

ENTREPRENEURSHIP

for Computer Science and

Engineering

Lecture I:

Introduction and Course Overview

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Today...

- Introduction
- Course Overview
- Getting Started
- Announcements
 - Classes are on Sunday and Tuesday, 15:00 to 16:30 in Room 202
 - Course webpage: To be announced!

Outline

- **Introduction**
 - News Flash: Entrepreneurship Can Be Taught!
- **Course Overview**
 - Objectives, topics, and learning outcomes
 - Administrivia
- **Getting Started**
 - Why are you interested in entrepreneurship?
 - What is a startup?
 - What is entrepreneurship?
 - Who is an entrepreneur?
 - Types of entrepreneurship
 - Why do startups usually fail?

The First Question

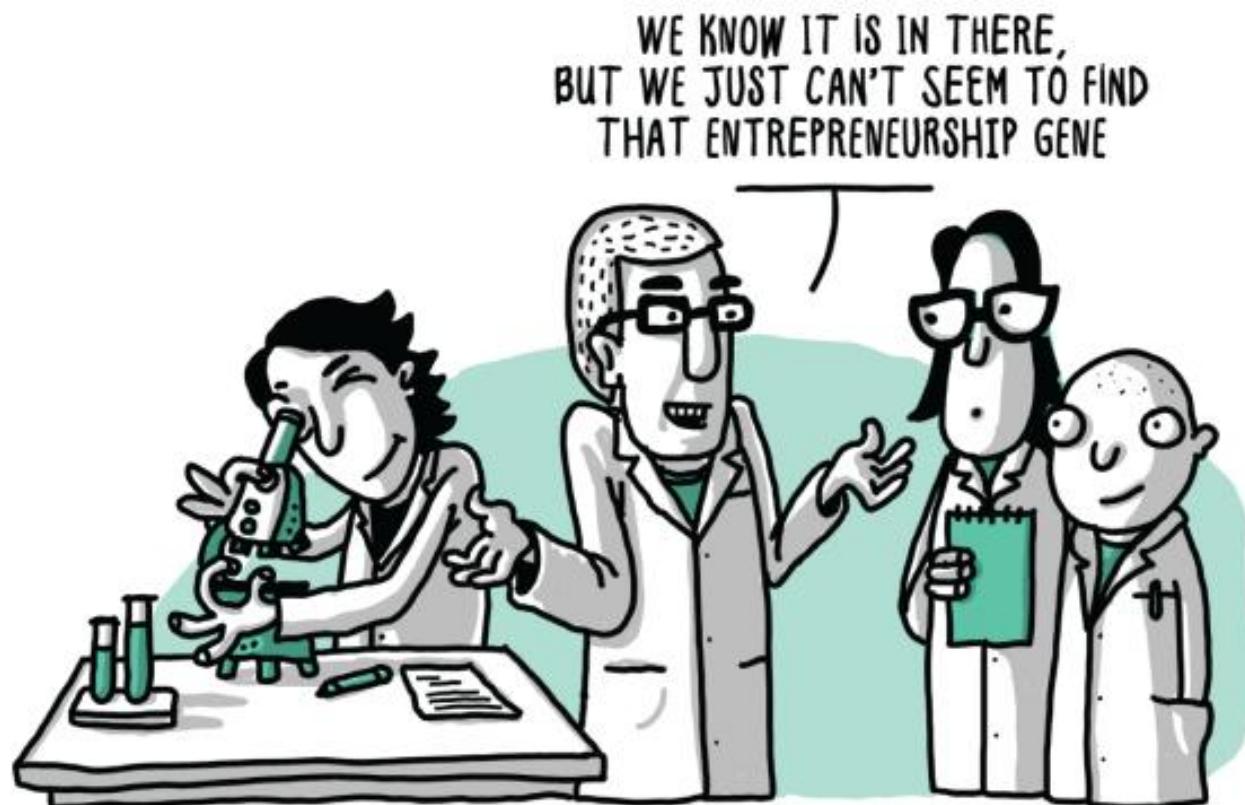
- Do you think entrepreneurship can be taught?
 - To be a successful entrepreneur, you must have a great and innovative product!



<https://startuptalky.com/famous-entrepreneur-world/>

News Flash: Entrepreneurship Can Be Taught!

- Entrepreneurship is nurture, not nature. Everyone can be an entrepreneur, and it can be taught.



