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How can space do more for Earth?

Space4Impact aims at maximizing the positive impact of space technologies on the planet by linking New Space companies to non-space markets. The goal is to boost the growing New Space Economy on an international level, in line with the UN SDGs addressing one of the primary needs expressed by the UN Office for Outer Space Affairs (UNOOSA). Among the most promising opportunities to catalyse the impact of space technologies lies in bringing onboard non-space industries and support them to address their Environmental, Social and Governance (ESG) objectives by adopting and embracing new applications. To realize this potential, Space4Impact's business model is that of a non-profit oriented knowledge and technology transfer organization, which uses open innovation to promoting downstream applications in new markets. In this role, Space4Impact pursues the following activities:

- **Educating:** Open Online Course: globally educate students, researchers, entrepreneurs, and managers about space applications for different industry verticals by illustrating real life case studies.
- **Connecting:** Space2Earth Accelerator Program: to accelerate the growth of New Space companies with downstream applications by showcasing their products in front of potential customers and investors outside of the space sector.
- **Implementing:** Open Innovation Challenge: to let New Space startups compete to solve the innovation challenge of one non-space actors and boost their impact.

Space4Impact vise à maximiser l'impact des technologies spatiales sur Terre en mettant en relation les entreprises de l'économie New Space avec l'industrie non-spatiale. L'objectif est de stimuler l'économie New Space en pleine croissance au niveau international, conformément aux ODD de l'ONU, en répondant à l'un des principaux besoins exprimés par le Bureau des Affaires Spatiales de l'ONU (UNOOSA). Afin de catalyser l'impact des technologies spatiales, il nous incombe de promouvoir l'adoption de ses technologies dans des industries non-spatiales et d'aider ses industries à atteindre leurs objectifs environnementaux, sociaux et de gouvernance (ESG). Pour réaliser ce potentiel, le modèle commercial de Space4Impact est celui d'une organisation de transfert de connaissances et de technologies à but non lucratif, qui utilise l'Open Innovation pour promouvoir des applications downstream sur de nouveaux marchés. Dans ce rôle, Space4Impact poursuit les activités suivantes:

- *Education: Open Online Course: éduquer globalement les étudiants, les chercheurs, les entrepreneurs et les managers sur les applications spatiales pour chaque secteur de l'industrie en illustrant avec des cas concrets.*
- *Connection: Programme d'accélération Space2Earth: stimuler la croissance des entreprises New Space ayant des applications downstream, en présentant leurs produits devant des nouveaux clients et des investisseurs potentiels, en dehors du secteur spatial.*
- *Implementation: Open Innovation Challenge: organiser une compétition pour les New Space startups afin qu'elles puissent résoudre des challenges définis par un acteur du secteur non spatial et de les aider à renforcer l'impact de leur business.*

Space4Impact will die positiven Auswirkungen von Raumfahrttechnologien auf der Erde maximieren, indem New Space-Unternehmen mit Märkten ausserhalb der Raumfahrtindustrie vernetzt werden. Ziel ist es, die wachsende New Space Economy auf internationaler Ebene im Einklang mit den Zielen für nachhaltige Entwicklung der Vereinten Nationen (UN SDGs) anzukurbeln, was einem zentralen Anliegen des UN-Büros für Weltraumfragen (UNOOSA) entspricht. Eine der vielversprechendsten Möglichkeiten, die Auswirkungen der Raumfahrttechnologien zu fördern, besteht darin, die «Nicht-Raumfahrtindustrie» anzusprechen und Firmen ausserhalb der Weltraumindustrie dabei zu unterstützen, ihre Ziele in den Bereichen Umwelt, Soziales und Unternehmensführung (ESGs) zu erreichen, indem sie neue Technologien übernehmen und integrieren. Um dieses Potenzial auszuschöpfen, ist das Geschäftsmodell von Space4Impact das einer gemeinnützigen Organisation für Wissens- und Technologietransfer, die offene Innovation nutzt, um Downstream-Anwendungen in neuen Märkten zu fördern. In dieser Rolle verfolgt Space4Impact die folgenden Aktivitäten:

- **Bildung:** Offener Onlinekurs: Bildung von Studenten, Forschern, Unternehmern und Managern weltweit über Weltraumtechnologien für verschiedene Industriezweige mithilfe von Fallstudien aus der Praxis.
- **Vernetzung:** Space2Earth Accelerator Program: Förderung des Wachstums von New-Space-Unternehmen mit Downstream-Anwendungen durch die Präsentation ihrer Produkte vor potenziellen Kunden und Investoren ausserhalb des Weltraumsektors.
- **Umsetzung:** Open Innovation Challenge: Start-ups aus der Raumfahrt sollen in einen Wettbewerb treten, um die Innovationsbarrieren eines Akteurs ausserhalb der Raumfahrt zu lösen und ihren nachhaltigen Einfluss zu fördern.

N. Walker, G. Petit

Seizing the moment

The New Space sector, driven by private, commercialized space-related activities, is a fast-growing market, boosting the historical institutional space exploration economy. The Global Space Economy yielded \$366 revenue in 2019 and is predicted to grow to 1 Trillion by 2040 [1] [2]. From the annual income in 2019, only 5% can be allocated strictly to space exploration, the remaining revenue came from the space-to-Earth sector [1] [3]. The space-to-Earth sector encompasses, among others, downstream applications, such as telecommunication, Earth observation capabilities and navigation systems. Downstream applications describe the space market segment that sells products and services to final customers on Earth. This includes the generation of products, applications and services based on space data, infrastructure, and technologies.

The current growth in the development of space infrastructures and production of data from space is opening a full range of new applications with as many new potential businesses. This trend is difficult to follow for companies and investors outside of the space sector, due to the lack of education/knowledge transfer. As a result, New Space companies can face difficulties in addressing and reaching the right customer for their products. This untapped potential goes in parallel with the UN recognizing the important role of space technology in achieving the 2030 Agenda for Sustainable Development [4]. Earth observation alone can support 13 out of 17 of the UN sustained development goals, while a joint report by UN-OOSA and the European GNSS Agency found that almost 40% of the associated targets benefit directly from EGNSS and Copernicus services [5][6]. According to Morgan Stanley's Space team, the emerging New Space economy increases its capability to monitor and address sustainability and climate change in areas including EO, communications, and energy.

Namely, space technology could support food security, greenhouse-gas monitoring, utilities, access to renewable energy, supply-demand optimization, broad internet access, and tertiary benefits in adjunct sectors.

These advanced insights on environmental data and science could also support investors interested in sustainability returns [7]. Among the sectors that could especially benefit from decision making tools based on space technology, are the ones that still lag behind in digitalization, such as agriculture, transportation, mining, energy, and utilities [8].

Our Goal: Knowledge transfer

The integration of external knowledge/technology into a firm is key to develop business innovation. Yet, producers of knowledge, universities, and laboratories, are driven by incentives related to maximization of measurable research results, while firms, the user of the knowledge, focus on maximising the commercial results [9]. Hence, knowledge and technology transfer intermediaries act as essential nodes in the innovation process by linking the knowledge suppliers and users [10]. These knowledge and technology transfer organizations (KTTO) provide services to firms to help them extract value from knowledge, in order to enhance their endogenous potential of innovation [9]. Different types of KTTO are necessary and complement each other as firms are heterogenous in regard of their innovation capabilities, resources and value creation [11]. Commonly known KTTOs are the publicly funded university technology transfer offices and public research organizations, which focus mainly on the exploration and technical validation stage of the knowledge transfer value chain, i.e., patents and spin-offs. As a follow up, semi-publicly funded, non-profit knowledge and technology transfer organizations (NPOs), focus on the exploitation stage of the value chain. The NPO's service encompasses commercialization (product positioning, business

model, go-to-market strategy), capital access and legal issues [9].

