Common Deep Tech Startup Mistakes

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My dream was to do a tech startup

- Brown: Math and Music
- Chase Manhattan Bank: Corporate Finance, Oil & Gas
- Thermo Electron: Mergers & Acquisitions
- MIT: Masters of Science, Mechanical Engineering
- Search for technology to commercialize => MIT TLO

Z Corp. 3D Printing Leader

Installed Base (# Units)

- Founded in 1994 in Kendall Square
- Delivered product within 2 years; then profitability
- Fastest-growing business in New England (2001)
- No venture capital
- Over 10 years, grew to $30M, 125 employees
- Early market leader with #2 in market share
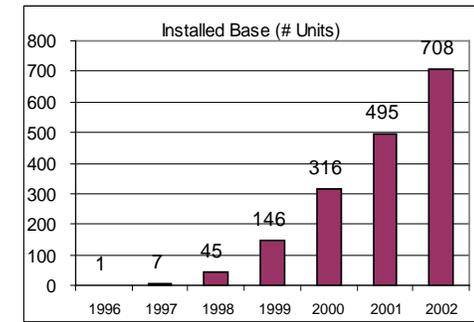
Exit after 10 years

- Deep tech takes time!
- Corporate Board Director
- Angel investor
- Advisor
- Greek startup ecosystem & now a little in Italy
- Writer: Business Articles, Essays & Short Stories at **windystreet.com**

Why create a startup?

- Passion for a particular technology
- Solve a problem-make the world a little better
- Solve a specific problem
- Independence (no boss)
- Teamwork and community
- Make money

Deep Tech depends on IP

- **Patents**
  - Difficult to invent, Easy to copy
  - Enable product differentiation
  - Block competition for 20 years
- **Trade Secrets**
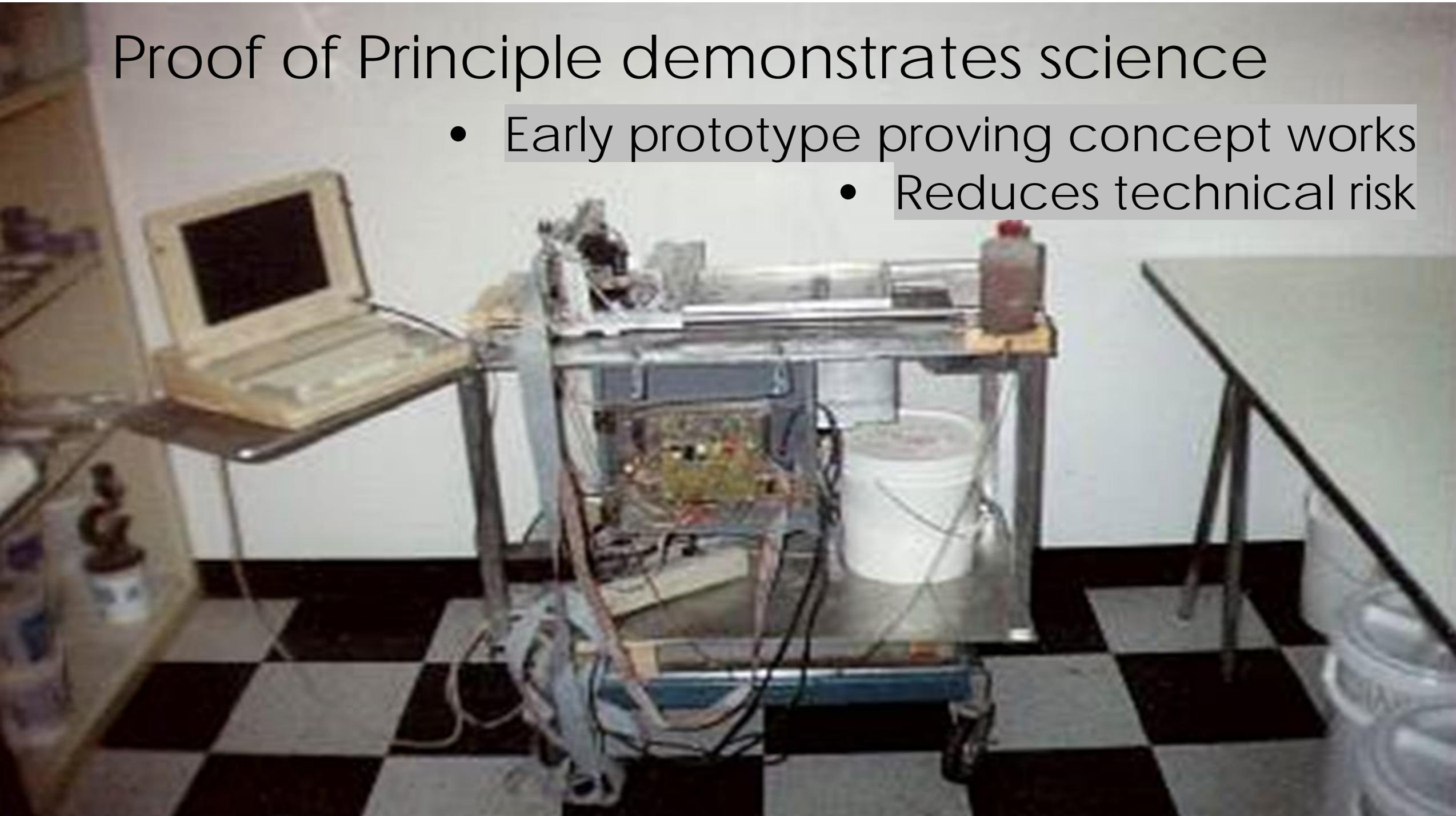 - Not patentable, Difficult to copy
- **Know-how**
  - Processes, Ingredients, etc.