Always remember the pioneers

- Computer science celebrities

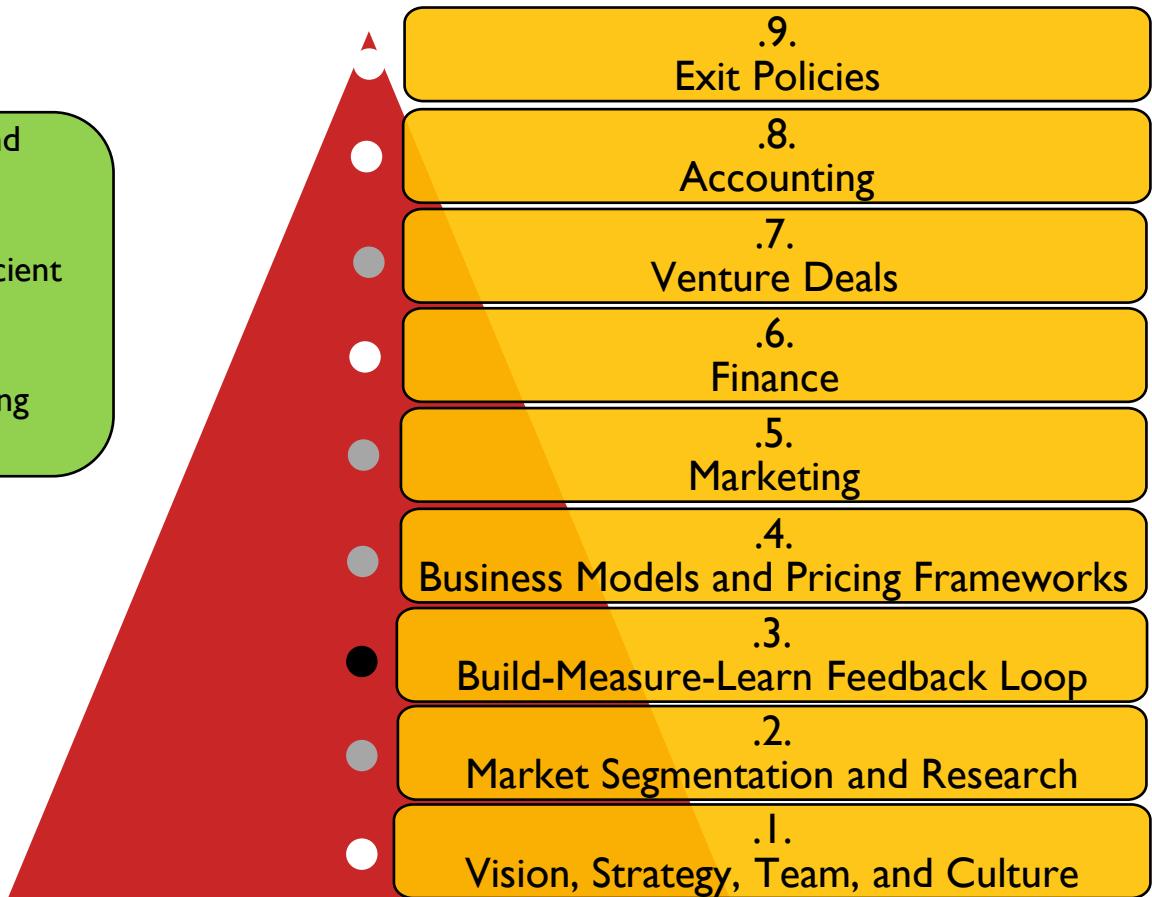


Course Objectives

- Starting a new venture is a serious undertaking with a great deal of risk and sacrifice.
- The objective of this course is to increase your odds of succeeding in starting, executing, and growing a company.
- The course will provide you with a scientific and practical end-to-end framework, which will help you either succeed quickly or **fail fast** (if failure was inevitable for the path that you were on)

List of Topics

- **Considered:** a reasonably critical and comprehensive understanding
- **Thoughtful:** fluent, flexible, and efficient understanding
- **Masterful:** a powerful and illuminating understanding



Learning Outcomes

- After finishing this course, you should be able to:
 1. Form a complementary team and create an innovative culture
 2. Conduct in-depth primary and secondary market research, select a beachhead market, and calculate its **Total Addressable Market (TAM)** size
 3. Identify leap-of-faith assumptions, namely the value and growth hypotheses of a startup
 4. Appreciate the build-measure-learn feedback loop as a scientific method to spiral towards testing and verifying leap-of-faith assumptions
 5. Design and develop a **Minimum Viable Product (MVP)** to enter the build phase of the build-measure-learn feedback loop as quickly as possible

Learning Outcomes

- After finishing this course, you should be able to:
 6. Test MVP with early adopters, collect feedback, and apply actionable analytics to steer MVP towards a Viable Product (VP)
 7. Apply split-test (or A/B) experiments to evaluate different variations of an MVP or VP feature
 8. Identify different engines of growth (e.g., viral and paid engines of growth) to determine product-market fit and achieve a sustainable business
 9. Differentiate between various types of pivots (e.g., zoom in, zoom out, customer segment, and engine of growth pivots)
 10. Design a business model, set a pricing framework, calculate the Lifetime Value (LTV) of an acquired customer, and compute the Cost of Customer Acquisition (COCA)

Learning Outcomes

- After finishing this course, you should be able to:
 - I1. Value pre-revenue and post-revenue companies
 - I2. Differentiate between different corporate metrics (e.g., price-to-earnings ratio and return-on-assets), stock types, bonds, equity, and debt
 - I3. Understand the venture capital financing process and raise money for a startup the right way
 - I4. Apply accrual accounting and interpret the three core financial statements, namely, the balance sheet, income statement, and cash flow statement
 - I5. Recognize different exit policies (e.g., Initial Public Offering)

Assessment Methods

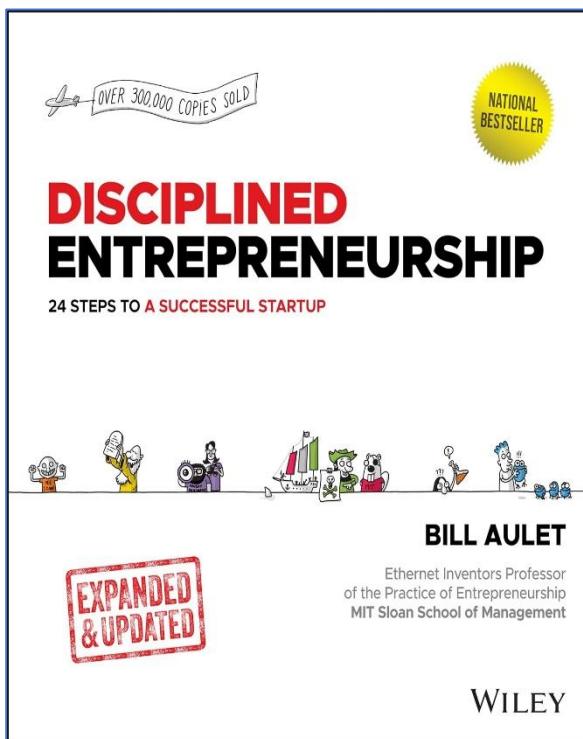
- How learning will be measured?

