**WEEK ONE: Market Segmentation & Competitive Landscape**

**Goals: Founders should be able to have a tool or framework to: Find their value proposition. Understand where and how much value can be created through the use of their quantum technology. Map the competitive andscape in which they are operating. Articate their differentiation and moat.**

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For identifying value proposition, assessing value creation, mapping competition, and articulating differentiation, we use specific tools such as **Value Proposition Canvas, Business Model Canvas, Competitive Matrix, Differentiation Mapping and Narrative Development Tools.**

**Value proposition and Goal:**
- The value proposition is to offer a speed-up to simulation software for industrial research departments. A current bottleneck is the massive computational requirements that computational fluido-dynamics, and differential equations more in general, require. Offering cheaper solutions will seamlessly trigger faster and economically more sustainable technological development.

- The long-term goal is to be a frontrunner in quantum and AI, revolutionizing industries reliant on computational fluid dynamics (CFD) and other complex simulations by drastically reducing simulation time and cost while maintaining high accuracy.

- The impact on market is acheived by dramatically accelerating product development cycles, enable the design of more efficient and innovative products (e.g., aircraft, vehicles, energy systems), and democratize access to high-fidelity simulations, fostering breakthroughs across multiple sectors.

- Higher value can be created by combining the agility and generalization ability of classical deep learning, with the expressive power of quantum circuits for differential equations, or a useful subset thereof, at least.

**Market Segmentation**

**1. What is your TAM, SAM, SOM, and how is it expected to grow over the next few years? Explain where your estimates come from.**

QuaSi's Total Addressable Market (TAM) is the global semiconductor market, estimated at over $600B in 2024 and projected to grow beyond $1T by 2030, driven by increasing demand for advanced chips. Within this, our Serviceable Available Market (SAM) is the ~$2B+ market for simulation software and optimization tools used in crystal growth for semiconductor manufacturing, including tools for Czochralski and float zone processes. Our Serviceable Obtainable Market (SOM) is initially focused on high-value R&D labs and fabs in Europe and North America, representing an estimated $100–250M opportunity in the next 3–5 years. These figures are based on data from McKinsey (semiconductor outlook), SEMI, and niche materials modeling market reports.

The Detailed analysis of SAM and SOM: Serviceable Addressable Market (SAM): Our SAM is the segment of the CAE market focused on high-stakes multiphysics and fluid dynamics simulations within our initial target industries: semiconductor manufacturing, aerospace, and advanced materials R&D. We estimate this market to be $1.5B.This figures derived by segmenting the broader CAE market,with a primary focus on the Technical Computer−AidedDesign(TCAD) and process simulation software market for semiconductors (estimated at 800M-$1B), supplemented by the R&D simulation budgets in adjacent high-value fields. The growth in this segment outpaces the broader market, driven by the demand for next-generation chips (e.g., SiC, GaN) and more complex material science challenges.

Serviceable Obtainable Market (SOM): Our initial SOM over the next 3-5 years is $40-60 million. This is our realistic "wedge" into the market, calculated from the bottom up. We are targeting an initial set of 20-30 high-value customers, including specialized crystal growth equipment OEMs, tier-one semiconductor fabs, and leading national research labs in Europe and North America. Assuming an average annual contract value (ACV) ranging from enterprise licenses to smaller R&D partnerships, this SOM represents an attainable market share as we validate our technology and build commercial traction. This focused approach allows us to establish a strong foothold before expanding into the broader SAM.

**2. What are the different customer segments within the market, and what percentage of the total market do they represent?**

Key customer segments we identified:

- Semiconductor manufacturers with in-house crystal growth operations

- Specialized crystal growth equipment manufacturers

-R&D centers focusing on next-gen chip materials and Academic research groups involved in materials science and process optimization

Semiconductor Manufacturers & Fabs (45%): This is our largest segment, including major players like Intel and TSMC, as well as specialized material suppliers like Siltronic or Wolfspeed. They rely heavily on process simulation to maximize yield, reduce defects, and accelerate the development of new materials (e.g., SiC for EVs). Their primary drivers are cost reduction and time-to-market for high-volume manufacturing. Their massive R&D budgets and acute need for optimization make them the largest portion of our SAM.

Semiconductor OEMs (25%): This segment includes companies, which design and build the manufacturing equipment used by fabs. For them, simulation is a critical design tool to improve equipment performance, validate new process recipes, and offer a competitive edge to their customers. They need high-fidelity predictive tools to embed in their design and sales cycles.

Industrial R&D Centers (20%): Institutions like Fraunhofer, IMEC, and DESY are at the forefront of materials science and next-generation manufacturing processes. They serve as crucial validation partners and early adopters, focused on pushing the boundaries of what's possible. They require flexible, powerful tools for exploratory research and often collaborate directly with industry, influencing future technology adoption.

Cryogenics, Energy, and Niche Advanced Materials Companies (10%): While our initial focus is on semiconductors, this segment represents our first expansion vertical. Companies in these fields face similar challenges with complex thermofluid dynamics (e.g., turbine design, hydrogen storage, battery cooling). They represent a smaller but significant portion of our initial SAM and a key vector for future growth.

