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Early internationalization of space firms providing services for sustainable development goals

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ABSTRACT :

New space economy is evolving every day. Recognizing the changing aspects of the ever varying highly technology-oriented space industry is also becoming increasingly critical and interesting as well. An ever-varying business topography, rapid improvements in the space technology industry, and a new space economy lined the way for internationalizing themselves. Space firms are unique and complex to understand due to their nature. This uniqueness has enabled these space firms to undergo challenges in many of the existing theories in the international business field.

To provide a deeper understanding of how these space firms expand internationally, this thesis explores its internationalization through an investigation of their internationalization trails, business ecosystem and their encounters. For exploring this phenomenon, the thesis was conducted by the utilization of multiple case studies with a semi-structured questionnaire. Through in-depth interviews and data analysis, the thesis identifies key considerations shaping the internationalization strategies of these firms including technological innovation, market entry challenges, and other roles of partnerships.

The findings show that space firms are born global, and they are utilizing the network model with resource dependency for their early internationalization. These behaviors are substantially entwined, with respectively guiding others. The findings also expose that though space firms face unique obstructions, their contributions to sustainable development goals and global collaboration are substantial.

Improving and strengthening existing international business theories to adapt the space firms’ internationalization phenomena, the thesis makes several research contributions. It enhances the understanding of the early internationalization of space firms. Through the case studies from different seven firms situated in different five countries portraying insights into it. While posits the early internationalization of these firms it also introduces some new wisdom on networking relationships founded on the resources they have. This research not only fills existing gaps in the literature on international business and space firms but also provides realistic insights for policymakers and industry stakeholders aiming to leverage space technologies for sustainable development. The thesis concludes with recommendations for future research and implications for the broader field of international business.

KEYWORDS: (Internationalization, space firm, networking model, born global, resource dependency theory, sustainable development goals)

Contents

Figures

Tables

1 Introduction

In this chapter, readers will be provided with a comprehensive introduction to the background and context of the thesis, including an in-depth discussion of the identified research gap, research questions, and the objectives that guide the study. Furthermore, this chapter will define key terms and concepts essential for understanding the subject matter. It will also outline the limitations of the research, providing transparency on the scope and boundaries of the study. Additionally, the structure of the thesis (see **fig. 1**) will be presented, accompanied by a thematic map (see **fig. 2**) that visually organizes the main themes and subtopics explored throughout the research. The thesis employs artificial intelligence to enhance grammatical accuracy and improve the academic quality of the writing.

1.1 Background of the thesis

Internationalization is a global phenomenon that has been extensively studied, particularly concerning the internationalization of small and medium enterprises (SMEs) and large companies across various industries (Johanson & Vahlne, 1977; Cavusgil & Knight, 2015; Knight & Liesch, 2016; Ojala et al., 2018). In the context of the Fourth Industrial Revolution, an increasing number of local firms are engaging in internationalization, a process often referred to as traditional internationalization (Johanson & Vahlne, 1977, p. 5). However, definitions of internationalization vary among scholars, with different researchers offering distinct interpretations of the concept.

According to Johanson and Vahlne (1977), internationalization is a gradual involvement in the international market with stage-by-stage engagement. According to Liesch and Knight (1999, p. 9), internationalization cannot be possible without knowing the information about the market. Internationalization is related to the activities that are increasing foreign operations (Turnbull, 1987). As companies pursue internationalization, many focus on leveraging their existing networks or establishing new connections, a process often referred to as networking (Johansson & Matteson, 1988). The internationalization process has also been conceptualized as "born global" or as the development of "born-again global" firms, reflecting firms that internationalize either from inception or after a period of domestic focus (Gabrielsson et al., 2008; Bell et al., 2001).

Extensive research has been conducted on the traditional internationalization, born global, and born-again global models of small and medium enterprises (SMEs). Similar studies have also been carried out on large organizations in both high-technology and non-technology sectors. However, a considerable gap exists in the existing body of literature regarding the internationalization of high-technology space firms. Despite the increasing relevance of these firms in the global economy, particularly in addressing complex challenges like those outlined in the Sustainable Development Goals (SDGs), scholarly work on their internationalization strategies and processes remains limited. This scarcity of research leaves much to be explored about how high-technology space firms navigate cross-border expansion, adapt to diverse regulatory environments (Bousedra, 2023), and foster international collaborations within a rapidly evolving and competitive global market. Given the unique characteristics of high-technology space firms, a deeper examination of their internationalization processes is imperative for advancing both theoretical frameworks and practical insights within the field of International Business (IB).

The growth of space firms is accelerating due to the emergence of the new space economy, driven by a shift from government funding to commercial investment (Davidian, 2021, p. 2). This growth is evident both domestically and internationally, presenting significant opportunities for the internationalization of space firms. Since 2005, space firms have increasingly secured contracts from satellite manufacturing companies to serve a global clientele (Noble, 2008). In the context of the new space economy, numerous organizations, such as the International Astronautical Federation (IAF), the International Institute of Space Law (IISL), the International Academy of Astronautics (IAA), and the European Space Agency (ESA), have entered the sector. These entities are investing in the development of innovative space technologies, with a particular focus on advancing the SDGs set by the United Nations, which aim to be achieved by 2030 (Davidian, 2021,

p. 8). This thesis seeks to examine the internationalization of these distinctive space firms during their early stages of development.

1.2 Research gap

The concept of internationalization has been a fundamental point of scholarly investigation for several decades. Within the field of International Business, traditional research has predominantly concentrated on firms that first establish their products or services prior to developing global networks, with a particular emphasis on manufacturing-based multinational corporations (Buckley & Casson, 2009, 2016; Dunning, 1988; Vernon, 1966). However, internationalization within the space industry presents a more intricate dynamic. In this sector, firms often connect in the establishment of international networks and partnerships as a requirement to the full development of their services. This divergence from traditional models highlights the distinctive nature of the space industry, wherein operations span multiple, interconnected marketplaces. The internationalization of space firms is further facilitated by digital platforms, which enable cross-border collaboration and partnerships across several nations (Evans, 2016; Eisenmann, 2006). This complexity underlines the magnitude of understanding internationalization within this high-tech sector, where interdependencies between global networks and service development are more explicit.

This thesis employs the International New Venture (INV) theory as a framework to investigate whether the early internationalization of space firms diverged from those in other sectors. Furthermore, it critically analyzes how space firms utilize network theory, as articulated by Johanson and Mattsson (1988), to facilitate access to critical resources, examining this through the perspective of resource dependency theory (Pfeffer & Salancik, 2015; Hillman et al., 2009). By integrating these theoretical approaches, the study aims to offer a comprehensive understanding of how space firms navigate the complexities of internationalization, with particular emphasis on the strategic use of networks and resource acquisition in a highly specialized industry.

In the field of International Business, extensive research has been conducted on born global firms, with particular emphasis on how these firms leverage networks (Smith et al., 2014; Coviello, 2006) and global resources (Andersson et al., 2018) to facilitate rapid internationalization. However, there remains a relatively limited body of research that addresses the specific policies and regulatory frameworks governing entrepreneurial processes within the space industry (Wong et al., 2018; Van Burg et al., 2017). Furthermore, the space sector is becoming increasingly complex due to the participation of various non-space-related business organizations that contribute to the broader space ecosystem (Bousedra, 2023, p. 5). This growing involvement of firms from diverse sectors highlights that it is not only companies directly engaged in the space industry that operate on a global scale, but also those from adjacent industries, thereby adding new dimensions to the internationalization landscape.

As a result, the internationalization of space firms has acquired increased academic attention and empirical investigation (Del Canto Viterale, 2023). Nevertheless, there is a significant gap in the literature concerning the early-stage internationalization of space firms, with limited studies exploring how these firms overcome the challenges of expanding into foreign markets during their developmental years. Therefore, it is crucial to further investigate the fundamental international business theories relevant to space firms, while examining how these firms achieve internationalization within the context of a rapidly growing and highly regulated global space ecosystem.

In the current business landscape, investing in the space industry offers not only financial returns but also serves as a gateway to entering new global markets, fostering job creation (Davidian, 2021), and driving economic growth. Prior to the advent of the "New Space Economy," the space industry attracted investments totaling approximately $360 billion (Crane et al., 2022). However, with the emergence of this new economic paradigm, projections from Toivonen (2022) forecast a potential tripling of this figure, with investment values reaching an estimated $3 trillion by 2045 in the commercial space business.

Space technologies have demonstrated their utility across various sectors, including agriculture, environmental monitoring, and telecommunications (George, 2019). The combination of commercial and government investment has rendered the new space economy increasingly dynamic, enhancing space-dependent services. Space capabilities now play a critical role in addressing numerous financial, social, and environmental challenges (Moranta & Donati, 2020).

The entry of major firms, the sector's strong innovation capacity, and the synergies between satellite and terrestrial technologies have further increased its appeal to investors. Understanding the space industry is particularly complex due to its dependence on advanced technologies and the unique characteristics of its business model. The European Commission's satellite policy, introduced in 2016, directs to establish Europe as a globally competitive and innovative leader in the satellite sector (Sagath et al., 2018). Considering these developments, it is needed to investigate how the space industry contributes to broader societal benefits, particularly in advancing the United Nations' SDGs. Given the sector's capacity to drive innovation in areas such as environmental monitoring, telecommunications, and disaster management, the role of space technologies in addressing global challenges deserves further academic examination. Understanding the intersections between the space industry and the SDGs is essential for evaluating the broader impact of space firms on sustainable development.

1.3 Research questions and objectives

Considering the aforesaid research gap, this thesis aims to generate new insights into how space firms leverage existing theories within the International New Venture (INV) framework to facilitate their internationalization. Furthermore, the research will gauge how the data collected from these firms' internationalization strategies can contribute to addressing sustainability challenges, particularly within the framework of the SDGs. By doing so, the thesis seeks to advance the academic understanding of the interplay between internationalization and sustainability in the context of high-technology space firms. The purpose of this study is to investigate *the early internationalization of space* *firms providing services for sustainable development goals.* The aim will be achieved by conducting case studies on selective firms by interview. Therefore, the central research question will be the following:

What is the early internationalization of space firms while providing services for ensuring sustainable development goals?

This thesis aims to critically examine the prevailing internationalization theories within international business literature, with the intent of identifying the theoretical frameworks employed by space firms in their global expansion. Furthermore, the research seeks to evaluate the tangible benefits derived by end users from satellite data, specifically in the context of advancing the SDGs. To broadly address the central research question, the empirical section of this study is organized about three distinct sub-questions, each designed to deliver thoughtful insights into the connection of space firm internationalization and sustainable development initiatives.

Formation of research question 1

The European Union, in collaboration with the European Space Agency, has emphasized the strategic importance of fostering the growth of the space business sector by supporting exploration, innovation, development, and employment across all member states, with the goal of capturing larger shares of global markets (European Space Agency, 2016). Access to expansive markets is crucial for new space startups to transform promising opportunities into viable and sustainable enterprises (Moranta & Donati, 2020). Effective internationalization is pivotal for securing entry into these larger markets. The internationalization of space firms is characterized by their high-tech orientation, which distinguishes them from firms in other industries (Beckman et al., 2012). Significantly, 82% of space startups identify networking as a core element of their internationalization strategies (Moranta & Donati, 2020). Therefore, it becomes essential to explore how space firms leverage established internationalization theories to facilitate their successful entry into new markets.

Many works in international business literature focus on traditional internationalization, born global, and born-again global on SMEs and large organization in high-tech industries (Crick & Spence, 2005; Baldwin & Gellatly, 1998). The internationalization of high-tech firms differs from non-high-tech firms, as they need to act quickly when the opportunity comes into their hands and allocate resources immediately (Crick & Spence, 2005, p. 2). According to Moore (1999), high-tech firms are dynamic and move first to take the first-mover advantage. The environment where high-tech firms are working is very insubstantial as the environment is changing rapidly (Knight & Cavusgil, 1996; Ojala et al., 2018). According to Bürgel et al. (2004), a single theoretical model is not able to explain the internationalization process of a new and young firm that is working in a highly technology-oriented environment. To shed light on the above the first research question is:

RQ 1. What is the early internationalization of space firms as highly technology-oriented firms?

Formation of research question 2

The acceleration of globalization, particularly from the 1980s onward, has led to increasing evidence of early and rapid internationalization among firms. Remarkably, there has been a pronounced rise in the number of young, entrepreneurial firms that actively seek to engage with foreign markets from the outset of their operations. These firms, commonly referred to as "born global" enterprises, have been defined as "young, entrepreneurial start-ups that begin international business activities, typically through exporting, shortly after their establishment" (Knight & Cavusgil, 2004, p. 3). The term "born global" is believed to have originated from a study conducted in Australia by McKinsey & Company, which investigated firms exhibiting early internationalization behaviors (Rennie, 1993; McKinsey & Company, 1993).

Born global firms are characterized by their intense international focus from the very beginning of their operations. Aligned with the globalization framework, founders of born global firms, either explicitly or implicitly, identify the global market as their prime realm for business operations. Several factors have been recognized by scholars as catalysts for early internationalization. These include the limited size of domestic markets, shifting global market conditions, such as the growth of niche markets, technological advancements in communication and production, the formation of global networks and alliances, and unique organizational competencies that enable firms to function effectively in international environments (Cavusgil & Knight, 2015, p. 3).

Critical organizational attributes contributing to the successful early internationalization of these firms include prior international experience, visionary leadership, strong commitment, innovation, and an entrepreneurial mindset. Additionally, born global firms are often characterized by high-value offerings, whether through advanced technology or superior product quality, and a focus on global niche markets. Early internationalization is also associated with a firm's market orientation, its international marketing competencies, and its ability to adapt to dynamic conditions in foreign markets. These factors collectively enhance the competitiveness and resilience of born global firms in the global business environment (Cavusgil & Knight, 2015, p. 5).

According to Gabrielsson et al. (2007), early internationalization also depends on the role of resources and the ability of the firm’s managing body. Knowledge of the firms, commitment, high-tech, and dynamic capabilities are very important during internationalization (Cavusgil & Knight, 2015, p. 7). When high-tech firms decide to enter a new market, it is important to remember the needs and specific requirements of the customer (Ahi et al., 2022). Accordingly, this thesis seeks to examine the challenges and opportunities encountered by space firms through the lens of international business literature. Hence, the second research question is as follows:

RQ 2. What are the challenges and opportunities for space firms while entering the international market?