Item/activity	#	Weight	Grade (20)
Capstone project (MVP)*	1	30%	6
Exams*	2	40%	8
Problem sets*	3 to 4	10%	2
Presentations (Idea + BP)*	2	10%	2
Reading and tutorial making	2	10%	2
In-class participation and attendance	32 + 8	+5%	+1

- Must get at least **50%** of scores from *-items to pass the course.

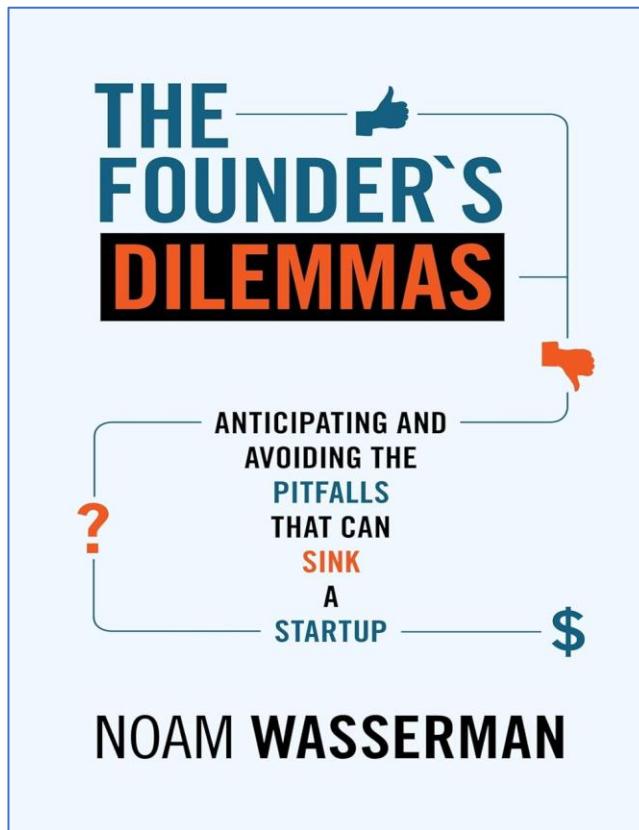
Textbooks (I)

- No specific textbook, but here are some references:
 - Aulet, Bill. *Disciplined Entrepreneurship: 24 Steps to a Successful Startup*, Expanded & Updated. United Kingdom: Wiley, 2024.



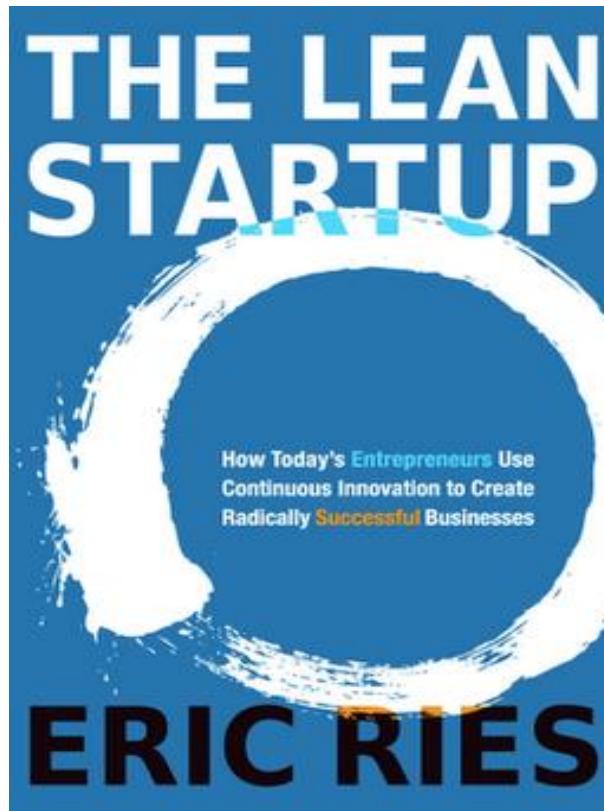
Textbooks (II)

- Wasserman, Noam. *The Founder's Dilemmas: Anticipating and Avoiding the Pitfalls That Can Sink a Startup*. United Kingdom: Princeton University Press, 2013.



