secure communication goals, expanding expertise in communication	Regional expertise with a focus on serving diverse customer needs across continents.
Thales Alenia Space	Private satellite manufacturer	Renowned expertise in satellite design, integration, and quantum technologies. Expertise in satellite architecture and large-scale space projects	Drive innovation in satellite manufacturing; secure long-term government and commercial contracts.	Technological leadership, focused on R&D and risk-sharing collaboration.
Airbus Defense and Space	Private satellite manufacturer	Renowned expertise in satellite design and integration Expertise in satellite architecture and large-scale space projects.	Drive innovation in satellite manufacturing; secure long-term government and commercial contracts.	Technological leadership, focused on R&D and risk-sharing collaboration.

4.1. CHALLENGES IN MULTI-STAKEHOLDER COLLABORATION IN INNOVATION CONSORTIUM

The IRIS² project is mobilizing a wide range of industrial partners, from competing satellite manufacturers to competing telecommunications operators who are also in clients-suppliers' relationships, generating diverse type of collaboration challenges.

4.1.1. Challenges due to coopetitive dynamics between satellites manufacturers

For technological completing the IRIS² satellites constellation, it is important to hear the voice of the satellites manufacturers such ADS and TAS. It is crucial to have them engaged in the consortium at first because they have the technical knowledge and expertise on the manufacturing side of satellites. Before having them operable and launching them, the consortium needs to be sure that technologically, the satellites are interoperable, using the same technical standards for communication and security across the constellation. Thus, they would need to collaborate on the IRIS² project to meet the technical demands required by the European Union. Each company contributes different technological capabilities. For example, TAS might focusing on system integration, payloads, and quantum communication technologies, while ADS could lead in satellite design and architecture. This cooperation is essential for achieving the complex goals of the IRIS² constellation, ensuring that the satellites meet strict security and communication standards.

However, ADS and TAS are two traditional market competitors. Indeed, they compete daily in institutional markets to answer calls from space agencies and gain market share in commercial markets. They are strong competitors because they have market overlap, as they offer similar products to the same clients and target similar markets.

4.1.2. Challenges due to coopetitive dynamics between satellites operators

In addition to the involvement of satellites manufacturers in the creation of the consortium, as IRIS² is a telecommunication satellites constellations, it was essential to have the engagement of satellites telecommunication operators. Satellite operators are responsible for managing and

operating satellites once they are in orbit. They lease or sell satellite capacity to commercial, government or military customers for various applications (telecommunications, Earth observation, etc.), manage telecommunications networks, offering services such as broadband Internet access, satellite TV, and secure communications for governments, and control satellites from the ground via ground stations, optimizing their positioning and ensuring remote operational maintenance. SES, Hispasat, and Eutelsat are competitors in the operations of the satellite telecommunications sector. They compete in providing broadcast TV, internet connectivity, and secure communication services to government and commercial clients. SES stands out with specific type of satellites (multi-orbit strategy satellites), Eutelsat is involved through its own satellite network (called OneWeb), while Hispasat focuses on Spain and Latin America. All three are vying for leadership in global telecommunications and satellite connectivity markets.

However, at the same time, they collaborate within IRIS². SES contributes to IRIS² with its expertise in multi-orbit connectivity and resilient communications, notably via its SES Government Solutions business unit, which offers mission-critical services for security and defense. Hispasat is focusing on improving Internet connectivity and is working closely with European partners to ensure a reliable and resilient infrastructure for the IRIS² project. As part of IRIS², Eutelsat will contribute to the creation of a secure communications infrastructure, essential for government and commercial services in Europe.

4.1.3. Inter-organizational dynamics between satellites manufacturers and operators

In the space industry, the relationship between satellite operators and satellite manufacturers is essential. Satellite manufacturers are the companies that design, manufacture and test satellites prior to launch. Satellite operators are responsible for overseeing and controlling satellite operations once they reach orbit. In other words, along the value chain of the space industry, satellites operators are clients from satellite manufacturers. In the IRIS² project, the

collaboration between satellite manufacturers and operators is essential for the success of this large-scale satellite constellation.

