



Chaos Theory of Technical Startups:

a close look at the risks of founders
and how it impacts commercialization

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Outline

- Brief Personal Biosketch and Research Review
- Overview of Several Technical Startups
- Milestones Chronology for Startups
- Joe Entrepreneur: a typical route from research to commercialization in a startup
- Founder Risk Analysis of Starting a Company
- Suggestions for improving NSF center commercialization efforts
- Conclusion



Biosketch

- I am a PhD candidate in electrical engineering in the WIMS ERC at the University of Michigan.
- I defend on Dec 10th!
- My research is on microvalves for application in implantable drug delivery devices
- I am a 26 year old single male U. S. citizen
- I have recently decided NOT to start a company based on my research
 - A year ago I was ~75% sure I would commercialize
 - That decision caused me to question that mentality change and investigate the situations founders of technical start ups in the early stages of incorporation

A Review of Five Founders and Their Startups

Time (months)



1

- Started PhD
- 1st Device
- Pay 22k/yr
- 2nd Device
- 1st thoughts
- grant app
- 3rd Device
- Incorporated
- grant received (150k)
- Pay 50k/yr
- Graduation
- grant apps

2

- Started PhD
- Pay 22k/yr
- 1st Device
- 1st thoughts
- Business comps
- 2nd Device
- Cust. contact
- Graduation
- Small contracts (~70k)
- Contract (190k)
- Pay 25k/yr
- Pay 70k/yr

3

- Started PhD
- 1st Device
- Pay 0k/yr
- 2nd Device
- Customer 10k
- Sponsored research (250k)
- Pay 22k/yr
- 3rd Device
- patent
- 1st thoughts
- Graduation
- S. Res. (160k)
- Paid event
- Pay 25k/yr
- 50k/yr
- 65k/yr

4

- Started PhD
- Pay 22k/yr
- 1st Device
- 2nd Device
- 1st thoughts
- Side project
- Graduation
- Grant award (150k)
- Fundraising and development
- Pay 48k/yr

5

- Started PhD
- 1st thoughts
- Pay 22k/yr
- 1st Device
- 2nd Device
- Biz comps (200k)
- 1st customer
- Seed fund(160k)
- Pay 50k/yr
- 80k/yr
- Graduation



Founder Review with Milestones

All founders are male, U.S. citizens, with no dependents when the company started

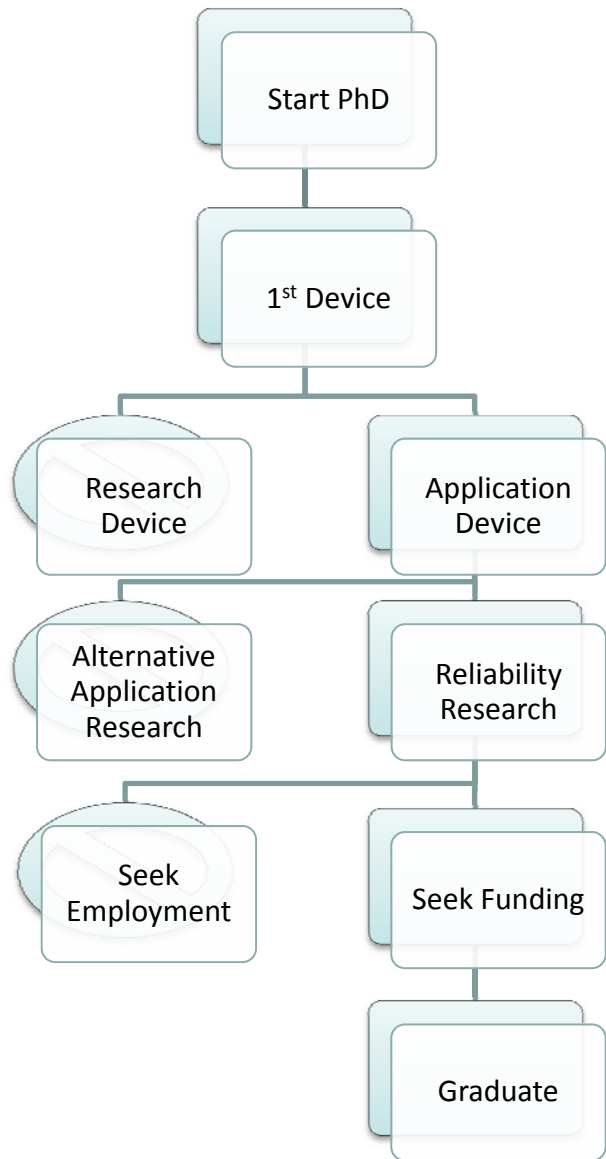
Ordered milestones that apply to all 5 founders