Publications come after patents

- Incentives for professors to publish
- Indicator of innovation
- After publication, too late to patent!

Proof of Principle demonstrates science

- Early prototype proving concept works
- Reduces technical risk

MISTAKE:
Part-time Entrepreneurship

- "I can do it on Saturdays"
- Entrepreneurship is not a part-time job
- Researchers need entrepreneurs & vice versa

A strong name is important

Create a brand to grow the business

Avoid legal issues

Mistake: Choosing a poor name

INSTEAD, make sure:

- Website available
- Easy to spell & type
- Search doesn't bring up millions
- No Trademark Infringement
- Name available legally
- Not too limiting for the future

>>Stay stealth!

People might try to steal your idea

Don't bog down dev. with customer input

It's difficult & time-consuming to find customers

Hard to parse different opinions

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INSTEAD: Get feedback

- More to gain than lose by talking with customers
- People can steal your idea as soon as it hits market
- Keep secrets while sharing ideas
- Is problem painful enough?
- How big is the market?

Startup Opportunities come from Market Disruptions

Examples:

- Regulations
- Demographic changes
- New enabling technologies

Beware transient disruptions

- Corporate Investments in DEI
- Covid

Startups can Pivot

- Incumbents have money, manufacturing, R&D, Sales & Distribution
- What they lack is the ability to pivot
- Ability to pivot is the startup edge

Startups are always pivoting

- Decisions with incomplete information
- The more innovative, the more unknowns
- No playbook to follow
- Uncharted waters => mistakes
- Must try a lot of things and then shift
- New information leads to pivots

Pursue Two Concurrent Paths

Technology Development

- Run tests to try paths without investing too much
- De-risk areas of technical risk without building complete solution

Product-market fit

- Articulate technical advantages
- Consider wide range of industries and speak with experts
- Try for 20 ideas
- Test ideas quickly (like dating; not dinner, just coffee)
- Both paths driven by IP-enabled technology differentiation

Market & Tech Development interact

- Answer isn't in book or on internet
- Articulate what is special & different (due to IP)
- Identify possible markets
- Create prototype or storyboard
- Customer interviews & testing
- Customer input directs technology development
- Iterative process => information from one drives the other
- Example: Large 3D printer
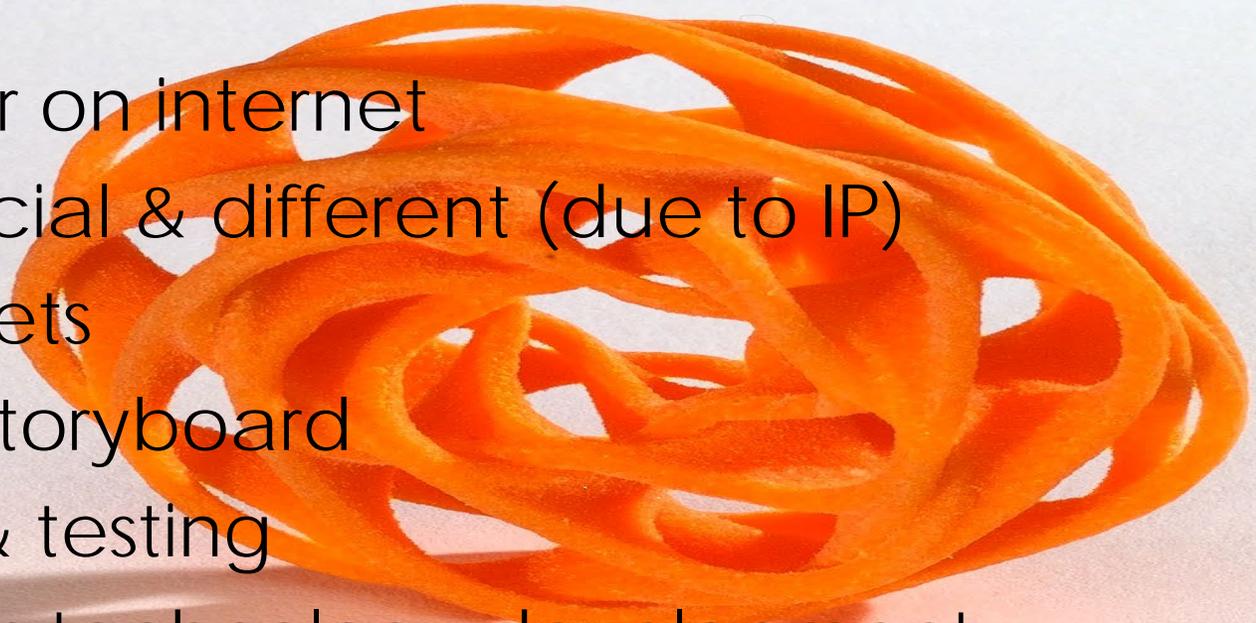
>>Seek a popular market