> *Europe gets closer to the major European players in the sector. Manufacturers (ADS and TAS) and operators (SES, Hipasat, EUTELSAT) meet around the table. The 5 companies responded to a joint call for tenders because these companies have significant skills and complementary expertise - Project manager EUTELSAT*
>
> *We look for the best in everyone: 'we'll take it from you because you do it well'. - Project manager EUTELSAT*

The manufacturers in IRIS² are responsible for designing, building, and delivering the satellite infrastructure that makes up the constellation. Companies like TAS and ADS are expected to play key roles as they have extensive expertise in satellite development. They will oversee designing and constructing the satellites with advanced telecommunications capabilities. They will ensure that the satellites meet the specific technical requirements for secure communication and resilience.

On the other side, operators like Eutelsat, SES, and Hispasat will manage the operational side of the constellation. Thus, they will launch and place the satellites in orbit (in cooperation with launch service providers), operate the satellite network, managing the flow of communication data between the satellites and Earth. With that, they will be able to provide commercial services to their clients. Finally, they are also in charge of ensuring the day-to-day functioning of the constellation, including maintenance, signal management, and service quality assurance.

4.2. IMPLEMENTING A CONSORTIUM STRUCTURE AND ITS EVOLUTION ALONG THE EMERGENCE OF CHALLENGES

4.2.1. Choosing an adequate structure

The manufacturers and operators work closely together in the development phase to ensure that the technical specifications align with the operational needs. For that, at the first step of the project, the operators and manufacturers were gathered in the same consortium.

Divide up the cake between all the firms, while trying to get the biggest slice possible – Project manager CNES

Having a consortium that brought together the major players was a way of increasing the size of the cake, rather than taking the risk of having nothing. – Project manager SES

The decision of having a first private consortium was motivated by the fact that Europe has strengthened its ties with major European players in the space sector. A roundtable meeting brought together key manufacturers, ADS and TAS, along with prominent operators such as SES, Hispasat, and EUTELSAT. These five companies responded jointly to a common call for proposals, demonstrating their complementary capabilities within the industry.

The programme is still in its early stages - trade-offs to be made among the manufacturers who have joined forces to form a consortium - Project manager EUTELSAT

Faced with this American threat, we need to react together. It is in our interests to work together, to pool our energy and our shared experience. We need to find a win-win situation for everyone. At the moment, the subject is broadly defined but not in detail. The activities not clearly defined - Project manager EUTELSAT

Indeed, this collaboration is crucial because the operators need satellites that are technologically advanced and cost-efficient to launch and operate. Manufacturers and operators in the space sector offer complementary expertise. Knowing how to build satellites is invaluable, but it is equally essential to operate them effectively and analyze the resulting data to leverage their full

potential. The commitment of the five companies—ADS, TAS, SES, Hispasat, and EUTELSAT—is essential, as the success of the entire chain relies on each link; should any one of them fail to uphold or sustain this commitment, the entire collaboration risks being compromised.

> *They need to have the same level of commitment because if one link in the chain can't/won't. The whole project won't work. And it is necessary to have collaboration between major players it's a large-scale project for Europe – Project manager EUTELSAT*
>
> *Knowing how to make satellites is great, but you need to know how to operate them and process/understand the data to use them. However, these companies have different business models. So, you have to juggle between the two contradictions. - Project manager EUTELSAT*

This consortium between TAS, ADS, SES, Hispasat, and EUTELSAT is also essential because of benefits, stemming from their collaboration, especially in terms of resources sharing both financial resources. By pooling their budgets, these companies create a larger, more robust financial foundation, enabling the project to achieve a scale and ambition that would be difficult for a single entity.