Formation of research question 3

In this fourth industrial revolution, the interest in space exploration, different satellite technologies, and space-related activities is at its peak. For example, navigation satellites Medium Earth Orbit (MEO) equipped with resonating stabilized lasers and associated through reasonable laser joins will permit the transmission of route signals synchronized to a level infinitely better than present-day Global Navigation Satellite system (GNSS)'s (Giorgi et al., 2019). Countries worldwide are increasingly investing in space-related projects, recognizing the essential role that space-based solutions play in addressing various global challenges. For instance, the National Oceanic and Atmospheric Administration (NOAA) has the capability to produce nearly instantaneous reports to meet its operational requirements (Blois et al., 2013). This exemplifies how investment in space technologies can enhance governmental and organizational responsiveness to critical needs, further underscoring the significance of internationalization within the space sector. Different countries have different motivations to invest, examine, and utilize the data collected from space satellites. Countries are now also collecting data from the satellite to predict the drought, flood, education, space sustainability and other sustainable development goals. Based on the above the third research question is:

RQ 3. What is the end-user value-added services in the context of sustainable development goals that can be ensured by satellite data?

The sub-questions are utilized to deliver a more profound understanding of the internationalization theories of space firms. By collecting information regarding end-user benefits it is possible to find out how the collected data are being used in different sectors of humanity. Sustainability is a burning issue nowadays, so it is also possible to identify to what extent the data or services are useful to ensure sustainable development goals.

The conclusions are then analyzed with the current research in the International Business literature.

The foremost objective therefore of the thesis is to observe the current situation of how space firms are internationalizing at their early stage. It is important to know how space firms from the country level can benefit from entering the new global market by providing value-added services. Engagement in the international market can also enhance global alliances, increase diplomatic relations with other countries, and enable knowledge-sharing. Space is a common strategic zone, so each of the noteworthy giants (European Union, United States, India, China, and Japan) prepared a significant supportive arrangement (Cross, 2021).

Providing the solution to the above research questions, this thesis can be contributed to several sectors. These can be classified into theoretical contributions and managerial contributions. First, this thesis can contribute to international business research, in particular, the early internationalization in space firms, and can identify what type of internationalization theories they are using to enter the international market. Secondly, this study can add new insights into sustainable development goals with the help of data collected from space technologies. In addition, this thesis intends to create some managerial contributions about the challenges and opportunities of the space firms creating value-added services with the help of satellite data.

1.4 Definition of main concepts

1.4.1 Internationalization

Internationalization refers to the procedure by which a company grows its operations outside domestic markets, engaging in international business activities through different forms and strategies. Welch and Luostarinen (1988, p. 3) describe internationalization as encompassing a wide range of business engagements, from basic forms of trade, such as barter, to more complex arrangements like buy-back policies. This process enables firms to access new markets, increase their customer base, and enhance their competitive advantage on a global scale. Internationalization can occur through a gradual, step-by-step approach, often referred to as the "stages model" or "incremental internationalization." In this approach, companies progressively gather market information, develop foreign market knowledge, and engage in international activities as they accumulate experience and reduce uncertainty over time. This method allows firms to cautiously enter new markets, adjusting their strategies as they become more familiar with the international landscape.

1.4.2 New space economy

Peeters (2018, p. 4) defined the new space economy as an era in which private and commercial enterprises operate autonomously, without reliance on government funding, instead utilizing equity investments to support their activities. This shift has facilitated broader and more affordable access to space and space-related applications. A key factor driving this trend is the advancement of small satellite technologies, particularly those with a mass of up to 50 kg, which has contributed to the growing prominence of this sector (Paikowsky, 2017, p. 3). Within this new space economy, most innovations and technological advancements are spearheaded by private entities, with collaborations between established companies aimed at developing cost-effective solutions for space exploration and utilization (Paikowsky, 2017, p. 3).

1.4.3 Sustainable development goals

Sustainable Development Goals (SDGs) are widely recognized as a comprehensive framework aimed at fostering social and economic progress while ensuring environmental sustainability. According to the Organization for Economic Co-operation and Development (OECD, 2019), the SDGs represent a balance between economic growth, environmental stewardship, and social equity. This holistic approach underlines the interconnectedness of these three dimensions, highlighting that sustainable development requires the simultaneous advancement of all sectors without compromising the ability of future generations to meet their own needs. The SDG framework, adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development, encompasses 17 goals, 169 targets, and 330 indicators, which serve as measurable benchmarks to guide global efforts toward sustainability. These goals address a wide range of global challenges, including poverty eradication, climate action, responsible consumption and production, and the promotion of inclusive societies. The targets and indicators within the SDGs provide a structured pathway for nations, organizations, and industries to contribute to sustainable development through both policy and practice.

The SDGs are not only aimed at mitigating the adverse impacts of human activity on the planet but also at fostering economic resilience and social inclusivity. As such, they call for collaborative efforts across multiple sectors—public, private, and civil society—to ensure that economic growth is both inclusive and environmentally responsible. This balanced approach to development is essential for tackling the complex, interrelated global issues that characterize the 21st century.

1.4.4 Born global

Some firms engage in what is known as "born global" or "instant internationalization," whereby they internationalize immediately after the production of goods or services, without following the traditional step-by-step process (Cavusgil & Knight, 2015). These companies, often characterized by high levels of innovation and technological advancement, leverage global networks, digital platforms, and knowledge-intensive resources to compete internationally from the outset. This rapid internationalization challenges the traditional view of gradual market entry and reflects the dynamic nature of today's global economy, where firms can rapidly scale and reach international markets.

1.5 Delimitation of the study

The study will focus on eight interviews from seven case companies from five different countries to make it more valid to understand the internationalization of space firms. This thesis will also discuss the internationalization theories, the new space economy, and sustainable development goals. It will be based on the need for the growth of international business in the space industry and ensure SDGs. The research will be based on internationalization theories like born global, the network approach model, and the resource-dependency theory. To collect the data, a qualitative approach will be used about the case companies, by interviewing the relevant personnel. All the data collected from the interview will be used to help gain knowledge on space-driven solutions and will also add some insights into the internationalization process of the space industry.

A dearth of research exists regarding the internationalization of space firms engaged in sustainable practices. This thesis aims to address this gap by investigating the internationalization strategies employed by these firms. The findings will not only contribute to the existing body of knowledge but also provide valuable insights for space companies seeking to expand their operations into the global market. By analyzing the international market's demand for sustainable solutions, this thesis will equip space companies with the knowledge necessary to address these needs and contribute to a more sustainable future. All the interviews collected from English speaking person and transcribed with the usage of software named Turboscribe to ensure the quality.

1.6 Structure of the thesis

The structure of the thesis is divided into six segments (see **fig. 1**). Each of the chapters will be supported following the research objectives and provide data. The thesis structure will combine previous research, and theoretical findings, providing the background and information to fill the research gap. The results of the study provide new insights into the space industry on how the data collected through space technology is viable for maintaining sustainable development goals.

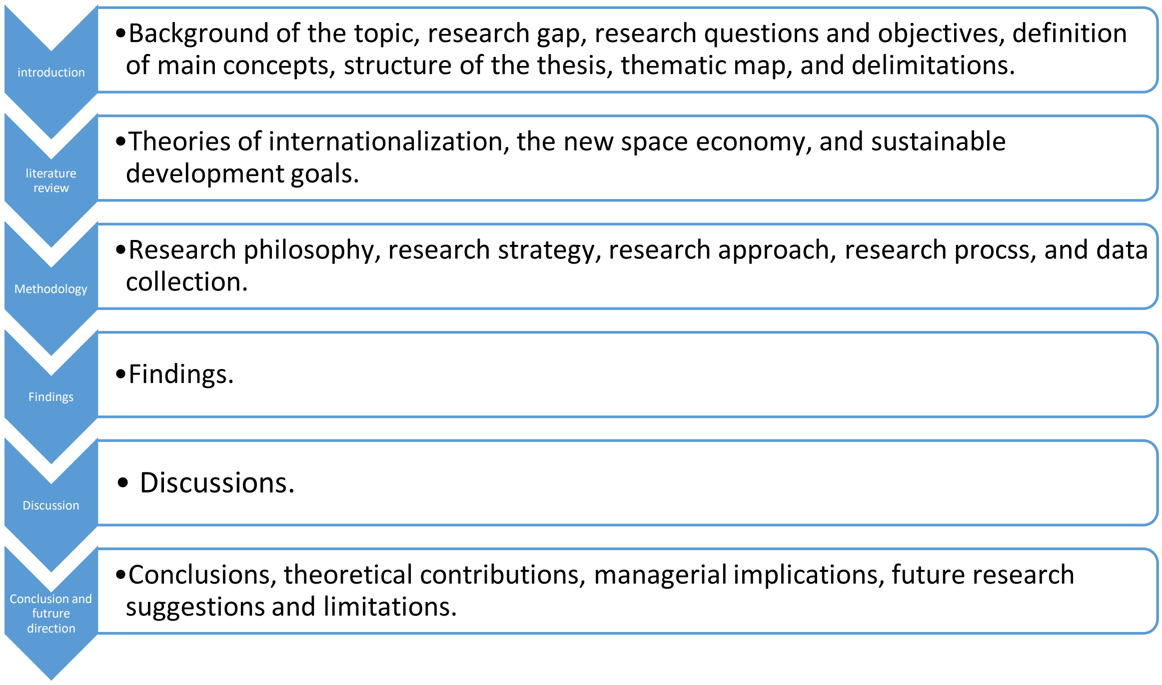

Figure 1. Thesis structure

The first chapter of the thesis provides a comprehensive overview of the research topic and its significance, grounded in the identification of the research gap and formulation of the research questions. This chapter also outlines the anticipated contributions of the study to the field of international business, while acknowledging the inherent limitations of the research. Additionally, a visual representation of the thesis structure (see fig. 1) and a thematic map (see fig. 2) is included to offer a clear and succinct overview of the study's organization, facilitating a deeper understanding of its objectives, methodology, and scope.

The second section of this study will comprise a comprehensive literature review, wherein key theoretical frameworks will be examined alongside real-world examples, particularly from the perspective of the end user. This chapter will critically engage with a range of scholarly theories and academic literature, including internationalization, the born global theory, the network model approach, resource dependency theory, the new space economy, and the SDGs. Each of these theoretical constructs will be thoroughly analyzed in relation to their practical applications, offering insights into how they inform and shape contemporary business practices, particularly within the context of global expansion and sustainability initiatives. Through this review, the study will highlight the interconnections between these concepts and their relevance to the evolving dynamics of international markets and sustainable development efforts.

The third section of the thesis presents a detailed exposition of the chosen methodology, encompassing the research approach, philosophical assumptions, data collection methods, case firm selection criteria, and data analysis techniques (see **table 3**). This chapter serves as the methodological foundation of the study, establishing the framework for the subsequent chapter, which will present the results and key findings. By providing a rigorous justification of the research design, this section ensures the reliability and validity of the study's outcomes, positioning the reader for a clear understanding of how the research objectives are systematically addressed.

The fourth chapter of the thesis will emphasis on presenting the findings of the study, offering a thorough discussion of the data acquired from the questionnaires and interviews. This section will explore the key insights derived from these data sources, providing a comprehensive review of how the selected firms approach internationalization, their strategies within the context of the new space economy, and their alignment with sustainable development goals. Through the analysis, the findings will not only provide empirical evidence to address the research questions but will also contribute to the ongoing discourse on international business and sustainability in the context of the new space economy. The chapter aims to bridge the gap between theoretical concepts and real-world business practices, ultimately enhancing the academic and practical understanding of these complex dynamics.

The fifth chapter of the thesis will focus on an in-depth discussion of the findings, synthesizing the insights gathered from the interviews and other data sources. By interpreting the findings through the lens of internationalization theories, this chapter will aim to create a holistic understanding of the research outcomes. A significant aspect of this chapter will be the development of a conceptual framework (see **fig. 3**) that integrates the main findings of the study. By refining the key elements of the findings into a cohesive model, the conceptual framework will provide a clear, structured visualization of how internationalization strategies, sustainable development goals, and new space economy dynamics interact within the context of the case companies.

In addition to presenting the conceptual framework, this chapter will offer a detailed summary of the study's key takeaways, synthesizing the main points from the analysis of the case companies and interviews. The components of the conceptual framework (see **table 4**) aim to draw clear conclusions regarding the practical implications of the research, particularly how firms in the new space economy navigate global expansion while aligning with sustainable development goals.

The final chapter of the thesis will present the conclusion, summarizing the core findings of the research while offering a reflection on the study's overall contributions to both theory and practice. This section will synthesize the key insights drawn from the previous chapters, reinforcing the main arguments regarding the internationalization of space firms, their alignment with the SDGs, and the implications of the new space economy. Furthermore, the limitations of the thesis will be thoroughly discussed, acknowledging the constraints faced during the research process. These limitations may include factors such as sample size, the scope of the case studies, the generalizability of the findings, and potential biases inherent in qualitative data collection methods.

Finally, the chapter will propose directions for future research, identifying gaps in the current body of knowledge and suggesting areas where further investigation could yield valuable insights. These future research directions may include deeper investigations of emerging trends in the space industry, a broader examination of internationalization strategies in different sectors, or a more granular analysis of the role of the SDGs in shaping business practices. By offering a forward-looking perspective, this section will contribute to the ongoing development of academic research in the fields of international business, sustainability, and space internationalization.

1.7 Thematic map of the thesis

For understanding of the reader, the author tried to include a thematic concept of the thesis.