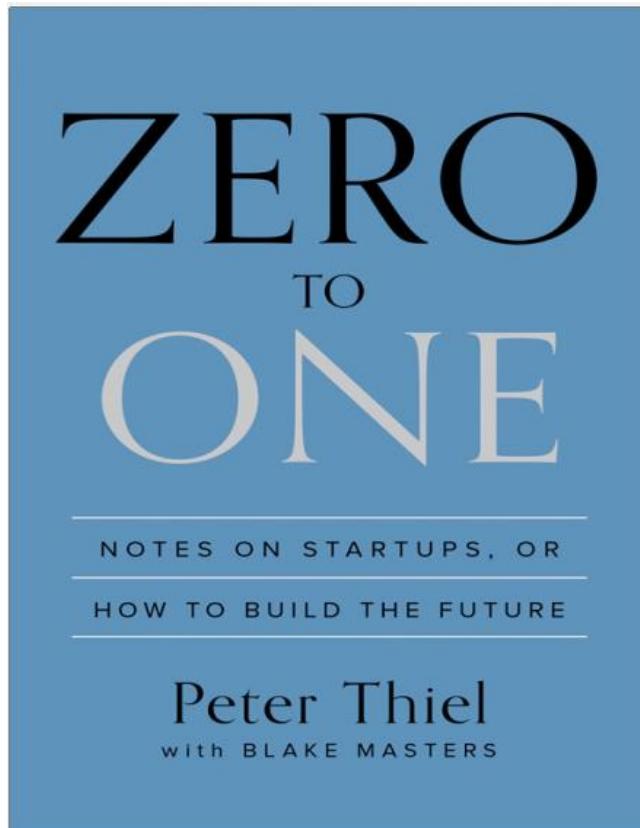
Textbooks (III)

- Ries, Eric. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business, 2011.



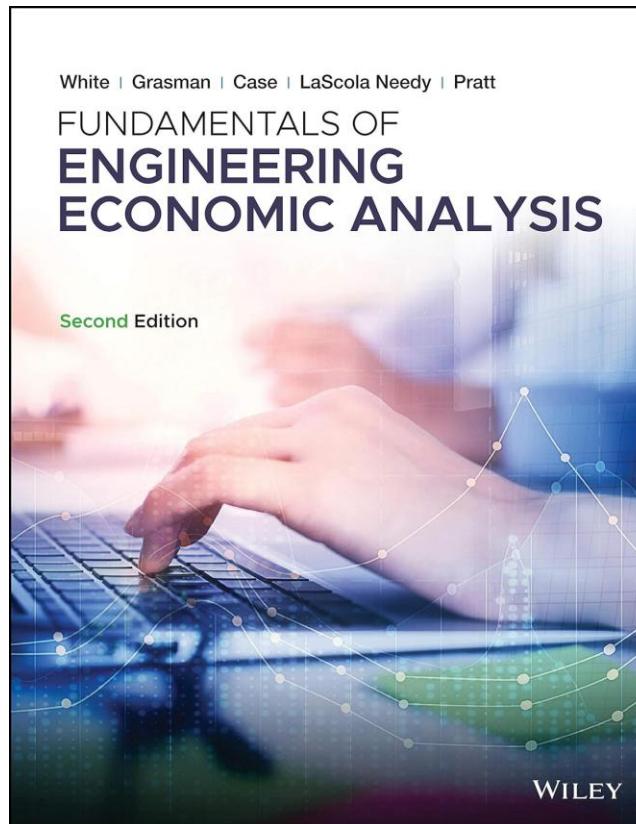
Textbooks (IV)

- Thiel, Peter., Masters, Blake. *Zero to One: Notes on Startups, Or How to Build the Future*. Germany: Crown, 2014.



Complementary textbooks

- White, John A., Grasman, Kellie S., Case, Kenneth E., LaScola Needy, Kim., Pratt, David B.. *Fundamentals of Engineering Economic Analysis*. United Kingdom: Wiley, 2020.

