

Mikko Punnala

Internationalising in the Space Economy

Ecosystems, Institutions, and the Strategic
Behaviour of Small and Medium-Sized Enterprises
in the New Space Economy



ACTA WASAENSIA 567



University of Vaasa
VAASAN YLIOPISTO



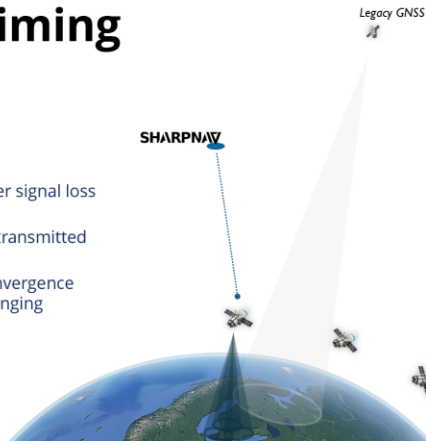
PhD (Space Economy)
Colonel (ret.)
Chairman, Sharpnav Oy
and Space Air Technologies

SHARPNAV

A European LEO-PNT constellation for secure and resilient navigation and timing

LEO-PNT constellations

- Satellites in Low Earth Orbit
- Altitude ~800 kilometres
- Significantly faster time to first fix & lower signal loss compared to traditional systems
- Up to **100x signal strength** with same transmitted power compared to GNSS
- Significantly lower latency & shorter convergence times due to more dynamic, quickly changing signal paths



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Vaasan yliopisto
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What a doctoral dissertation is — and is not

Scientific dissertation, not a market forecast

The work is an academic study with a defined data window. Some of the underlying information is already outdated because the space economy moves so fast.

Direction over precision

The value of the dissertation lies in the direction it shows — the structural shifts and future opportunities — not in the exact timing.

Trends have realised — faster and stronger than predicted

The trends and opportunities identified in the data have now materialised even more strongly than was foreseeable at the time of writing. The exact moment was unknown — the direction was clear.

Why Internationalisation Theory Was the Frame

ACADEMIC REQUIREMENT

Internationalisation theory as the lens

A doctoral dissertation in business studies must be anchored in established theoretical frameworks. The work therefore had to be built on internationalisation theories:

- Network Model of Internationalisation (NMI)
- Resource-Based View (RBV)
- Dynamic Capabilities Theory (DCT)
- Ecosystem Theory (ET)

These four theories provided the academic scaffolding for the analysis of SMEs in the New Space Economy.

RESEARCH FOCUS

Space economy + technology + geopolitics

My genuine research interest was — and is — to understand the interaction of three forces:

- Space economy and its value chains
- Space technology and its commercialisation
- Geopolitics shaping demand and access

Theory provided the tool. The substance is the opportunity space that emerges when these three converge.

Read theories as method — read the substance for opportunity.

How can small and medium-sized enterprises succeed internationally within such a demanding and regulated environment as the **new space economy?**

Comparative overview of the theoretical frameworks

Theory	Core Insights	Relevance to SMEs in the NSE	Limitations
NMI	Internationalisation is relational and embedded in institutional networks	Explains network formation, PPPs, and embeddedness within ecosystems	May underplay firm-internal capability development
RBV	Competitive advantage stems from valuable, rare, inimitable resources	Highlights internal innovation, IP, and differentiation as strategic assets	Overlooks institutional constraints and relational enablers
DCT	Firms adapt and reconfigure capabilities to respond to change	Captures SME agility in managing regulation, alliance shifts, and technology transitions	Assumes preexisting dynamic capabilities not always present in early-stage SMEs
ET	Firms coevolve within ecosystems of interdependent actors	Reveals how embeddedness in policy, funding, and innovation ecosystems facilitates scaling	May overlook firm-level agency and strategy



Research questions and research execution

Research questions

1 What structural and institutional conditions shape the internationalisation opportunities and constraints for SMEs operating in the NSE?

2 How do SMEs develop and mobilise strategic capabilities through networks, partnerships, and innovation ecosystems to internationalise?

3 How can existing internationalisation theories be adapted to account for the regulatory asymmetries, institutional embeddedness, and accelerated growth dynamics specific to the space sector?

