NIH I-CORPS CUSTOMER DISCOVERY

Beyond Biological Complexity

What NIH I-Corps Taught Us About Translating Advanced In Vitro Models

By Pranav Joshi, Ph.D., and the Bioprinting Laboratories Inc. team

August 2026

Completing the 2026 NIH I-Corps program gave our team something more valuable than confirmation of our original assumptions: it forced us to challenge them.

Over two intensive months, NIH I-Corps Team 4667, Moo-Yeal Lee, Pranav Joshi, and industry mentor David Rozzell, conducted more than 100 customer-discovery interviews. We spoke with academic researchers, pharmaceutical and biotechnology scientists, contract research organizations, organoid developers, microphysiological system (MPS) experts, technology providers, and translational researchers working across advanced in vitro models.

These conversations were not product pitches. They were designed to understand how people actually work, where current approaches fail, what evidence users need, and what has to change before organoids and MPS can become routine tools rather than specialized technologies used primarily by expert laboratories.

THE CENTRAL LESSON

Better biology alone is not enough.

1. Biological complexity does not automatically create value

Advanced in vitro models are becoming increasingly sophisticated. More cell types, dynamic culture, immune components, vascular interfaces, patient-derived cells, and complex readouts can all increase physiological relevance.

But interviewees repeatedly pushed us toward a more fundamental question: What problem does the model solve, and how does it improve the scientific decision being made?

A highly complex model may be valuable for one application and unnecessary for another. Increasing complexity can also introduce additional variability, cost, training requirements, and analytical ambiguity. The recurring message was to start with the context of use and build only the level of complexity necessary to answer the intended question.

That was an important shift for us. We entered I-Corps believing that versatility, the ability of our platform to support many applications, was itself a strong value proposition. Customer discovery showed us that broad capability becomes meaningful only when it is connected to a defined problem and decision.

2. Much of the burden happens before the experiment begins

Another recurring theme was how much effort goes into simply getting an advanced biological model ready for use. Depending on the system, researchers may spend weeks or months on cell expansion, differentiation, maturation, optimization, quality control, transfer, and troubleshooting before performing the experiment that motivated the project.

In individual interviews, researchers described organoid-production timelines ranging from approximately two to six months. Some also reported low success during early model establishment, as low as roughly 20% in their own workflows. These observations were qualitative accounts rather than prevalence estimates, but they illustrated the scale of the pre-assay burden.

For many laboratories, the challenge is therefore not simply running the assay. It is building and qualifying a reproducible model before the assay can even start.

This helps explain the interest we heard in standardized model providers, CRO services, cryopreserved biological systems, and other approaches that move part of the model-generation burden away from individual end users.

3. Reproducibility is a systems problem

Reproducibility was one of the most consistent themes across our conversations. The interviews also showed that it is too simplistic to treat reproducibility as a single biological metric. Variability can enter through:

- biological source and donor
- media, matrix, and reagent lots
- timing, handling, and operator technique
- equipment and instrumentation
- site-to-site implementation
- analytical methods and endpoints

Several interviewees described protocols that worked well in the laboratory where they were developed but were difficult to reproduce after transfer, even when the written protocol was followed.

That distinction between **reproducibility** and **transferability** is important. A model is not truly standardized simply because an expert laboratory can repeatedly make it work. Routine adoption requires another laboratory, another operator, and potentially another instrument to achieve comparable performance.

4. Ease of use is part of scientific performance

Before I-Corps, we tended to think about usability primarily as a commercial consideration. The interviews changed that perspective. Workflow simplicity affects much more than convenience. It can influence training requirements, operator-to-operator variability, experimental failure rates, protocol transferability, throughput, cost, and adoption across laboratories.

In complex organoid and MPS workflows, reducing unnecessary manual steps can directly improve consistency. Researchers also emphasized compatibility with existing laboratory infrastructure. Technologies that work with familiar multiwell formats, imaging systems, plate readers, and liquid-handling workflows can be easier to introduce than systems requiring substantial new equipment or specialized operational expertise.

DESIGN PRINCIPLE

Operational complexity has to earn its place by providing meaningful additional information.

5. SOPs are necessary, but may not be sufficient

Detailed standard operating procedures are essential, but written protocols often fail to capture the small procedural details that experienced researchers perform almost automatically. These details may include how cells are handled, what a culture should look like before proceeding, how quickly a transfer is performed, or subtle differences in technique.

For complex biological systems, successful technology transfer may therefore require more than a document. Video protocols, hands-on training, defined quality-control checkpoints, reference images, acceptance criteria, and standardized reagents may all be needed to make a workflow truly transferable.

6. Validation has to be fit for purpose

A model cannot be validated simply by showing that it looks more physiological. Users want to know whether it provides reliable information for a specific decision. Depending on the application, that may require:

- comparison with established assays
- known positive and negative reference compounds
- functional, not only morphological, endpoints
- batch-to-batch reproducibility
- cross-site testing
- comparison with human data
- evidence that the model improves a downstream decision

VALIDATION PRINCIPLE

Context of use should guide both model design and validation.

What I-Corps changed for Bioprinting Laboratories

The most valuable part of I-Corps was not learning how to better explain our technology. It was learning to stop starting with the technology.

We began the program largely thinking of the PillarPlate™ and PerfusionPlate™ as versatile platform products that customers could adapt to many 3D cell-culture applications. The interviews showed that versatility alone can make it difficult for buyers to understand exactly what decision the product helps them make.

At the same time, respondents repeatedly described the same pre-assay burden: lengthy cell culture and differentiation, failed batches, manual transfers, variable matrices and reagents, specialized expertise, and incomplete quality control. Many users were less interested in building another organoid workflow than in receiving a qualified model that could fit their existing screening infrastructure.

Those findings shifted our product-development direction toward an assay-ready, cryopreserved organoid-on-plate concept in which the biology, plate format, workflow, and quality-control criteria are developed together. The intended user experience is straightforward:

INTENDED WORKFLOW

Purchase → Thaw → Recover → Assay

This is a development direction, not yet a finished commercial product. Important questions remain: Can organoids retain identity, structure, and function after recovery? Can we manufacture them reproducibly and at a sustainable yield and cost? Can they withstand storage and shipping? Will performance transfer

across operators and sites? And will customers repeatedly pay for the reduction in time, labor, training, and experimental risk?

I-Corps did not prove that we had a scalable business. It helped us identify a stronger problem-solution hypothesis and the evidence we now need to generate.

The broader lesson

Customer discovery forced us to ask different questions: What is the user trying to accomplish? Where does the workflow break down? What creates the greatest burden? What evidence would make someone trust a new model? And what level of complexity is actually necessary?

Those questions changed how we think about product development, validation, and commercialization. They also point toward a broader lesson for the organoid and MPS community.

TAKEAWAY

The future of advanced in vitro models may not depend only on making them more biologically sophisticated. It may depend equally on making them ready, reliable, and relevant for the people who need to use them.

Continue the conversation

We welcome perspectives from researchers, technology developers, CROs, pharmaceutical and biotechnology teams, and other organizations working to translate advanced in vitro models into routine practice. What creates the greatest burden in your current organoid or MPS workflow, and what evidence would you need before adopting an assay-ready model?

Learn more at **www.3dbpl.com** or contact **sales@3dbpl.com**.

ABOUT BIOPRINTING LABORATORIES INC.

Bioprinting Laboratories Inc. develops PillarPlate™ and PerfusionPlate™ technologies for scalable 3D cell culture, pump-free dynamic culture, organoid research, drug screening, disease modeling, and toxicity assessment. The company is working to make advanced biological models more reproducible, accessible, and compatible with standard laboratory workflows.