For setting up the responsibilities within the consortium, each company—TAS, ADS, SES, Hispasat, and EUTELSAT—has appointed a representative, creating a large, collaborative team structure based on the duplication of managers. Thanks to the complementary expertise between manufacturers and operators, the first meetings between them about the global scope of the project went well. This smooth organization was also notably thanks to equity rules about the organization meeting that rotated.

> *Things are going very well, especially with the manufacturers and operators. For example, last week we were all at ADS, and it went well'. There are also my former*

colleagues from TAS around the table, so I go and drink beers with them. Meetings were held alternatively among the industrials.

4.3.2. Emergence of multiple challenges

Challenges 1: Operators vs. Manufacturers. Traditionally, relationships between satellite manufacturers and operators resembled a straightforward client-supplier model, where operators dictated requirements and manufacturers fulfilled them. However, in the consortium, this dynamic needs to shift toward a partnership model. In IRIS², manufacturers and operators needed to be interdependent, sharing both responsibilities and risks. Indeed, operators position themselves as customers in the consortium towards the manufacturers, while the later wanted to be engaged in a long-term, cooperative approach, and seen as strategic partners. The shift from a traditional client-supplier model to **a** partnership model was challenging as it changed established norms, requiring both groups to share risks and responsibilities. Manufacturers (e.g., TAS and ADS) traditionally focused on delivering products based on operator requirements, while operators controlled specifications and financial terms. In IRIS², this dynamic is upended, pushing operators to adopt collaborative behaviors that are not habitual. Thus, manufacturers and operators to act as interdependent equals**,** breaking away from deeply ingrained hierarchical relationships in the space industry.

Changing relationships between manufacturers: from customers to partners. Pushing operators towards choices that are not necessarily optimal for them. Conversely, manufacturers are pushed to take the same risks as operators - Project manager TAS

First phase with companies with different objectives, public money helps to smooth out these competing objectives – Project manager TAS

The lack of cooperation could be explained by incompatible norms and habits. Operators are accustomed to controlling projects and expecting manufacturers to follow instructions without sharing financial risks. Manufacturers, on the other hand, seek equal partnerships but lack

leverage due to their dependency on operators as clients. It was also exacerbated by the collaborative past experiences. For example, ADS and TAS may have streamlined collaboration among themselves due to previous shared experience on projects. However, when operators with competing interests are involved, these dynamics become more challenging. Despite the necessity for collaboration among the five companies, presence of multiple competing interests complicates coordination and decision-making.

Sometimes it is more difficult to work with customers than with competitors, because ADS and TAS generally work well together. They are used to working together on different projects. - Project manager TAS

Not entirely clear how operators and TAS/ADS are going to work together. Need for coordination between them – Project manager CNES

Working together as a team is a pain, everyone is acting in bad faith. Everyone has their own agenda (hidden or displayed) and calendar. - Project manager SES

Although operators did not behave cooperatively, they nonetheless expected manufacturers to assume equal financial risks in the project, without giving any details on what type of activities manufacturers will be responsible. This expectation reflects a unilateral approach, where operators sought to transfer part of the project's financial burden without necessarily precising the activities division.

Need for collaboration between the three operators and two manufacturers, but very high level of risk – Project manager TAS

After cutting the big shares, who interfaces? Who bears the risks? It's precisely in these details that everyone needs to find a solution – Project manager CNES

Operators think they can do anything, they live in the old world – Project manager TAS

The lack of cooperation would also exacerbate conflicts over risk-sharing, responsibilities, and priorities, leading to delays, inefficiencies, or even project failure. If manufacturers revert to

viewing operators as clients, rather than partners, they may disengage or provide suboptimal solutions, undermining the consortium's goals. Failure could jeopardize manufacturers' relationships with operators outside IRIS², damaging their commercial viability. Afterwards, the lack collaborative behaviors associated with this willingness of co-responsibility lead to conflicts. Such conflicts were problematic as the consortium need to provide a common solution, requiring a joint problem-solving and a commitment to shared goals. It was also problematic because satellites manufacturers could not be against their clients. Indeed, the internal conflicts of IRIS 2 could have consequences on their market relationship as customers-suppliers. As their financial viability depends on these relationships outside the IRIS project, they need to find a solution.