- A crowded market must be promising
- There's room for Pepsi and Coke
- Incumbents are slow and stupid
- Product differentiation is not critical
- Nobody has ever considered lowering the price

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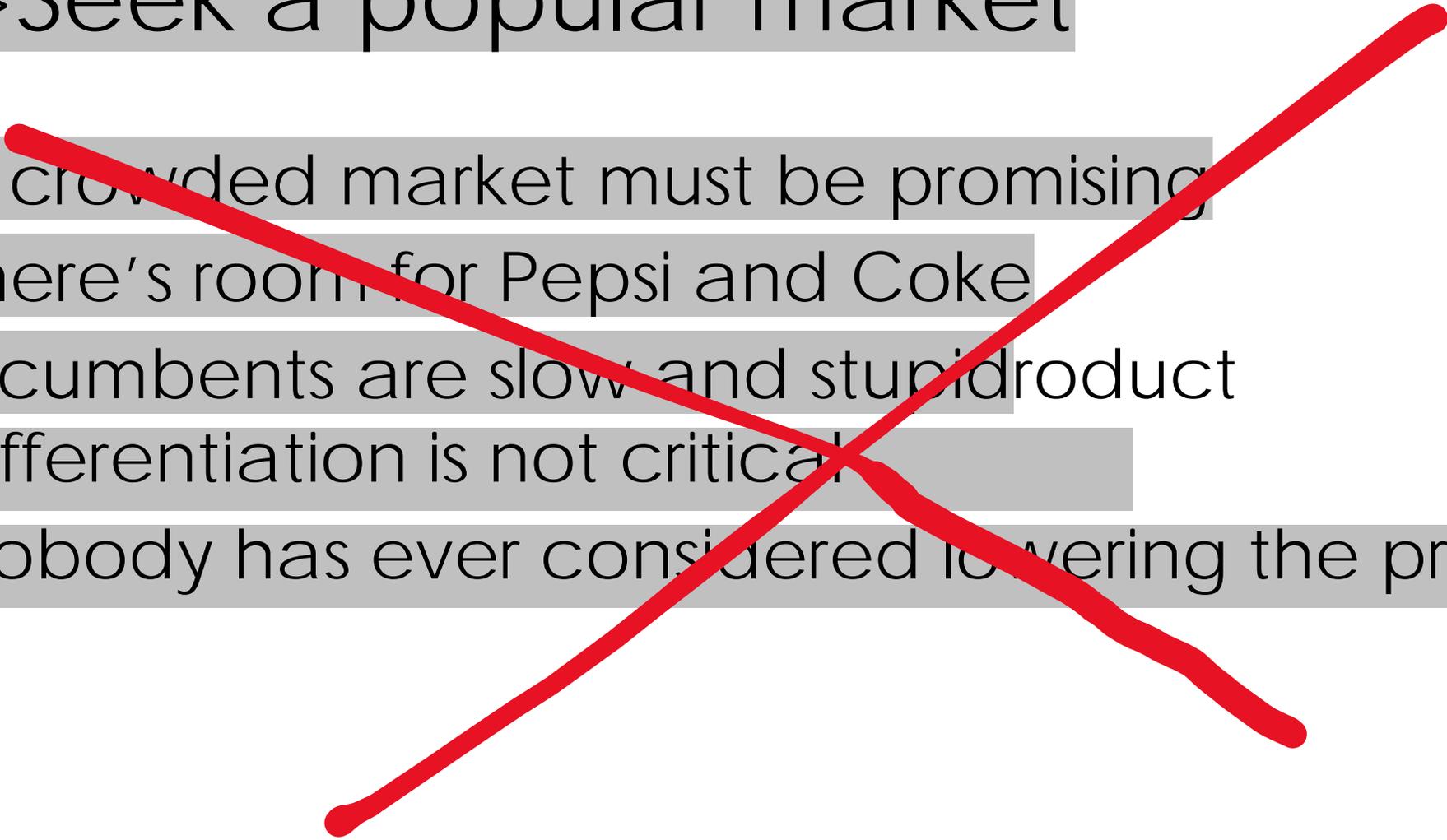
INSTEAD: Differentiate