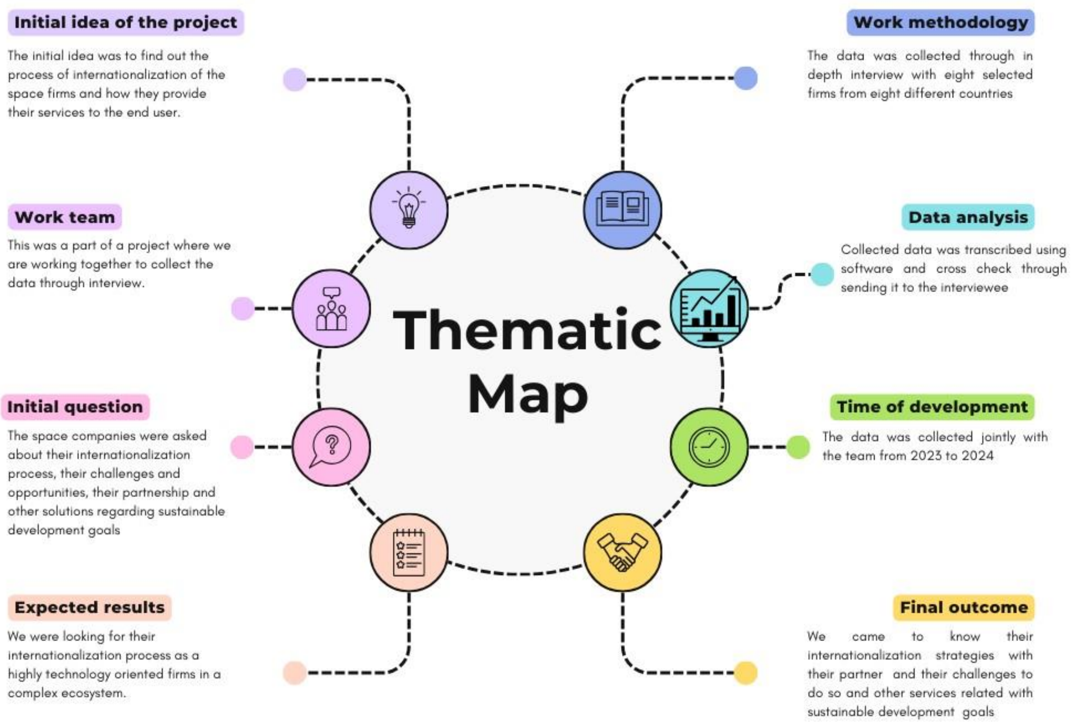

Figure 2. Thematic map of the thesis.

2 Literature review

This chapter presents a comprehensive literature review, beginning with an exploration of the concept of internationalization. It proceeds by examining the born global phenomenon, detailing the stages and processes of internationalization specific to born global firms. Following this, the internationalization of high-tech firms is analyzed, highlighting the unique challenges and opportunities faced by these entities in global markets. The chapter also delves into the network approach to internationalization, emphasizing the role of inter-firm networks and relationships in facilitating global expansion. In addition, the resource dependency theory is discussed in the context of internationalization, illustrating how firms leverage external resources to overcome challenges associated with entering foreign markets. The review concludes with an analysis of the emerging new space economy, focusing on its transformative impact on global markets and its alignment with the United Nations' SDGs.

2.1 The concept of internationalization

The concept of internationalization is a well-established phenomenon, having garnered significant scholarly attention over the years. A thorough examination of existing literature is essential for a comprehensive understanding of this subject. Notably, theoretical frameworks pertaining to internationalization across various sectors have emerged over the past two decades (Mejri & Umemoto, 2010). Different researchers have approached the topic from diverse perspectives. For instance, Johanson and Vahlne (1977, p. 23) propose that the internationalization process unfolds incrementally, beginning when a firm identifies a suitable international partner operating in an environment analogous to its domestic context. This thesis specifically focuses on space firms characterized by a born-global orientation.

2.1.1 Born global concept of internationalization

Multinational corporations engage in global trade due to their extensive resources and experience (Caves, 1971, 1996; Chandler, 1986, 1990). In contrast, there exist small firms that operate internationally by capitalizing on reductions in transportation and communication costs, as well as by shortening product life cycles. These firms are referred to as "born global" or "international new ventures" (Rennie, 1993; Cavusgil & Knight, 2015; McKinsey & Company, 1993). Unlike multinationals, born global firms tend to focus on narrower market niches; however, they exhibit a remarkable ability to adapt to rapid changes and demonstrate significant dynamism (Vossen, 1998). Furthermore, born global firms often fall within the category of small and medium-sized enterprises (SMEs), as they frequently start small yet possess advanced capabilities and potential for profound development (Stam & Wennberg, 2009; Lee, 2014). This agility allows them to exert substantial economic influence despite their size.

Born global firms are predominantly expected to be associated with advanced technology-related sectors (Madsen & Servais, 1997). These firms exhibit distinctive characteristics, as they are typically new and small in terms of ownership and management, often initiating international operations shortly after their inception (McKinsey & Company, 1993). Notably, their revenue generation tends to be more pronounced in international markets compared to domestic markets (Korot & Tovstiga, 1999). Scholars increasingly attribute the emergence of born global firms to technological advancements and globalization, anticipating continued growth in this phenomenon (Cavusgil & Knight, 2015). Nevertheless, a substantial body of research indicates that born global firms are primarily concentrated in high-tech industries and sectors (Rialp et al., 2005). However, it is important to note that Rennie (1993) contends that the definition of born global firms is not rigidly confined to specific technologies or economic segments.

Organizational factors play a pivotal role in the internationalization of technology-oriented firms, as noted by Knight and Kim (2009). The size of a nation significantly influences the internationalization processes of firms, with larger nations often providing easier access to neighboring markets (Bloodgood et al., 1996). Additionally, the size of domestic markets is a crucial determinant in a firm's decision to internationalize, as a more substantial domestic market can facilitate the accumulation of resources and capabilities necessary for global expansion (Gabrielsson et al., 2004).

Born global firms distinguish their market orientation from that of traditional enterprises by closely aligning it with their overarching mission and vision (Gabrielsson et al., 2008). This strategic orientation enables them to respond rapidly to international market opportunities, thereby facilitating swift growth in foreign markets. The intrinsic agility and innovative capacity of born global firms enable them to effectively leverage their unique value propositions, thereby accelerating their internationalization processes in comparison to more conventional firms (Cavusgil & Knight, 2015). This phenomenon highlights the dynamic landscape of contemporary international business, where new entrants increasingly challenge established firms in the global marketplace, reflecting a shift in competitive paradigms and emphasizing the importance of adaptability and innovation in achieving international success.

According to Cavusgil and Knight (2015), born global are comprised of relatively trivial, new companies, and their profits come from internationally mainly, and they have distinctive tangible and intangible products and services. The entrance of born global firms accorded with the emergence of globalization. Born global are supposed to subsidize the domestic economy, foster the country’s reputation, develop skills, promote newly invented activities, and growth of new international diligences (Mandl & Celikel-Esser, 2012; OECD, 2019).

2.1.2 Steps involved in internationalization of born global firms

According to Bell et al. (2003), there are three different kinds of internationalization processes of SMEs, consolidating thoughts from the INV theory and the Uppsala model.

Three main born global literature have gained the attention of the academics of international business literature, those are: traditional, born global, and born-again global (Gabrielsson et al., 2008). All three processes are right in their justification.

The initial progression of internationalization is the traditional approach where the firms go slowly for internationalization and primarily, they go for their neighboring countries who are similar with their culture and not that far. The prime purposes of the organizations are to continue and flourish (Bell et al., 2003). The firms in this process first try to develop the products or services according to their home country's demand and then focus on international marketplaces (Bell et al., 2004). Companies usually follow the most notable and practiced theory in this internationalization progression which was defined in the Uppsala model (Johanson & Vahlne, 1977). Therefore, the firms are gathering insights and newness about other global markets and slowly developing the intensity of that knowledge and moving forward to internationalize their firm (Johanson & Vahlne, 1977).

The next type of process is purely born global. A maximum of the firms internationalizes within three years of their activation of business (Kuivalainen et al., 2012). This is the process where firms internationalize themselves into several foreign markets with less influence of psychic distance. They understand their market well and the sales volume of their products or services is good. Born global's products are global not for pure domestic consumers (Bell et al., 2004). These types of firms are taking the leverage of their innovative business which was initially for the domestic market, and they are very confident about their business. Born global firms are taking the opportunity of doing business in the foreign market. These firms are not entering international markets gradually, instead, they are pursuing early internationalization with remarkable speed. The distinction between traditional businesses and born global firms lies primarily in their approaches to internationalization, modes of market entry, and levels of commitment to foreign markets. According to Cannone and Ughetto (2014), born global firms typically adopt a more proactive and accelerated internationalization strategy compared to their general business counterparts.

Bell et al.'s (2003) research work on international business strategy introduced the concept of born-again global firms. Unlike their born-global counterparts, who exhibit an innate international orientation, born-again global firms initially focus on domestic markets but subsequently transition to a more globalized business model. This transformation is often catalyzed by changes in top management, leading to a renewed emphasis on international expansion. While Bell et al. (2001) highlights the potential financial and managerial benefits of this transition, facilitated by established domestic networks, the exact timeframe for a firm to be classified as born-again global remains a subject of debate. Sheppard and McNaughton's (2012) research suggest a minimum of 28 years of domestic presence before a firm can be considered a born-again global. However, this metric may be overly simplistic, as factors such as industry dynamics, market conditions, and the nature of the management change could influence the timing of this transition (Walters et al., 2023). It is noteworthy that born-again global firms tend to be larger than born-global firms and often operate in a wider range of overseas markets. This suggests that their established domestic base provides them with a solid foundation for international expansion, enabling them to leverage existing resources, capabilities, and networks to compete effectively in global markets.

2.2 Internationalization of high-tech firms

In our everyday lives, we use digitalization (Yoo, 2010) and transform businesses whatever their size or industry, creating highly technologically value-based service to the end-user locally or globally. Technologies are changing very fast and therefore firms need to remain proactive in continuous research and development to survive (Sabatini et al., 2022). Research and development are important for firms in high-tech organizations before going to an international market. Nowadays the world is thinking in a new way and technology has given a new meaning to production and services (Corvello et al., 2021).

Internationalization of highly technology-oriented firms is different from non-technology-oriented firms, especially in innovation and operation (Gaweł, 2021). Previously innovation was important mainly for large multinationals but nowadays it is also important for born global (Cavusgil & Knight, 2015).

Digitalization nowadays has changed the process of doing business in international settings and the entry mood (Monaghan et al., 2020). The firms who heavily rely on digital platforms are called digital international new ventures (Ojala et al., 2018). Digitalization plays an important role in Internationalization. Digital-based INVs operate their business in a relatively unpredictable atmosphere (Ojala et al., 2018) where technology can modify at any moment and change the condition (Arthur, 2009).

In the contemporary digital era, firms are continually engaging in self-renewal through the transformation of their business models (Bouwman et al., 2019; Baber & Ojala, 2020; Sousa et al., 2020). This ongoing process of adaptation is essential for organizations seeking to maintain competitive advantage and respond effectively to the rapidly evolving technological landscape. The changes are more prominent where the firms are working in a fast and digitally converting environment (George & Bock, 2011; Ojala et al., 2018; Khare et al., 2022). The space industry is also expanding in the foreign market by providing different value-added services. The convergence facilitated by digital technologies has significantly enhanced funding opportunities for space firms, attracting investments from major global investors aimed at advancing space technology (Frischauf et al., 2018; Giannopapa et al., 2022; Nardon, 2017). The deployment of satellite technologies, along with the data they generate, plays a critical role in the production of extensive datasets, particularly when leveraged through advancements in space technologies (Bousedra, 2023). Within the field of international business research, the exploration of internationalization pathways for companies remains a focal point of inquiry. This exploration commenced in the 1960s, and researchers continue to identify novel forms of internationalization across various emerging sectors.

However, doing business outside one's own country is always challenging, and it is also constantly changing, new situations are coming and making alterations in the International Business sector (Ghauri et al., 2021; Monaghan et al., 2020). Therefore, studies on internationalization are still going on. According to their findings (Ojala et al., 2018) in the digital platform business or high technology-oriented business similarly, the new space economy also flourished rapidly due to its ability to use digital platforms and the generation of information and communication technologies and became a dominator by providing those to the end-user for different usage. The internationalization process of such firms is unlike the traditional firms dealing with non-highly technology-oriented firms.

2.3 The network model of firms' internationalization

The traditional model of internationalization, as articulated by Johanson and Vahlne (1977), emphasizes a gradual and knowledge-based approach whereby firms expand into foreign markets incrementally. This process involves an accumulation of market-specific knowledge that informs strategic decision-making. However, the inherent limitations of this model include the potential for Liability of Foreignness (LoF) and heightened investment risks stemming from the knowledge gaps that firms may experience when entering unfamiliar international markets (Brouthers et al., 2016).

To mitigate these challenges, the utilization of international networks emerges as a critical strategy (Johanson & Mattsson, 1988). Within such networks, firms can leverage established relationships and positions that are grounded in prior interactions and experiences. These networks facilitate knowledge transfer, reduce uncertainty, and provide firms with essential resources that can enhance their internationalization efforts (Brouthers et al., 2016). By engaging in collaborative relationships within these networks, firms can effectively navigate the complexities of foreign markets and diminish the associated risks of international expansion. This perspective underscores the importance of relational dynamics in shaping the internationalization trajectory of firms, offering a more nuanced understanding of how firms can strategically position themselves in the global landscape. After the introduction of Johanson and Mattsson's (1988) network model of firms' internationalization, there was a widespread examination on small firms' internationalization (Johanson & Vahlne, 2003, 2009; Ojala, 2009; Oviatt & McDougall, 2005; Smith et al., 2014).

Highly internationalized firms are enjoying the benefits of having a direct relationship with the industry's ecosystem (Johanson & Mattsson, 1988). Johanson and Mattsson (1988) utilize the network framework to recommend an internationalization typology. They portray how the level of internationalization at both micro and macro levels can be conceptualized as four wide firm-level global circumstances, specifically the Quick Enterer, the Late Enterer, the Isolated International, and the International amid Others (Johanson & Mattsson, 1988).

The essential concept of the network model is that firms are creating networks with each other due to the benefits of some unique resources that are possessed by the other firms. With the collaboration of the firms working at an international level, the early internationalized firms can have access to the required resources they need. These relationships can be dynamic and stable and can be added to or removed from the existing and new networks. Network relationships have a constructive influence on selecting the international market and accelerate the pace of internationalization (Coviello & Munro, 1997). The network plays a direct role in ascertaining the altercation partners in the foreign market (Ellis, 2000). Overall, it can be understandable the situation of the firms by observing or analyzing with the help of their connectivity with the network (Sharma & Blomstermo, 2003).

The network relationship is important in various stages of the company as one company cannot have all the resources it needs both tangible and intangible (Sullivan et al., 2012; Johanson & Vahlne, 2009; Smith et al., 2014). Many scholars mentioned that firms can develop their resources without owning those resources within their network (Coviello, 2006; Murmann et al., Oviatt & McDougall, 2005; Chetty & Holm, 2000). However, according to Ojala (2009), the network model assumes that firms have already an established network within the ecosystem that enhances internationalization. Therefore, in the network model approach, the firms are trying to create relationships with other firms to accelerate the process of internationalization.

