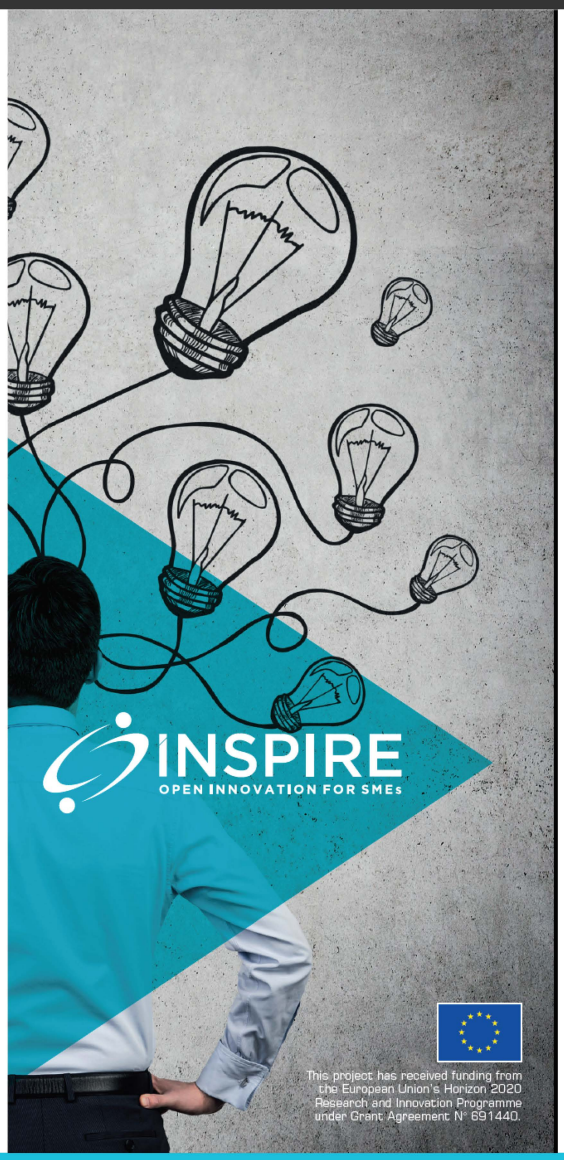

FAUNAPHOTONICS

Denmark, www.faunaphotonics.com

By exploiting the founders' alumni network and connections in the research community, a university spin-off was able to intensify its technology development by securing an QI collaboration with a multinational

Executive Summary

FaunaPhotonics began in 2014 as an initiative of MIT postgraduate, Frederick Tarrnhoj, to start a company based on the inventions of scientist Mikkel Bydegaard Sorenson – a researcher at Lund University who had invented some sensor imaging instruments. The company started very precariously, but after entering a local tech-accelerator programme started by the university, and securing their first patent with the help of advisory board members, they were able to apply for grants and attract business angel backing to carry out proof-of-concept tests of their technology. This was done in collaboration with universities and research centres in three different application areas: malaria mosquito surveillance, detection and deterrence of birds in wind farms, and digital farming.

The second part of the development phase also involves QI, but with a large corporation. We can see the journey of how FaunaPhotonics tried to reach large corporations for QI collaborations, through to the negotiations with Bayer Crop Science to reach a 3-year contract agreement.

CASE N°: SC109

SECTOR: PHOTONICS, IMAGING

TECH INTENSITY: HIGH-TECH

LIFE CYCLE STAGE: START-UP

INNOVATION VECTORS: PRODUCT

01 PARTNERS: PSR, LARGE CORPORATION

KEYWORDS: Photonics, data capture, sustainable crop management, agriculture, pesticides

- BACKGROUND FRAMEWORK
- INNOVATION CHALLENGE & MARKET OPPORTUNITIES
- OI TRAJECTORY
- BUSINESS IMPACT
- LESSONS LEARNED

FaunaPhotonics

BACKGROUND

FaunaPhotonics is a university spin-off which builds on 1Oyears of studies and PhD projects at Lund University Laser Center (Sweden). The company is registered in Denmark where it was founded in 2014 by three people: Frederik Taarnhoj (CEO), Mikkel Brydegaard (researcher at Lund University and inventor of the company's technologies) and Carsten Kirkeby (biologist at the Technical University of Denmark). Through its technology offer, FaunaPhotonics quantifies aerial fauna to ensure sustainable crop utilization and to improve tools for disease control and biodiversity for the benefit of mankind.

