I-Corps from the Trenches

For audio, dial in: +1 (631) 992-3221
Access Code: 329-042-040
Webinar ID: 133-621-595
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sbir.cancer.gov/icorps
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I-Corps from the Trenches

Conversations with companies that have gone through the program

February 4, 2016

Michael Weingarten
Director
National Cancer Institute SBIR Development Center
“We’re scaling up the National Science Foundation’s successful Innovation Corps program at six more federal agencies so we can help more of our scientists move their ideas out of the lab and into the marketplace.”

– President Obama (August 4, 2015)

https://www.whitehouse.gov/the-press-office/2015/08/04/remarks-president-white-house-demo-day
Program Description

• Intensive *Entrepreneurial Immersion* course aimed at providing teams with skills and strategies to reduce commercialization risk

• Curriculum emphasizes *Reaching out to Customers* to test hypotheses about the need and market for the technology being developed.
  • Each team is expected to conduct over 100 interviews over 10 weeks.

• Format is focused on *Experiential Learning*
Hypotheses Testing and Insight...
SBIR/STTR Phase II grant applications have two components

1. The Research Strategy

2. The Commercialization Plan

- Phase II applicants often focus on #1
- The strongest Phase II applications focus on both

Important goal of I-Corps™ at NIH is to inform the Commercialization Plan
I-Corps participants gain new insights into:

- Clinical utility
- Customers / customer segments
- Data & data quality that is needed
- Aspects of the product that are (& are not) valuable
- Roles of partners

New insights can have a dramatic affect on the aims of a future Phase II SBIR grant
Pilot Program Summary

• 19 teams conducted 2,128 customer discovery interviews
• 82% found the program “very good” or “excellent”
• 82% would recommend I-Corps™ at NIH to other companies
• All made possible with significant planning and financial support from NSF

“We clarified the value propositions, who our target customers would be, revenue streams, customer relationships…”

“After going through I-Corps we understand we have to focus on a small subset [of customers] and prioritize segments based on their value propositions.”
Please rate the following components of the I-Corps course to date in terms of their impact on your team's learning.

<table>
<thead>
<tr>
<th>Component</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Relationships</td>
<td></td>
<td></td>
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<tr>
<td>Customer Segments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue Streams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value Propositions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Not sure
- Very little
- Nothing
- Some
- A great deal

![Bar Chart Comparison Between Before and After](image-url)
Commercialization of life science technologies requires consideration of the following key topic areas. For each component, indicate your level of knowledge.

- Medical reimbursement
- Regulatory Strategy
- Pre-clinical Development
- Clinical Trials
- IP

Before After

-100% -80% -60% -40% -20% 0% 20% 40% 60% 80% 100%
Edmund Pendleton

Lead Instructor, NIH & NSF I-Corps
Asst. Faculty Director, NSF I-Corps
Why *I-Corps*
I WANT YOU FOR NSF Innovation Corps NEAREST RECRUITING STATION
$7 Billion
“How can we increase the economic impact of the research dollars invested every year?”
Lean LaunchPad Course
Developed by Entrepreneurs
Taught by
Entrepreneurs
Why the Lean Start-Up Changes Everything

by Steve Blank

by Harvard Business School's Shikhar Ghosh shows, 75% of all start-ups fail.

But recently an important countervailing force has emerged, one that can make the process of starting a company less risky. It's a methodology called the "lean start-up," and it favors experimentation over elaborate planning, customer feedback over intuition, and iterative design over traditional "big design up front" development. Although the methodology is just a few years old, its concepts—such as "minimum viable product" and "pivoting"—have quickly taken root in the start-up world, and business schools have already begun adapting their curricula to teach them.

The lean start-up movement hasn't gone totally mainstream, however, and we have yet to feel its full impact. In many ways it is roughly where the big data movement was five years ago—consisting mainly of buzzword that's not yet widely understood, whose applications companies are just beginning to grasp. As its practices spread, they're turning the conventional wisdom about entrepreneurship on its head. New ventures of all kinds are attempting to improve their chances of success by following its principles of failing fast and continually learning. And despite the methodology's name, in the long term some of its biggest payoffs may be gained by the large companies that embrace it.