- Lowering price is not the answer
- Do something different
- Learn what's out there & do better using IP
- State-of-the-Art is starting point, not endpoint
- Differentiate so you can sell at a premium price
- What makes you uniquely positioned to do this?

Consider your Competition

- Competition can be OK
  - Educate the market
  - Easier to have a benchmark to sell against
- Competition from huge incumbents is tough
  - They have capital, mfg, distribution; slow but not stupid
- Who is well-positioned in terms of customers or technology?
- Why haven't they done it already?
  - Enabling technology didn't exist
  - Regulatory environment wasn't conducive
  - NOT: They're stupid. We're smarter than them.
- What will keep them from entering the market?
- Will they have an unfair advantage or will you? [eg, Z Corp.]
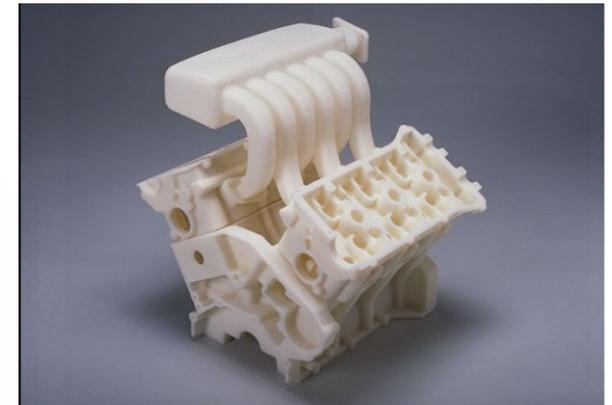
Create Minimum Viable Product ASAP

- Get customer feedback => Iterate design

Z Corporation's 3D Printer

Engine model made on Z Corp.'s 3D Printer

>>Strive for Perfection!

- Make it PERFECT before showing it to customers
- Poor feedback means they don't get it
- Friends & family love it!

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INSTEAD: Strive for feedback

- Perfection is your enemy
  - By the time it's perfect, too late
- Speak with customers every day
- Get something in their hands to try out
- Try to sell product, before it even exists
  - Prospects guide development
  - Customers may fund R&D
- Can't please everyone; start with niche

>>Create Buzz!

- Focus on awards instead of customers
- Invest in videos to go viral
- Track social media & press instead of customers

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INSTEAD: Focus

- Stay focused & ignore distractions
- Disregard awards, press coverage and other accolades
- Value is in REVENUE, GROWTH and PROFITS

>>Hire people you trust!

- Loyal teams made with friends & family, even if irrelevant experience
- Famous board chair who is on many boards

>>Hire people you trust!

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Instead:
Find Founders with specific skills

- Jim Bredt: Material Science & Software
- Walter Bornhorst: Business Strategy
- Marina Hatsopoulos: Busines Execution
- Tim Anderson: Hardware

Build a Diverse Team

- Diverse education, experience, talents, interests
- Leverage network
- Don't hire someone you can't fire
- Work with people before hiring
- Empower the stars, even if holes
- Fill in missing expertise
- Salesperson on Founding Team
- Senior executives may be out of touch
- Busy board members may be disengaged

Our Team made our Success

Cofounders & early team

Tom Clay & John Kawola, senior leadership, drove growth

>>Be nice!

- Avoid conflict so people will like you
- Negotiating is unseemly & unnecessary; people are fair

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- Negotiating is unseemly & unnecessary; people are fair

INSTEAD: Embrace conflict

- Avoiding decisions makes problems worse
- Encourage diverse opinions
- Make tough decisions
- Learn to negotiate

>>Work hard!

