



Defining a capitals approach to evaluating the socio-economic benefits of space exploration

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Summary:

This project investigates the socioeconomic benefits of space exploration, particularly in light of the expansion of the space sector to the private sector and non-traditional nations.

Project Highlights:

- Evaluating the socio-economic benefits of space exploration;
- Utilising a capitals approach as central to a Multi-Criteria Analysis (MCA) evaluation framework;
- Defining and applying how science can be integrated into a capitals approach, to classify and identify the benefits of space exploration.

Overview:

As space exploration moves outside the remit of traditional government organisations, there is a need to evaluate, particularly for emerging space-faring nations, the socio-economic benefits of space exploration. Indeed, the benefits to society of 'science' led programmes may be unclear. However, regardless of the mission goals, behind these programmes lie an emerging space economy that encompasses

many previously unnoticed socio-economic benefits.

The Organisation for Economic Cooperation and Development (OECD) defined the space economy as (OECD, 2009):

"...the full range of activities and the use of resources that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilising space."

The development of a space economy also feeds into public policy, for example, the European Commission's industrial policy, *Space 4.0*:

"Space policy can help boost jobs, growth and investments in Europe. Investing in space pushes the boundaries of science and research. Europe has a world-class space sector, with a strong satellite manufacturing industry...[] ...The European space economy, including manufacturing and services, employs over 230 000 professionals and its value was estimated at €46-54 bn in 2014, representing around 21% of the value of the global space sector. (European Commission, 2016)

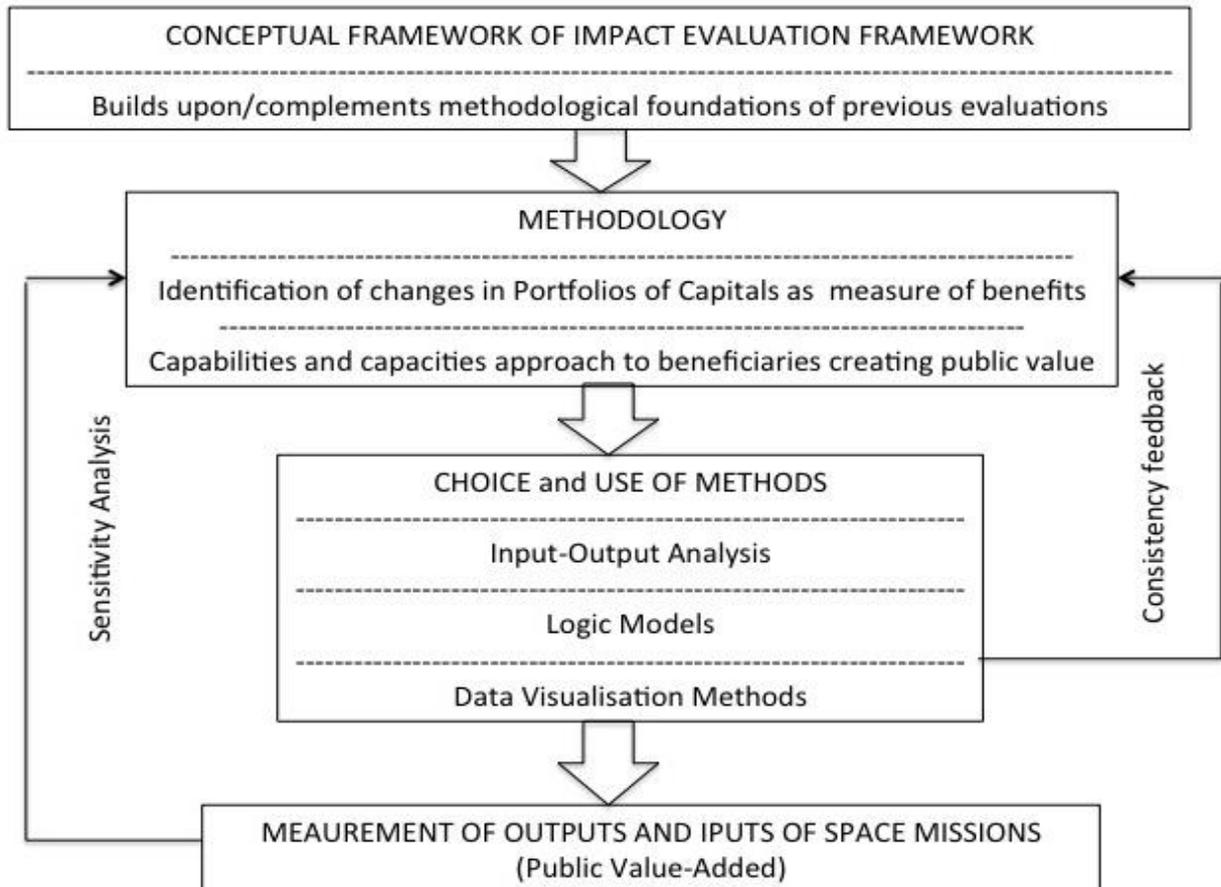


Figure 1: Elements of MCA Approach

Evaluating the complex interaction between the Space and Earth economies and the value chains that underpin their activities is challenging, with classifying and measuring qualitative benefits one of the biggest barriers to evaluation.

