Assessment of Cooperation in the Space Sector

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***Abstract*—The phrase "united we stand, divided we fall" is often quoted to inspire unity and cooperation.**

The celebrated Apollo programme relied on over 20,000 different organisations to put humans on the Moon. Fifteen nations from five space agencies cooperated to build and maintain the International Space Station. The European Space Agency is another exemplar of successful cooperation at an international level.

Can we apply lessons from these and other historic achievements to the New Space era? Are there more advantages than disadvantages to cooperation, and what are the key factors that determine success? What are the barriers to entry for SMEs who try to grow alone?

Large enterprises are often reluctant to accept risk purchasing from small or startup companies held back by their size, restricted capital or limited history. Some of the benefits from cooperation include reduced costs and risks, sharing of financial and human resources, greater buying power, and improved supply chain assurance (especially for scarce components), as well as the efficiency benefits from economies of scale and market reach.

One of the main challenges competing companies face is determining whether growing the whole pie cooperatively will generate greater financial and strategic benefits than just their segment of the pie.

It is possible for firms to simultaneously exist as competitors and partners through a Coopetition framework. Analysing the strengths and weaknesses within a country or industry using Porter's Diamond model can help determine if there is a competitive advantage or disadvantage. Business clusters are one method for competing companies to work together to achieve goals that would not be possible independently. However, to achieve any measurable impact, clusters need to be more than just a passive catalogue of entities and capabilities.

Examples of successful cooperation in the space sector between emerging and well established companies include the European New Symphonie consortium, led by Unseenlabs and Euroconsult which has 22 members from 8 countries. Unio Enterprise operates with 14 companies including SES. Large conglomerates such as Airbus and Thales have grown through effective cooperation.

It is important to adopt the most appropriate collaborative model to be effective in the space sector. However, success will depend on having a clear common purpose, with well-structured and managed governance working with a true spirit of trust and employing effective communications.

Keywords— collaboration; consortium; competition; coopetition.

I. History of Space Cooperation

Although the "Old Space" era was initially conceived from an ideological conflict during the Cold War, many of the accomplishments were made possible through the cooperation of many entities.

The collective efforts of more than 20,000 different enterprises at the peak of the Apollo programme [1] contributed to the successful landing of humans on the Moon in the late 60's early 70's. A few years later, ten nations pooled their resources to create the largest multinational space cooperation entity - the European Space Agency. Former Cold War adversaries joined a 15-nation consortium to create the largest spacecraft to orbit the Earth - the International Space Station, the scope, scale, and cost of which was unlikely to have been feasible for any single nation alone.

Global and regional satellite services were pioneered through cooperative frameworks of Intergovernmental Organisations (IGO) before they became privatised. The International Telecommunications Satellite Organization (Intelsat) began services in 1964 with ownership and control from over 100 national entities, delivering global voice, data, and television services to nearly 150 countries. In 1977, 17 countries established the European Telecommunications Satellite Organization (Eutelsat) and a few years later in 1979, the International Maritime (Mobile) Satellite Organization (Inmarsat) delivered maritime and mobile communications services globally through the cooperation of its 86 member countries.

Each of these IGOs was governed and funded by traditional telecommunications operators who were competitors in the open market while being collaborators in the IGO board rooms.

Are there any lessons we can learn from these successful collaborative space endeavours or other industries? What were the key success factors that made these ambitious programmes possible and in the context of the "New Space" era, what are the opportunities for small to medium enterprises who wish to grow in a globally competitive market?

II. Cooperation Advantages

The end of the 20th and beginning of the 21st century conveniently delineates the Old and New Space eras. Estimated by McKinsey [2] to grow to $1 trillion in value by 2030, space was once considered an exotic domain reserved for only a few large economies. Now it is an industry pursued by over 90 nations [3] as an attractive contributor to many of their

economies. Developing nations, particularly in Asia and Africa, are investing in and cooperating together with their space initiatives. In 2023 the African Space Agency was established with some 20 countries having active national space programmes. The Indian Space Research Organisation (ISRO) has a long and distinguished history, having signed 230 agreements with 60 countries and five IGOs [4]. Collaboration in the form of foreign technology inputs played an important role in accelerating ISRO's growth and success [5].

As space is becoming more crowded with a proliferation of space missions (and debris), the space marketplace is similarly becoming more crowded. This growth creates opportunities as well as threats (and risks).