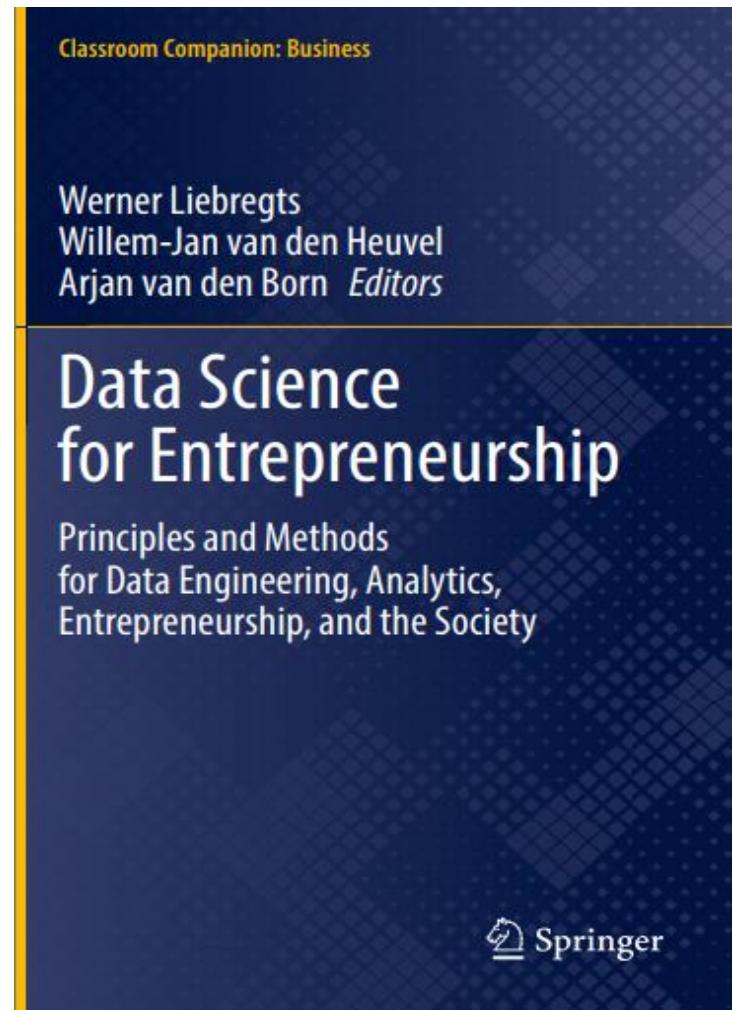


Other textbooks

- Read, Stuart., Sarasvathy, Saras D., Dew, Nick., Wiltbank, Robert. *Effectual Entrepreneurship*. 2nd edition, United Kingdom: Routledge, 2017.
- Nandan, H.. *Fundamentals of Entrepreneurship*. 3rd edition, India: PHI Learning, 2013.
- Bock, Laszlo. *Work Rules! Insights from Inside Google That Will Transform How You Live and Lead*. United States: Grand Central Publishing, 2022.
- and
 - “**How Google Works**”, 2014 by Eric Schmidt and Jonathan Rosenberg

Reading and tutorial-making works

- Work 1: Book reading
 - Select a chapter
 - Translate to Persian
- Work 2: Tutorial making
 - Choose a topic
 - Create a tutorial/slides
 - With practical examples



Reading and tutorial-making topics

- I. Computer Model for Feasibility Analysis and Reporting (COMFAR)
 - <https://www.unido.org/comfar>
2. Cashflows: A Package for Investment Modeling and Advanced Engineering Economics using Python
 - <https://cashflows.readthedocs.io/en/latest/>
3. QuantLib-Python Object Building Documentation
 - <https://quantlib-python-docs.readthedocs.io/en/latest/>
4. Python Accounting
 - <https://python-accounting.readthedocs.io/en/latest/>
5. Zipline and pyfolio
 - <https://quantopian.github.io/pyfolio/>

Reading and tutorial-making topics

6. Market analysis and research platforms

- **Market research:** A study done to collect statistics on a given market within a specific industry.
- **Market analysis:** Interpretation of market information to determine a market's size, growth potential, audience, and competitive landscape.
- Example platforms:
 1. Grand View Research (<https://www.grandviewresearch.com>)
 2. Transparency Market Research (<https://www.transparencymarketresearch.com/>)
 3. Future Market Insights (<https://www.futuremarketinsights.com/>)
 4. Allied Market Research (<https://www.alliedmarketresearch.com>)

7. Patents, copyright, and trading laws

8. Company establishment and types of companies and businesses

Reading and tutorial-making topics

9. Review top startups in a specific business
 - Example: Finance, cyber-security, Internet of Things
 - The 50 Hottest Fintech Startups In 2025 (Forbes 2025 Fintech 50)
 - <https://www.forbes.com/lists/fintech50/>
10. Choose a scientific paper about entrepreneurship and replicate/improve its results
 - Example journals:
 - Entrepreneurship Theory and Practice
 - Entrepreneurship and Regional Development
 - Strategic Entrepreneurship Journal
11. Other relevant topics

Target Audience and Prerequisites

- Target audience
 - All AUT students
 - Specifically, AUT CSE students
- Prerequisites
 - Being an AUT student,
 - Familiar with computers and basic programming,
 - Have **passion and discipline.**

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Why are you interested in entrepreneurship?

- You may have an *idea* that can **change the world** or improve an existing process you are *familiar* with
- You may have a **technological breakthrough** and want to *capitalize* on it
 - perhaps by founding a *startup*
- You may have a **passion** and want to learn about entrepreneurship while looking for a good idea, technology, and/or a *partner*

Why are you Interested in Entrepreneurship?

- Three most common ways to start a new venture

I have a
technological
breakthrough!



I have
an idea!



I have
a passion!



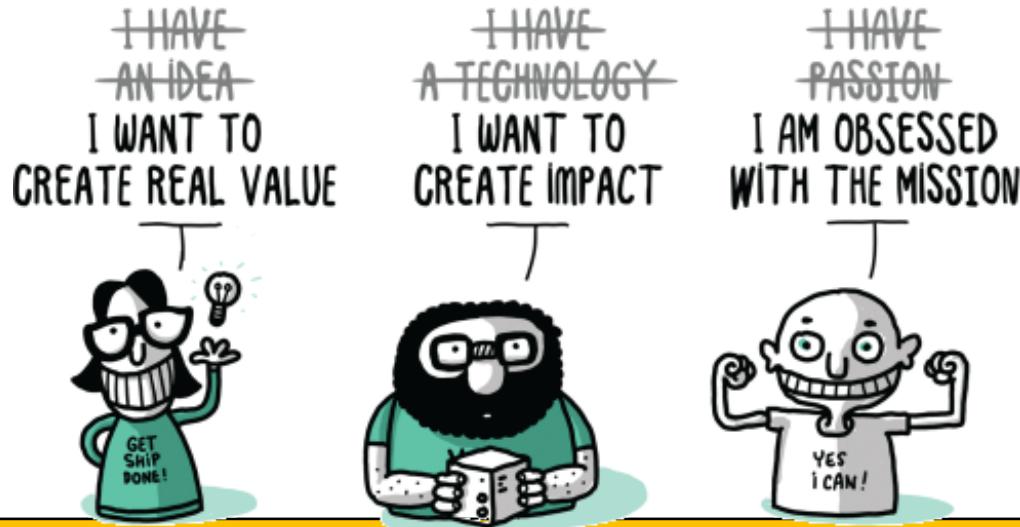
Raison d'Être (Reason for Existence)

- Internal motivations must be at a higher level.
 - Please do not try to start a company because you simply have an idea or technology.