It is very difficult for manufacturers to get angry with commercial customers such as operators - Project manager TAS

Challenges 2: Coopetition. The presence of coopetitive relationship among the manufacturers and among the operators generated also managerial challenges inside the consortium. First, pr-existing competition between TAS and ADS did not allow a smooth collaboration between the five companies. Because of the risks of knowledge misappropriation due to competition, TAS and ADS limited their sharing among the consortia. For example, manufacturers avoided sharing specific architectural or technical details for fear of exposing strategic advantages. The five companies needed to share and exchange key and strategic knowledge for setting up the activity's perimeter and the technological boundaries of the consortia. However, these information were extremely sensitive. Sharing them would be very risky as competitors could understand their present strategy but also their future development. This lack of knowledge sharing impedes the global collaboration, making the decision-making process inefficient.

Between TAS and ADS, protection of sensitive information: we can discover the strategic roadmap of each company – Project manager CNES

It is impossible for satellite manufacturers to discuss technical details with each other. There's no opportunity for in-depth discussion, or for unfiltered discussion because of their competition. For example, they send us information about the overall architecture, but we never get detailed information. There's a lot of inefficiency because of the competition between manufacturers. - Project manager SES

Second, the pre-existing between satellites operators also hamper the collaboration within the consortia. Three operators have also their own strategy, that we do not wish to openly explain to their competitors. Therefore, on their side, the knowledge sharing was also extremely limited Because the lack of collaborative behavior, the discussion about responsibilities and task division was not optimum. Moreover, while ADS and TAS have common shared collaborative experience, it is less common for SES, Hispasat and Eutelsat to collaborate jointly. They were then even more reluctant to have open discussion and to share strategic information. Thus, this perception created barriers to collaboration, as operators, unused to cooperating with one another, found it difficult to align on common goals or to compromise for the project's benefit

Conversely, collaboration between operators is more complicated, as is that with manufacturers, because operators believe they are the kings of the world. They are not used to working together. – Project manager TAS

There are hidden agendas. No discussion of what we do or don't do. – Project manager SES

All in all, the combined effect of coopetition among both manufacturers and operators placed considerable strain on the IRIS project's collaborative potential. Thus, due to the presence of these multi-level collaborative challenges, the five companies needed to find managerial solutions to foster better collaboration within the consortium.

EUTELSAT and SES are competitors. TAS and ADS are competitors. They spend their time having opposed but complementary ideas. But it is crucial that they are well coordinated – Project manager CNES

4.3.3. Changing the structure due to challenges

From the starts of the formation, several challenges have been emerging. First, the different role definition between operators and manufacturers. Operators like SES, Eutelsat, and Hispasat viewed manufacturers as subcontractors and pushed financial risks onto them, while manufacturers (TAS, ADS) sought equal partnerships. Operators were accustomed to controlling projects, while manufacturers, dependent on operators for business, lacked leverage to demand partnership equality. The lack of clarity about who bore financial risks and operational responsibilities led to inefficiencies and tensions. Then, pre-existing competition among operators and manufacturers limited trust and knowledge sharing. TAS and ADS hesitated to share technical details, fearing strategic misappropriation, while operators (e.g., SES, Eutelsat) refrained from disclosing their long-term strategies to competitors.

To address the above-mentioned challenges, the composition of the consortia has changed. To address conflicts, manufacturers (TAS and ADS) were repositioned as subcontractors and integrated a core team, rather than core decision-makers. This allowed them to focus on technological contributions without bearing excessive financial and operational risks. Operators retained leadership roles but were required to collaborate more transparently with manufacturers. The consortium between SES, Hispasat, Eutelsat will collaborate with a core team composed eight European space and telecommunications companies as subcontractors: TAS, OHB, ADS, Telespazio, Deutsche Telekom, Orange, Hispasat, and Thales SIX. This decision will allow ADS and TAS to focus on their core competencies—primarily technology development and specialized solutions—without shouldering the extensive responsibilities and risks typically associated with lead positions, especially the one that the operators wanted us to

carry. This role adjustment allows them to operate as suppliers to other companies in the consortium rather than as overarching decision-makers. Indeed, it will allow them to bear less financial responsibility and technological risk.