There are clear economies of scale advantages for any enterprise. Large organisations have greater procurement order volumes and buying power to negotiate better pricing and supply chain assurance which can help to lower production costs and reduce critical component shortages. Access to scarce or high-demand components such as semiconductors can be substantially improved through collaborative buying to help make the group's purchase order value more attractive to suppliers leading to better pricing and priority delivery.

One study of 71 manufacturers who undertook collaborative purchasing, achieved material cost reductions between 2.6% to 50%, demonstrating how cooperation can benefit businesses [6].

Being able to tap into a substantial workforce also gives an advantage to larger entities that can exploit the diversity of knowledge and skills as well as the capacity to support vital orders. Finally, larger entities have access to more capital which increases the confidence of their prospective customers, especially when bidding for competitive tenders.

Despite some space organisations establishing policies to encourage participation from startups and small to medium enterprises (SMEs), large entities are often reluctant to accept the risk of purchasing goods and services from smaller companies. When large scale integrators are faced with purchasing mission-critical or long-lead time items from either a small or large entity, the competitive advantage of the latter can influence procurement decisions.

This risk aversion by large companies who are less willing to work with startups is especially acute in Europe where there is more of a business cultural bias against SMEs compared to the USA [7].

In a highly competitive environment, one of the many challenges and barriers to cooperation is the desire to grow national market share. The fundamental question that companies of all sizes should address is: would growing the total size of the pie rather than just their segment of the pie generate greater financial and strategic benefits?

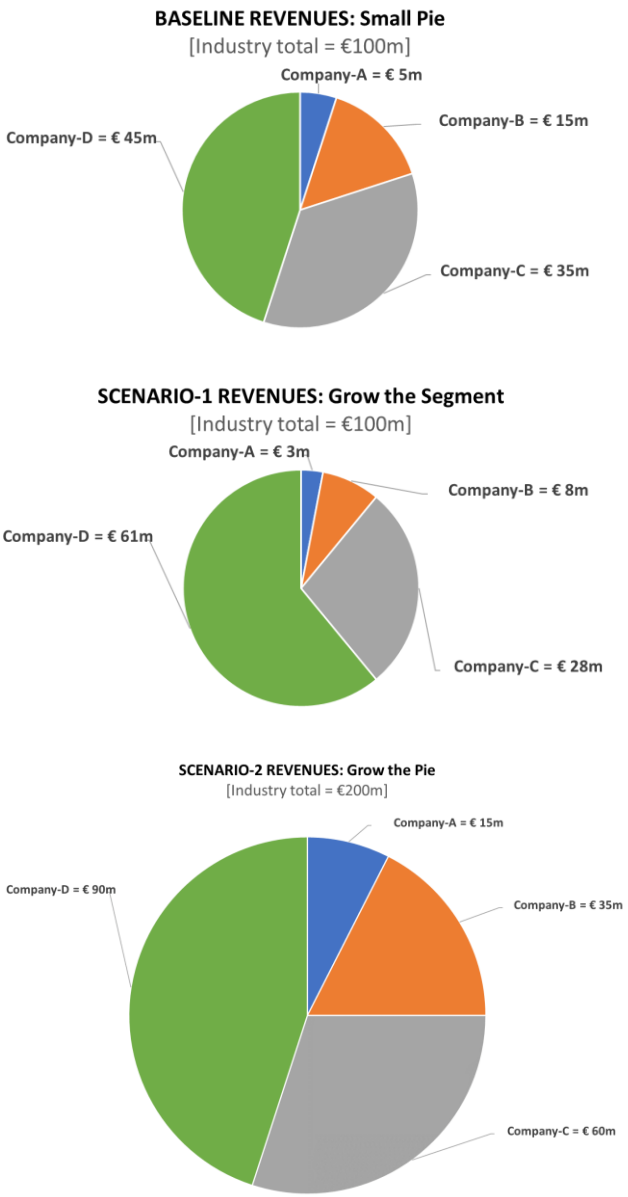

Fig. 1. Advantages of Growing the Pie

One way to address this question is to consider the simplified scenarios shown in Fig. 1. These illustrate a hypothetical small country's space industry that has four players dominated by two major companies. The baseline scenario has these four companies competing against each other, contributing a collective total of €100m in revenues to their national space economy.

In Scenario-1, the dominant player aggressively grows their €45m national segment of the pie by 16% to €61m at the expense of the three other companies, but the total national industry pie remains static at €100m. However, in Scenario-2, by establishing a mutually beneficial model of cooperation, this ambitious space-faring nation grows its international market share by collectively winning more higher value contracts regionally and globally. In this scenario, all the players enjoy increased revenues while the dominant player doubles their

revenues to €90m while growing the entire national industry pie to €200m.