Research execution

Systematic Literature Review

Theoretical Framework
(NMI + complementary/ models)

Case Study Design
(Kvarken + Nordic SMEs)

Data Collection
(documents, interviews, reports)

Thematic and Cross-Case
Analysis

Theory Refinement and
Policy Implications



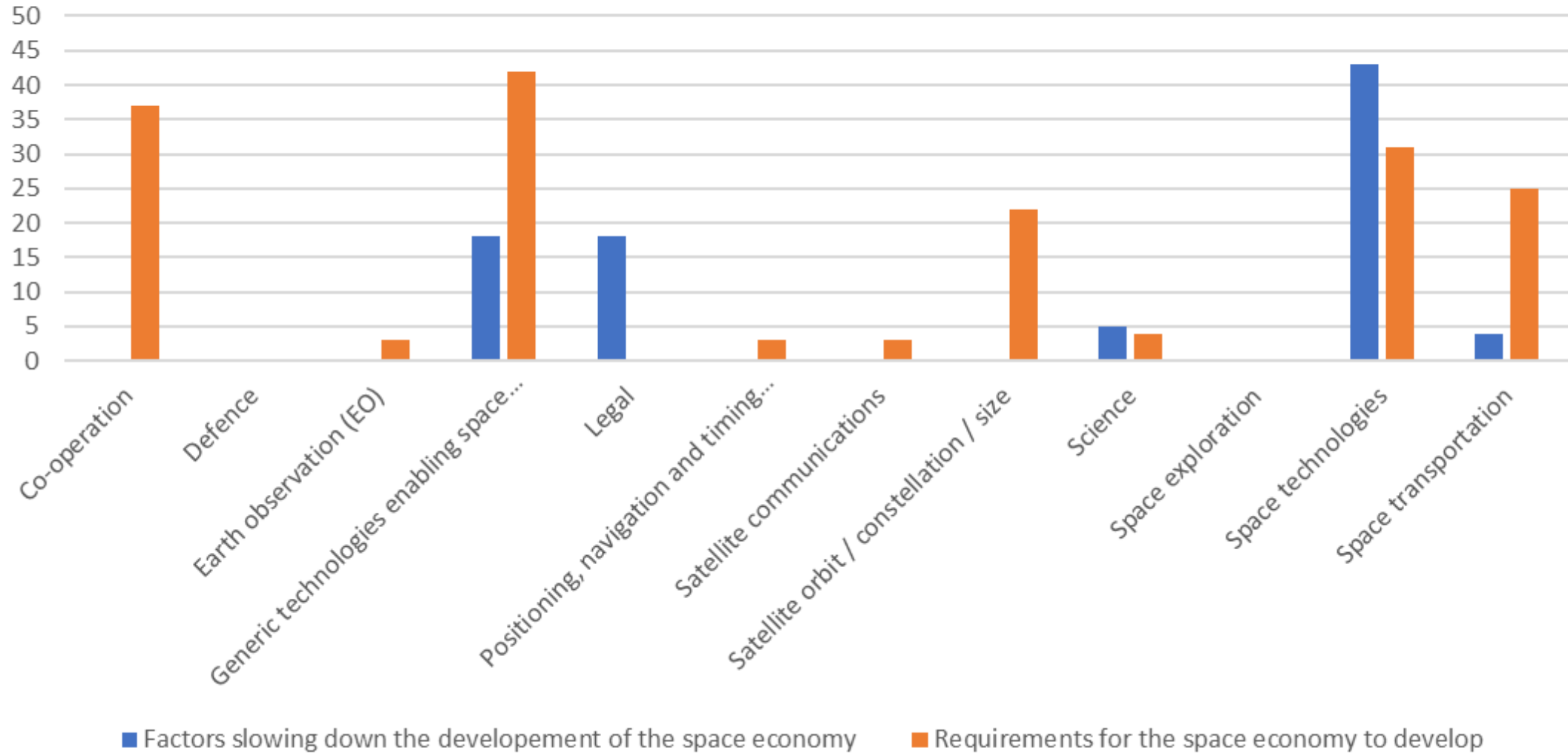
Data Analysis

- Conducted 14.1.2023 – 9.4.2024
- Selected Journals n=98
- Publication years 2018 – 2023
- Categorized based on **OECD Handbook on Measuring the Space Economy (2022), 2nd Edition**
 - 1 to 8/(9) based on handbook
 - 10 to 13 added to achieve more comprehensive analyses
- Data matrix size: 986 x 74 = **72 964** data points

