xSpectre

LEAD Entrepreneurs in Residence - Halftime Document

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Aim

During the Entrepreneurs in Residence (EiR) programme at LEAD, we were tasked with working on the xSpectre case, which proposes using a spectrometer to analyse a substance which in turn will provide measured parameters from this substance.

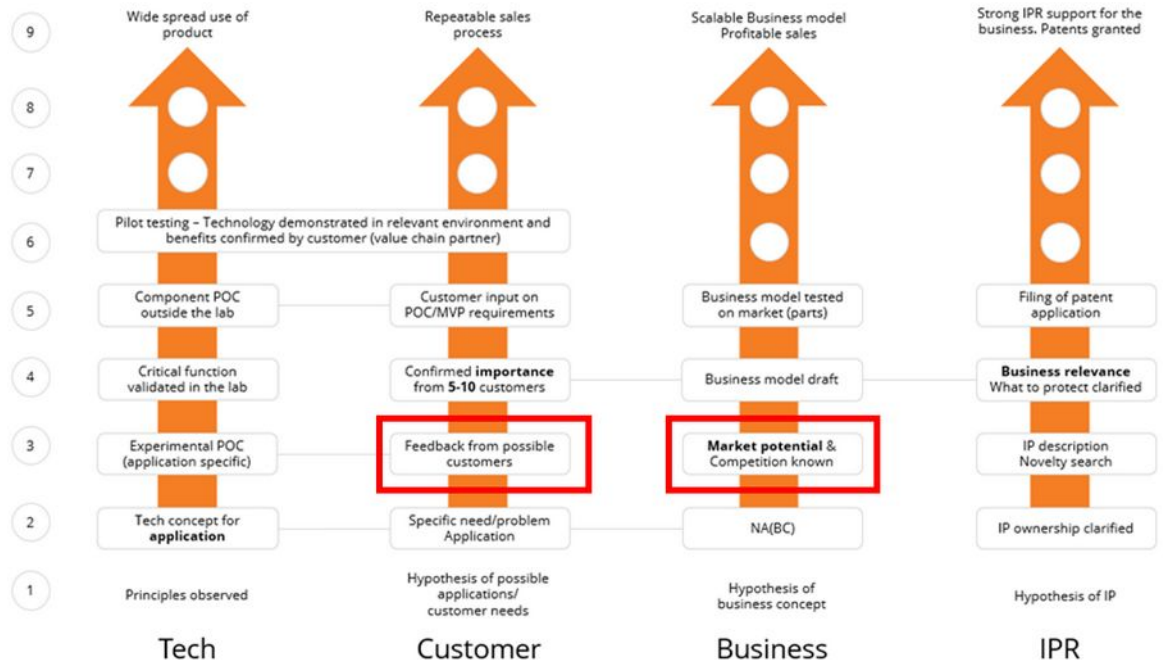
The chosen target market for the xSpectre technology was the agricultural sector, and thus the 'substance' is soil. During the EiR programme the use of xSpectre's technology in agriculture has been investigated, and the findings from this investigation will be explained in this document along with suggestions for moving forward with the case.

Defined Goals at Programme Start

At the start of the EiR programme, the following goals were agreed upon between the EiR and the xSpectre idea owners for the preceding 3 months of work by the EiR until the halftime mark of their programme:

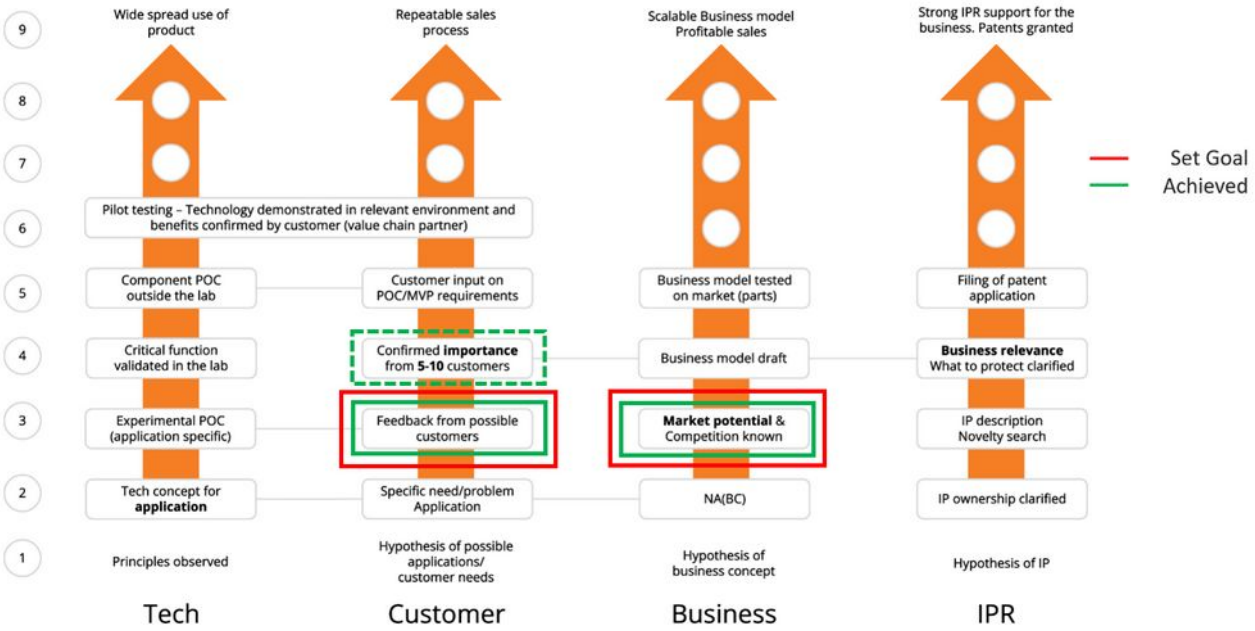
1. Define if there is a market need – get feedback from customers
    a. Define the best approach into the market
    b. Define the market uses
    c. Define what requirement the market has on the technology
2. Have a better idea of the competitor market

This is alike to reaching level 3 for both the Customer Readiness Level (CRL) and the Business Readiness Level (BRL), as illustrated below:



Accomplishments at Halftime

According to the feedback from the customers, and the research done, we would say that we have attained the set goals of level 3 for both the CRL and BRL, and potentially even level 4 for the CRL. This is on the grounds of having confirmed the interest of at least 5 customers in the xSpectre technology to measure soil.



These levels are based on the findings from the interviews that were conducted. The findings of which will be discussed in the next section.

All individuals that were interviewed will be referred to as ‘customers’ during this report.

Findings

Initially when interviewing the customers, a broad approach was taken to find out what general problems they face within agriculture. Many people listed their biggest problems as aspects they cannot control, such as the weather, or politics surrounding agriculture. However, after more investigation into how they work within agriculture the importance of soil was confirmed, and thus also the market need.

As a result, in the later stages of this first half of the EiR programme the interviewing approach was changed to have more specific questions regarding soil, and thereon the interest that the customer would have in xSpectre’s technology. All individuals interviewed using the second approach were interested in the technology, although the interest levels varied from low to high and there appears to be a lot of scepticism around the technology (and technology’s use in agriculture in general), even though there is an interest.

A total of 17 customers were interviewed during the first half of the programme, and the main takeaways from these interviews are listed and discussed below. For additional information, check the respective meeting notes for the interviews.

Interview Material

The 17 interviewees can be broadly split into four groups, namely: farmers (4), agricultural consultants (7), AgTech innovators (5), and researchers (1). These group names are self-explanatory, except for ‘AgTech innovators’ which includes individuals/companies with technology solutions in the agricultural sector or who were involved in the business side of agriculture. The general questions that we asked the interviewees can be seen below. The questions were adapted to the interviewees themselves, and follow-up questions were asked based on the conversation:

- Could you tell me a bit about yourself?
    - What is your particular role?
- What is a typical day as a ()?
    - What do you do?
        - Tell me more about ().
    - Do you monitor your soil?
        - How often?
        - How?
        - Do you wait for the results of the soil before continuing with farming?
            - How long before you get the results?
    - What ‘parameters’ are important to consider when monitoring the farm/soil?
- What are the biggest challenges you face when monitoring farms?
    - How do you deal with them?
        - What do you like and dislike about these current solutions/processes?
    - Have you tried other solutions in the past?
    - Can you describe a typical day when this problem arises? (Alike to the question above)
    - “If you had a magic wand, what would your solution be?”
- (Would you be interested in our solution?)

- Could you please suggest other contacts to us that we may also speak to?