ADS and TAS are no longer part of the consortium, which is more comfortable and less risky for them. But they are still part of the project because they need to keep growing. Without this type of project, in the long term, skills could disappear. - Project manager TAS

The competition between ADS and TAS is having a very disturbing impact on relations. As a result, the pattern has changed, and they are no longer part of the consortium. They no longer want to bear the risks. – Project manager SES

4. DISCUSSION

4.1. CONTRIBUTIONS TO RESEARCH

By conducting an in-depth, longitudinal study of the IRIS² consortium, we contribute to a richer understanding of the phenomenon of multi-stakeholder cooperation including different set of competitors, clients-suppliers' interactions, and public-private collaboration within R&D consortium. Our contributions are threefold.

First, we shed light on the specific challenges stemming from the coexistence of coopetition—simultaneous collaboration and competition—and client-supplier relationships within R&D consortia. Existing academic research shows that the coexistence of coopetition and inter-organizational relationships with non-competing partners (such as clients-suppliers) can complicate the management of divergent interests (Zeng & Chen, 2003; Fonti et al., 2017; Gnyawali & Ryan-Charleton, 2018; Farazi et al., 2024). However, these studies often focus on a single dynamic at a time, without considering their co-existence in R&D consortia. We go further by demonstrating that involvement of a diverse mix of stakeholders with varying and sometimes conflicting interests, including satellite operators and manufacturers, public entities

like the European Commission and ESA, and private entities such as SES and Eutelsat. Traditionally, the relationship between operators and manufacturers follows a client-supplier dynamic; however, the IRIS² project necessitates a collaborative approach, introducing unique challenges in redefining roles, responsibilities, and shared risks. Additionally, coopetition between operators and coopetition between manufacturers add further layers of complexity to the collaboration, as these stakeholders must simultaneously cooperate to achieve shared objectives while maintaining their competitive positions in the market. This contribution enriches the literature on inter-organizational relationships by illustrating how these multi-layered inter-organizational relationships interact and shape the dynamics of collaboration within R&D consortia, particularly in contexts combining cooperative, competitive, and hierarchical dependencies.

Second, we analyze how consortium structures can be effectively designed and adjusted to navigate the complexities of multi-stakeholder cooperation. Particular emphasis is placed on the evolution of the coordinating team structure to address these challenges. This insight contributes to the literature on the management of R&D consortia, on the design and adaptation of organizational structures (Ring et al., 2005; Sakakibara, 1997). Previous research emphasizes the importance of an adapted structure to overcome the challenges of stakeholder diversity and to foster collaboration (Mothe & Quélin, 2001; Lavie et al., 2007). However, they do not examine in depth how these structures evolve in the face of the complexity and multiplicity of inter-organizational relationships in the same R&D consortia. We go further by showing that the structure of consortia can be designed and modified to respond to the diversity of actors within multi-stakeholder cooperation. We specifically analyze the changing dynamics of the management team, which must manage the tensions associated with knowledge sharing-protection and difference in risk management. These results deepen our understanding of the mechanisms by which coordination team within consortia structures adapt and underline the

importance of structural flexibility in managing organizational complexity and maximizing innovation.