Space4Impact's non-profit oriented business model is closely related to this NPO model, offering services at commercialization stage, especially for the go-to-market strategy, by working closely with the private and public sector. Space4Impact's mission is to maximize the positive impact of Space technologies on Earth by fostering the adoption of space technology in so called non-space market in line with the UN SDGs. The term non-space market encompasses industries which traditionally do not directly use space applications in their daily operations, such as agriculture, finance, insurances, utilities (energy, infrastructure), and commodities. To achieve its mission, Space4Impact wants to 1) educate stakeholders outside of the space industry about the positive impact and commercialization potential of space technology, 2) connect space startups with new customers outside of the space sector, and 3) implement pilot projects with customers outside of the space sector.

Our Tool: Open Innovation

In the early 2000s Chesbrough noted that established companies, who had traditionally relied on internal research and development as a competitive advantage, were suddenly overtaken by newcomers with little basic research of their own but integrating innovations of others. This development caused a paradigm shift by companies in their commercialization of knowledge, from *closed innovation* to *open innovation* [12]. Chesbrough explains open innovation as "innovation (that) is generated by accessing, harnessing, and absorbing flows of knowledge across the firm's boundaries" [13]. By spinning in innovation from external sources of technology the company drastically increases its number and variety of innovation sources, which in turn improves the firm's innovation process. Moreover, open innovation includes the spin-off of knowledge, allowing the company to pass underutilized/unused knowledge to an outside

entity. Be it spinning-in or spinning-off of knowledge, intellectual property remains a strong asset that can be traded, create new revenue streams, and inspire new business models [13]. Yet, the high number of external innovation sources inadvertently leads to a higher difficulty and complexity when evaluating early-stage technologies, taking into account uncertainty of performance and market adoption [12]. As a consequence, the role of the knowledge intermediaries grows in importance [14]. In its Open Innovation 2.0 Yearbook 2017-2018 the European Commission, highlights the importance of open innovation ecosystems which provide well-defined processes to capture innovation [15].

Space4Impact aims at building an innovation network that offers in-person and online infra-structure to foster creativity, promote innovation in the private sector. To launch the Space4Impact initiative, a call for New Space companies was organized in 2020, to which more than 60 entities across the World applied. Among them 42, whose activities are directly aligned with the UN SDGs, were considered in the Space4Impact ecosystem, and registered on our digital marketplace platform. Following the call, a kick-off event was organized and held virtually on November 25-26, 2020, to raise awareness about space technologies and launch the digital marketplace platform. It gathered key stakeholders from the Space4Impact ecosystem, including New Space companies, non-space corporates, investors, and institutions & NGOs (Figure 1). Building up on this network, Space4Impact created an innovation pipeline strat-

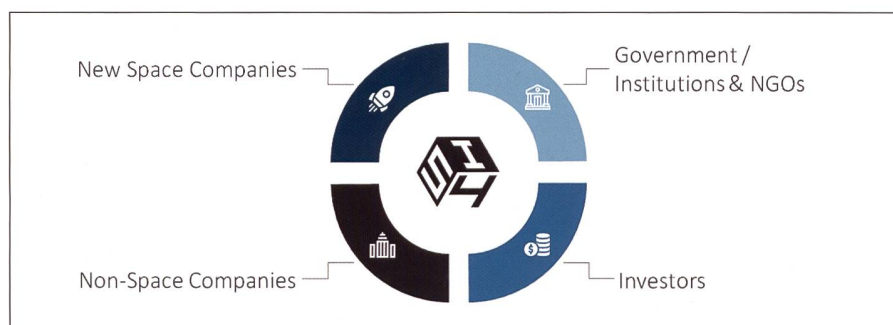


Fig. 1: Space4Impact Ecosystem Stakeholders.