Soil Sampling Process

A soil sample test is performed to analyse the properties of soil at a given location, to be able to adapt the farming strategy taken – to fertilize, lime, etc. Within Sweden, soil sampling is recommended to be performed once every 10 years, although it is not compulsory. The standard practice is to take a soil sample every 1 hectare spaced over the land area being mapped. These samples are then sent to a lab to be analysed. In Sweden the two main soil sampling labs are at Hushållningssällskapet and Eurofins. According to Magnus Westöö, who takes soil samples for Hushållningssällskapet in Östergötland, the lab analysis should take 3-5 weeks, although it can take months during the peak sampling time – which is in August, at the end of summer after harvesting the crops from the previous year.

From our findings, the soil sample is taken in two ways: (both images are taken from the Hushållningssällskapet website)

1. Manually using a tool similar to a spade

2. Using an ATV with a ‘sampling device’ attached to it:

These samples are then packaged in a box and sent to the lab. When each sample is taken, its geographical location is marked either using physical markings on the farm or using GPS. The sampling itself (and thus the geographical marking of the samples) is generally done by a farming consultant, such as those from Hushållningssällskapet, yet they can be done by the farmer themselves – which we found to be very uncommon.

According to Magnus Westöö the number of soil samples he predicts to take in Östergötland for **2022 is 25,000 soil samples** – which will be the most soil samples he has taken in his 15 years of taking them. In **2021** they took **11,600** soil samples which at the time was the most he had ever taken. He mentioned that the reason this year’s number of soil samples will be more than double of last year’s, is as a result of the new EU regulation supporting having soil samples ‘younger’ than 10 years old. There is also a **compensation scheme for if you have soil samples ‘younger’ than 10 years**

old, as outlined here by Jordbruksverket (https://jordbruksverket.se/stod/stod-till-jordbruket-och-landsbygden-2023-2027/jordbrukarstod/1-ariga-miljo--och-klimatersattningar-2023-2027/precisionsjordbruk---planering)

When asked if this spike is just temporary, as the EU regulation was announced this year, he said something along the lines of **it is possible** that this is just a spike – **only time will tell**. If it drops, he hopes it goes down to 'normal' around 10,000 or 11,000 samples

There are also **companies such as Arla that are enforcing/supporting soil sampling**, which forces the farmer to take soil samples if they want to sell their produce to Arla (or the specific company). (A link to Arla's website listing their requirements https://www.arla.com/company/news-and-press/2021/pressrelease/arla-is-stepping-up-its-organic-proposition-to-capture-category-growth-in-europe/)

- Regarding Arla, this may be a result of them doing business internationally, and other countries have different regulations regarding soil samples. Therefore, Arla needs to meet the other countries soil sample requirements if they are to do business with them

Feedback from Customers

As mentioned before, initially when interviewing the customers, a broad approach was taken with the questions. From these questions the **main problems** found in agriculture were found to be aspects that the farmer could not control – such as **weather and politics**. Although, after asking the more direct questions regarding soil, it was found to be an important part of agriculture and people are interested in taking care of it.

However, there was not always a clear interest in measuring soil. A common statement was that 'soil parameters take a long time to change,' so they are not so interested in monitoring it. There is also the aspect that performing soil samples costs money, so if a farmer wants to perform soil samples more frequently, or take more samples (in general or in shorter distances than the standard 1ha), they have to pay more money – which they are reluctant to do, and often do not.

Furthermore, when we asked the customers '**if they are interested in the xSpectre solution'**, they **all said yes**. Although, many of them are **sceptical about the technology** (and the use of technology in general within agriculture). It was mentioned a few times that technology will be more present in the future, as the younger generation will be more inclined to use it, although concerns in existing technologies were highlighted. We found out that there are two Stenon devices in Sweden (at the time of doing our interviews), which is one of xSpectre's biggest competitors (https://stenon.io/en/). One device with Fredrik Tidström, a farming consultant in Västergötland (also a bit of an 'agriculture influencer' - https://www.vaxtab.se/ or see his Facebook page), and one device in one of Hushållningssällskapet's southern branches (we believe Skåne, according to Magnus Westöö). The **feedback** we received from them about the **Stenon device** is as follows:

1. Fredrik Tidström
    a. He enjoyed the ability to measure the soil wherever he wanted, as opposed to every 1ha, as the soil parameters may change every 10 m.
    b. The device is not fully accurate – maybe 4 or 5% off with its results. Although it offers a good indication

        i. However, the device cannot give a ‘wrong’ measurement, and it just provides an error message. I.e. if a nutrient’s value is (much) higher/lower than it should be it will just say ‘error’
    c. It takes 15 minutes to setup the device, which he does not enjoy. It takes 2 minutes to measure
    d. Sometimes the device cannot make measurements. Such as when the sun’s rays interfere with the measurement (in summer) or if there is something like grass in the way of the sensor in the soil.
        i. It also cannot work in loam soil, allegedly.
    e. He is sceptical about the technology
        i. As it is new. He’s not sure if it is accurate.
        ii. People want **proof that it works**. Need to build **trust** in the farming community
2. Magnus Westööö
    a. They found the lab soil results were more accurate than the ‘instant results’ of the Stenon device.
    b. It was difficult to get ‘accurate results’ when using the Stenon device
    c. However, technology could improve in the future, so then maybe in the future it could

Farmlabs, the company that has the Stenon device, contacted Fredrik Tidström to test this device – likely as he is an ‘agricultural influencer’ with his Facebook page. He mentioned this device is in it’s testing phase, and that the device costs 30-50k SEK (per year) now, although may cost around 80k SEK per year once the device is complete.

(We never interviewed Jordbruksverket, although some of the other trainees did and they found out that Jordbruksverket cannot contact farmers directly as they are prohibited by law - they can only contact advisors. Although, Jordbruksverket do have a newsletter, host workshops, and things of that sort that farmers can join.)

The **main soil parameters** that the customers were interested in are:

- pH
- Organic matter (hummus)
- Clay content
- (Phosphorous)

These four parameters were the most mentioned parameters, and the first three were the ‘three important parameters’ that Magnus Westööö says Hushållningssällskapet consider. Other parameters included potassium, calcium, nitrogen, magnesium. People are also interested in water retention, or how compact the soil is. (There are possibly other parameters mentioned in the interview notes, although, as previously mentioned, the four parameters listed in the bullet points were the most common)

Interpretation of Findings

People seem interested in the technology, and the ability to measure their soil, however, they are sceptical about the technology. They need a proof of concept that the technology works, and in that way you need to build trust in the agricultural community.

Consultants are likely the way in – launch market. People do not analyse their soil that often, so people would likely not be willing to buy a spectrometer, yet you could rent it to consultants. Also, **consultants/agronomists are trusted within the agricultural community**

Make an actionable solution – actively add value to them. With a measurement, recommend to the farmer/consultant what they could do. Such as with liming companies based on the soil's pH measurement

- Farmers are selling yield (1) -> Need to fertilize areas producing high yield (2). This way they'd be interested if the measurement helped them maintain/increase their yield.

People are interested in an easy solution. A 'plug and play' solution, so to speak, where the user has to do as little as possible

There seems to be a high interest in soil samples currently as a result of the EU regulation (and due to companies like Arla), although it is uncertain whether this interest will decrease in the coming years.

There are a few people that are very interested in the technology, and could be your early adopters. Such as:

- Fredrik Tidström
- Adam Giertta
- Jens Blomquist

There are also potential collaborators:

- Dataväxt
- Ekobot

Hinders

Soil takes a long time to change its parameters, so people are not so interested.

There does seem to be an interest in measuring soil, and there appears to be other competing technologies coming out.

People are not so open to technology

- (Many people mentioned technology will be more present in '10 years', so why not start now – need to prove the technology)

Competition

The companies that xSpectre have already highlighted on their blog, such as Stenon

Dataväxt – opening a new application Markdata (https://datavaxt.com/sv/produkter/markdata/)

Paultech (https://paul-tech.com/)

Yardstick (https://www.useyardstick.com/)

Soyl are apparently developing a technology – according to Johanna Wetterlind (https://www.soyl.com/)

Suggestions/Next Step

Get a proof of concept, as it is still uncertain if the technology works.

- (Can get more attention from the market by increasing the TRL. Focus on getting the technology to work, even if it's just measuring one parameter)
    - Get reproducibility. Gain trust in the technology

Does the technology work for soil?

- If yes -> Business model canvas and technology development/PoC (with customers).
- If not, pivot. Find a new market as this technology could work somewhere else
    - Medicine? -> E.g., blood analysis or drug analysis for pharmaceuticals

Potential collaborations

- AgTech 2030? (Ulrik Lovang)
- Ekobot
- Dataväxt