* A company is considered "started" when it receives 50k+ from outside sources

1	•Pay 22k/yr	•1 st thoughts	•Age 27	•Grant (150k)	
2	•Pay 22k/yr	•1 st thoughts	•Biz comps •Cust. talks	•Age 31	•Contract (190k) •Small contracts (~70k) •Pay 25k/yr •Pay 70k/yr
3	•Pay 0k/yr •Pay 22k/yr	•patent •1 st thoughts	•Age 27	•Sponsored Research (160k)	•Paid event •Fundraising rounds •Pay 25k/yr •50k/yr •65k/yr
4	•Pay 22k/yr	•1 st thoughts	•Age 25	•Grant award (150k)	•Fundraising and dev. •Pay 48k/yr
5	•1 st thoughts •Pay 22k/yr		•Age 29	•Biz comps (200k)	•Seed fund(160k) •1 st customer •Pay 50k/yr •80k/yr

Joe Entrepreneur: A typical story

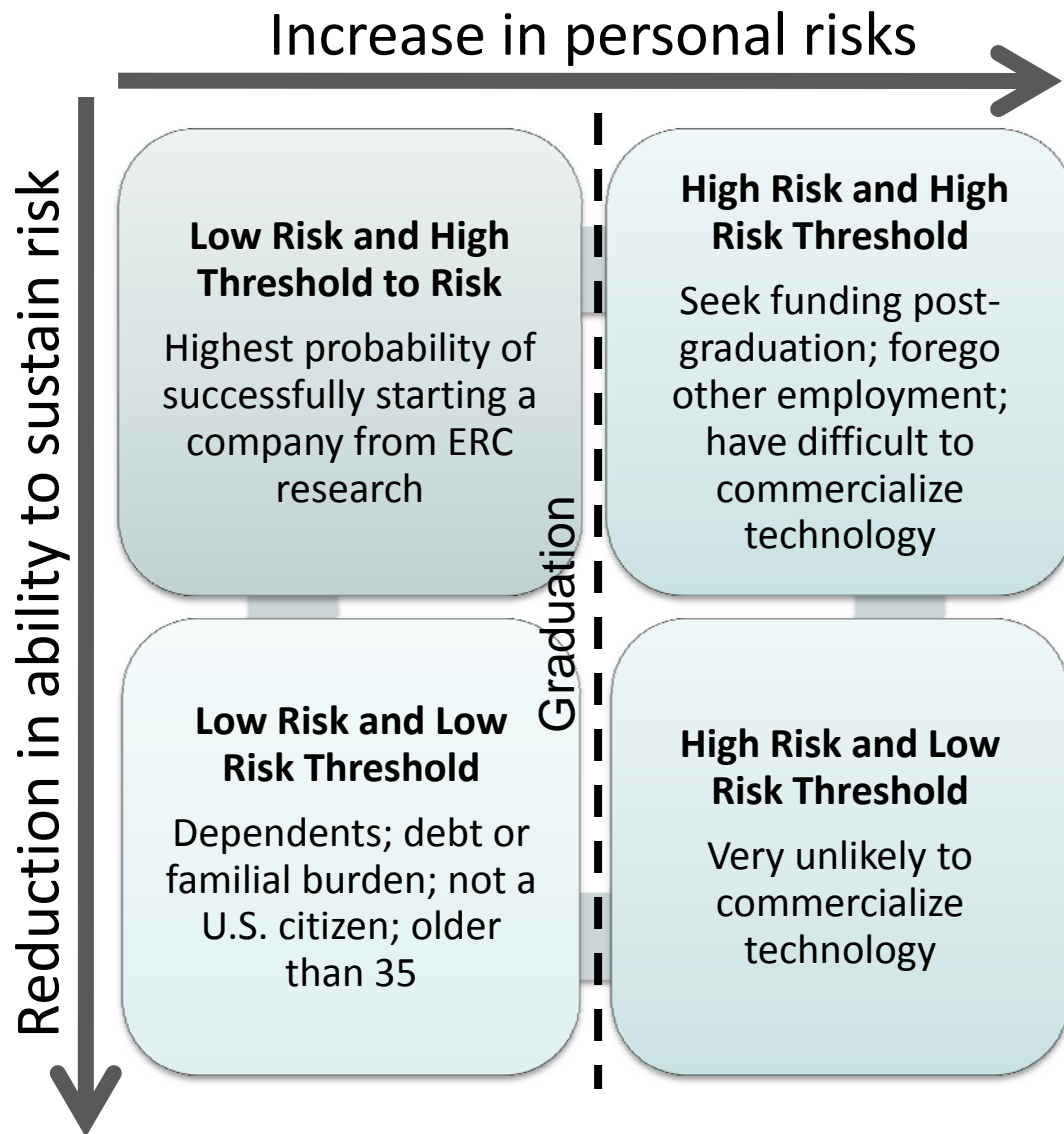


- Joe E. Begins a PhD Program at an NSF ERC
- Research on a device that can be commercialized begins
- A first generation device demonstrates basic concepts
- Either the system is pushed toward commercialization or further exploratory research is undertaken. The latter route is usually terminal to commercialization
- After an application prototype is developed further developmental research is undertaken or alternative applications or side projects are explored (terminal)
- After multiple years of commercializable research, either funding is sought after to start a company or Joe E. seeks out traditional employment (terminal)
- Joe E. graduates. If he graduates before securing funding, it is significantly less likely that a start-up will occur or be successful

Risks of Tech. Startups

The founders of technology startups exist in one of four risk quadrants. They are based on personal risk as being low or high and on ability to sustain risk as being low or high. Graduation is one of the most influential factors in the risk map. This is apparent in the fact that all of the interviewed founders had company starts before graduation.