2.4 Resource dependency theory on Internationalization

Resource dependence theory denotes a considerable landmark in organizational research, as it provides a comprehensive framework for understanding power dynamics at the organizational level of analysis. Nearly three decades after the publication of Pfeffer and Salancik's seminal work (1978), resource dependence theory continues to be extensively referenced by scholars in the field of organizational studies. Its enduring relevance features its foundational role in elucidating the complexities of organizational interactions and the critical importance of resource acquisition and management in shaping organizational behavior and strategy.

According to Hunger (1983), 24% of business failed within two years, and 63% failed within six years. However, to avoid this failure in the early stage highly technology-related firms are trying to connect with their network and want to use their resources to enter new markets which is also relevant to resource dependency theory (Pfeffer & Salancik, 2003, 2015). It is mentioned that the resources that the firms are controlling will drive opportunities in the foreign market (Johanson & Vahlne, 1977; Autio et al., 2000). From the resource-dependency theory, firms are enjoying competitive advantages over their rivals and reducing the survival risks. The resource dependency theory provides firms with unique opportunities for some resources that might not be easily replicable by other firms (Dierickx & Cool, 1989, p. 5). The survival of high-tech firms is mostly reliant on the alliance they can make with their existing technologies, resources, and external networks (Lee et al., 2012, p. 2). The resource dependency theory (Pfeffer & Salancik, 2003) has mentioned some factors that help owner-managed firms to export internationally, and they have also mentioned that the individual firms cannot own or manage all the resources they need as this is an open system. Firms that acquire resources, technologies, stocks, and other non-replicable features can compete with their rivals.

The resource dependency theory can be employed to explain internationalization of firms by studying a unique set of resources that a firm possess and how do these resources enhance the commitment of the firm towards internationalization (Bianchi & Wickramasekera, 2016). Due to this knowledge and resources, the risks have been reduced and the firms have gained the confidence to enter overseas (Williams, 2011). Resource dependency theory plays a crucial role in the sustainable utilization of resources, highlighting the necessity to consider the long-term accessibility of resources for future generations (Chaudhuri et al., 2022). However, Resource dependency theory not only considers identifying unique resources and capabilities but also ensures how to utilize those resources in a certain environment (Braganza et al., 2017).

2.5 Internationalization of space firms

According to Pelton et al. (2017) with the launching of Sputnik in 1957 and the commencement of the era of space, the development of space machinery directed to a hundred other developmental applications that use satellite data, containing daily usage devices of every day. Notwithstanding, twenty years after the Soviet Association broke up, there were no less than forty-three countries that had their satellites and 12 other countries sending off their satellite (Noble, 2008), this rapid development in space technology managed momentum for humankind, like the moon landing. Throughout the centuries, the expansion of the space business has encouraged thousands of moviemakers and writers to imagine and visualize imaginary developments in space technologies (Paravano et al., 2023, p. 5). Although this was imaginary technology, following that there are new opportunities to develop technologies in this new environment (Davidian, 2021).

The space business is at present experiencing substantial shifts that have emerged over the past decades for many grounds, first, the shift in funding from the government to the private sector which is known as “New Space” (Peeters, 2021, p. 214) has given individual firms the flexibility to invest money in specific niche space technology to expand their business internationally (Peeters, 2021, p. 212). In the space industry now, there are many stakeholders that are related. New stakeholders are joining together in knowledge, technology, and infrastructure and developing next-generation space technologies (Davidian, 2021, p. 2). Previously, it was only related to financial benefits but now it is also considered the long-term social and environmental benefits. Lately, with the enhancement of remote sensing (RS) and geographic information systems (GIS), it is possible to monitor and investigate climate quality and other sustainable development goals (Chen, 2021, p. 9). The utilization of satellite data and the adoption of small and medium satellites improves the speed of internationalization (Bousedra, 2023).

Due to this increase in investment and commercial activities and the increase in end-users, it is possible to make the space economy expansion at an international level. The international new space economy increased from $173.36 billion in 2022 to $177.25 billion in 2023 by 2.2% according to the Commercial Aircraft Global Market Report (2023). Internationalization in the space business has many benefits for example space exploration and development require a handsome amount of investment, and a single country cannot develop its infrastructure and cannot fully utilize its benefits from satellite data. Therefore, in the investment area space companies will pursue more government support from the angle of public-private partnership (PPP) (Nardon, 2011) concepts.

The country can share its resources and bear the research and development costs. Again, different countries have different expertise in technology, skills, and knowledge regarding space-related activities. One country can help another country to excel in the sector and collaborate with the technology development. In that case, we are suffering many global problems that can be solved by the space industry like mitigating space debris, monitoring space weather, and addressing environmental concerns. To effectively address this global challenge, the facilitation of global collaboration can be achieved through the mechanism of early internationalization. By engaging in early internationalization, space firms can establish transnational partnerships and networks that enhance their capacity to respond to complex global issues. This proactive approach not only fosters knowledge exchange and resource sharing among diverse stakeholders but also promotes innovative solutions that are crucial for tackling pressing international challenges.

2.6 New space economy and sustainable development goals

In the new space, there are constant technological revolutions with many new commercial players previously dominated by traditional players (Hall & Page, 2014). The new space is defined by Peeters (2018) as when private or commercial companies are working independently without the help of government funds with the help of equity funds and encouraging reasonable entrance to space and space applications. The new space denotes the companies that are working independently in the space ecosystem (Davidian, 2020).

In the new space economy, market freedom, easier entry, and inexpensive entry to space data have completely altered the proposition of space administrations to the final user. For example, without the help of GNSS, Uber, Foodora, Wolt, and other navigation services are not able to provide the service (Paravano et al., 2023, p. 4). Only final consumers can add value to the usage of satellite data. Different end users can demand different usages of the satellite data, even data generated from the same satellite can be of different use for different nations and different end users (Paravano et al., 2023, p. 4). Based on the needs of the end-users' firms are establishing their relationship with the other firms. The new space economy has made this easy for both upstream and downstream in the space supply chain.

The space economy has changed dramatically from government-driven to private-driven organizations. Many countries now understand the importance of investment in the space economy and thus support the new infrastructural development in this sector. For example, Kano, Nigeria uses remote-sensing ARC-GIS 10.7 software for various developmental works in the monitoring of climate change (Otuoze et al., 2020, p. 7). The space economy now is facing more global partnerships as well as more competition. This situation increases public-private partnerships around the world (Nardon, 2011, p. 8). Hence, it is important to study more about the stakeholders' benefits from space activities, especially from the sustainable development goals perspective. Scholars suggest that spatial knowledge should be useful for all stakeholders from all backgrounds, interests, influences, and knowledge (McCall, 2003; Gupta et al., 2006; Pfeffer et al., 2015; McCall & Dunn, 2012).

Through the utilization of satellite data, imagery, and associated services provided by relevant governmental or organizational departments, stakeholders can harness this information for various advantageous applications. These data resources enable a range of users from researchers and policymakers to businesses and non-governmental organizations to conduct analyses that inform decision-making processes, enhance operational efficiencies, and contribute to sustainable development initiatives. The United Nations, through its SDGs articulated in the Paris Agreement on climate change, has underscored the imperative for global engagement in addressing environmental sustainability (Resolution, 2015). This framework compels all stakeholders' governments, private sector actors, and civil society to invest in sustainable practices that contribute to the preservation of the Earth's ecosystems. The UN has established a comprehensive agenda for coordinated national and international efforts aimed at fostering sustainable development.

Within the scope of this thesis, the focus is primarily directed toward the dimensions of environmental sustainability and education. Leveraging satellite data has emerged as a pivotal strategy in this context, enabling the tracking of climate change, monitoring of natural resources, and promotion of environmentally friendly products. The application

of remote sensing technologies facilitates informed decision-making and strategic actions that are essential for advancing sustainability goals, thereby reinforcing the significance of data-driven approaches in the pursuit of ecological resilience and education.
In this new space economy, there is a crossbreeding between space technology-related companies with non-space-related companies (Zhu et al., 2019; Oltrogge & Christensen, 2020). This new breeding has attracted many new business opportunities around the world. The new space economy has also attracted new funds and new technologies. Space and non-space-related technologies have downsized the cost and hence reduced the risk of investing in space launch missions (Davidian, 2021, p. 3). Most businesses are related to the end-user, who ultimately uses the data collected from space. Moreover, the innovation of digital technologies and their inexpensiveness is creating more end-users for space data (Liu et al., 2021; George, 2019). Due to the increase in end-users, space industries are now more focused on internationalizing their business by different value-added services. Value-adding services in the space business are now becoming easier due to their availability, reusability, and analytical re-productivity in the case of satellite data (Hardwicke et al., 2018).

Due to technological advancement, it is expected that utilizing the new space sustainable development goals for the earth by the United Nations will be approachable. According to the OECD (2019), Sustainable development goals mean a balance between economic, environmental, and social dimensions. Sustainable development goals are interconnected with cross-industries. Numerous SDGs can be attained by multifaceted low-orbit satellite technologies that are skillful in delivering geospatial knowledge in the environment and ecosystem (Clegg et al., 2024, p. 3). New space promises rapid development in technologies and cheapening the hardware (Vidmar, 2020, p. 5). This rapid development has ensured the replicability of the ongoing space projects with the price decrease in the satellite and its other associated launching activities (Garzaniti et al., 2019; Miranda et al., 2019). This price reduction not only helps the entrepreneurs of the space industry but also helps to create new technological solutions that are related to maintaining SDGs, especially sustainability on the globe (Gustetic et al., 2019).

The utilization of low-orbit commercial satellites not only facilitates data collection but also enables capabilities that extend beyond geographical boundaries, offering enhanced global coverage and accessibility. (Rejeb et al., 2022; George & Schillebeeckx, 2021). Convergence involves the connectivity of five key spheres of technology in the new space economy. These are access to space, habitats, satellite data access, analytics, remote sensing technology, low Earth orbit, and space stations (Weinzierl et al., 2018). These new space-related technologies are important for ensuring the Sustainable Development Goals in many ways (Anderson et al., 2017). Due to the new space technology, humans are now able to imagine, observe, and predict climate change and other meaningful consequences. For instance, the International Space Station (ISS) is now using automated Earth Observation platforms for observing weather modification, environmental alteration as well as natural calamities (Uhran, 2010). New space's information is impactful to SDGs and comprises evidence connected to demographic, numerical, and ecological data to observe the goals of SDGs (Kojima et al., 2018). Alphanumeric figures collected from new space technologies (Weinzierl, 2018) increase the state of modern agribusiness by 4.0 to be achieved by players in the World as a part of the SDGs.

Although there are many studies focused on the importance of the space industry and the usage of collected data on the Earth's sustainability (Forkuor et al., 2020), there are many studies by scholars who argue that due to space debris, the environment of the Earth is at risk with the increase in aluminum oxide and black carbon (Miraux et al., 2022). Satellite technologies can help to achieve environmental sustainability, yet increased exploitation of satellites causes a risk of satellite collision, congestion, and finally space debris. If this debris problem cannot be addressed properly it will create further collisions (Kessler et al., 2010). Although there are ongoing debates, the space project can be a game changer for ensuring the SDGs, especially environmental sustainability like the restoration of water-related ecosystems (Schaeffer & Lebedev, 2013) with the help of remote sensing; clean energy solutions (Stokes & Seto, 2019); monitoring of oceans (Gobler et al., 2017); sustainability of life on land (Forkuor et al., 2020).

3 Methodology

This chapter presents a comprehensive overview of the methodological framework employed in this study. It interprets the rationale behind the selection of qualitative research, specifically utilizing a multiple-case study approach. The discussion will encompass the reasons for this methodological choice, detailing its appropriateness for addressing the research questions and objectives. Furthermore, the chapter will explain the methods of data collection employed in the study, alongside the analytical techniques utilized to interpret the data. Consideration will also be given to the reliability and validity of the research findings, ensuring a rigorous evaluation of the methodological thoroughness. Through this systematic approach, the chapter aims to provide a clear understanding of how the selected methodologies contribute to the credibility and applicability of the research outcomes.

3.1 Research philosophy

Philosophical assumptions play a crucial role in research, particularly in shaping both the outcomes and the research process itself. Under philosophical assumptions, the reader can comprehend the explanation for picking a particular examination worldview, like positivism, interpretivism, or basic hypothesis. The research philosophy is perceived as the arrangement of strategies and techniques that help the researcher to lead the review (Mingers, 2003). According to Su (2018), different philosophical assumptions justify the needs of different research methods while positivists are trying to go for the quantitative methods and interpretivists choose qualitative approach. Within these two board wings researchers must take one side to justify the study. The reasoning decision likewise impacts the research plan, data assortment techniques, and data investigation way. Different philosophical suppositions are additionally founded on various ontological directions. As per Hirsjärvi et al. (2007), understanding the philosophical beginning stages is viewed as significant in the exercises of the people who start work on their research. However, there is a research philosophy that takes a hybrid stance, ‘qualitative positivism’ (Piekkari

& Welch, 2018) that uses the non-quantitative methods of data collection like observation and interview. This philosophy will function to manage the thesis.

Although there are some researchers who argue about the ability of positivism to conduct impactful research (Piekkari & Paavilainen, 2009), while some others are arguing that this philosophy can offer and improvise the quality of the thesis suggesting 'continually developing and improving' and therefore guarantee the originality (Chandra & Shang, 2019, p. 6). According to Su (2018, p. 34), the positivism and qualitative approach can co-exist and be well-balancing approach for an environment that is constantly changing like the highly technology-oriented space organization.

3.2 Research methods

Methodological choice in research is more essential before choosing the methods as they decide what a scientific group jointly assumes (Nielsen et al., 2020, p. 1481). Although in the international business field there was a heavy reliance on quantitative research, after that there was some vigorous qualitative research there over time (Wilkins, 1974; Johanson & Vahlne, 1977). Day by day the qualitative researchers have proven the quality of the research and meaningful contribution in the field of IB to formalize the theory and concepts (Su, 2018, p. 19). If we can analysis the recent trends in IB field, there were 90% qualitative papers using interviews published in the renowned journals (Nielsen et al., 2020, p. 1487). Many researchers argue that in this field there is a need for creative and flexible research designs that could be followed (Ghauri et al., 2020).

In recent studies it was found by (Klarin & Suseno, 2021) that there was more research based on qualitative than quantitative and it was also found that these statistics could be thrice (Agarwal & Steinmetz, 2019). This thesis will employ answers a "how" and "why" so the research is exploratory, and it is also engaged with a semi-structured interview to collect in-depth insight on the subject that will clarify overall understanding (Saunders et al., 2019). Given the exploratory nature of the study, it was deemed appropriate to use a qualitative method.