- Frenetic office culture
- Sweat & slog 14 hours per day
- Use TV as model (abusive bosses, lingering wine lunches…)
- Check off To Do list instead of strategic contemplation

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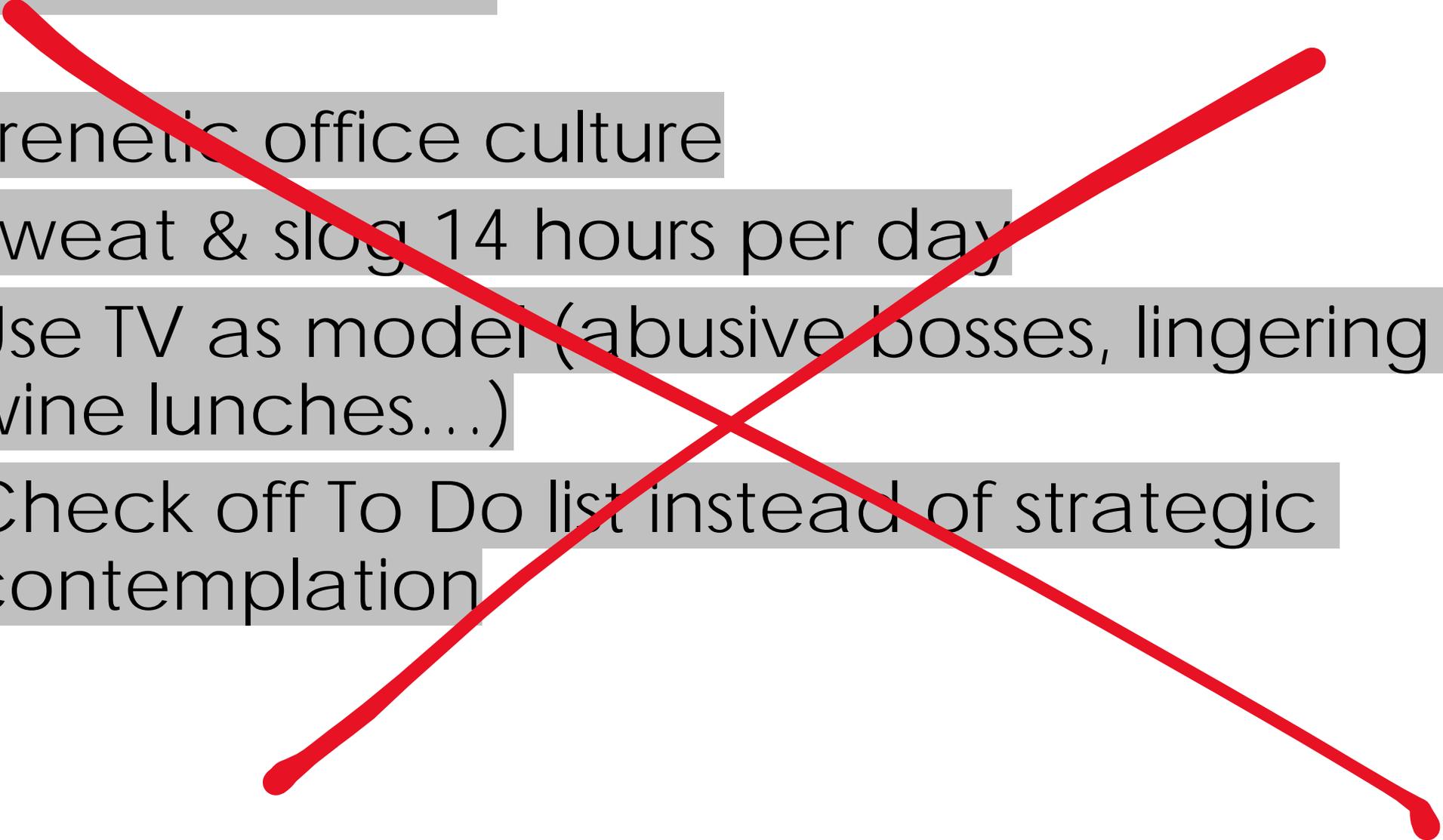
Team & healthy culture critical to success

- Focus; can't do everything
- Smart, well-functioning teams are able to navigate
- All that matters is results, not face time
- Time to market is critical