In this article I'll offer a brief overview of lean start-up techniques and how they've evolved. Most important, I'll explain how, in combination with other business trends, they could ignite a new entrepreneurial economy.
A Cambrian moment
You Promised Me Mars Colonies. Instead, I Got Facebook.

We've stopped solving big problems. Meet the technologists who refuse to give up. p26
You Promised Me Mars Colonies. Instead, I Got Facebook.
I-Corps first program to apply lean startup principles to complex engineering, technology, and science based startups
Life Sciences?
$7 Billion
“How can we increase the economic impact of the research dollars invested every year?”
Just like NSF grantees,
Just like NSF grantees, we believe there is a better way to build life sciences startups.
NIH  I-Corps
Reinventing Life Science Startups – Evidence-based Entrepreneurship

Posted on August 21, 2013 by steveblank

What if we could increase productivity and stave the capital flight by helping Life Sciences startups build their companies more efficiently?

We’re going to test this hypothesis by teaching a Lean LaunchPad class for Life Sciences and Health Care (therapeutics, diagnostics, devices and digital health) this October at UCSF with a team of veteran venture capitalists.

Part 1 of this post described the issues in the drug discovery. Part 2 covered medical devices and digital health. This post describes what we’re going to do about it. And why you ought to take this class.

---

When I wrote Four Steps to the Epiphany and the Startup Owners Manual, I believed that Life Sciences startups didn’t need Customer Discovery. Heck how hard could it be? You invent a cure for cancer and then figure out where to put the bags of money. (In fact, for oncology, with a successful clinical trial, this is the case.)
In most cases, it’s not just about *the execution of science*. 
You need to reduce technology, regulatory, and market/customer risk...
...by using an approach driven by customer needs.
Why are we here?
Our Goal
Improve **Odds**
Pick Winners
Pick Winners
Startup Statistics
Create More Winners
Shift the Curve
How do we build a startup?
<table>
<thead>
<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Propositions</th>
<th>Customer Relationships</th>
<th>Customer Segments</th>
</tr>
</thead>
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</table>

<table>
<thead>
<tr>
<th>Key Resources</th>
<th>Channels</th>
<th>Revenue Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Business Model Canvas: A framework for visualizing and exploring the key dimensions of a business model.
We use **Customer Development** to build Business Models
Search for...
Problem-Solution Fit
“Can you identify and validate a problem or need in the market that enough people care about?”
Search for... 

*Product-Market Fit*
“Can you build and deliver a product/service that satisfies the customer problem or need?”
Search for...

Business Model Fit
“Can you build and validate a repeatable and scalable (profitable) business model?”
Search for Business Model
Get out of the building!
Validated facts versus untested guesses...
Evidence comes from
Evidence comes from Customer Discovery Interviews
This is what we call...
This is what we call...

Evidence Based

*Entrepreneurship*
What will you do?
Jump In
7 Weeks
100 Interviews
Gut Feeling
But why?
“The first principle is that you must not fool yourself.”

– Richard Feynman
“The first principle is that you must not fool yourself, and you are the easiest person to fool.”

– Richard Feynman
Everyone has a plan...
...until he gets punched in the face.”
TOP 10 STARTUP MISTAKES

1. Building something nobody wants - Score: 300, 36% of Tot.
2. Hiring Poorly - Score: 153, 18% of Tot.
3. Lack of Focus - Score: 112, 13% of Tot.
4. Fail to execute Sales & Marketing - Score: 98, 12% of Tot.
5. Not Having The Right Co-Founders - Score: 66, 7.9% of Tot.
6. Chasing Investors, Not Customers - Score: 45, 5.4% of Tot.
7. Not Making Sure You Have Enough Money - Score: 28, 3.3% of Tot.
8. Spending Too Much Money - Score: 18, 2.1% of Tot.
9. Failing To Ask For Help - Score: 12, 1.4% of Tot.
10. Ignoring Social Media - Score: 6, 0.7% of Tot.