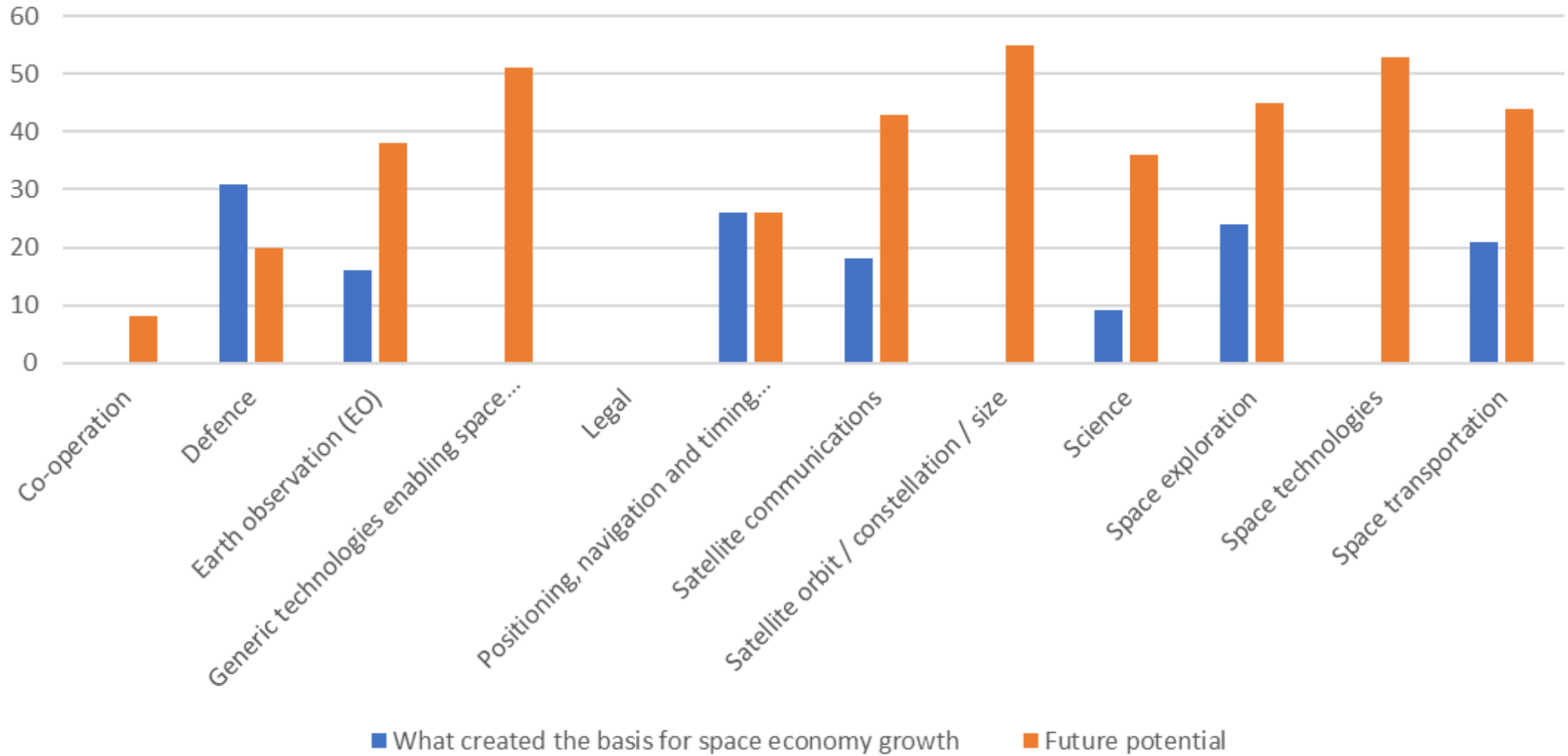
1. Satellite communications
2. Positioning, navigation and timing (PNT)
3. Earth observation (EO)
4. Space transportation
5. Space exploration
6. Science
7. Space technologies
8. Generic technologies or components that may enable space capabilities
9. Defence
- 10. Space Economy**
- 11. Satellite orbit / constellation / size**
- 12. Cooperation**
- 13. Legal**



High level requirements and development factors for the space economy based on the examined articles



High level growth factors and future potential of the space economy based on the examined articles



Key success factors of new space companies

1

Institutional agility

Successful firms in the New Space Economy are those that can **adapt quickly to changing circumstances** across all possible challenges.