Focus on Strategic Decisions

- Business: What business to go into

- Team: Who to hire

- Product Development: What to build

- Pricing

- Re-make decisions when new information
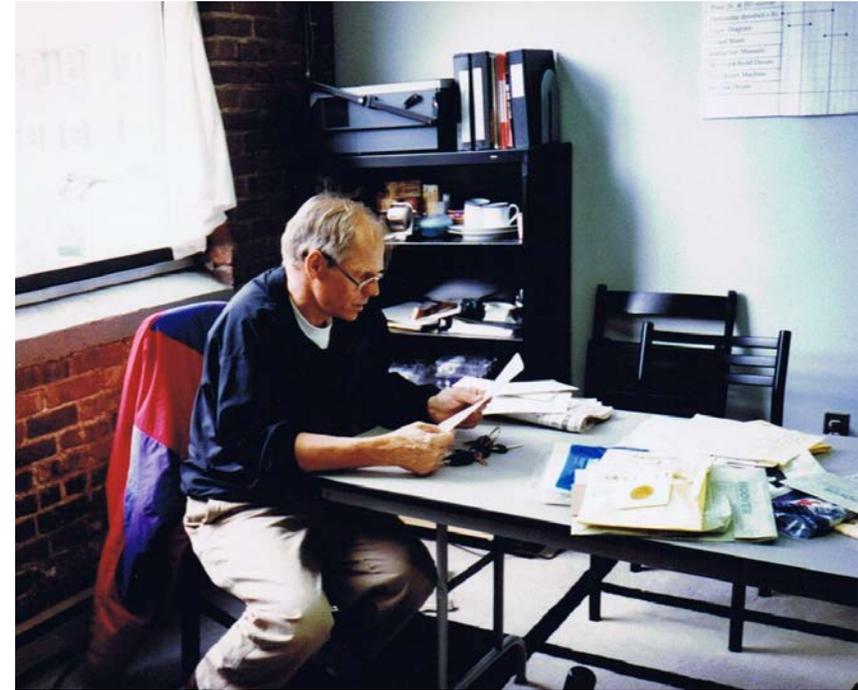
Chairman Walter Bornhorst

Delegate Non-Strategic Decisions

- Who gets which office
- Furniture
- Accounting software
- Number of conference rooms

Strategic decisions determined our future

- No venture capital: used only $2.5M to build Z Corporation
- Focus on profitability: Revenues in Year 2, Profits in Year 4
- Product pricing: Expensive to make and sell
- Re-make decisions when new information

3D Printing Market was ripe for disruption

- Large lab equipment
- Difficult to use
- Expensive: $100K-$1M
- Chasing accuracy, going higher- and higher-end, more expensive, more difficult to use
- Hole in the market for fast, cheap prototypes
- Early stage of design cycle

Great Plan for Disrupting the Market

- Office-compatible 3D printer
- Easy to use
- Inexpensive: $20K
- 2 years of development
- BUT…1 year in…

Our Plan was threatened

- Trade show that almost killed us
- Incumbent advantages
- Market research-data collection on competition:
  - Higher accuracy
  - Nicer surface finish
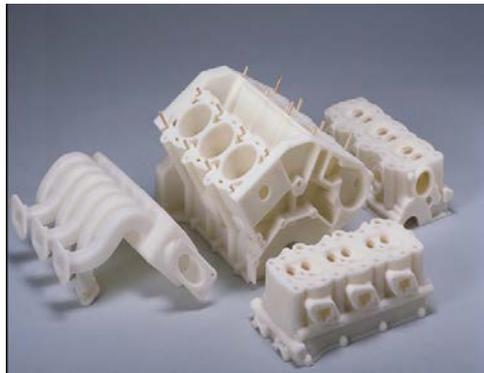 - Stronger parts
  - $60K
  - BUT, we were 10x faster
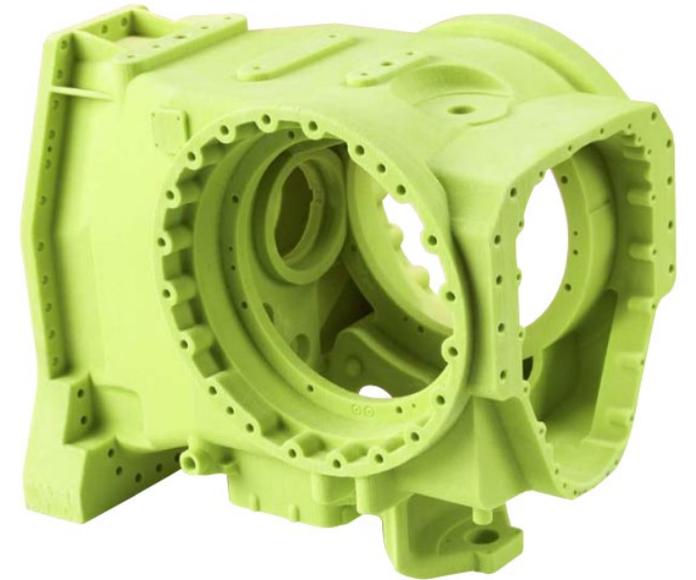
Product Differentiation is critical

- Don't need to be better at everything
- Better at something customer cares about

Color chain printed on 3D Printer

8 minutes, $3 cost

	Z Corp	Competitor #1 Product X	Competitor #2 Product Y
Price	$60K	$60K	$60K
Resolution	Poor	Great	Okay
Strength	Poor	Okay	Good
Speed	Fast	Slow	Medium

IP-based Differentiation is North Star

- Too many decisions to make
- Too many directions
  - Which products to develop?
  - Which markets to pursue?
- Not enough information
- Conflicting opinions

>>Stay positive!