This collective growth was achieved from the benefits of cooperation. These benefits include lower material costs through collaborative buying, greater supply chain assurance and cross-fertilisation of innovation and human resources to cope with demand surges as well as standardisation and interoperability.

To demonstrate how this works with a real example from the space industry, consider Inmarsat, established with 28 member countries in 1979, and growing to 86 members prior to its privatization in 1999. The partners were simultaneously investors of capital, suppliers of satellite capacity, customers of bandwidth, as well as competing at the operating level. Inmarsat grew to be the largest global mobile satellite service provider at the time.

I witnessed this kind of cooperative working while serving as a board member on Inmarsat's Governing Council alongside strategic advisor Rosabeth Moss Kanter, professor of business at Harvard Business School [8].

When individual investor interests conflicted with the broader ambitions of the organisation, the advantages of growing the pie rather than the segment was used as a strategic argument to achieve consensus. This collaborative advantage principle was not dissimilar to the hypothetical example illustrated in Fig 1.

The benefit of cooperation is not limited to large firms. According to research on more than 9,000 SMEs in the UK between 2002 and 2014, the economic returns gained from knowledge exchange with external partners achieved higher returns to SMEs than larger firms [9].

III. Successful Cooperation

The phrase "United we stand, divided we fall" was attributed to the ancient Greek storyteller Aesop more than two and a half thousand years ago but still rings true today.

An examination of cooperation in a wider context provides useful insights that could inform cooperation in the space sector.

In the animal world, many species depend on cooperation to survive. The diminutive Meerkats thrive in the harsh savanna of the Kalahari Desert by living in highly cooperative societies that share food foraging and predator scanning duties to support and protect their large family communities.

Although opinion is divided amongst some anthropologists, the social and technological advancements of humans largely relied upon cooperation and community support.

In the business world, cooperation can exist in many forms and models such as (i) strategic alliances, (ii) joint ventures, (iii) horizontal mergers, (iv) partner ecosystems, and (v) portfolio of collaborators, which can be applied within a national and international context.

To be successful, cooperation requires a shared vision with common goals, access to capital, infrastructure and expertise, as well as transparency, flexibility, trust and effective communications [10].

The acclaimed Harvard Business School guru, Michael Porter, created a model that describes how various factors within a domestic market can contribute to the competitive advantage of a nation to succeed globally.

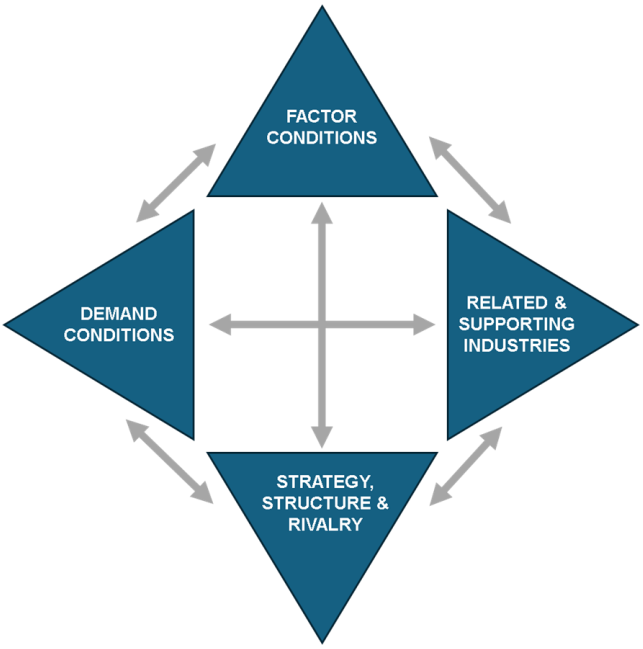

Fig. 2. Porter's Diamond Model

The Porter Diamond Model [11] shown in Fig. 2 illustrates four interrelated industry factors that span (i) Strategy, Structure & Rivalry, (ii) Demand Conditions, (iii) Factor Conditions, and (iv) Related & Supporting Industries. Corporate strategists use this analysis framework to assess investment and operational attractiveness for national markets.

When these factors or conditions are favourable, it encourages domestic companies to continuously improve and innovate, thus increasing their international competitiveness. Usually, competition amongst national firms is required to achieve this, but in some cases to excel in all these dimensions, two or more companies may need to join forces to improve their chances of winning business outside of their domestic markets.