2

Regulatory alignment

In this industry, regulatory knowledge is a strategic asset - **the capacity of a firm to anticipate regulatory change** and adapt before the rules force it to is essential.

3

Ecosystem engagement

Successful internationalisation depends on **being part of strong networks**. Participation in collaborative programmes is usually essential for credibility and funding.



ESA's Role — The Most Effective Catalyst for Space SMEs

ESABIC

Business Incubation
Centres

PPP

Public-Private
Partnerships

Programmes

Procurement &
Research Framework

Clusters

Regional Innovation
Ecosystems

Why ESA works

Network orchestrator

ESA convenes governments, research and industry into trust-based collaborative environments.

Institutional scaffolding

Mentoring, seed funding, infrastructure access and strategic guidance for early-stage firms.

Procurement = financing + validation

ESA contracts inject capital and simultaneously legitimise firms in international markets.

Theoretical lens applied to ESA

NMI — Networks

Provides the relational ties that embed SMEs into international markets.

RBV — Resources

Gives access to technical, financial and reputational resources beyond a single firm's reach.

DCT — Dynamic Capabilities

Builds the adaptive capacity to align with evolving regulation and technology.

ET — Ecosystem

Orchestrates interdependent actors so innovation, legitimacy and learning co-evolve.

Concrete ESA Findings — From Incubation to Global Markets

01

ESA Business Incubation Centres (ESABICs)

Cornerstone of European space innovation: technical mentoring, seed funding, infrastructure and strategic guidance. ESA affiliation acts as a strong validation signal that helps firms secure follow-on investment and partnerships.

02

Regional clusters & 'borrowed scale'

ESA-linked clusters (e.g. Kvarken Space Center, Nordic consortia) connect SMEs to research infrastructure, regulatory expertise and funding streams — letting small firms leverage shared resources to overcome size constraints.

03

Procurement & legitimacy-building

ESA-led contracts and framework programmes function as dual instruments — capital plus international legitimacy. The reputational capital opens doors to venture funding and global supply-chain integration.

ESA = strategic intermediary that converts institutional embeddedness into entrepreneurial dynamism.

From Forecast to Reality — The Trends Have Materialised

PREDICTED IN THE DISSERTATION (2018–2024 data)

- LEO mega-constellations becoming the new infrastructure backbone
- Falling launch costs reshaping market access for SMEs
- Earth observation moving from niche to commodity data layer
- PNT diversification beyond GPS/Galileo monoculture
- Geopolitics elevating space to strategic infrastructure
- Dual-use becoming the dominant funding logic

NOW REALISED — 2024–2026

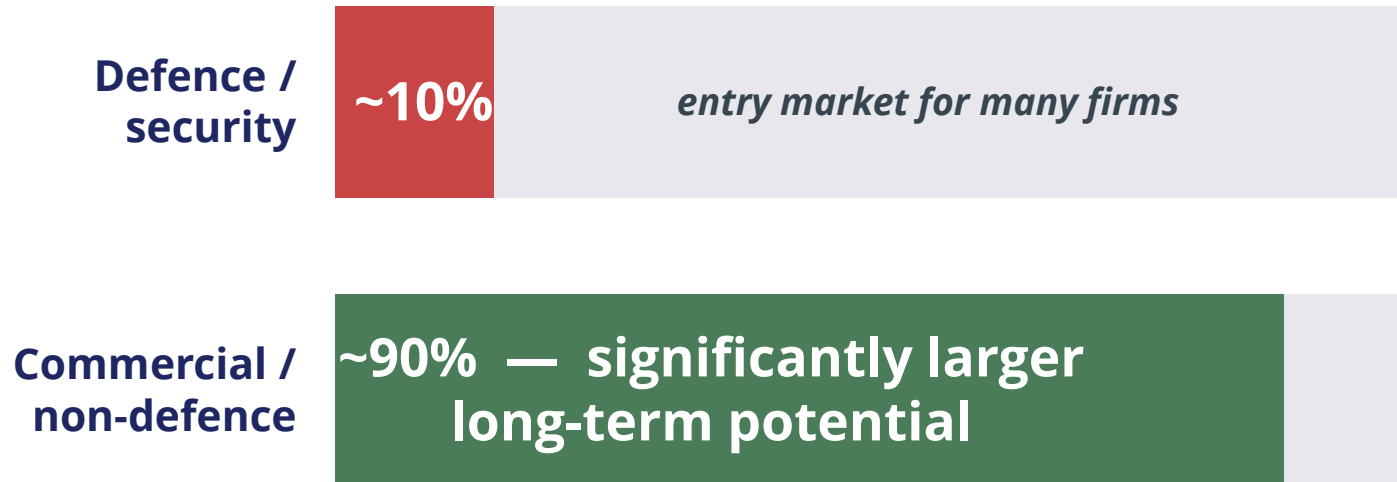
- Constellations in operational deployment, commercial services scaling
- Launch capacity multiplied; SMEs are flying real payloads
- EO-derived data integrated into mainstream business decisions
- LEO-PNT moving from concept to procurement (e.g. Sharpnav, ESA initiatives)
- Space explicitly named as strategic asset in national & EU policy
- Capital flowing massively into dual-use ventures