**3. What do you hypothesize are the customer needs/pain points?**
Current pain points include:

- Limited predictive power of existing CFD tools in modeling complex heat, mass, and phase transitions during complex crystal growth and cryogenic vessels design

- Costly trial-and-error in optimizing process parameters

- Difficulty integrating emerging quantum ML methods

- Lack of modular, high-performance AI/ML frameworks tailored for CFD simulations

Prohibitively Long R&D Cycles: Traditional CFD/FEM simulations for complex processes like crystal growth can take days or weeks on expensive HPC clusters. This creates a severe bottleneck in the design-build-test-learn cycle, slowing down innovation and increasing time-to-market.

Inadequate Predictive Accuracy for Complex Physics: Existing tools struggle to accurately model highly nonlinear, coupled phenomena (e.g., turbulent melt convection, thermal radiation, and phase change simultaneously). This forces engineers to rely on costly and time-consuming physical prototyping and trial-and-error.

High Cost of Computation (HPC & Energy): The reliance on large-scale HPC clusters is not only a significant capital and operational expense but also carries a substantial energy footprint, which is increasingly at odds with corporate ESG (Environmental, Social, Governance) goals.

Workflow Integration and Scalability Challenges: Integrating novel simulation methods into decades-old legacy engineering workflows is a major hurdle. Existing in-house or commercial tools are often monolithic and not designed for modular, hybrid approaches that can leverage both AI and future quantum enhancements.

**Competitive Landscape**

**4. What are your direct and indirect competitor categories (quantum computing hardware type, classical alternatives) in your targeted industry? What is your differentiation for each of these categories?**
Direct competitors:

- COMSOL Multiphysics, Ansys, BQP, and PhysiX Process–classical multiphysics simulators.

For the differentiation not trying to replace Ansys/Comsol overnight. We are targeting the specific, high-value problems where they are weakest. Our QPINN architecture offers a potential 10-20x speedup, turning week-long simulations into overnight or near-real-time results. Our physics-informed core ensures we maintain the physical fidelity that engineers trust.

Indirect competitors:

- Quantum simulation startups like Zapata or QC Ware

Emerging AI-for-CFD Startups (Indirect Competitors): Emmi AI, Neural Concept, SimScale (with AI features). These companies leverage AI to accelerate simulations, primarily by learning from existing simulation data.

QuaSi differentiates by offering a physics-informed which includes Neural Networks, Neural operators, Operator Transformer approaches in modular manner platform combined with the quantum variants in Hybrid quantm classical phyiscs inspired AI models for crystal growth simulations and advanced semiconducting materials. It combines classical and emerging quantum methods under a unified interface.

## 5. What will rivals and new entrants do in response to your success? Do you have some source of defensibility?
Rivals may enhance their crystal growth simulation capabilities or acquire niche players. However, we builds defensibility through:

- Deep integration of domain-specific priors into its simulation architecture

- Modular backend enabling both classical and quantum methods

- Early academic and industrial collaborations

- Potential IP around hybrid quantum-classical solvers tailored to crystal growth scenarios

We anticipate a multi-pronged competitive response as we gain traction, but our strategy is built around creating a defensible "moat."

Team as a Moat: Our founding team's rare combination of skills is our most durable asset. Replicating a team with this specific blend of deep scientific knowledge, applied AI/quantum experience, and business acumen is exceptionally difficult.

Anticipated Competitive Responses: Incumbents (Ansys, etc.) will likely respond through acquisition, attempting to buy AI or quantum startups to integrate into their

platforms. They may also launch "AI-accelerated" marketing campaigns for existing features, even if the underlying technology is not transformative.

Quantum Players (Zapata, etc.) may attempt to build "industry solutions" teams to replicate our application-first model, seeking partnerships with our target customers. New Entrants will emerge, but will face a steep learning curve in both the complex physics of crystal growth and the nuances of building hybrid quantum-AI models.

Defense Strategy based on Domain Expertise & Proprietary Models: Our primary moat is the fusion of our team's expertise in condensed matter physics, AI, and quantum computing, which is codified into our simulation models. These QPINNs, trained and validated on specific crystal growth physics and cryogenic design , are highly specialized and not easily replicated

Early Partner Data & Integration: Our collaborations with leading research institutes (IKZ, Fraunhofer) provide us with early access to validation data and deep insights into customer workflows. Deeply integrating into a partner's R&D process creates high switching costs and a powerful first-mover advantage.

IP in Hybrid Approaches and Architectures: We are training the hybrid quantum-classical solvers on heterogenous architectures. As we refine these methods, we will pursue patent protection for our novel integration of physics-informed AI with quantum subroutines, creating a technical and legal barrier to entry.

Virtuous Cycle of Data and Accuracy: As more customers use our platform, we will accumulate a unique and valuable dataset of simulation parameters and results. This data can be used to further refine and pre-train our models, creating a feedback loop where the accuracy and performance of our platform continuously improve, widening our lead over competitors.