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In any of these cases, at this stage, you may want to explore the world of **startups** and **entrepreneurship**. If so, let us get started!

What is a Startup?

- A startup is an **organization** designed to **innovate** a new product or service under conditions of extreme uncertainty
 - “*The Lean Startup*” by Eric Ries
 - An **organization** encompasses mission, vision, strategy, culture, accounting, finance, operations, etc.
 - In this context, however, it operates under too much uncertainty, following *leap-of-faith assumptions* concerning its invention
 - **Innovation** = Invention × commercialization
 - This implies that having a product does not mean you have a business.

The Single Condition for a Business

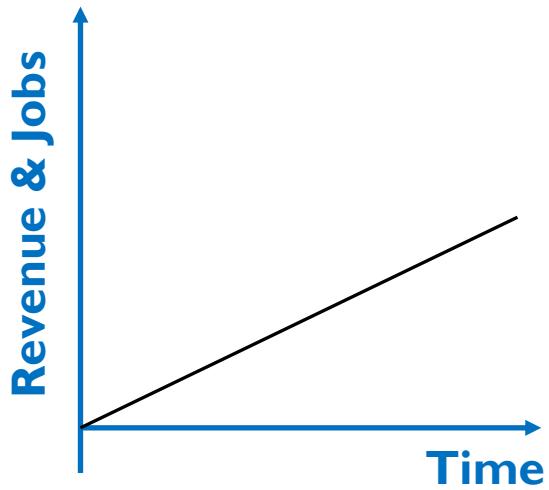
- The single **necessary** and **sufficient** condition for a business is a **paying customer**
- The day someone pays you money for your product or service, you have a business, and NOT the day before!
 - However, having a paying customer does not mean you have a **sustainable** business!
- To have a **sustainable** business, you need enough customers paying enough money within a reasonable amount of time.

Entrepreneurship

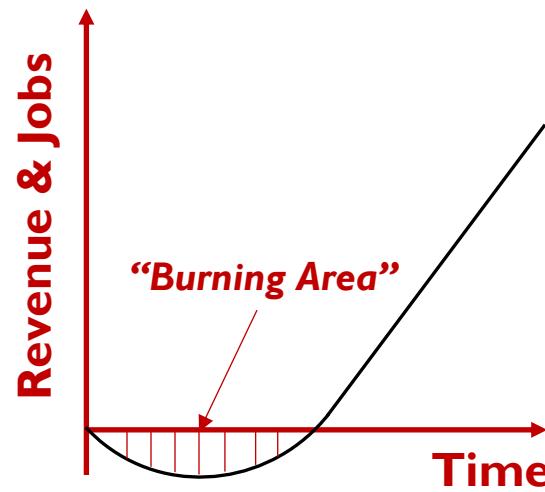
- Entrepreneurship is *the process of creating a sustainable business*
- There are two types of entrepreneurship
 - Small and Medium Enterprise (SME)
 - Innovation-Driven Enterprise (IDE)

	SME	IDE
Market	Local and/or Regional	Regional/Global
Invention	Not Necessary	Necessary
Jobs	Non-tradable	Tradable
External Capital	Typically No	Yes
Growth	Linear	Exponential

SME and IDE Expected Revenue & Job Trends

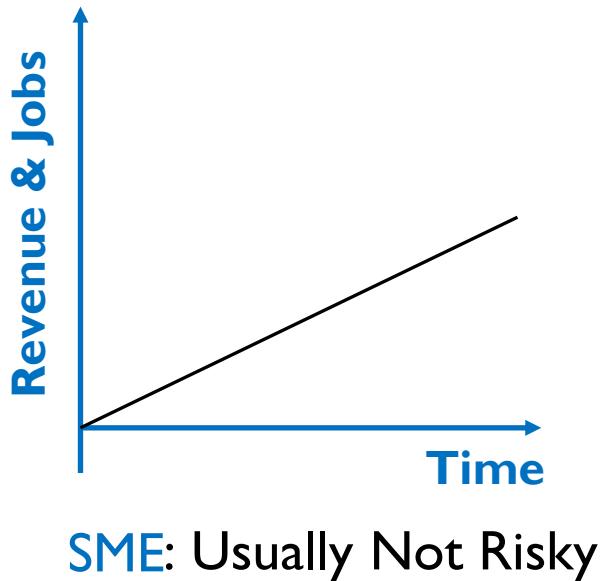


SME: Usually Not Risky



IDE: Much Riskier, but
More Ambitious (*Go Big
or Go Home!*)

SME and IDE Expected Revenue & Job Trends



Ten common myths about entrepreneurship

I. Entrepreneurship is about mercurial individuals.

- The truth is that entrepreneurship is a **team sport**, and that gets truer every day as the world gets more complex.

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 - **Authenticity** is much more important than charisma.

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 - The truth is that entrepreneurship is a **team sport**, and that gets truer every day as the world gets more complex.
2. Entrepreneurs succeed because they have special charisma.
 - **Authenticity** is much more important than charisma.
3. Entrepreneurs are born, not made.
 - Entrepreneurship is **nurture**, not nature.

Ten common myths about entrepreneurship

4. Entrepreneurs are successful because they are smarter than the rest of us.
 - It is all about **focus** on becoming an expert in one area rather than general intelligence.