Direction was right. Speed surprised. The exact timing was unknowable — the structural shift was not.

Defence in Proportion — A Crucial but Partial Story

Global space-economy business potential

Illustrative — based on dissertation analysis and industry reporting



Defence is highly visible right now — but globally, the non-defence opportunity is larger.

What the data really says

Defence dimension is momentarily over-emphasised

Geopolitical tension has made the security narrative dominant in public discussion.

Its real weight is broader, not narrower

Defence is woven through many segments rather than confined to one — but it is one input among several.

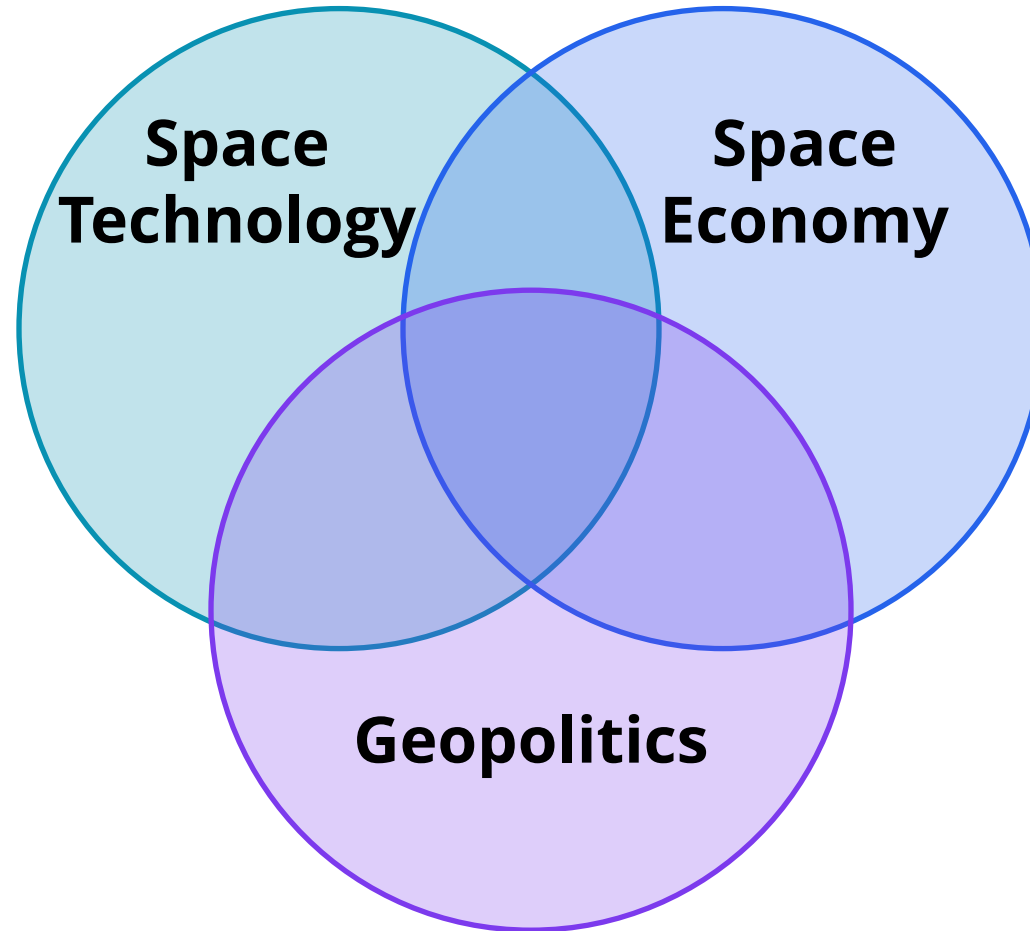
Useful entry market — not a destination

Defence is a sensible first foothold for many firms. The mistake is to stop there.

Commercial & dual-use carry the long horizon

The bigger global business potential lies in commercial and dual-use applications.

Space as an Enabler



The space economy is the largest invisible infrastructure of the 21st century. The question is, can you take advantage of its potential?

Space Economy Is Growing — The Opportunity Is Now

Strategic infrastructure

of the 21st century

Growth

Significant

expansion in the coming years

The space economy is moving from frontier to backbone — supporting finance, logistics, energy, agriculture, transport, environmental monitoring and security.

Largest invisible

infrastructure today

Defence

Entry market

for many firms — useful but limited

A practical first step. Public discourse over-weights it. The real opportunity is broader.

Massive untapped

commercial upside

Commercial

Significantly larger

global non-defence potential

EO data, PNT services, satcom, dual-use technologies and downstream applications open scalable global markets.

The question is not whether the opportunity is real — it is whether your business is positioned to capture it.

Message to Boards & Executive Teams

WHERE THE GAP IS

Two worlds — one momentum

Inside the space ecosystem