3.3 Research strategy

After the selection of the study, the researchers need to identify the types of study. There are five types of study in qualitative research (Creswell, 2014). For research purposes, the study will be a multiple case study. The multiple-case study will enrich the theoretical construct which is also the main objective of the thesis (Eisenhardt, 1989). Because of the creation of new theory and insights Klarin and Suseno (2021), advice to utilize case study methods in the research. Believing the importance of the research question 'how do firms internationalize themselves in space business?' and as there are some lacks in the existent theory, the author has established a research strategy grounded on 'theory building from cases' by Eisenhardt and Graebner's (2007, p. 28). According to Yin (2014, p. 25), if there are adequate sources for data collection one should use a multiple-case study method. Multiple-case study methods also proved the reliability of the collected data as there will be less biased information (Baxter & Jack, 2015). Yin (2014) also mentioned that the multiple case study approach increases the connections of the collected data that are beyond the researcher's control. However, the author also uses secondary data collected through the company's website, reports provided by the interviewee, last 15 years articles published in different renowned journals.

3.4 Research process

3.4.1 Sampling

The primary objective of this thesis is to investigate the early internationalization of born global firms in the space industry. Seven case companies were selected based on their active involvement in early-stage internationalization. A purposive sampling strategy was employed, in conjunction with one snowball sampling technique (Creswell, 2014), to identify these case firms. The selection process adhered to the following criteria:

- Active in at least one foreign market.
- Operates in the space industry.

- Providing sustainable development goal related services like environmental sustainability and education.
- International experience in space industry.

The thesis incorporates a strategic selection of five countries, chosen to provide a comprehensive understanding of the internationalization of space firms. This cross-national approach aims to generate insights that contribute meaningfully to international business literature by offering a more generalized framework for firms providing services aligned with the Sustainable Development Goals.

Table 1. Overview of the case companies

SL.	Name of the firms	Year of establishment	Main activity	Team size	Active internationalization
1	Firm A	2020	Satellite communication	7	2
2	Firm B	2019	Providing geo spatial services, climate mitigation service, space education	3	1
3	Firm C	2019	Cloud computing, MiniSpace works, soft Landing program,	5	5
4	Firm D	2015	Producing images, producing satellites	500	7
5	Firm E	2017	Software as a Service	7	1
6	Firm F	2012	Building satellites and rockets	35	3
7	Firm G	2013	Developing and providing satellite technologies.	570	4

3.4.2 Data collection

According to Su (2018, p. 27), case studies will have the option to collect novel and reliable theories and concepts in a complex and evolving environment. This thesis utilized interviews as a method of data collection (Nielsen et al., 2020). Again, for collecting core in-depth information on any area, it is recommended to implement interviews or a virtual conversational medium of communication (Saunders et al., 2019). This thesis's research questions are mainly to identify what and why related, for these types of questions it is important to deploy qualitative research. The interview questionnaire was semi-structured as it left more open room for the researcher to allow the participants more flexibility in adding new and necessary information (Saunders et al., 2019).

Within the scope of a broader research project, this master's thesis delves into the internationalization strategies of seven space firms active in satellite development and educational software. The firms were selected from a pool of candidates operating within the industry between August 2023 and September 2024. To gain a deep understanding of their approaches, the author conducted five in-depth interviews, supplemented by three additional interviews secured through the research team. This methodological framework provides a comprehensive analysis of the selected firms within the dynamic context of the global space sector.

All case companies are relatively new and small in their international journey. Interviews were conducted with CEOs, COOs, regional directors, co-founders, presidents, and business development specialists. While some critics question the use of limited interviews per company (Poulis et al., 2013), in this case, it was appropriate as interviewees possessed both strategic and operational insights. A semi-structured interview questionnaire was used to allow interviewees to share additional information (Yin, 2014). At the start of each interview, the author explained the purpose, project, and reason for the interview and obtained permission to record the data for future use. In most cases, the questionnaire was provided in advance for better understanding.

The interviews were conducted remotely using internet-based communication tools, a widely adopted method for qualitative data collection in contemporary research (Lobe et al., 2020). These platforms offer greater flexibility, cost-effectiveness, and environmental sustainability compared to traditional face-to-face interviews (Lo Iacono et al., 2016). Given these advantages, Zoom and Teams were selected for the interviews, accommodating the geographically diverse locations of the respondents. During the interview's, detailed notes were taken, and additional data was collected from company websites and shared documents. Specialized software was employed to interpret and transcribe the interview data, which was subsequently emailed to the respondents for validation to ensure accuracy and minimize the risk of misinterpretation (Ojala et al., 2018).

Secondary sources will be utilized to enhance the feasibility and accessibility of data. These sources, including historical data relevant to understanding the facts, can be categorized into documentary, survey-based, and data collected from multiple sources (Saunders et al., 2019). For this thesis, the primary focus will be on academic journals related to international business, the space industry, and sustainability, which will be used for literature review purposes.

Table 2. Information of the companies and the interviewees

Abbreviation in the text	Name of the company	Title of the interviewees	Company origin	Duration of the interview
C1	Firm A	Business development specialist	Finland	45 minutes
C2	Firm B	COO	UK	1 hour 20 minutes
C3	Firm C	President	France	45 minutes
C4	Firm D	Regional director	Finland	1 hour
C4	Firm D	Chief strategy office and co-founder	Finland	1 hour
C5	Firm E	CEO	Finland	1 hour
C6	Firm F	Chief operation manager	Japan	45 minutes
C7	Firm G	COO	India	1 hour

3.4.3 Data analysis

This research investigates the early internationalization of space firms. To achieve this, a two-phased qualitative analysis was conducted. First, in-depth interviews were conducted to gather primary data. Subsequently, these data were analyzed and compared across case studies to identify common patterns in the firms' internationalization processes. Qualitative techniques were employed to analyze the data, following the methodological guidelines of Eisenhardt (1989) and Miles et al. (2014). After a thorough analysis, redundant data were systematically eliminated using Miles et al.'s (2014) thematic coding approach (see **table 3**) applied to the interview transcripts. Following the data reduction, coding was employed to facilitate thematic analysis (Miles et al., 2014; Karami et al., 2022). The coding process was structured according to key themes, including the internationalization of the case firms, their internal motivations for international expansion, the resources required to enter new markets, internal capabilities, and networking practices. The labels assigned to the codes were grounded in the conceptual framework (see **fig. 3**) of the study. The identified codes were systematically organized into distinct concepts, which were subsequently refined into higher-level abstract axial categories, in accordance with the grounded theory approach (Corbin & Strauss, 2014). This process involved the application of growing analytical expertise to synthesize and categorize the concepts into broader thematic categories, ensuring a deeper understanding of the data. These all were taken from the interview transcript.

For instance, when an interviewee remarked, "we were talking to lots of different people in the market, competitors, looking for ways to cooperate and try to make partnerships," the statement was categorized under the theme of networking. As illustrated in the conceptual framework the data were further categorized into themes such as networking, born global, technology, investment, infrastructure, and political influence. To achieve more detailed action-oriented coding, Johansson and Mattsson's (1988) networking model theory was employed. For example, when an interviewee stated, "We need to maintain high-level collaboration on the PR marketing side. The European Space Agency is, of course, an important partner for us as a funder and so on. We try to keep a good relationship with them," this response was coded under networking. This approach facilitated a deeper understanding of the underlying motivations for networking within space firms.

The study also sought to explore the early internationalization of space firms, as well as the challenges encountered in this. For instance, when a firm indicated, "It was only one motivation. When we began, we wanted to work at the international level," this was categorized under the concept of born global. Similarly, when interviewees discussed their technological capabilities, such as, "we have a room in Tokyo that can fit four satellites," the statement was coded as technology, recognizing it as either a potential challenge or opportunity. Additionally, the research examined the alignment of the firms' services with the SDGs, particularly in terms of end-user benefits. For example, a response such as, "we are a company that works in Arctic areas, ice cover and ice management, ice cover development, ice management support, and so on," was classified under sustainable development goals related services. This approach enabled the study to interrelate the early internationalization of space firms, their motivations for international expansion, and the SDG-related services they provide. All coding was systematically presented in a table, adhering to the guidelines of Miles et al. (2014), ensuring a coherent analysis across the identified themes.

Table 3 Selected quotations and examples underlying open coding, axial coding and final codes (Karami et al., 2022)

Codes and examples	*Open coding*	*Axial Coding*	*Final coding*
"We outsource the key development of our company to the international market." C1	capabilities, outsourcing, control of technology	Technological capabilities	Technology
"We have a room in Tokyo that can fit four satellites." C2	in house development, internal infrastructure		Technology
"We use JAXA Tsukuba test facilities for our satellites." C3	External testing	Use of facilities	Technology partnerships
"Internationalization is absolutely a must because satellites are not a product that you'd like a computer that you can sell to anybody" (C2)	Internationalization, international partner	Foreign footprint	Born global
"It was only one motivation. When we began, we wanted to work at international level" C3	Internal motivation, international level work	International	Born global
"It had to have an international footprint" (C5)	motivation to work in international	international work experience	Internationalized
"We worked with the Department of Commerce to set up in Denver."(C5)	Government collaboration	Regulatory influence	Political influence
"Signed a study phase agreement with CNES, the French Space Agency."(C3)	Partnership agreements	Government influence	Political influence

"We also get support from the European Union through grants."(C1)	External support, Government financial aid		Political-economic influence
"We chose Toulouse as our headquarters due to its proximity to Airbus and the French Space Agency."(C6).	Strategic location	Regulatory partnerships	Political influence
"We need to maintain high-level collaboration on the PR marketing side. The European Space Agency is of course an important partner for us as a funder and so on. We try to keep a good relationship with them" (C5).	Collaboration, important partner		Networking Continued next page
"We were talking to lots of different people in the market, competitors, looking for ways to find ways to co-operate and try to make partnership". (C5)	Co-creation, collaboration, many working partner	Finding best way to work with	Networking
"It depends on who your client is. If we are dealing with a political client or it's a national, it's a government for example that's a decision that's not going to be made overnight because there's a lot of approval that needs to be taking place" (C1).	political client, government, management decisions	Government influence	Political influence
"Geopolitical influences are important, and we could just use the example of Russia if a Russian millionaire can come to our company and say I need 10 satellites, but the satellite business is very politically influenced……. we cannot go the deal as our other supplier are from other country" (C 1).	politics, geo-politics		Political influence
"For an example Africa as a continent is more behind than most continents when it comes to satellites technology communication" (C7).	Technology, communication	Technological infrastructure	Infrastructure
"If we have a client who wants to acquire a satellite and then say it's a third world country, they don't have infrastructure they don't have anything so the kind of business that we're doing with them needs to be dialed back" (C6).	Technology, under-developed country, satellite infrastructure	Satellite infrastructure	Infrastructure
"The clean room in Tokyo can fit out the building of four satellites." (C2).	In-house facilities, facility development		Infrastructure
"We have 13 different ground stations around the world, including one in Yokohama." (C4)	Global infrastructure, communication network, facility development		Infrastructure
"We got a few grants from the UK and started gaining traction there." (C1)	External funding, financial support	Investment acquisition	Investment
"The ecosystem has evolved into large VC-backed funding with long horizons." (C7).	Venture capital, long-term investment		Investment
"We were able to raise additional funding to develop our satellite system."(C6).	Fundraising, capital accumulation	Funding	Investment

"We received incentives from the Air Force Academy CU Boulder for setting up the office."(C2).	Institutional incentives	Financial aids	Investment
"We are a company who works in the Arctic areas, ice cover and ice management, ice cover development, ice management support, and so on" (C7)	Services by the firm, climate change, ice monitoring	Earth observation	Sustainable development goals
"An earth observation constellation that we delivered of three satellites I would say that it could help in aiding in solution like in coming up with solutions to emerging environmental crisis for example you know the earth observation applications quick time to response natural disaster management" (C1)	Satellite solution, satellite data	Environmental monitoring	Sustainable development goals

3.4.4 Validity and reliability

According to Saunders et al. (2019), validity refers to the extent to which a research methodology accurately measures the intended concepts. While validity is typically evaluated in the findings chapter, this research design incorporates rigorous methods to ensure its validity. In-depth interviews and meticulous coding have been employed to preserve the original language and perspectives of the participants. The use of tags enables readers to effortlessly compare research findings with relevant literature and the interviewees' interpretations, thereby enhancing the overall trustworthiness of the study.

Reliability is a crucial component of research design, ensuring the consistency and trustworthiness of findings. While internal reliability refers to the consistency of measurements within a study, external reliability focuses on the generalizability of results to different contexts or populations. Saunders et al. (2019) highlight the importance of addressing both aspects in research design. Internal reliability is achieved through rigorous instrument development and validation, such as using established scales or conducting pilot testing. External reliability, on the other hand, depends on the appropriateness of data collection methods and the robustness of analytical techniques. In this research design, the author has carefully considered these factors to enhance the reliability of the study. For example, the study employed multiple case studies with semi-structured interviews and utilized transcription software known for their reliability and validity in this field of research.

4 Findings

This chapter is designed to present the findings of the thesis, expected to direct the central research question: "*What is the early internationalization of space firms while providing services for ensuring sustainable development goals?*". To facilitate a comprehensive understanding of this principal question, the thesis is structured around three sub-questions. Representing from the empirical findings of seven case firms, the author has identified and developed three broads' areas based on the sub research questions. The study finds that space firms tend to internationalize from their inception due to the industry's complex ecosystem and the limitations of domestic markets, with most firms forming international partnerships from the start. Networking is critical for success, while political influences, infrastructure challenges, technological challenges, and securing skilled labor remain significant barriers. Firms leverage technological advancements and strategic collaborations to gain a competitive edge. Additionally, space firms play a critical role in achieving SDGs by utilizing satellite data for environmental monitoring, disaster management, and climate change mitigation, highlighting their contribution to global sustainability efforts.