One method for addressing this challenge is the capitals approach, which has been increasingly used in studies evaluating public policy programmes (Nussbaum, 2011; Thomas and McElroy). Capitals (Bourdieu, 1985) may include, *inter alia*: cultural/symbolic capital; educational capital; environmental capital; financial capital; human capital; organisational capital; social capital and technological capital.

The purpose of this studentship is to evaluate the categories of socio-economic benefits that arise from particular space exploration programmes by defining and applying a capitals approach. Of particular interest here is exploring how science is integrated and measured; 'science capital' is an established approach used to evaluate the various

influences that impact on an individual's (specifically young people's) science identity and participation in science-related activities (Archer, et al., 2015), but its utility in the context of socio-economic analysis is yet to be tested.

Methodology:

The capitals approach has consistent recognition in being able to identify socio-economic benefits that are not easily measured in monetary terms. In the case of space exploration, the approach can offer a more fine-grained analysis of indirect and downstream benefits. By being part of an Multi Criteria Analysis (MCA) framework (Figure 1), the capitals approach can build upon the results of conventional studies thereby strengthening any analysis.

The student will review the use of the capitals approach in evaluation studies in both space and non-space contexts and on this basis choose the appropriate capitals to evaluate

categories of socio-economic benefits within particular space programmes.

Training and skills:

The student will receive training in the specific skills required for the project, including research design, methodologies and methods in the social sciences. Training will also be provided for relevant statistical packages.

The student will benefit from a diverse training programme, ranging from skills that support their PhD studies, e.g., writing skills, time management, presentation skills, research skills and thesis writing, and skills that prepare them for the future after graduation, e.g., CV writing, and networking, including making active contact with to industry and academic partners.

Possible timeline:

Year 1 – Perform a literature review and design an evaluation framework using the capitals approach in application to a particular space programme or mission.

Year 2 – Create a survey and engage with a sample of relevant stakeholders to create indicators/evidence of different capitals. Define how science can be integrated into the framework and apply this to chosen programme or mission. Present initial findings to a national/ international conference.

Year 3 – Evaluate and present results to stakeholders as part of a sensitivity analysis. Submit an international conference/paper and journal article. Write up and submit thesis.

Further reading:

Archer, L., Dawson, E., De Witt, J., Seakins, A. and Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*, 52(7), 922-48, <https://doi.org/10.1002/tea.21227>.

Bourdieu, P (1985) *Distinction: A Critique of Taste*, Oxford: Oxford University Press.

European Commission (2016) Communication from the Commission to the European

Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Space strategy for Europe COM(2016) 705 final, Brussels; European Commission.

Nussbaum, M. (2011). *Creating Capabilities: The Human Development Approach*. Cambridge, MA: Harvard University Press

OECD (2012) *OECD Handbook on Measuring of the Space Economy*, Paris; Organisation for Economic Co-operation and Development, p.9.

Salter, A.J. and Martin, B.R. (2001) The economic benefits of public funded research: a critical review, *Research Policy*, vol. 30, 509-532.

Thomas, M.P. and McElroy, M.W. (2016) *The MultiCapital Scorecard: Rethinking Organizational Performance*, Vermont: Chelsea Green Publishing,

Further details:

Students should have a strong background in some combination of business, economics, management, law or related social sciences, with a keen interest in science and technology underpinning space-exploration.

This studentship is interdisciplinary and the student will be welcomed into AstrobiologyOU in the STEM faculty, and the Citizenship and Governance Strategic Research Area (SRA) in the Faculties of Business and Law and Art and Social Sciences at the Open University.

Please contact leslie.budd@open.ac.uk for further information.

Applications must include:

- a cover letter outlining why the project is of interest and how your skills are well suited to the project
- an academic CV
- an application form and an Open University application form, downloadable http://www.open.ac.uk/students/research/system/files/documents/Application%20form%20-%20uk-eu_0.docx

- contact details of three academic references

Applications should be sent to STEM-EEES-PhD@open.ac.uk by 5pm on 30th September 2019.

About us:

AstrobiologyOU has recently been awarded a £6.7m 'Expanding Excellence in England' award by Research England to grow capacity and capabilities. This will allow us to expand and bring together expertise in technology, international development and governance to address the scientific and governance challenges associated with the advancement of astrobiology and related space exploration missions. As part of this expansion we will be recruiting new PhD students who will span these discipline areas. Each studentship will play an important role in the growth of AstrobiologyOU.

The PhD candidate joining us for this project will be working in a vibrant interdisciplinary environment, alongside PhD students from STEM, Law and Governance, and Social Sciences. They will also be part of the wider OU student community, which is a friendly and supportive cohort, with regular social events organised through groups such as RocSoc, HookeSoc and the OU Club.