Companies operating in space already have a strong understanding of the opportunity space.

Outside the space ecosystem

Most companies that could benefit do not yet recognise themselves as part of the space-enabled value chain — and miss services, funding instruments and partnerships.

The bridge

Communicating space-economy benefits to companies that can integrate them into their core business.

THE STRATEGIC LEVER

Boards and executive teams

The decisive variable is the level of understanding among board members and senior leadership of companies outside the space sector.

What boards and execs need to do

- Recognise space as enabling infrastructure for their existing business
- Understand the Space economy + technology + geopolitics triangle
- Allocate strategic attention while the momentum window is open
- Make space part of strategy reviews
- Use defence as an entry, not as a ceiling

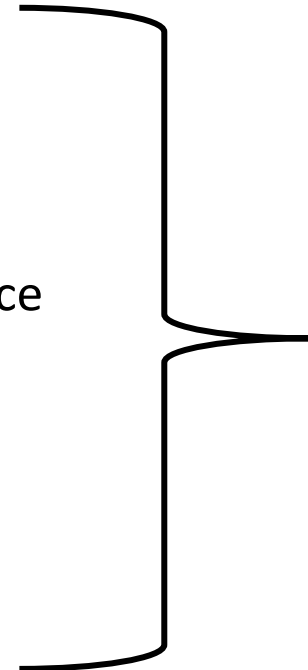
Use this momentum — or watch others use it for you.

Space Economy Research at Vaasa university

- Mikko Punnala
 - Internationalising in the Space Economy
- Eldrige de Melo
 - Strategic Behaviour of Firms in the New Space Economy: Growth, Internationalisation, and Sustainability-Oriented Value Creation
- Santeri Punnala
 - The geopolitical landscape of the new space economy - new factor for internalisation

Supervisors

- Professor Ojala Arto
- Professor Kuusnioemi Heidi



The SpacEconomy project is led by Tampere University. Other partners are Aalto University, University of Helsinki, University of Turku, University of Vaasa, Finnish Meteorological Institute, National Land Survey of Finland, and Kupla Productions Ltd.



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE



Tampereen yliopisto
Tampereen ammattikorkeakoulu



UNIVERSITY
OF TURKU



Vaasan
yliopisto
UNIVERSITY OF VAASA



‘Life is full of great miracles for those who are ready to receive them.’

— Moominpappa, Moominpappa at Sea

This research has been carried out with the hope that the invisible can become visible if only we look closely enough.