4.1 Early internationalization of space firms

To investigate the internationalization of space firms, which are highly technology-oriented, the first research sub-question investigated their global expansion strategies. To address this inquiry, interviews were conducted with companies that had at least one international client. At the beginning of each interview, participants were asked about their foreign operations, and all respondents confirmed having international clients, either as suppliers, customers, or partners. Empirical data reveals that all case firms, except C2, have adopted an internationalization strategy from their inception. Case firm C2, however, initially focused on the domestic market. Recognizing the limitations of domestic operations, the firm sought international partnerships through existing and new networks. Networking, the case firm C2 emphasized, is crucial for expansion but requires alignment in business orientations and considerations of differing national priorities. In the global market, firms must navigate international operations that align with both their own and their partner countries' objectives. Market maturity is another factor to consider, as exemplified by C7's assessment of South America as an immature market despite significant demand. All case firms expressed the importance of having international partners. Although they have different ways of getting collaboration with one another, international partners are a must here in the case of space firms. For clarity, the companies were labeled C1, C2, C3, C4, C5, C6, and C7 (see **Table 2**).

> *"Internationalization is essential in the space industry because satellites are not a standard product, like a computer, that can be sold to a wide range of consumers. We need to contact with the international clients from the very beginning of our journey" [……] (C1).*

> *"Working internationally is the one and only motivation. When we began, we wanted to work at an international level, therefore we are international from the early stage of our starting". (C3)*

> *"We had to have an international footprint in every of our products or solutions as we have international customers from the beginning." (C5)*

The interviewees unanimously agreed on the critical importance of internationalization in the space industry. They emphasized that a global approach is essential from the outset, given the limitations of individual entities and the need for international collaboration to meet global service demands. All seven participants from five different countries confirmed their involvement in collaborative partnerships with foreign entities. As Kotler et al. (2005) point out, a comprehensive market analysis requires a thorough understanding of a firm's internal capabilities and strategic objectives. Neglecting these factors can lead to suboptimal market assessments. To gain insights into their internal strategies and reasons for internationalization, the interviewees were asked to share their perspectives.

The internationalization of space firms is driven by the need to operate globally from the inception due to the highly specialized and niche nature of their services. Unlike traditional industries, space firms often find limited opportunities in their domestic markets, pushing them to expand internationally early on. As one participant noted*, "Our operations have been international from day one... we basically don't have any [domestic] customers. European Space Agency has been our first international customer*". (C7). This global focus is further necessitated by the high level of technological expertise and infrastructure required, which are often beyond the capacity of a single country. The reliance on international partnerships, particularly for resources like satellite ground stations and AI-driven data processing, is critical for operational success. As explained, *"When we have 100 satellites... we will use a ground station network run by third-party providers around the world"*(C5). Furthermore, geopolitical factors and political influences also play a crucial role, particularly in highly regulated markets such as defense. Companies must navigate these complexities carefully, as *"Geopolitically, the defense sector is with highly increased budgets, giving us a possibility"*(C7). While other regions may impose restrictions based on political or defense-related sensitivities. Thus, early internationalization in the space sector is not only a strategic choice but a necessity driven by technology, market limitations, and geopolitical factors.

Trust and communication emerged as key factors in successful international business relationships. All interviewees stressed the importance of networking and relied heavily on their personal networks. The selection of suppliers as strategic partners involved a rigorous evaluation process. While international suppliers offered a range of price points, case firms prioritized timely delivery and cost-effectiveness. By identifying reliable suppliers capable of meeting these criteria, they established partnerships or appointed them as agents.

> *"So, we require the appropriate international relationship when it comes to the supply. At the end of the day, we're going to the ones that have heritage, the ones that are more reliable, the ones whose price points also fit our budgets. So that's the other part" (C1).*

Other case firms highlighted the critical importance of having international customers, primarily due to the nature of the space industry and the limitations imposed by small domestic markets. Space firms operate within a complex ecosystem, where many interconnected businesses, not directly related to space or satellite services, play a significant role. Three of the case firms, based in Finland, underscored the constraints of their domestic market and emphasized their reliance on customers from around the world. As noted by Zekiri and Angelova (2000), the era of globalization has both encouraged and necessitated the adoption of internationalization strategies by businesses of all sizes. To gain deeper insights into these firms' approaches, the case firms were asked to outline their internal strategies for pursuing international expansion. All seven case firms confirmed that they are utilizing the network approach for the resources they need and that are not available to their company. Here are some quotations from the interviews,

> *"We are reaching out directly to customers regardless of where they are. We are using Business Finland's delegation trips to make new connections as well and to go meet companies around these countries" (C7).*

> *"We are seeking these large companies and governmental bodies that actually want to co-develop the first products with us... we learn together with the customer on the information content."(C7).*

> *"We need to maintain high-level collaboration on the PR marketing side. The European Space Agency is of course an important partner for us as a funder and so on. We try to keep a good relationship with them" (C5)*

4.2 Challenges and opportunities of space firms

The second sub question was "*What are the challenges and opportunities for space firms while entering the international market?*" To address this question, the questionnaire included a dedicated section where interviewees were asked to discuss the challenges and opportunities they encountered during the internationalization of their business. The case firms explained that they had to suffer from initial contact and investment. Space industry is complex to understand and difficult to establish alone. The individual firm needs to collaborate with the other firms in the eco system. In the interview guideline we kept questions about what kind of challenges they are facing while internationalization, what are the main challenges, what kind of resources they needed? Surprisingly all the case firms posit similar types of challenges they have faced. Infrastructure plays a significant role in the international expansion of space firms, particularly in managing satellite constellations and ground station networks. Countries with limited infrastructure face barriers in adopting advanced space services, which affects firms' ability to scale internationally. One interview has mentioned about the problem the firm is facing regarding infrastructure is,

> *"If we have a client who wants to acquire a satellite and then say it's a third world country, they don't have infrastructure they don't have anything so the kind of business that we're doing with them needs to be dialed back" (C6)*

Developing venture capital and securing funding is a pivotal challenge in the growth and internationalization of space firms. The ability to access investment resources at key stages of development impacts the firm's ability to advance technology and expand services. Geopolitical factors and political stability significantly influence international partnerships and market entry for space firms. Political regulations and restrictions, particularly in sectors like defense, often dictate where and how companies can operate, especially in regions like the U.S. and countries under sensitive political conditions. Political influence and the power dynamics within a country significantly impact the establishment of partnerships in the space sector. Case firm C6 has indicated its engagement in space, highlighting its initial attempts to collaborate with Effective Space Solutions, an Israeli company specializing in satellite servicing. When C6 initiated discussions in 2015, Effective Space Solutions was striving to develop its capabilities for refueling satellites via its servicing dock in geostationary orbit (GEO). Although the company successfully built the technical capacity to dock, refuel, and maneuver satellites, it faced challenges in gaining traction in the market, primarily due to its limited presence, which consisted of a small office in the United Kingdom alongside its operations in Israel.

> *"Political decisions have led us to cancel deals, such as ones with local authorities abroad" (C2).*

> *“It depends on who your client is. If we are dealing with a political client or it's a national, it's a government for example that's a decision that's not going to be made overnight because there's a lot of approval that needs to be taking place” (C1).*

Beginning in 2019, Case firm C6 resumed discussions with Effective Space Solutions, which expressed a need for assistance in expanding its operational reach. However, the protracted negotiations towards forming a partnership were complicated by lengthy deliberations influenced by the political landscape, including the power relations, regulations, and restrictions associated with conducting business across national borders. This scenario underscores the critical role that geopolitical factors play in shaping collaborative efforts within the international space industry.

> *“That initial conversations in the summer of 2019 turned into some due diligence and an acquisition in 2020” (C6).*

> *“Geopolitical influences are important, and we could just use the example of Russia if a Russian millionaire can come to our company and say I need 10 satellites, but the satellite business is very politically influenced……. we cannot go the deal as our other supplier are from other country” (C 1).*

Case firm C2 mentioned that due to political relationship with other countries also made them bound to cancel their deal. Case firm C1 highlighted the influence of political factors on international partnerships. Countries often seek partners with similar political stability, fostering a sense of comfort and security.

> *“There’s a lot of approval that needs to be taking place. Satellite sales cycles are something that takes time because there's a lot of bureaucracy involved because of the kind of entities we're dealing with” (C2).*

The desire for independence can lead nations to invest in their own satellites for communication, creating opportunities for firms like C1. C1 identified numerous customers seeking to procure satellites for independent communication. Government budgets and infrastructure capabilities often constrain these endeavors. While nations may desire satellite solutions, underdeveloped infrastructure can hinder their ability to acquire them. Therefore, case firms emphasize the critical role of infrastructure in successful international expansion.

> *"For an example Africa as a continent is more behind than most continents when it comes to satellites technology communication" (C7)*

Case firm C5 emphasized the critical role of technological advancements in maintaining a competitive edge within the international market. They highlighted their unique position as the sole provider capable of offering satellites, satellite constellations, and satellite capacity to a diverse customer base. Their robust infrastructure enables the provision of real-time data essential for natural disaster forecasting. Moreover, C5 offers customers simulations of potential satellite configurations, allowing them to visualize and select the most appropriate options for their specific needs. By seamlessly managing satellite launches, data collection, image processing, and delivery, C5 demonstrates the strategic importance of infrastructure in attracting and serving international customers.

> *"And so, they're clearly the market leader there, but we see that there's an obvious need for additional technological capability and infrastructure. And so that's what we think we can provide. We also have a bit different technology" (C5).*

A persistent challenge faced by firms within the industry is the acquisition of qualified and skilled employees. Projects involving students, young entrepreneurs, and startups often necessitate distinct approaches to collaboration. In addition to environmental and geopolitical factors, managerial challenges also contribute to the complexity of the operating environment. Case firms C1, C3, and C7 highlighted the difficulties they encountered in securing skilled manpower, while case firm C2 emphasized its global recruitment strategy aimed at fostering industry competitiveness. The availability of skilled personnel, coupled with adequate investment and infrastructure, can undoubtedly provide a significant competitive advantage. As previously noted, the primary challenges confronting the firms involved centered on investment, infrastructure, and political influences. Moreover, technical bottlenecks emerged as a significant factor influencing the potential for future partnerships.

Case firm C5 leverages Synthetic Aperture Radar (SAR) imagery within a data fusion model. This comprehensive approach incorporates various data layers, including topographic data, infrastructure information, and terrain characteristics. By overlaying SAR images, C5 can accurately identify water bodies in specific regions. In conjunction with existing depth data, this information enables the prediction of future water levels. C5's in-house meteorologists monitor weather patterns to ensure timely satellite image adjustments, mitigating the risks associated with rapidly changing weather conditions. This unique capability positions C5 as the sole satellite provider capable of delivering real-time, accurate data to clients such as insurance companies and state protection agencies. These capabilities gave them opportunities to become competitive. A company possessing advanced technological capabilities can establish a significant competitive advantage in today's dynamic business landscape. These capabilities can enable the development of innovative products and services, enhance operational efficiency, and foster strategic partnerships. Therefore, such companies are well-positioned to capitalize on emerging market opportunities, mitigate risks, and achieve long-term sustainable growth.

4.3 Satellite data in sustainable development goals

The third objective of this study was to examine the alignment of the case firms with SDGs. The data obtained from satellite observations plays an important role in facilitating the achievement of these goals. By leveraging advanced satellite technologies, firms can gather detailed information that supports environmental monitoring, resource management, and disaster response, thereby contributing to sustainable development initiatives. Governments of all countries nowadays consider space industries importance in education, disaster management, national security, and scientific research. For example, The German Aerospace Center (DLR) has a dedicated wing named "Center for Satellite-based Crisis Information" (ZKI), which smooths different kinds of disastrous moments with the help of its satellite technologies countrywide and worldwide, charitable relief efforts, and public safety concerns (Voigt et. al., 2007). In addition, satellite data can be useful for tracking deforestation, rising sea levels, changes in ice cover, planning smart cities, and monitoring global temperature.

> *"We are a company who works in the Arctic areas, ice cover and ice management, ice cover development, ice management support, and so on" (C7).*

There are over three thousand satellites currently orbiting Earth, serving diverse purposes such as Earth observation, climate monitoring, and weather forecasting (Lavender, 2017). Remote sensing (RS) technology, utilizing satellite sensors (SS), measures marine, terrestrial, and specialized modules through electromagnetic energy (EME) without direct physical interaction (Ma et al., 2015). Among the case companies studied, five were directly engaged in environmental sustainability initiatives, involved in satellite development and software-related services and two provided space education. The environmental sustainability goals of these companies primarily centered on heatwave monitoring, smart city planning, and vegetation monitoring.

> *"An earth observation constellation that we delivered of three satellites I would say that it could help in aiding in solution like in coming up with solutions to emerging environmental crisis for example you know the earth observation applications quick time to response natural disaster management" (C1).*

> *"The first thing if you want to use the satellite images, we have to monitor fishing borders you can do that because you'll have a view on how many boats are in your port if your border is being taken over or affected or things" (C1).*

> *"There is environmental monitoring and coal management and with the help of hypersphere we can separate species to ensure biodiversity" (C5).*

Space firms play a vital role in advancing SDGs through their innovative services aimed at monitoring and optimizing Earth's resources. One interview documented, *"We offer services that are meant to monitor and optimize Earth's resources and monitor that they* *are not misused"* highlighting their commitment to addressing critical global challenges such as climate change and food security (C7). By providing actionable insights derived from satellite data, these firms assist various sectors, including agriculture, in implementing sustainable practices. For instance, they evaluate whether farmers are utilizing regenerative farming methods that sequester CO2, as one respondent stated: *"we are using technology that is regenerative farming methods that would be sequestering CO2 from the sky"* (C3). Additionally, the capacity to deliver early warnings regarding environmental hazards—such as wildfires and methane leaks—demonstrates how these firms contribute to both ecological preservation and the overall safety of communities. Ultimately, as noted,

> *"Our customers are based on the information that we provide. Therefore, we contribute in quite a few of the sustainability goals," emphasizing the intersection of their operational objectives with the global agenda for sustainable development" (C7).*

> *"We have our own meteorologists who monitor the weather so that the probability of a future" (C7).*

> *"Using satellite data to monitor the state of the different roads where there were a lot of roads that had degradation instead of sending the team to do that" (C1, C4).*

> *"We have a product or services but within Thailand, you know, in the big country, in the big cities, with climate change, you could have very high temperature in the town. So, we are able with our partner to monitor this phenomenon and to help the client, the city" (C3).*

5 Discussion

This research delves into the early internationalization of space firms and their essential role in advancing SDGs. This thesis synthesizes the theoretical framework with the empirical findings to provide a comprehensive analysis of the data. The primary aim of this study was to explore the early internationalization of space firms in the context of their contributions to achieving SDGs. The research question is meticulously divided into three sub-research questions, enabling a systematic exploration of the multifaceted dimensions of early internationalization and its implications for sustainable development within the space sector. This approach allows for a systematic examination of the various dimensions of early internationalization and its implications for sustainable development within the space industry.