The driver of the company has been the entrepreneur Frederik Taarnhoj who saw the potential in the technologies developed by Brydegaard and who sought application insights and biologist expertise from Kirkeby to start the business. Taarnhoj worked for 8 months setting up FaunaPhotonics and during this time took no salary. Then the Technical University of Denmark announced that it was opening a new business accelerator programme. Taarnhoj applied and pitched FaunaPhotonics, and obtained a place within the programme. It provided him with office space and openings to innovation competitions, and attracted investor capital. By gaining media attention and exploiting his MIT alumni networks, Taarnhoj made inroads into the company's target sector industries in order to establish an OI collaboration agreement with a leading multinational company.

INNOVATION CHALLENGE & MARKET OPPORTUNITIES

The strategic challenges which the start-up encountered were related to:

- Identifying possible application areas for the technologies invented by co-founder;
- Keeping the company alive in the early stages;
- Attracting private investors to develop the business idea;
- Establishing and managing open innovation collaborations with large corporations and R&D centres.

The market opportunity involved developing cutting-edge optical remote sensing tools, which would set new standards for monitoring birds and insects. The innovative technology platform automates manual processes, thereby optimizing the monitoring of birds in wind farms, crop scouting processes in agriculture and malaria mosquito surveys in Africa. This is a major change from the norm of manual observation and sampling. The solution combines optical, laser and data processing technologies to detect biological objects, thereby creating tools that provide new insights.

OPEN INNOVATION TRAJECTORY

Concept development

FaunaPhotonics' light Detection and Ranging (LIDAR) is a technology for profiling the atmosphere for aerial fauna. The system transmits a laser beam into the atmosphere and measures the backscattered laser light from birds and insects. The portable in-field sensor system with wireless connectivity enables the automation of manual processes to improve efficiency and accuracy.

The development process, IPR and competition strategy

During the early months of the start-up, the company had no office space and Taarnhoj worked in a precarious situation, based in some spare research office space in order to be close to the team of biologists and co-founder Kirkeby at the Veterinary Institute. This proximity was vital in order to begin developing the ideas and applications for the technology and instruments.

Collaborating with Lund University and the Veterinary Institute at Uni Denmark, the co-owners identified 3 target application areas: malaria mosquito surveillance, detection and deterrence of birds in wind farms, and digital farming. They were then able to use these collaborations to apply for and access different projects for applying and testing the technology in these different areas.

After gaining a more permanent workspace through the local technical university's accelerator programme, FaunaPhotonics's development phase for the application areas involved establishing different OI collaborations in order to prototype and test the technologies, and - importantly -to attract external funding through private investor pitches and applying for R&D grants. During 2015-16, they went through two rounds of financing

with private investors, and obtained three R&D grants. The OI projects with Danish R&D and technology centres served to advance FaunaPhotonics' proof-of-concept and user-application testing work and to raise their profile in scientific communities and through media focus.

In Sweden the IPR ownership lies with the researcher/inventor. Therefore the co-founders did not need to enter into any licensing agreement with Lund University for the technologies. The university allowed the creation of the spin-off and Mikkel Brydegaard brought his IP into the Danish-based company as co-founder, although he does not work or contribute to the operations of FaunaPhotonics.

None of the founders had any experience in writing patent applications and they could not afford a patent lawyer. They therefore turned for help to one of their advisory board members, who wrote their first patent application for them. This subsequently enabled the company to acquire more funding.

Presently, no competitors exist in the market.

Commercialization and follow-up

In order to take the start-up to the next level of the development phase it was necessary for FaunaPhotonics to establish a relationship with a large corporation and important market player. Taanhoj notes that this was quite a long journey. One thing that really helped was that Taanhoj had studied at MIT and was able to exploit their network of 30 000 alumni. Through the network and with the help of MIT's industrial liaison officers and start-up exchange platform, MIT STEX, he was able to identify some relevant contacts and talk to them about the company's technology.

He was first contacted by Monsanto who were looking for start-ups working on agricultural technology and were interested in new innovations that they could perhaps benefit from. He had some discussions with Monsanto and also with competitors, Dupont, and Taarnhoj said that he was confident that FaunaPhotonics would establish an OI agreement with one of those two companies.