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5. You have to love risk to be an entrepreneur.
 - What entrepreneurs learn is how to take **intelligent informed risk**.

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 - It is all about **focus** on becoming an expert in one area rather than general intelligence.
5. You have to love risk to be an entrepreneur.
 - What entrepreneurs learn is how to take **intelligent informed risk**.
6. Entrepreneurs are lucky.
 - By **working smart and hard**, entrepreneurs **make their own luck**; they do not depend on random events happening.

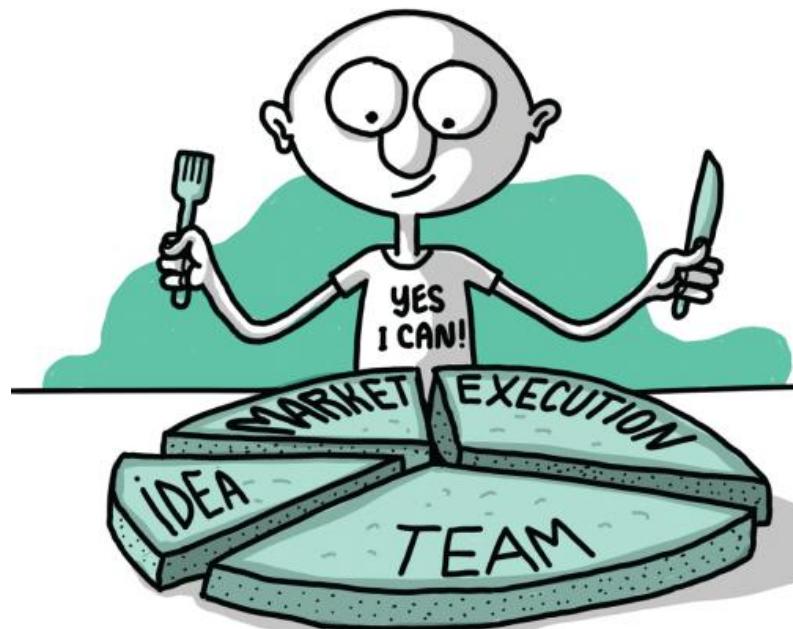
Ten common myths about entrepreneurship

- While good entrepreneurs might appear to be lucky, that luck is often **by design**.
- They see a future opportunity, and they work **diligently** to be prepared to take advantage of it when it happens.



Ten common myths about entrepreneurship

7. Entrepreneurs are successful because they came up with a novel idea.
 - An idea is necessary to **catalyze** a team into action, but what is even more important is executing effectively on a **viable idea** that will **evolve**.



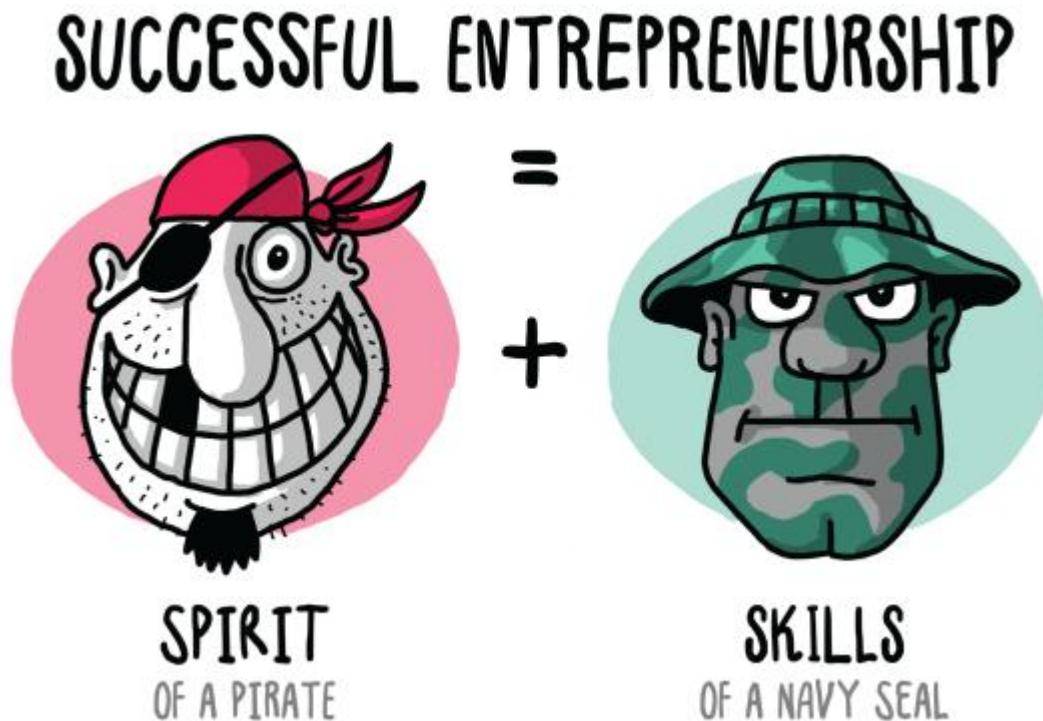
Ten common myths about entrepreneurship

8. You need to be young to be a successful entrepreneur.
 - Average age at founding for the 1,000 fastest-growing new ventures was **45** (Pierre Azoulay).
 - Successful entrepreneurship is more likely to come with age and **experience**.
9. Entrepreneurs succeed at a rate of less than 10%.
 - Success would be defined as being **in business** five years after founding.
 - If you know what you are doing, entrepreneurship is not as risky as it is generally perceived.