A nation doesn't need to have a large population to successfully compete internationally. One case in point is Finland's Nokia which achieved market dominance in the mobile phone industry for years.

New Zealand, Singapore, Luxembourg, and Israel are examples of small nations with respectable and growing space industries and many smaller former soviet bloc countries are enjoying remarkable growth in the Space Sector.

The greater opportunities for smaller states can be realized by understanding and exploiting their comparative advantages

and focusing on best-fit market niches, often by pooling resources.

Business collaboration through Porterian or business clusters can be established by geography, industry sector or through vertical and horizontal resources or supply chains. Business clusters span many diverse industries, with well-known examples such as Hollywood for the entertainment industry, Bangalore, Cambridge and of course Silicon Valley for information technologies. Bremen is known as the "City of Space" where 140 companies and 20 institutes provide jobs for 12,000 people generating billions of euros from the aerospace industry [12].

The Netherlands Aerospace Group (NAG) has a mission to support competitive international growth. They provide support to more than 100 Dutch aerospace members with international business development, networking, knowledge development, innovation, representation, and lobbying [13].

At the regional level, the European Aerospace Cluster (EACP) is a network of more than 45 European aerospace clusters in 18 countries that supports concrete projects in an informal, decentralised manner. EACP is structured as a partnership using Letters of Intent to allow continuous working groups, temporary project consortia as well as bi- or multilateral ad-hoc partnerships [14].

At the international cooperation level, a diverse group of 22 pan-European small and medium sized organisations representing 8 countries led by Unseenlabs and Euroconsult combined their ingenuity, resources, knowledge, and skills to successfully win a €1.4m study for the European Commission to shape future global connectivity by satellite [15]. This New Symphonie consortium demonstrates how the power of unity and cooperation between different sized companies across many nations can win competitive bids.

Another example of European cooperation is Unio Enterprise which operates with 14 companies including SES to develop an integrated space and 5G network providing global always-on connectivity.

The Airbus consortium, formed in 1970, operates under a unique and flexible form of partnership under French law. The partners have a dual role as both shareholders and industrial participants. It is one of the largest and most well-known consortiums that has succeeded in winning global market share in the aviation and aerospace industries.

The Artemis Accord, led by NASA, is a truly global collaborative framework to support lunar exploration. It involves the cooperation of 38 nations with Slovenia and Sweden having joined in April 2024. Some of the benefits to be realised from the Accord include sharing scientific information, interoperability standards for space-based infrastructure, and mitigation and disposal of space debris [16].

To be successful, cooperation requires an appropriate governance structure, the setting of clear individual and shared targets, a proper appraisal of the resources from each organization, and having very clearly defined Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART) goals while maintaining effective communications.

IV. Cooperating with Competitors

Competition, in all its forms, is a natural and healthy part of a growing economy as companies seek to increase market share, profits and customer base. This often requires intellectual property and know-how to be jealously guarded. But as we have seen in the Old Space era, IGOs and companies were able to build and grow successful businesses with international rivals at the delivery level while cooperating at the shared strategic infrastructure level.

The term "Coopetition" which has gained popularity from the book of the same name [17] describes how companies can simultaneously cooperate while being competitors.

The concept is not new and dates back to the early 20th century. Intelsat, Eutelsat, and Inmarsat were classic examples of coopetition in the satellite communications industry. The high-profile coopetition between Pfizer and BioNTech helped to battle the COVID-19 pandemic. Other notable and successful coopetition examples include Apple and Samsung, Apple and Microsoft, UPS and DHL, as well as Delta and American Airlines.

Coopetition in the airline industry is well established and quite common. Many airlines often employ code-share agreements to ensure optimal load factors and efficient utilization of aircraft for various destinations.

There are many examples of successful coopetition in the space industry. The Boeing and Lockheed Martin United Launch Alliance (ULA) joint venture was established to compete with SpaceX. Their coopetition helped to successfully deliver the Curiosity rover to Mars in 2012.

V. Conclusion

Large enterprises and SMEs can benefit from cooperation, especially from knowledge exchange, shared resources, innovation, cost reduction and supply chain assurance.

There is no single cooperation model or blueprint that is universally applicable whether it be a consortium, joint venture, or simply a project-focused collaborative agreement.