- Put bad news out of your mind
- Believe the engineers' forecasts on time and cost, regardless of history. This time will be different.

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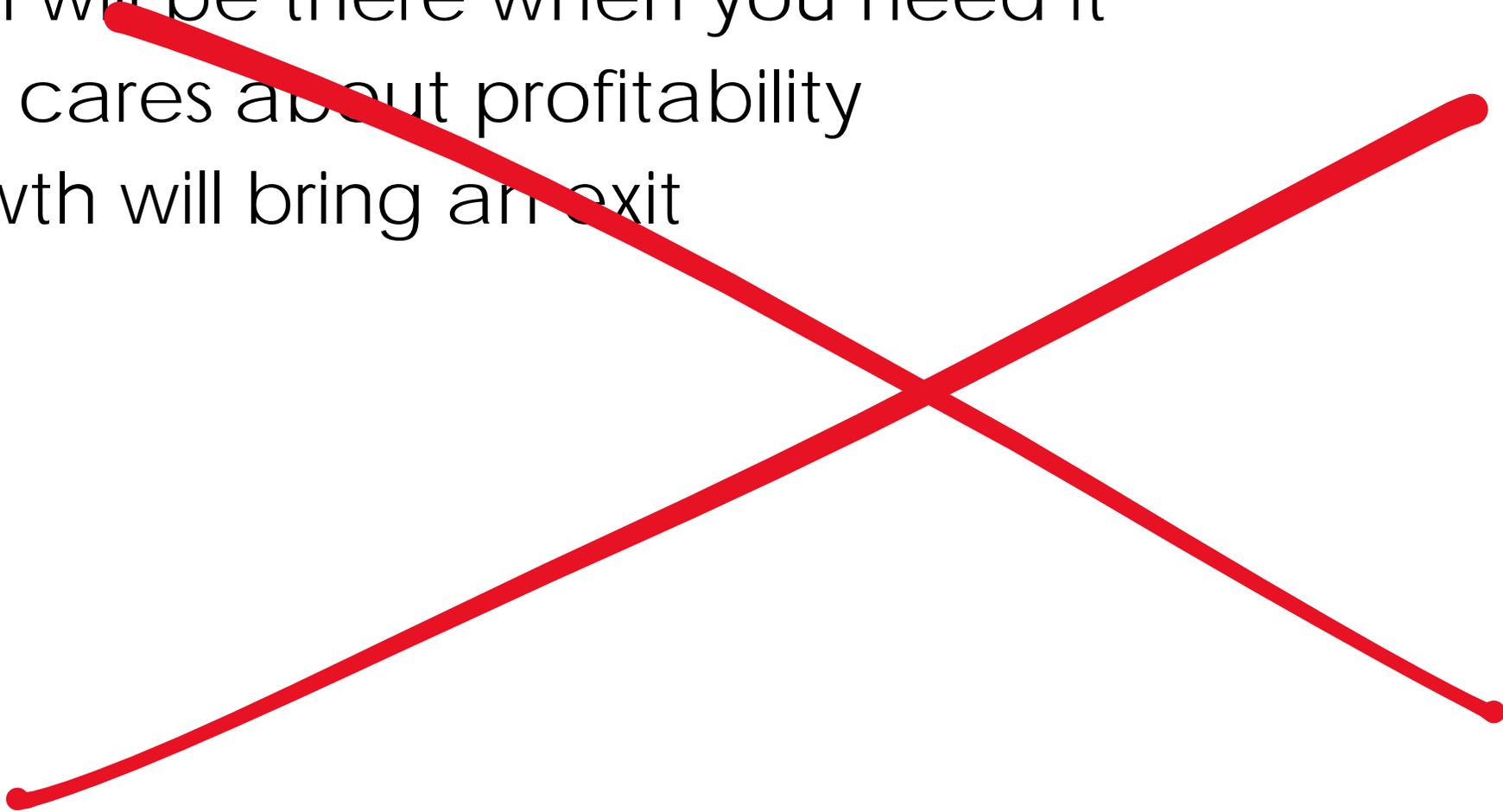
INSTEAD: Learn from failures

- Do things differently
- Time & cost will be double
- Rocky road
- New information => Reconsider decisions

>>Focus only on growth!