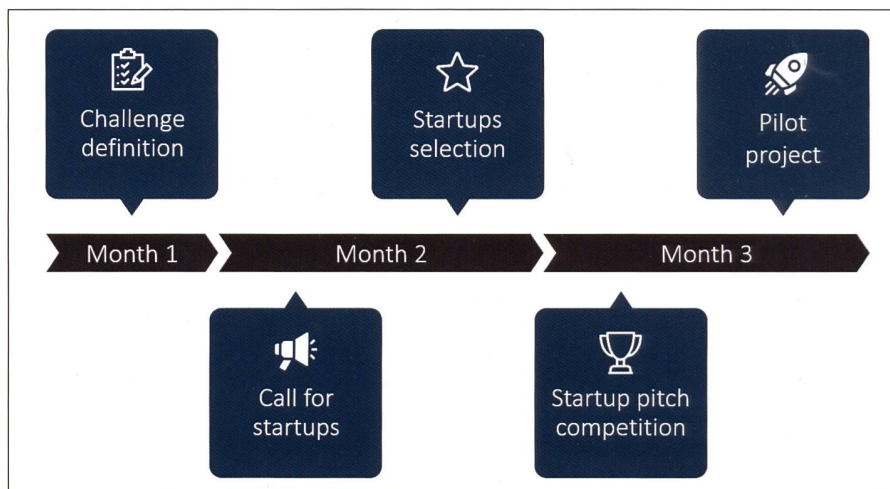


Fig. 2: Open Innovation Challenge Rollout.

egy focused around three pillars 1) educating, connecting, and implementing. The activities are as follows:

- 1) **Educating:** Space4Impact is creating an *Open Online Course* (MOOC) on New Space Economy in collaboration with E2MC, eSpace at EPFL and the Space Innovation Unit at EPFL and ETHZ. The MOOC will be publicly accessible worldwide on edX and eligible for credits at for certain study programs at EPFL. The production of the course is in process and should be completed before the spring semester 2022.
- 2) **Connecting:** Supported by the canton of Vaud and industry partners, Space4Impact is realizing the *Space2Earth Accelerator* program, which will start its first edition in January 2022. The aim of this program is to introduce New Space companies to potential customers outside of the space sector. The program will contain four roadshows,

where the New Space companies will pitch their applications in front of the following industry verticals: 1) Commodities & Finance, 2) Agriculture & Food, 3) Insurances & Energy, and 4) Investors. The industry representatives will also have an opportunity to present their firm's need in front of the startups. Space4Impact tested this concept of fast and targeted exchange event in July 2021, when in collaboration with Inno-vaud, it held a successful networking event for New Space companies and commodity trading companies from the United Kingdom and Switzerland.

- 3) **Implementing:** As a natural extension of the Space2Earth Accelerator program, the *Open Innovation Challenges* offer interested industry partners the opportunity to issue a specific call for ideas for a need of their business. Specifically, Space4Impact created a start-up competition framework to conduct Open Innovation Challenges with one single industry partner at the time to provide them with the necessary expertise and network that allows them to innovate faster, cheaper, and more efficient with space technology (Figure 2).

Conclusion

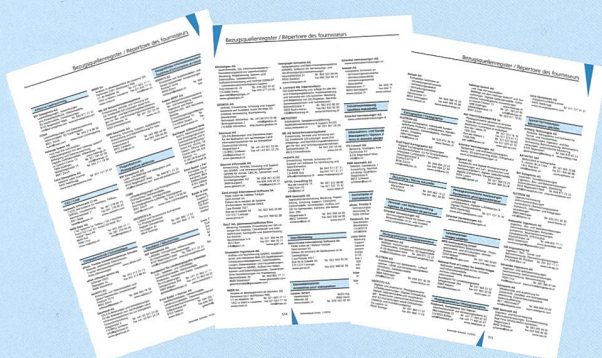
Space4Impact wants to promote the transfer of space technologies in new market outside of the space industry through open innovation. As semi-publicly funded,

non-profit oriented KTTO, Space4Impact aims at offering well-defined processes to transfer innovation at the commercialization stage. After initiating its Ecosystem Marketplace, Space4Impact is now launching its innovation pipeline, conceptualized around the three pillars: 1) educating, 2) connecting, and 3) implementing. Specifically, its Open Online Course will educate actors, its Accelerator Program will connect space and non-space actors, and its Open Innovation Challenges will foster the adoption of space technologies and maximize their impact on Earth.

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Wie? Was? Wo?

Das Bezugsquellen-Verzeichnis gibt Ihnen auf alle diese Fragen Antwort.