To achieve real success, business clusters need to be more than just a passive directory or catalogue of eligible entities. A proactive and goal-driven program of active participation, contribution and cooperation among its members is not just desirable, it is essential.

Establishing cooperative and collaborative relationships is not without risk and success is not guaranteed. Corporate and national cultures as well as the scope and scale of the opportunity will determine what model works best. Successful cooperative ventures typically embrace the following four factors:

(i) Shared vision and common goals

(ii) National or location focus with access to capital and industry expertise

(iii) Effective communications, flexibility, transparency, and trust

(iv) Efficient use of shared resources, know-how, personnel, or infrastructure

Of course, the devil is always in the details, and much depends on proper execution.

Ultimately, successful cooperation will depend on the right entities working together at the right time using the right methods with the right resources for the right reasons.

REFERENCES

[1] NASA, (2019): The First Step: Langley's Contributions to Apollo nasa.gov, 22 March 2019. Online: https://web.archive.org/web/20240423172015/https://www.nasa.gov/history/the-first-step-langleys-contributions-to-apollo

[2] MCKINSEY, (2024): The space economy is blasting off mckinsey.com, 11 January 2024. Online: https://web.archive.org/web/20240423172324/https://www.mckinsey.com/featured-insights/themes/the-space-economy-is-blasting-off

[3] CIA FACTBOOK, (2024): Space program overview cia.gov, 23 April 2024. Online: https://web.archive.org/web/20240423172635/https://www.cia.gov/the-world-factbook/field/space-program-overview

[4] S. KALHORO, (2024): Space 2.0: Developing nations lead the race for the final frontier trtworld.com, 23 April 2023. Online: https://web.archive.org/web/20240423172853/https://www.trtworld.com/opinion/space-20-developing-nations-lead-the-race-for-the-final-frontier-12796733

[5] A. BASKARAN, (2001): Technology accumulation in the ground systems of India's space program: the contribution of foreign and indigenous inputs, 2 April 2001. Online: https://doi.org/10.1016/S0160-791X(01)00009-4

[6] S. KIM, S. NETESSINE, (2012): Collaborative Cost Reduction and Component Procurement Under Information Asymmetry jstor.org, 24 October 2012. Online: https://www.jstor.org/stable/23359613

[7] J. POHLEN, (2019): Dynamics of startups in Europe: What are the critical success factors to put in place to help startups grow into scale-ups, especially in Belgium? handle.net, 2019. Online: http://hdl.handle.net/2078.1/thesis:19008

[8] R. KANTER, (1994): Collaborative Advantage: The Art of Alliances, August 1994. Online: https://hbr.org/1994/07/collaborative-advantage-the-art-of-alliances

[9] D. AUDRETSCH, M. BELITSKI, R. CAIAZZA, P. PHAN, (2023): Collaboration strategies and SME innovation performance, 17 May 2023. Online: https://doi.org/10.1016/j.jbusres.2023.114018

[10] FASTER CAPITAL, (2024): Key Factors For Successful Collaboration, 2024. Online: https://web.archive.org/web/20240919145842/https://fastercapital.com/topics/key-factors-for-successful-collaboration.html

[11] M.E. PORTER, (1990): The Competitive Advantage of Nations. New York: The Free Press.

[12] J RAVELING, (2021): 10 Bremen Companies in the Aviation and Aerospace Sector wfb-bremen.de, 12 August 2021. Online: https://web.archive.org/web/20240503175905/https://www.wfb-bremen.de/en/page/companies-aviation-aerospace

[13] NAG, (2024): Netherlands Aerospace Group (NAG) nag.aero, 2024. Online: https://web.archive.org/web/20240503180139/https://nag.aero/nag/about-nag

[14] EACP, (2024): EUROPEAN AEROSPACE CLUSTER PARTNERSHIP eacp-aero.eu, 2024. Online: https://web.archive.org/web/20240503183622/https://www.eacp-aero.eu/about-eacp/mission.html

[15] EUROCONSULT, (2021): New symphonie takes collaborative approach to european commission call for connectivity euroconsult-ec.com/, 9 December 2021. Online: https://web.archive.org/web/20240503180816/https://www.euroconsult-ec.com/press-release/new-symphonie-takes-collaborative-approach-to-european-commission-call-for-connectivity

[16] NASA, (2020): THE ARTEMIS ACCORDS, 13 October 2020. Online: https://web.archive.org/save/https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf?emrc=653a00

[17] A. BRANDENBURGER, B. NALEBUFF, (2011): Co-Opetition. New York: Doubleday.