But then suddenly Bayer Crops Science approached him in mid-2016 and they began to discuss a joint OI project. It is unclear how Bayer came to hear about FaunaPhotonics, but Taarnhoj believes that the most likely explanation is that it was through the sector business networks and conferences. It took around 8 months of negotiations to finally sign a contract with Bayer.

An initial difficulty for FaunaPhotonics and Bayer Crop Science to overcome was that Bayer's open innovation activities are a long way into the future; they are really thinking about how radically agriculture is changing and how they can contribute to that. On the other hand, as a start-up SME, FaunaPhotonics had a very early-stage technology for which they did not have full proof of concept but certainly some ideas about which development path to take. The negotiations and discussions were therefore based on establishing trust and creating a space where both sides could share ideas and create a shared story.

After their initial meeting they had a long process during which they did not discuss contracts or how they would co-operate together on a legal basis. The companies dedicated their time to establishing which steps in the collaboration project would be in the form of actual work packages: writing a well-defined OI project establishing what FaunaPhotonics would deliver to Bayer and what Bayer would support the SME with.

This took around 3 months, and then the contract had to be prepared and signed. Taarnhoj says that this was quite a difficult time: they were afraid that the contract would not be signed or would be delayed. During this time they were supporting costs and a cash-flow burden, meaning that they could very quickly get into a difficult situation if they did not have the necessary funds to maintain their international patents.

Through their Digital Farming department, Bayer Crop Science are trying to build some digital tools around their agricultural consultancy service, which source sensor data and model these inputs to come up with more quantified recommendations for farmers and provide the best recommendations to benefit agriculture and society in a wider sense. In this way, Bayer obtains access to the newest technology within the space of insect surveillance. This allows them to include data from sensors which can detect and survey insects within their software systems and tailor recommendations accordingly. FaunaPhotonics gains financial security and are able to develop their insect surveillance product line beyond its initial specifications.

The company had to expand and take on more staff quite rapidly to deal with the development projects and manage the different OI collaborations which were taking place. They grew from just one person to nine employees within quite a short period of time. New organizational requirements involved a more structured company in order to extend the development phase and manage the commercial aspects and also to manage the OI relationships between the market

and the research community.

In terms of marketing strategy and alliances, the start-up responded in the following ways:

- They used their initial QI experience in the early start-up stages to gain media coverage and raise the profile of the company to attract private investors. This included innovation challenges, tech pitches and taking part in the accelerator programme.
- Later, they used their QI projects to carry out proof-of-concept and development work to raise the profile of the company in the scientific community Goint projects with Danish R&D and technology centres; exploiting university contacts and alumni networks).
- QI collaboration with a large corporation provides financial stability, as well as larger-scale application and testing of the technology with the potential to roll out and scale up. The QI partner gains access to cutting-edge technology aligned with company strategy and mid-long term business lines.

BUSINESS IMPACT

The QI collaboration resulted in new patents, and product prototypes were tested in 3 different environments/applications. The 3-year QI contract with a major international corporation helped stabilize the start-up's development.

The company learned to use open innovation to create a link between the market and the research community.

The company has relied 100% on private investors, business angel backing, as well as funding from grants to keep going since its creation in 2014. The new 3-year QI contract with Bayer is helping to stabilize the company's development.

LESSONS LEARNED

This is an interesting example of an QI collaboration between a start-up and a large multinational corporation. The SME has learned to use open innovation to create a link between the market and the research community. Two of the company's co-founders do not have an active role in the day-to-day running of the business and have remained in their research career tracks, yet they are necessary to drive the innovation forward and provide scientific credibility. These two points were vital in gaining the trust of the large QI partner.

Main lessons learned:

1. Strong networks and trust are vital for successful open innovation partnerships with leading large companies. Without exploiting networks (alumni and scientific community) it would have been difficult to establish partnerships.
2. As a university spin-off, maintaining contacts within the university can give access to a range of knowledge and opportunities needed by start-ups and small companies – such as free office space, accelerator programmes, proximity to scientists to validate ideas, etc.
3. Open innovation can help an SME to combine business, technology and research in a balanced way and survive financial pitfalls during the product development process.