www.100FirstHits.com
TOP 10 STARTUP MISTAKES

Top Three

1. Building something nobody wants
   - Score: 300
   - 36% of Tot.

2. Hiring Poorly
   - Score: 153
   - 18% of Tot.

3. Lack of Focus
   - Score: 112
   - 13% of Tot.

4. Failing to execute Sales & Marketing
   - Score: 98
   - 12% of Tot.

5. Not Having The Right Co-Founders
   - Score: 91
   - 11% of Tot.

6. Chasing Investors, Not Customers
   - Score: 56
   - 6% of Tot.

7. Not Making Sure You Have Enough Money
   - Score: 45
   - 5% of Tot.

8. Spending Too Much Money
   - Score: 28
   - 3% of Tot.

9. Failing To Ask For Help
   - Score: 21
   - 2% of Tot.

10. Ignoring Social Media
    - Score: 18
    - 2% of Tot.

www.100FirstHits.com

Top Three
Why is I-Corps especially valuable for Life Sciences?
There is A LOT to learn in these markets.
Markets are often complex with many stakeholders.
Pathways to market are often *lengthy, costly, and complex.*
Startup risks are generally very high.
**Team 10 - Team IGI Tech**

**Lessons Learned**

**Product:** Laparoscopic image fusion box that works with a surgeon’s existing lap camera and ultrasound.

---

### Interview count

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>In person</th>
<th>Video Chat</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td><strong>102</strong></td>
<td>50</td>
<td>6</td>
<td>43</td>
</tr>
</tbody>
</table>

- Total Available Market - Every operating room in the US
- Served Available Market - Every operating equipped for minimally invasive surgery (MIS)
- Target - Thoracic Surgeons in the US
Background: High performance processing of tracking and visualization

Patent pending (14/245,721)

“Perfect balance” - Timothy Kane, MD

Clinical prototype at Children’s National (IRB)
IGI Technologies Team

**Principal Investigator**

Raj Shekhar, PhD

- Principal investigator within the Sheikh Zayed Institute for Pediatric Surgical Innovation
- 15 years of experience as a serial innovator of medical and surgical imaging technologies
- Two of his prior inventions have led to successful commercial products.

**Entrepreneur**

William Plishker, PhD

- CEO of IGI Technologies
- Specializes in building and leading startups, converting academic research into real-world products.
- 3 different Silicon Valley startups as an engineer and marketer
- Mayfield Fellow

**Industry Expert**

Mark Chandler, MBA

- Early stage medical device investor
- Expert in commercializing intellectual property (IP)
- Founder of Upstream Partners
- CEO of TAO Lifesciences
## 1st Business Canvas - what we thought

<table>
<thead>
<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Proposition</th>
<th>Customer Relations</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>lap camera company</td>
<td>our solution saves 5 mins on a</td>
<td>public demonstrations.</td>
<td>3D lap surgeons without</td>
<td>lap surgeons with 3D camera</td>
</tr>
<tr>
<td>ultrasound company</td>
<td>our solution improves any</td>
<td></td>
<td>patients having</td>
<td></td>
</tr>
<tr>
<td></td>
<td>our solution attracts 20</td>
<td></td>
<td>other minimally invasive</td>
<td></td>
</tr>
</tbody>
</table>

### Key Resources

<table>
<thead>
<tr>
<th>Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>lap camera companies</td>
</tr>
<tr>
<td>ultrasound companies</td>
</tr>
<tr>
<td>Thoracic Surgeons</td>
</tr>
</tbody>
</table>

### Cost Structure

| development costs |

### Revenue Streams

| sell through camera companies |
| free: just chose a hospital that has our system |
So we talked to surgeons - and learned we didn’t know them as well as we thought

