



Technology, Innovation and Entrepreneurship in the New Space Era (MGMT 897) Oct, 2022

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COURSE DESCRIPTION

Over the past five years, humanity has taken a massive leap into a new Space Era made possible by powerful enabling technologies and private sector entrepreneurs from around the world in collaboration with the public sector. What used to be the exclusive domain of two superpowers is now being democratized and made accessible to established organizations and entrepreneurs from both developed and emerging countries. The cost of escaping Earth's gravity is expected to fall by more than two orders of magnitude by innovations in reusable rockets and business models.

The objective of the course is to provide students with an extraordinary exposure to this exciting global business domain in the new space era and the opportunities for value creation it unfolds. Immersion into the new space age will provide students with several unique learning opportunities because:

- it departs from the traditional mindset of superpowers, arms race and nation defense
- it is a “green field” in terms of use cases and business models; Hence, it presents significant opportunities for creativity and experimentation
- it is a challenging technological domain with long periods of development and commercialization with high uncertainty in terms of which/whose technological solution will emerge as an eventual winner
- it also presents significant challenges in terms of financing of innovation because the costs and the returns are not a good fit with the traditional VC and internal or external capital markets models

The course will consist of a series of panel discussions and lectures focusing on the historical evolution of the space sector, global trends in technologies, markets and business models, strategies of emerging start-ups and established organizations, financing models and the role of the public sector in different global regions. The panels would involve prominent leaders and public officials involved within the new space age. The course will culminate with a team project in which students will have to ideate, design and share a pitch for a new business related to the opportunities the new space era will create on our planet and beyond. In so doing, the course would provide students with a rare stimulating intellectual journey to stretch their thinking and provide fresh perspectives that can be applied to any nascent industry context encompassing emerging technologies and business models.

Through this course, students would be exposed to the new space age as an emerging context with exciting possibilities for technological innovation and entrepreneurship at a global-level. It would also help broaden the horizon in terms of opportunities and challenges around technology commercialization and entrepreneurship in a complex technological and institutional landscape.

PREPARATION & GRADING

Students will be evaluated based on their active participation throughout the course in terms of attendance, and engagement. They would also be evaluated through a market analysis assignment and the final project presentation:

- Participation (50%)
- Individual Market Analysis Assignment (20%) due on Oct 17
- Team Project (30%) due on Oct 28

INDIVIDUAL MARKET ANALYSIS ASSIGNMENT

To better leverage the course and spark your curiosity and imagination, I would like you to conduct some pre-course work which will be both fun and instructive. The task is to prepare a short five- to seven-minute video presentation about a commercial opportunity within the New Space Era, covering aspects that you find most interesting, such as current state, leading players, technology enablers and bottlenecks, value creation potential and innovative business models. This pre-course assignment is an individual assignment and you are free to leverage any data sources available on the internet. Here are some opportunity areas that you could consider:

- Launch
- Telecommunications
- Satellite manufacturing
- Space habitats
- Space tourism
- Space manufacturing
- Space mining

TEAM PROJECT

To make the most of the course, you would collaborate in teams of 5-6 students to come up with a business idea and pitch connected to the New Space Era and submit a 7-minute video presentation a week after the course ends. The presentation should include the following:

- What is the problem you are trying to solve?
- What is your solution?
- How can this be a viable business (considering existing solutions, market size, costs, competitive advantage) along with key assumptions?

The presentations would be evaluated by some of the guest speakers, and you may have an opportunity to follow-up with them to help take the idea forward.

SUGGESTED READINGS

Course Synopsis

- <https://www.wharton.upenn.edu/story/in-the-classroom-technology-innovation-and-entrepreneurship-in-the-new-space-era/>

Industry Emergence and Disruption

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- Furr, Nathan and Kapoor, Rahul "Capabilities, Technologies, and Firm Survival during Industry Shakeout: Evidence from the Global Solar Photovoltaic Industry." *Strategic Management Journal*. 2017.
- Kapoor, Rahul and Furr, Nathan and (2015), "Complementarities and Competition: Unpacking the Drivers of Entrants' Technology Choices in the Solar Photovoltaic Industry," *Strategic Management Journal*, 36(3): 416-436.
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- Kapoor, Rahul and Klueter, Thomas (2020), "Unbundling and Managing Uncertainty Surrounding Emerging Technologies," *Strategy Science*, 6(1), 62-74.
- Kapoor, Rahul and Klueter, Thomas. "Innovation's Uncertainty Factor", MIT Sloan Management Review, Fall 2020.
- Kapoor, R. (2018). "Ecosystems: Broadening the Locus of Value Creation." *Journal of Org. Design*.
- Teece, David. "Profiting from technological innovation: Implications for integration, licensing and public policy" *Research Policy*, December 1986.