Sub-question 1: *What is the early internationalization of space firms as highly technology-oriented firms?*

This thesis focuses on the early internationalization of space firms with the help of the existing international business literature. The theoretical foundation of the thesis is the born global concept of internationalization, network model, and the resource dependency theory. According to Cavusgil and Knight (2015), born global are comprised of relatively trivial, new companies, and their profits come from internationally mainly, and they have distinctive tangible and intangible products and services. We know from previous literature that born global appears to have unique features and although they are new and small in terms of proprietorship and administration and their business runs through inception (McKinsey & Co., 1993), and their profit may generate more in the international market relatively than the internal market area (Korot & Tovstiga, 1999). According to Rialp et al. (2005) numerous studies have assured that born global are mainly related to highly technological areas and/or businesses. This thesis contributes to the existing body of knowledge by exploring the flourishing field of the space industry, where space firms are recognized for their advanced technological capabilities. By observing the dynamics of this sector, the study improves the understanding of how these firms leverage their technological expertise to address complex challenges and capitalize on opportunities within the global market.

All case firms confirmed that they immediately sought international partnerships due to the limited domestic market demand and size. Adopting a global perspective, many firms initiated these partnerships within one or two years of their establishment, aligning with the findings of McKinsey & Co. (1993). Additionally, they anticipated that over 20% of their future business would be generated from global markets. The analysis revealed that the case firms consistently pursued international collaborations within the first two years of operation, thereby validating the insights presented by McKinsey & Co. (1993).

Following in-depth interviews with key stakeholders, the case firms exhibit a distinct reliance on the resources possessed by their partners. This interdependence exhibits in a tendency to seek collaboration with entities that can provide the missing pieces of their business puzzle. As noted by Davidian (2021), the space industry is characterized by its inherent complexity and uncertainty. To mitigate these risks, case firms strategically leverage interorganizational networks, both internal and external, that possess the power to enhance efficiency. This aligns with the theoretical framework of resource dependency theory proposed by Pfeffer (1987, p. 27), who emphasizes the role of power and technology in shaping interorganizational relationships. While the concept of efficiency may be multifaceted, the convergence of power and technological advancements has undeniably strengthened such networks. Importantly, this interdependence is not solely driven by factors like company size, management style, or class but rather by a shared pursuit of profitability, mutual interests, and asset growth (Pfeffer, 1987, p. 30).

It can also be said after an analysis of the interview data that the case firms rely heavily on their existing networks, that is in line with Johanson and Mattsson (1988). This thesis introduces trust as a pivotal factor in the application of Johanson and Mattsson's (1988) network theory. By incorporating trust into the conceptual framework (see fig. 3), the research aims to provide a more thoughtful and broad understanding of the changing aspects within business networks, particularly in contexts where interpersonal relationships and reputation play significant roles. These networks are strategically formed based on the availability of resources within partner organizations as mentioned above. Operating in a dynamic and complex space environment, characterized by cutting-edge technology and unpredictable space weather, these firms must demonstrate agility in response to changing circumstances. As a business they require to establish a significance with importance, profitability, and sustainability not to compete but to complement for the greater benefits of the society.

Trust as a critical factor for success in this context is the establishment of trustworthy partnerships that can provide essential support during emergencies. The interviewees emphasized the imperative of internationalization for space firms due to the need to access global markets for their products and services. The European market is many times larger than the USA and other countries but unlike the USA they do not have enough buyers, therefore they need international customers to buy their products or space solutions. To Consequently, it can be concluded that space companies habitually adopt a born-global approach, leveraging network models in alignment with resource-dependence theory.

Sub-question 2: *What are the challenges and opportunities for space firms while entering the international market?*

Entering the space industry as an individual firm presents significant challenges due to its unique nature. This research aims to identify the primary obstacles and potential opportunities for international market entry in this sector. Through in-depth interviews, four main challenges were identified: investment, infrastructure, political influence, and technological hurdles. While advancements in launch technology, production processes, and miniaturization have facilitated the growth of space firms (Garzaniti et al., 2021), inflationary pressures and the relatively high costs of space operations can hinder investment decisions (Foust, 2023). The rapid growth of the space industry has necessitated the development of more contemporary governmental regulations (Patel & Koller, 2022). Governments, increasingly cognizant of the space sector's significance, are implementing measures such as fines, as exemplified by the Federal Communications Commission's (FCC) penalties for non-compliant satellite operations in the United States (FCC, 2023). Furthermore, the proliferation of space debris is likely to necessitate the imposition of stringent regulations governing the launch of satellites into orbit. Compliance with regulatory frameworks can lead to increased costs and may present challenges for businesses operating internationally that ultimately increase investment. As highlighted by the case firms, obtaining government approvals and navigating bureaucratic processes is a common challenge in the space industry. The complex nature of space technology and its potential national security implications often necessitate stringent government oversight. Establishing partnerships can be challenging due to varying national interests and budgetary constraints. Furthermore, the COVID-19 pandemic has negatively impacted many firms, hindering their recovery from financial losses and collecting funds for recovery.

Political restrictions imposed by certain countries can pose significant obstacles for space firms, even those operating in major markets. The pursuit of national interests and economic benefits can lead to policies that limit foreign investment or restrict the transfer of technology. This politicization of the space industry underscores the importance of understanding and adapting to the geopolitical landscape. The interviews with case firms provide concrete examples of the political challenges they face. For instance, the comments from case firm C2 highlights the time-consuming nature of obtaining government approvals, while case firm C7 emphasizes the politicization of the space industry in countries like Germany, France, and Italy. These experiences emphasize the need for space firms to be aware of and navigate the political complexities of their target markets.

The pursuit of national independence and the desire for enhanced communication capabilities have led to a growing demand for satellites among nations worldwide. However, the realization of these aspirations is often hindered by infrastructure limitations. Infrastructure plays a pivotal role in enabling nations to acquire and utilize satellites effectively. Governments often allocate budgets to space programs, but the lack of adequate infrastructure can impede their ability to capitalize on these investments. As highlighted by case firm C1, many potential customers express a desire for satellites but face constraints due to underdeveloped infrastructure. The African continent serves as a prime example of the infrastructure challenges hindering satellite adoption. As noted by C7, Africa lags other continents in satellite technology and communication. This disparity highlights the need for significant infrastructure development to facilitate the integration of satellite-based solutions.

Case firm C5 emphasizes that technological advancements are essential for maintaining a competitive edge in the space industry. Their ability to offer a comprehensive suite of satellite products and services, including satellite constellations and capacity, is underpinned by their robust infrastructure. This infrastructure enables them to provide real-time data, simulations, and end-to-end solutions, attracting international customers. Even after successful satellite deployment, numerous challenges persist in maintaining orbital operations. External factors such as solar storms, intentional attacks, or collisions can disrupt the entire system. Hence comes the technological problem. While the space industry has witnessed remarkable technological advancements, it continues to grapple with a range of challenges. One significant hurdle lies in the development of more efficient and cost-effective propulsion systems. Current propulsion technologies often limit the payload capacity and mission duration of spacecraft (Turner et al., 2009). Additionally, the design and construction of reliable and long-lasting spacecraft components remains a complex engineering challenge, particularly in the face of extreme environmental conditions encountered in space. Moreover, advancements in miniaturization and power management are crucial for enabling smaller, more affordable satellites, but these areas present ongoing technical challenges.

Owed to the new space, there are many opportunities that are going to open new doors for the space firms like precision navigation/agriculture, tourism, surveillance of Earth environments and many more (Sairajan et al., 2016). This thesis put forward the work of Sairajan et al.'s (2016) in case of new opportunities as all the case firms are doing the Earth environment monitoring, wild vegetation, climate changes monitoring, and eductaion nowadays. Lal et al. (2018) mentioned that there should be regulatory framework that can be ensured for doing business in this space industry. This study also wants to sheer light on the issue that the challenge lies in reconciling the imperative to foster technological innovation and development with the need for a regulatory framework that safeguards stakeholder interests, national sovereignty, and current and future human rights in line with (Aglietti, 2020). This research has introduced several novel challenges; however, it also highlights persistent challenges that require attention. Among these are the development of multifunctional space structures (Sairajan et al., 2016) and advancements in technologies such as quantum inter-satellite communication (Liao et al., 2017), which require future study and decision.

Analysis of empirical data gathered through interviews reveals that the primary challenges faced by space firms are securing funding or investments, coupled with technological assistance political influence, and infrastructure limitations. Interviewees emphasized the importance of aligning with partners possessing comparable technological infrastructure, often seeking to collaborate with countries possessing advanced technological capabilities that they themselves may lack.

Sub-question 3: *What is the end-user value-added services in the context of sustainable development goals that can be ensured by the space data?*

Numerous countries employ satellite-derived data to advance various objectives, primarily focusing on sustainable development goals, particularly education and environmental sustainability. Space based technologies can have a positive impact on delivering the sustainable development goals set by the United Nations that can also improve the life of the people living both in developing and developed countries (Manotti et al., 2023). These goals are broadly understood as the harmonious integration of social, economic, and environmental dimensions. Recognizing the significance of the three-pillar concept, determined efforts are necessary to achieve sustainable development (Moldan et al., 2012). Technological advancements have empowered us to monitor environmental sustainability through space-based data collection, primarily utilizing remote sensing technology from Low Earth Orbit (LEO). While space technologies were once primarily used for military purposes, nowadays they have a wide range of non-military applications, including communication, weather forecasting, navigation, and remote sensing of Earth's resources (Paikowsky, 2017).

Remote sensing is a technique that leverages the reflection of physical properties and surrounding substances to gather information. This technology involves employing space-based monitoring systems, satellite imagery, and other remote sensing tools to track changes in vegetation, land use, and climate-related factors over extended periods (Wang et al., 2010; Kerr & Ostrovsky, 2003; Newton et al., 2009). Additionally, remote sensing technologies are applied to land use (Turner, 2008; Verburg et al., 2006), air quality monitoring (Martin, 2008; Gupta et al., 2006), ecological disturbance (Laegdsgaard, 2006; Banks et al., 2013), and disaster risk management (Kaku, 2019; Joyce et al., 2009). Satellite data is invaluable in environmental education, particularly when addressing issues related to climate change, biodiversity, and sustainable resource management. Case firm C2, with the help of satellite-based remote sensing, helps students to observe and analyze changes in ecosystems, glacier movements, deforestation patterns, and urban sprawl that is SGD 4 (quality education). By doing so, the students can gain tangible understanding of global environmental issues, enhancing their awareness of SDGs such as SDG 13 (Climate Action) and SDG 15 (Life on Land). Although the use of satellite data in education offers numerous benefits, several challenges remain. The technical complexity of interpreting satellite data may require specialized training for both teachers and students. Additionally, access to the necessary technological infrastructure, including GIS software and high-speed internet, can be limited in some educational settings, particularly in developing countries. Overcoming these barriers will require investment in teacher training, curriculum development, and infrastructure to ensure equitable access to satellite data across educational institutions.

Monitoring environmental sustainability goals is crucial, and Earth Observation technologies like remote sensing provide invaluable insights into changes on our planet. Remote sensing data is particularly useful for longitudinal and time-based analysis (Estoque, 2020). The successful launch of the GEO in 2016, recognizing the benefits of Earth Observation data for climate change and environmental monitoring, highlights its importance (Anderson et al., 2017). The interview data consistently indicates that most case firms utilize Earth Observation technologies and remote sensing to deliver services such as disaster monitoring, heatwave analysis, smart city planning, and educational initiatives. The case firms engaged in satellite technology plays a pivotal role in fostering innovations that can directly address environmental sustainability. For instance, satellite-based technologies offer crucial tools for monitoring climate change and resource use, aligning closely with SDG 13 (Climate Action). The integration of remote sensing and Earth observation data allows firms to develop sustainable solutions for land and water management, disaster response, and biodiversity monitoring, thereby addressing the targets of SDG 15 (Life on Land).

The internationalization of the space business sector has significantly contributed to advancements in poverty reduction, environmental preservation, and food security. Beyond these direct benefits, remote sensing and Earth Observation technologies play a vital role in enhancing communication, rescue services in case of natural disaster (McGarry et al., 2023), and navigation capabilities. The case firms emphasize the essential role of these technologies in delivering value to end users. Numerous examples of end-user applications of spatial data, facilitated by various technologies, can be found globally. Given its cost-effectiveness, remote sensing technology has been extensively employed in Pakistan for land change analysis and sustainable urban planning (Bokhari et al., 2022). Case firms C1, C5, and C7 are directly involved in utilizing remote sensing technologies for monitoring environmental disasters.

Furthermore, space firms are actively engaged in advancing sustainable development goals through their various initiatives. All case firms highlight the potential to offer a wider range of value-added services to society if the costs associated with space technology, particularly launch services, were to decrease. The planet's environment is burdened by excessive carbon emissions, resulting in a multitude of adverse effects, including climate change, heatwaves, wildfires, droughts, rising sea levels, and other natural disasters. Case firms C1, C3, C4, and C5 are directly involved in addressing environmental sustainability challenges. These firms provide heat monitoring services, image production for monitoring Earth's changes, wild vegetation monitoring, space education, and navigation. Therefore, it is evident that satellite data possesses significant value for end users from various perspectives that was not be possible without the invention of spaced -based infrastructure (McElroy, 2022).

Based on the above discussion, the conceptual framework (see **fig. 3**) has been formulated to contribute to international business literature.