**Surgeon Value Propositions**

### Products/services
- Overlay ultrasound on lap field of view
- Guidance of ablative tools

### Gain creators
- Get to target more reliably than standalone ultrasound
- Get to target faster than standalone ultrasound
- Find targets

### Pain relievers
- Single display
- Lower technical difficulty
- Reduce risk of complication

**Surgeon Pains/Gains**

### Gains
- Belief in better patient care
- More confidence in complete treatment
- More lap target identification, less open surgeon
- Faster procedures

### Pains
- Mental correlation across two screens
- Unfamiliarity with ultrasound
- Steep learning curve
- Complication risk

### Customer Job(s)
- Lap surgery -- ablation/resection
- Pre-procedure -- diagnose
- Post procedure patient monitoring
  - Often no task for ultrasound
And we refined our surgeons into customer segments... and our value props

<table>
<thead>
<tr>
<th>Field</th>
<th>High volume procedure</th>
<th>core need</th>
<th>currently uses lap ultrasound</th>
<th>Does NOT use robot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urology</td>
<td>partial neph</td>
<td>See target and vessels (fast, sans radiologist, mobile) (\Rightarrow \text{do more laps (vs. open)})</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Gynecology</td>
<td>hysterectomies</td>
<td>See the ureter (\Rightarrow \text{fewer complications})</td>
<td>no, but can read it</td>
<td>✓</td>
</tr>
<tr>
<td>Oncology</td>
<td>liver resections/ablations</td>
<td>See the target with ablation needle critical sections (\Rightarrow \text{fewer readmissions})</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Thoracic</td>
<td>?</td>
<td>lesion location in collapsed lung (\Rightarrow \text{less invasive (more laps, no hand port)})</td>
<td>no</td>
<td>✓</td>
</tr>
</tbody>
</table>
### Business Canvas Iteration - CS Refinement

<table>
<thead>
<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Proposal</th>
<th>Customer Rela</th>
<th>Customer Segm</th>
</tr>
</thead>
<tbody>
<tr>
<td>lap camera company</td>
<td>perform studies with leading</td>
<td>~1mm accuracy of overlay</td>
<td>GET first, get luminary docs</td>
<td>Urology Surgeons</td>
</tr>
<tr>
<td>ultrasound company</td>
<td>★ Acquire commercial</td>
<td>our solution saves 5mins on a</td>
<td>GROW mainstream by</td>
<td>Gyno Surgeons</td>
</tr>
<tr>
<td>tracking company</td>
<td>seamless integration with</td>
<td>our solution improves any</td>
<td>KEEP by creating invaluable</td>
<td>Surgical Oncologists</td>
</tr>
<tr>
<td>luminary clinician - ablation</td>
<td>acquire 510(k)</td>
<td>our solution attracts 20</td>
<td>public</td>
<td>Thoracic Surgeons</td>
</tr>
<tr>
<td>leading clinician - solid organ</td>
<td>access to operating room</td>
<td>it is difficult to internalize where</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>software engineers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>patent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Key Resources

- access to operating room
- software engineers
- patent
- access to

### Key Activities

- ★ Acquire commercial
- seamless integration with
- acquire 510(k)
- access to operating room
- software engineers
- patent
- access to

### Value Proposal

- ~1mm accuracy of overlay
- our solution saves 5mins on a
- our solution improves any
- our solution attracts 20
- it is difficult to internalize where

### Customer Relation

- GET first, get luminary docs
- GROW mainstream by
- KEEP by creating invaluable
- public

### Customer Segmen

- Urology Surgeons
- Gyno Surgeons
- Surgical Oncologists
- Thoracic Surgeons

### Channels

- Ultrasound companies - co-
- hospital admins - surgical directors
- hospital admins - value
- patients having laparoscopic

### Cost Structure

- development costs
- field engineers to support use and calibration

### Revenue Streams

- direct sales with support for lap camera and ultrasound with disposables
- license to ultrasound company
We kept talking to surgeons - and found patterns in thoracic surgery