- Cash will be there when you need it
- Who cares about profitability
- Growth will bring an exit

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INSTEAD: Watch your finances

- Track cash
- Time & investment to get to Revenues & Profitability
- A strong company will be an acquisition target

>>Put on a great show for investors!

- Use industry acronyms that make you sound smart
- Complicated diagrams
- Entire paragraphs in tiny fonts on each slide
- Projections with revenues skyrocketing
- Talk about exit
- Demand a confidentiality agreement
- Add AI regardless of your business

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INSTEAD: Simplify your pitch

- What is the problem? What is your solution?
- Remove acronyms
- Remove diagrams which don't add information
- Limit # words to ~10-20 per slide
- Quantify customer value proposition
- Practice your pitch

Consider all Fundraising Options

- Friends & Family
- Angels
- Equity Crowdfunding
- Government Grants
- Strategic investors
  - Equity
  - R&D Contracts
  - Customer Deposits
- Venture Capital
  - Equity
  - Debt

Identify Strategic Investors

- Who is invested in your success
- Strategic investors
  - Suppliers, esp. critical components
  - Customers
  - Distributors

MISTAKE: Underestimating fundraising

- Fundraising is a big job

- Takes dedication, time, research, and energy

- Rejection and failure

- Important to learn from every rejection
  - Was it the pitch or the business?
  - Strategic takeaways?

Venture Capital is not for all Startups

Venture Capital offers Opportunity

- Cash to grow the business
- Advice
  - Experience
  - Strategic perspective
  - Visibility in related startups
- Connections
  - Customers
  - Investors
- Validation

Venture Capital may be necessary

- Some startups must grow fast & big or else will fail
- High growth is necessary to capture the market (eg, Uber)
- High capital costs to grow the business

Venture Capital carries Risk

- Easier to move forward without nailing product-market fit
- Easier to think everything is okay even if profitability is far away
- Some businesses can't grow at the pace VC's want
- Loss of control-founder may lose CEO role
- Higher valuation raises bar; harder to make return for investors

Consider your personal ownership

- VC's want unicorns: $1B businesses, all or nothing

- Push for growth=>Founder removed, startup fails

- It might thrive on a slower path

- Profitable10M startup=>success if you own it all

Beware CEO Syndrome

Startup CEO's face failure & rejection

- Skepticism and Doubt from:
    - Engineers, Customers, Investors…
- Ideas challenged every day
- Failure and rejection slam the CEO

Challenges lead to Rework

- Redesign of the product
- Redefinition of product-market fit
- Strong, quantified articulation of the value proposition

Rework leads to Success

- Success convinces everyone that the CEO is a visionary
- Company gains visibility and awards
- CEO becomes famous, and everyone listens
- People stop challenging

At the top, CEO gains confidence

- Starts to feel invincible
- Liberated from self-doubt and conflict with others
- Stops asking others for opinions
- Stops listening to others' ideas
- Dismisses competitive startups
- Primal urge for validation pulls CEO toward blindness

Success can trigger CEO Syndrome

- CEO is insulated from honest feedback
- CEO stops receiving diversity of opinion
- This leads to poor decisions

Poor Decisions can be fatal

- Develop the wrong product
- Demoralize employees by micromanaging
- Blindsided by the competition

Antidote to losing touch is being challenged

- Retain group willing—even eager—to challenge

- Ask questions, listen & learn

- Small failures are what fuel success

Commercializing Deep Tech Hardware is Tough

- Manufacturing involves complexity & supply chain issues
- Cost of goods is critical
  - Simplest solution is often best due to cost, even if less elegant
- Customers need Quality Control
  - Reliability is more important than more features
  - Servicing equipment out in the field is expensive
- Fundraising through rejection is emotionally taxing
- Time will be at least 2x
- Cost will be at least 2x
- You might do everything right & fail due to external circumstances

Focus on Key Elements for Success

- Defensible product differentiation
- Strong, diverse team
- Encourage debate & healthy culture
- Talk with customers & get prototype in their hands
- Focus on Revenues and Profitability within beachhead
- Make decisions again with new information

Entrepreneurship is Rewarding

- Persevere. It's hard. No "life balance."
- Find something you believe in-it's a long road
- Celebrate milestones and have fun
- Startups are risky
- Controlling your destiny is enriching

"It's more fun to be a pirate than to join the navy."
--Steve Jobs

Thank you

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