More Startups WILL occur if potential founders are shifted into the upper left risk quadrant

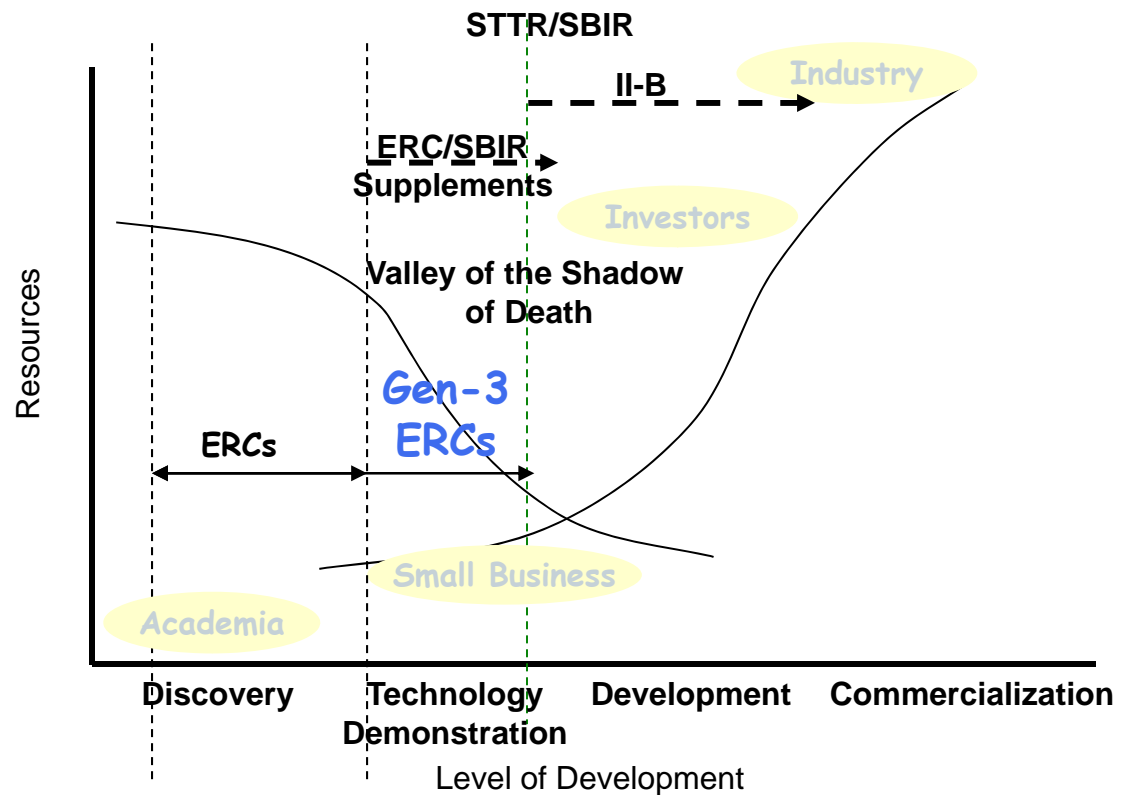


Why this matters

The NSF has a mandate for Gen-3 ERCs to facilitate the commercialization of research. In an effort to get more founders to start a start-up, it is important to understand the factors that influence individual decisions to commercialize.

Increasing the number of startups should lead to an increase in the number of successful startups. This will lead to an increase in research that eventually reaches the market.

Investment in risk management will result in more start ups



Adapted from slide created by Angus Kingon, Brown University



Potential Solution

- A competitive one year ERC post-doc position to work as an entrepreneur with a \$50K SBIR to sustain the company until further funding can be secured
- How does this reduce risk/ increase start-ups
 - Removes graduation as a major factor by eliminating the latency associated with the 6-9 months to find funding
 - Allows for a modest salary and benefits that involve people with lower risk thresholds; particularly people with dependents
 - Provides enough funding to the company to allow further developments that are often necessary to secure larger grants, contracts, or pre-seed funding
 - Formalizes entrepreneurship at a center level instead of at an advisor level allowing for organizational level mentoring and leadership



Summary

- The apparent chaos of the early stages of technical start-ups exhibits significant trends
- The most influential trend is the tendency of a start up to “start” before the founder graduates
- These trends are due to risk and risk threshold for the founders
- One solution is to create a competitive post-doc position with an attached SBIR