Finally, while the early-formation stage is widely recognized as critical in designing consortium structures (Hwang & Burger, 1997; Doz et al., 2000; Zeng & Chen, 2003), few studies investigate deeply into the specific challenges arising from the creation of consortia characterized by multi-stakeholder cooperation. Our research aimed to addresses this gap by offering a detailed illustration of emerging challenges at the first stage of consortia, which enriching existing research stream on consortia formation (Hwang & Burger, 1997; Doz et al., 2000; Zeng & Chen, 2003), on the challenges of multiple and complex inter-organizational relationships (Majchrzak et al., 2015; Gotsopoulos, 2018). Existing academic research shows that the initial formation phase is crucial for defining governance rules, building trust, and aligning goals (Ring et al., 2005; Doz, 1996). However, research often focuses on one-dimensional relationships, neglecting the complexity of the multi-stakeholder cooperation. that emerge in R&D consortia. We go further by analyzing how the diversity of types of partners within consortia influences the dynamics of collaboration from the formation phase onwards. We show that decisions taken at this stage, such as the knowledge sharing and the definition of risks, have a decisive impact on the long-term success of consortia. We shed new light on the interactions between multi-stakeholder cooperation during the formation of consortia, highlighting their central role in the design of effective coordination structures for promoting innovation to tackle grand challenges.

4.2. CONTRIBUTIONS TO PRACTICE

Our study offers valuable insights for policymakers and managers engaged in the formation and management of multilateral cooperation in consortium for innovation. The IRIS² case demonstrates that while assembling industry leaders associated their competing clients in innovation consortia is crucial for addressing innovation challenges, ensuring effective

collaboration within these consortia is fulfilled of challenges. Competitors industry leaders often hesitate to engage in open collaboration within the consortium due to their competitive positions in the market, creating tensions that can derail projects. Additionally, from a client perspective, considering a supplier as a real partner is a notable challenge, especially in the division and management of risks and responsibilities.

Given the increasing allocation of taxpayer funds to such consortia, our research highlights the necessity of managing properly the formation of R&D consortia that involves a large mix of stakeholders. In the case of IRIS², while the formation of the consortium and embedded collaborations were a deliberate strategy, from the beginning the consortium members did not anticipate the collaboration challenges. Understanding the potential obstacles notably in terms of difference of risks management between clients and suppliers or tensions knowledge sharing-protection between competitors could have prevented such issues. We recommend adopting early, proactive strategies to safeguard time and resources. These strategies should employ a separation of activities directly and potentially the intervention of a third-party to manage knowledge and risks, minimizing tensions and facilitating efficient knowledge flow among partners.

4.3. LIMITATIONS AND RESEARCH PERSPECTIVE

Our study has several limitations that open avenues for future research. First, Collaborative efforts across various domains often share common structural and governance characteristics, enabling generalization of our findings. Large R&D consortia that include key industrial stakeholders exemplify the power of pooling expertise and resources to drive innovation. Similarly, European consortia focused on developing regional products, whether in pharmaceuticals, automotive, or renewable energy sectors, highlight the replicability of our key findings. However, our research design is constrained using a single case study in the space industry. While we consider the chosen case an exemplar of multi-stakeholder cooperation in

R&D consortium within high-tech or knowledge-intensive industries, the generalizability of our findings remains uncertain. Future studies conducted in similar industries, as well as in low-tech or less knowledge-intensive sectors, are needed to validate and extend our conclusions.

Additionally, our study focuses exclusively on multi-stakeholder cooperation in R&D consortium, by focusing on coopetition and client-suppliers' relationships. Future research could broaden this scope by exploring governance structures in other contexts, such as public-private projects, or even broader scope such ecosystems, to better understand the various forms and dynamics of multi-stakeholder cooperation for innovations. Another promising direction would be to investigate multilateral collaboration outside the innovation context. For instance, examining governance practices in consortia aimed at the commercialization of new products could provide valuable insights into how such relationships function in different operational contexts. These directions would significantly enhance our understanding of the governance and dynamics of multi-stakeholder cooperation across diverse settings.

5. CONCLUDING REMARKS

Overall, this research aimed to investigate the management of multi-stakeholder collaboration within R&D consortia. We believe that collaboration with a diverse set of stakeholder in innovative consortium setting is prominent but also involves challenges and is a promising research topic that requires further investigation, and we invite scholars to investigate these topics in greater detail.

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