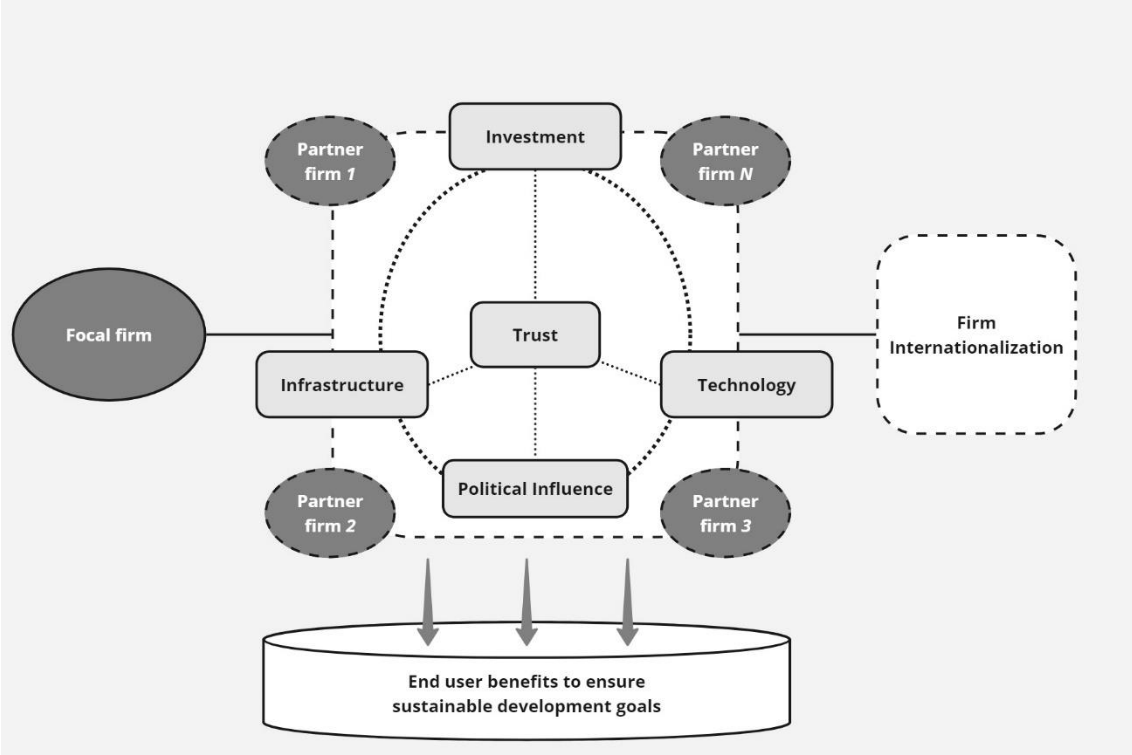

Figure 3. Conceptual framework (Self creation).

To facilitate the reader's comprehension, the components, theoretical concepts, and examples derived from the case firms are presented in the following tabular format.

Table 4 The explanation of the conceptual framework (adapted from Ojala et al., 2018).

Componenets	Theoretical Concepts	Activities	Empirical Examples	Explanation in the Conceptual Framework
Technology	-Resource Dependency -Active Networking -Technical bottlenecks	- Firm connects in networking to obtain advanced technology. - Strategic partnerships are established for technological access.	Space firms collaborate with tech firms or governments to access space technology, such as satellite systems or launch vehicles.	- The **focal firm** partners with **Partner Firm 3** (Technology) to access advanced technology, which is critical for internationalization. - **Trust** guides this relationship.

Infrastructure	- Resource Dependency - Active Networking	-Firm requires access to physical infrastructure (e.g., spaceports, ground stations). - Partners provide infrastructure support	Space firms partner with countries that provide space infrastructure like launch facilities or satellite ground stations.	- The **focal firm** relies on **Partner Firm 2** (Infrastructure) to access physical infrastructure, which is necessary for scaling operations. **Trust** fosters collaboration.
Investment	-Resource Dependency. - Active Networking. - Resource Exchange.	-Firm seeks investment capital through networking with potential investors. - Partners contribute financial resources for expansion.	Space firms secure funding from venture capital, private equity, or government grants to finance R&D and global expansion efforts	**Partner Firm 1** provides **investment** to the **focal firm**, which depends on external funding for R&D and scaling. **Trust** is key to maintaining long-term financial relationships.
Political Influence	- Resource Dependency. - Active Networking.	-Firm navigates regulatory challenges and gains political influence through partnerships. - Political networking supports internationalization.	Space firms work with regulatory bodies or foreign governments to obtain licenses and approvals for international operations.	The **focal firm** collaborates with **Partner Firms that can be indefinite (N)** to gain **political influence** and navigate international regulations. **Trust** plays a crucial role in overcoming political barriers.

6 Conclusion and future directions

This research delves into the early internationalization of space firms operating on a global scale. Through in-depth interviews with key stakeholders, the study offers valuable insights into the early internationalization, challenges, opportunities, and strategic considerations that characterize this sector. The findings reveal a complex and multifaceted manner of early internationalization for space firms. While the industry presents unique challenges, including the need for specialized managerial and technical skills, it also offers significant opportunities for growth and innovation. A key theme that emerged from the interviews is the importance of strategic partnerships. Given the resource-intensive nature of space activities, firms often rely on external collaborations to access complementary capabilities and expand their global reach.

The study adopts a network perspective to analyze internationalization. This approach emphasizes the importance of relationships and interdependencies between firms. By carefully considering the resources and capabilities of potential partners, firms can identify strategic alliances that enhance their competitive position. The findings highlight the unique challenges and opportunities faced by firms in this sector and emphasize the importance of strategic partnerships and network-based approaches. In conclusion, this research contributes to the existing literature on international business by providing a detailed examination of the early internationalization of space firms.

6.1 Theoretical contributions

The rapid internationalization of born global firms in the space industry presents unique challenges due to their high dependence on external resources and the complexity of entering the global networks. This paper extends the understanding of internationalization by integrating Resource Dependency Theory and Network Theory to address how space firms overcome infrastructure, technology, political influence, and investment challenges during the early internationalization.

RDT emphasizes that firms are dependent on external resources to survive and grow, especially when these resources are scarce or controlled by others (Pfeffer & Salancik, 1987, 2015). Born global space firms face significant resource constraints, including the need for advanced technology, highly specialized infrastructure (such as launch sites and satellite ground stations), and substantial investment for R&D and scaling operations. Additionally, the political influence needed to control regulatory approvals and international agreements is significant for these firms. As a result, space firms are particularly vulnerable to resource dependencies because these resources are controlled by a limited number of external factors, such as government agencies, large private firms, or international consortia. This study extends RDT by demonstrating how space firms strategically manage their dependencies on key external actors by forming alliances with partner firms. These alliances enable the focal firm to mitigate the risks associated with resource scarcity and political barriers, thereby facilitating internationalization. The role of investment, political influence, technology, and infrastructure are important, as these resources are not easily substitutable, making partnerships essential for survival and growth (Hillman et al., 2009).

Network Theory suggests that firms use their relationships with external actors to access the resources they need for growth and internationalization (Johanson & Mattsson, 1988). For space firms, the network includes partnerships with other firms that can provide technological expertise, investment capital, and access to infrastructure. In this context, the trust developed between the focal firm and its partners (See **fig. 3**) is important for the successful exchange of these resources.

This thesis's key theoretical contribution lies in integrating RDT and Network Theory to explain how space firms internationalize under conditions of extreme resource dependency and complex global networks. While RDT explains why space firms must depend on external actors for critical resources (such as technology, infrastructure, and political influence), network theory explains how these dependencies are managed through trust-based relationships within a global network of partner firms. The integration of these two theories is particularly valuable for born global firms in high-tech industries like space, where early internationalization is not just a matter of market entry but also of gaining access to critical, often non-substitutable resources controlled by powerful external actors. By demonstrating how firms build trust-based networks to access these resources, this study adds to the literature on both born global firms and the early internationalization of high-tech firms (Oviatt & McDougall, 1994; Coviello, 2006). Moreover, it provides a distinct understanding of how firms can strategically utilize both resource dependencies and network relationships to achieve sustainable development goals.

6.2 Managerial implications

The findings of this research offer valuable insights for managers seeking to minimize the complexities of early internationalization in the space industry. One key challenge identified is the difficulty of finding suitable partners. While existing relationships often provide a starting point, the search for new partners requires careful consideration of resource availability and technological compatibility. The study emphasizes the importance of infrastructure and technology as prerequisites for successful internationalization. Firms operating in the space sector must possess the necessary capabilities to engage in upstream and downstream activities. The development of such infrastructure can be a significant barrier to entry, requiring substantial investments from both the government and private sectors.

By understanding the risks associated with early internationalization, managers can make more informed decisions and develop strategies to mitigate potential challenges. The insights provided in this research can assist firms in identifying potential pitfalls, assessing the competitive landscape, and building effective partnerships.

6.3 Future directions for research

The findings of this research highlight the growing significance of space companies in addressing global sustainable development challenges. While the industry has demonstrated its potential, further expansion and engagement at the international level are essential. Future research could explore the specific barriers that space companies encounter when entering foreign markets. Additionally, comparative analyses of economic insights from case companies in different countries could provide valuable perspectives on regional variations and industry trends. By examining the challenges and opportunities faced by space firms, researchers can identify strategies for enhancing their international competitiveness and contribution to sustainable development goals. The author suggests that future research can further on the following topics in line with (Punnala et al., 2024).

- What could be the appropriate strategy for entering into a new market and collaborating with the partner?
- What is the business model the space industry is using?
- What specific environmental sustainability related solutions do space firms have and what others can be generated?
- How different country differ in the regulation while go for a partnership?
- How the space technology can be helpful in reducing space debris?

6.4 Limitations of the thesis

Given the highly specialized nature of the space industry, traditional research methodologies may not fully capture the distinctions and complexities of the sector. This study employed a multiple case study approach, supplemented by secondary data analysis. While this approach provided in-depth insights, it also has certain limitations. The case study design, despite its strengths, may lack the statistical rigor of quantitative research methods. To address this, future studies could consider incorporating surveys or other quantitative data collection techniques. Additionally, the relatively small sample size of seven interviews limits the generalizability of the findings. The potential for information asymmetry between interviewers and interviewees, particularly in a highly competitive industry like space, is another consideration. Interviewees may be reluctant to disclose sensitive information due to concerns about competitive advantage. To mitigate this, researchers can employ techniques such as anonymity and confidentiality assurances to encourage open and honest communication. Furthermore, the interpretation of interview questions and the provision of responses can be influenced by factors such as cultural differences and individual perspectives.

Ethical considerations, involving ensuring confidentiality and obtaining informed consent, are paramount when conducting interviews. Failure to address these issues can undermine the validity and authenticity of the responses. Given the rapidly evolving nature of the space industry, characterized by technological advancements, regulatory changes, and new market entrants, longitudinal research is essential. Such studies would provide a more comprehensive understanding of the long-term impact of space firms on sustainable development goals. Assessing the actual impact of space firms on SDGs can be challenging due to the indirect, long-term, and often intangible nature of these contributions. Quantifying the specific effects of space-based technologies on various aspects of sustainable development requires robust methodologies and data.

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Appendices

Appendix 1. Semi-structured interview questionnaire

No.	Interview questions:
	Overview/evolution of the company
1.	Could you briefly tell us about yourself and your role at the company?
2.	Could you briefly tell us about the history/evolution of the company? [an overview] How did the company come into being? When?
3.	How did the company start developing solutions/services, and where did the ideas come from? Is it because of a market need or the company wanted to introduce something new?
	Space solutions
4.	Could you briefly tell us about the space solutions [services] that your company develops and offers around space?
5.	What are the main resources [e.g., technical] that you need to run your products in space [or ground]? How do you manage these resources? Are there any additional resources that you need?
	Internationalization
6.	Can you briefly explain the company's internationalization journey? [what does internationalization [effort] mean for your company] In what point did you get your first international partners? [Which year?] Was this firm a supplier [provider] or customer? How did that partnership come about? Which country and why?
7.	How does getting your products into markets depend on other actors (e.g., customers, government, space agency, suppliers)? How does your assets are dependent on digital/physical assets of other actors for commercialization or vice versa?
8.	Briefly, which upstream (e.g., prior to asset handover in space) or downstream (e.g., after handover to operator) activities are international (or global)? [you may have a different view]
9.	How are the company's assets deployed (e.g., ground, space) and how do they interact? [also interact with partners' assets]
10.	How are you now developing and managing [new/existing] international partnerships? [international expansion through networking and finding new partners for collaboration]
11.	What are the challenges [may also create opportunities] that your company faces to organize and commercialize the solutions? How do they impact the firm, and how do you overcome them? Some illustrative examples: a. Technical challenges b. Societal challenges c. Environmental challenges d. Strategic challenges

	e. Management challenges f. Cross-national cultural challenges g. Geopolitical challenges h. Regulatory challenges i. Other: [Example 1: How does technology play in your internationalization process? [Any specific challenges related to technology transfer or any technology bottlenecks] How does the company cooperate with partners to overcome such challenges and capitalize on opportunities? Example 2: How does geopolitics or regulations enable or hinder commercialization or internationalization?]
	Expansion strategies
12.	What were the primary motivations to internationalize? [when and why did the company decide to expand internationally]
13.	What exact internationalization strategies [e.g., exports, joint ventures, foreign subsidiaries, suppliers] have you engaged in? How?
14.	What initial markets did you target? How did the company select the target international markets? [criteria on market selection]
15.	Could you elaborate on the adopted strategic approach to establish a presence in these markets?
16.	Did your company form any partnerships or collaborations with local or international entities to support internationalization? What were the key objectives behind such partnerships or collaborations?
17.	Do you need to localize or standardize the capabilities/solutions or business model to suit the needs of international markets? If so (or not, why), what drives you to that? [e.g., local cultures, regulations, or market preferences]
18.	How would you evaluate the success of your company's internationalization? What key performance indicators (KPIs) does your company use to measure the effectiveness of its internationalization strategies?
19.	What are the company's future plans regarding international expansion of your space solutions?
	Environmental sustainability
20.	How does your company's satellite data [data-driven solutions] contribute to environmental sustainability efforts (e.g., climate action, responsible sourcing)? Please provide an example of specific applications in a particular country. How do such applications/solutions positively impact on environmental sustainability efforts?
21.	What are the main customer segments?
22.	What value-added services (e.g., data analysis tools, training programs) do you offer to end-users to help them leverage the data-driven solutions for environmental sustainability? How?
	Artificial intelligence
23.	Do you use any AI [machine learning]? If so, how does AI is organized [in what point of process do you use] in your space-related capabilities/technological solutions? [What does it do, a concrete example please]

24.	How does AI change or improve any tasks that relate to machine-machine or human-machine interactions in space [or on the ground]?
	Closing
25.	[Optional] How do you see trends in commercialization, technology, sustainability, and regulation in the near term (1-5 years) and mid-term (5-10 years)? [if any, can you specify those]
26.	Do you have any further remarks or any additional point that we may miss in the discussion?
27.	Do you want to share any other relevant documents/links for our understanding (e.g., brochures, slides, white papers, reports, product catalog, meeting notes, website, blog post, news articles)?
28.	Filling the basic info about the interviewee(s) listed above.