DRaaS PITCH DECK

DILUTION REFRIGERATOR AS A SERVICE

PROBLEM

There is a high upfront cost for a dilution refrigerator (DR).

Some researchers and quantum computing startups can’t access a DR to conduct an experiment.

SOLUTION

- Making various types of dilution refrigerators less costly and globally accessible with *pay-as-you-go* model on a platform or having a lab

Since the number of quantum computing startups are on rise, there is an increasing demand for a DR to test a chip design. Therefore, the market size is growing.

Basic Steps of the Service

By Customer **:**

- Booking and registering the constraints of an experiment (no vibration, ultra-high vacuum, etc.)
- Shipping the sample/chip they want to have measured

By Company **:**

- Mounting the sample/chip and conducting the measurements
- Shipping the sample/chip back to the customer address
- Making the results secure and accessible through a platform

MARKET

- **TAM** (Total Available Market): global dilution refrigerator market → **$118 million**
- **SAM** (Service Available Market): target service region as Europe → **$54 million**
- **SOM** (Service Obtainable Market): SMEs and research teams that can't afford having a DR constitutes 1/3 of the available market→ **$18 million**

Competition

- In platform model: **Research collaboration**
- In Lab model**: No** competitors right now,
- **Potential competitors** in future: Current DR producers,
  Bluefors Oy, Oxford Instruments NanoScience, Leiden Cryogenics BV, Air Liquide (Cryoconcept), Cryomagnetics, Janis Research Company, NanoMagnetics Instruments, ICE Oxford Ltd., Quantum Design Inc., Leiden Cryogenics, Entropy, LTLab Inc.

Business Model of Platform

Connecting existing labs, having DRs, to customers who need a service

Servers and equipments cost: 0.5 M€
Staff cost: 0.2 M€ annually
Assuming the lifetime of servers are ~10 years
Total cost: 0.25 M€ annually (monthly ~21 k€)

Provide a platform and take 20% of the total benefit as a connector.
Cost for providers (Energy, technician): ~0.2 k€ per day and DR
Daily rental service: 1 k€ per service
The benefit is around 0.8 k€ per service (0.64 k€ for provider and 0.16 k€ for our platform)

Connecting five monthly services are covering our platform monthly cost
The more connections, the more revenue.

Business Model of Lab

A lab with **3 different DRs** cost: ~1.2 M€
Electronics and Servers costs: ~3 M€
Staff cost: 1 M€.
Total cost for our proposed lab is about 5.2 M€.

Assuming the lifetime of a DR, electronics, and servers is ~10 years,
0.4 M€ annually (for DRs and electronics and servers) + 1 M€ (for staff)
Total cost for our lab is 1.4 M€ annually.

Daily cost is ~1.3 k€ per DR
Daily rental service at 3 k€
Daily profit is around 1.7 k€ per DR
Annual profit of around **1.8 M€** from our lab

Advantages and Requirements of the Business Model

Advantages for Customers

- **No upfront costs**
- **Time advantage:** experiment results in a short time
- **Globally accessible:** no travel requirement to the service point
- **Stable power resource** reducing the risk of failure
- **No storage/installation/maintenance requirements**
- **No downtime:** technicians available
- **Sustainability**
- **Profit for Universities & companies:** renting their DRs during downtime period

Requirements

- **Stable energy resources**
- **Highly demanded talent** for assembling and maintenance
- **Providing modified designs** for customer
- **Estimating the computing cost** per unit work
- **Scalability**

REVENUE MODEL

Having a lab with **3 different DRs** ⇨ **daily cost** is **~1.3 k€** per DR

Providing daily rental service for **3 k€** ⇨ **the profit** is **~1.7 k€** per DR

1.8 M€ annual profit

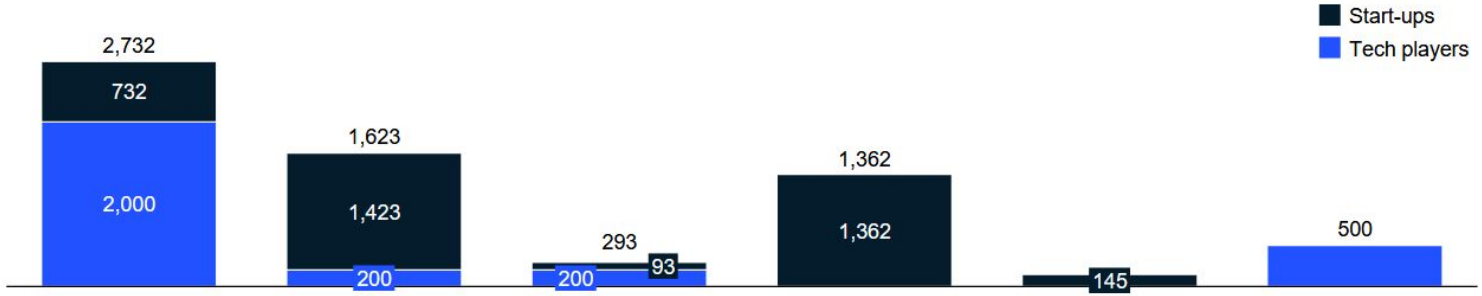
VISION

Highest investment has been done on **superconducting qubits** that requires **DRs**:

Preliminary

Technology	Superconducting circuits	Trapped ions	Spin qubits	Photonic networks	Neutral atoms	Majorana fermions
Qubit description	Difference in Cooper pairs between two islands of a Josephson tunnel junction	Internal energy levels of ions trapped by electromagnetic fields	Electron spin of one electron localized in a semiconductor quantum dot or insulator defect (eg, NV centers in diamond)	Occupation of a photonic waveguide	Internal energy levels of highly excited atoms trapped by laser fields	Two Majorana modes at superconductor/ semiconductor interfaces
Maturity						

Funding ($m)



Quantum Technology Monitor, p.27, June 2022, McKinsey & Company

Market & Revenue Forecasting 2028

Based on Market Research Reports Inc., 2022, and our speculations.

- **TAM** (Total Available Market): global dilution refrigerator market → **$236 million**
- **SAM** (Service Available Market): target service region as Europe → **$108 million**
- **SOM** (Service Obtainable Market): SMEs and research teams that can't afford having a DR constitutes 1/3 of the available market→ **$36 million**
- Our revenue for lab business model: At least around **4 M€** in 2028

TEAM

Johanna Janssen
johanna.janssen@rwth-aachen.de

Ali Asgharpour
a.asgharpour@uu.nl

Seher Ugurcuklu
seherugurcuklu@gmail.com

Other contributors: Katherine Dunne, katherine.dunne@fysik.su.se & Kübra Doğmuş, engkubradogmus@gmail.com

THANK YOU