New Space Era

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- Davidian, K. (2021). What makes space activities commercial?. *Acta Astronautica*, 182, 547-558.
- Davidian, K. (2020). Space tourism industry emergence: Description and data. *New Space*, 8(2), 87-102.
- Goldman Sachs (2020). "Space: The Next Investment Frontier."
- Menon, Anoop and Huang, Laura. The Final Frontier: How Entrepreneurs Cracked the Aerospace Industry. (<https://knowledge.wharton.upenn.edu/article/how-entrepreneurs-cracked-the-aerospace-industry/>)
- Tkatchova, S., The commercial future of orbital services, *Ruimtevaart 2020/3*, The Netherlands
- Weinzierl, Matthew. 2018. "Space, the Final Economic Frontier." *Journal of Economic Perspectives*, 32 (2): 173-92.

COURSE SCHEDULE*

Session 1, Oct 17 (4-7:30pm ET) - Introduction and Historical Perspective of the New Space Era

- 4:00pm-5:00pm Course Introduction
- 5:00pm-6:30pm Historical Perspective of the New Space Era
- Launch Vehicles, Ken Davidian (AST Director of Research and Program, FAA)
 - Telecom and Small Sat, Therese Jones (Senior Director, SIA)
 - Habitats, Mary Lynne Dittmar (EVP for Government Affairs, Axiom Space)
- 6:45pm-7:30pm Team Project Work

Session 2, Oct 18 (4-7:30pm ET) - Market and Technology Trends

- 4:00pm-4:30pm Reflection and session introduction
- 4:30pm-6:00pm Global trends
- Africa, Temidayo Oniosun (Managing Director, Space in Africa)
 - China, Blaine Curcio (Founder, Orbital Gateway Consulting)
 - Europe, Stella Tkatchova (Commercialisation Expert, S-Cosmos)
 - South Asia, Narayan Prasad (Chief Operations Officer, satsearch)
- 6:15pm-7:30pm Opportunities in space
- Rob Coneybeer (Co-Founder, Shasta Ventures)

Session 3, Oct 19 (4-7:30pm ET) - Strategies of Space Start-ups and Incumbents

- 4:00pm-4:30p Reflection and session introduction
- 4:30pm-5:45pm Rob Meyerson (former President, Blue Origin; CEO, Delalune Space)
- 6:00pm-7:30pm Space Strategy Panel
- Richard French (Director of Business Development and Strategy, Rocket Lab)
 - Robert Fleming (Vice President - Space Programs, Northrop Grumman)
 - Makenzie Lystrup (Vice President & GM - Civil Space, Ball Aerospace)

Session 4, Oct 20 (4-7:30pm ET) - Ecosystem Facilitation by Public Agencies

- 4:00pm-4:30pm Reflection and session introduction
- 4:30pm-5:30pm Bhavya Lal (Senior Advisor, NASA)
- 5:45pm-6:45pm Global Facilitation
- Peter Hughes (Chief Technologist, NASA Goddard)
 - Kota Umeda (Deputy Director, JAXA)

* The course schedule is subject to change based on external speaker availability and all changes would be announced on or before the first class session.

6:45pm-7:00pm Regulation
- Michelle Murray (Senior Technical Advisor, FAA)

Session 5, Oct 21 (4-7:30pm ET) – Funding the New Space Era

4:00pm-4:15pm Session introduction

4:15pm-5:00pm Carissa Christensen (Chief Executive Officer and Founder, BryceTech)

5:15pm-6:30pm Space Investment Panel
- Tess Hatch (Partner, Bessemer Venture Partners)
- Jose Ocasio-Christian (Chief Executive Officer, Community in Space LLC)
- Travis Nelson (Co-President & CFO, New Vista Acquisition Corp.)

6:30pm-7:30pm Course Reflections and Wrap-up