Pains
- Disorienting
- Hour-long search
- “Would do anything to localize tumors minimally invasively”
- 50-100 cases a year at academic hospitals
Customer segments - what we learned
(# of people overall supporting)

<table>
<thead>
<tr>
<th>Segment</th>
<th>High volume procedure</th>
<th>core need</th>
<th>uses lap ultrasound</th>
<th>Does NOT use robot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urology</td>
<td>partial neph</td>
<td>See target and vessels ⇒ <em>do more laps (vs. open)</em></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Gyn</td>
<td>hysterectomies</td>
<td>endomet surgery is sensitive to depth ⇒ <em>provide real-time depth (1mm accuracy) to prevent uterus punctures (2)</em></td>
<td>no, and most (3) can’t justify port</td>
<td>small but growing</td>
</tr>
<tr>
<td>Oncology</td>
<td>focus on ablations</td>
<td>Losing cases to interv rads (9) ⇒ <em>tool nav in lap ablation is hard, we would track everything in one place</em></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Thoracic</td>
<td>VATS for primary lung lesions</td>
<td>lesion location in collapsed lung ⇒ <em>less invasive (more laps, no hand port), easier workflow (no fiducials), organ sparing, find smaller nodules, ⇒ no reliance on interv rad (12)</em></td>
<td>no, but willing to learn (10)</td>
<td>limited</td>
</tr>
</tbody>
</table>
### Business Canvas - Thoracic Pivot

<table>
<thead>
<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Proposition</th>
<th>Customer Relations</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>robot company</td>
<td>perform studies with leading</td>
<td>fusion shows non-peripheral</td>
<td>GET first, get luminary docs</td>
<td>Thoracic Surgeons</td>
</tr>
<tr>
<td>lap camera company</td>
<td>Acquire commercial</td>
<td>save 30mins of OR time finding</td>
<td>GROW mainstream by</td>
<td>Surgical Oncologists</td>
</tr>
<tr>
<td>ultrasound company</td>
<td>seamless integration with</td>
<td>interventional radiology not</td>
<td>provide support with application</td>
<td></td>
</tr>
<tr>
<td>tracking company</td>
<td>acquire 510(k)</td>
<td>do not need a radiologist to</td>
<td>KEEP by creating</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Resources</td>
<td></td>
<td>~1mm accuracy of overlay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>luminary clinician - ablation</td>
<td>access to robot tracking</td>
<td>Enable more ablation cases to</td>
<td>hospital admins - surgical directors</td>
<td></td>
</tr>
<tr>
<td>leading clinician - solid organ</td>
<td>access to operating room</td>
<td>immediately orient surgeon in</td>
<td>hospital admins - value</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>patients having laparoscopic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>software engineers</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>patent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Channels

- Ultrasound companies - co-
- EOM equipment marker
- Lap camera companies - co-

### Cost Structure

- Development costs
- Field engineers to support use and calibration

### Revenue Streams

- Direct sales with support for lap camera and ultrasound with disposables
- License to ultrasound company
There were many other learnings...
... and we are in a better position than ever for commercialization.

<table>
<thead>
<tr>
<th>Group</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeons</td>
<td>55</td>
</tr>
<tr>
<td>Radiologists</td>
<td>6</td>
</tr>
<tr>
<td>Surgical support</td>
<td>10</td>
</tr>
<tr>
<td>Hospital administrators</td>
<td>10</td>
</tr>
<tr>
<td>Ultrasound company officials</td>
<td>5</td>
</tr>
<tr>
<td>Robot company officials</td>
<td>3</td>
</tr>
<tr>
<td>Tracking company officials</td>
<td>2</td>
</tr>
<tr>
<td>Regulatory, reimbursement, IP specialists</td>
<td>4</td>
</tr>
<tr>
<td>Misc</td>
<td>7</td>
</tr>
</tbody>
</table>

Questions or comments:

info@igitechnologies.com
Updates since

- NIH CAP Program
- New surgeons involved
- More partners discussion
- Pitches
  - M2D2, ACA, various friendly angels
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