Ten common myths about entrepreneurship

10. Entrepreneurs are undisciplined.

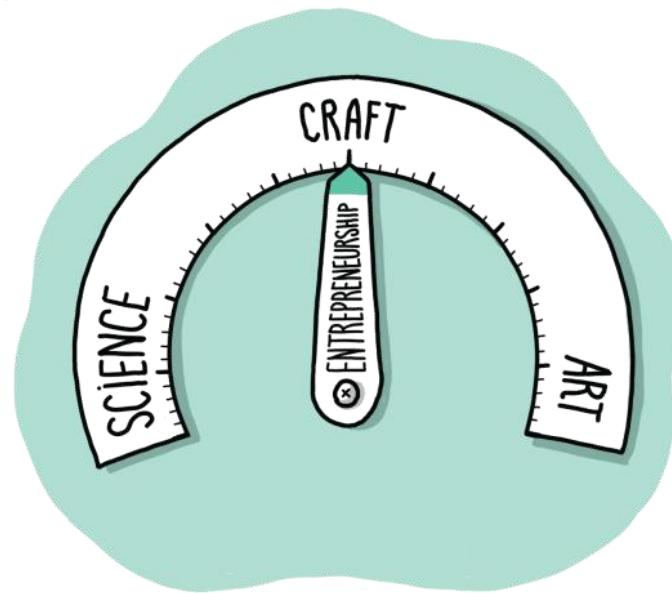
- Entrepreneurs must have *extraordinary discipline* to be successful.



Five useful mental models about entrepreneurship

I. Entrepreneurship is a craft, not a science or art.

- The sciences are well-defined and deterministic; art is the opposite.
- Entrepreneurship is a craft that sits between these two ends of the spectrum.



Five useful mental models about entrepreneurship

2. Entrepreneurship is a mindset, a skill set, and a way of operating.

- The four Hs summarize four key pillars to becoming a successful entrepreneur—and it all starts with the Heart.



HEART
SPIRIT



HEAD
KNOWLEDGE



HAND
CAPABILITY



HOME
COMMUNITY

Five useful mental models about entrepreneurship

- 3. Everyone is capable of entrepreneurship.**
- 4. Entrepreneurship is more than startups.**
 - Startups backed by venture capital.
 - Entrepreneurs are needed and certainly can exist inside already established organizations.
 - They can be in nonprofits, academia, government, and faith-based organizations.
- 5. Sustained and successful entrepreneurship is an ethical activity.**

Entrepreneurship vs. Management

- Innovation-Driven Enterprise (IDE) entrepreneurship is a **special** kind of management
 - Entrepreneurship is cool, innovative, and exciting
 - Management is dull, serious, and bland
 - What is actually exciting is to see a startup succeed and change the world
 - This cannot happen without *managing* it rightly
 - The road to excitement passes through the (boring) management stuff!
- Why is IDE entrepreneurship a **special** kind of management?

Entrepreneurship vs. Management

- Why **special?**
 - Traditional business thinking suggests:
 - Perfecting a product, even if it takes a great deal of time, hence, *long development cycles*
 - Large teams and hierarchical organizations
 - Failures are unacceptable
 - Modern business (or entrepreneurial) thinking suggests:
 - Building a minimum viable product (MVP); hence, *short development cycles*
 - Focusing on what customers want, thus experimenting tremendously
 - Failing as a prerequisite for success
 - Small teams and flat organizations

Schools of Thought in Entrepreneurship

- Three major schools of thought:

I. “Just Do It”

- Most entrepreneurs are wary of implementing traditional management practices, afraid that this will invite bureaucracy or stifle creativity
- They assume management is the problem, hence, chaos is the answer
- Unfortunately, this approach leads to chaos more often than it does to success

2. “Launch a Rocket Ship”

- Specify every single step to take in excruciating detail (typically by tapping into a proven set of techniques used for managing big companies)
- Specify the expected result of every single step taken— what happens if a tiny error occurs?
- Can you adapt or pivot?

Schools of Thought in Entrepreneurship

- Three major schools of thought:

3. “Plan and Improvise, but Verify”

- Set a (hypothetical) path to reach a destination (you are not sure whether this path will lead to the destination)
- Experiment with and validate your path
- Persevere, adapt, or even pivot if needed
 - If you are driving to work, do you give up if there is a detour in the road or you made a wrong turn?
 - No, you remain thoroughly focused on getting to your destination

The third school of thought is the recommended one!

Who is an Entrepreneur?

- Anyone who creates a startup is an entrepreneur
 - This implies that an entrepreneur should have a (strong) appetite for risk-taking.
- But an entrepreneur does not need to create a startup;
 - she/he can operate inside “established” organizations
 - This entrepreneur is typically referred to as an “intrapreneur”.
- In addition, an entrepreneur does not need to invent!
 - E.g., Steve Jobs identified the computer mouse created by Xerox PARC and commercialized it effectively through Apple.
 - E.g., Larry Page and Sergey Brin used AdWords (which was created by Overture Services, Inc.) on their search results pages.

The startup reality

- The grim reality is that most startups fail
- Five essential elements lead to successful startups:



IDEA



**TEAM &
Execution**



**BUSINESS
MODEL**



FUNDING



TIMING

What makes startups succeed?

- Succeeded



Idea	Team	B M	Funding	Timing
10	9	8	6	10

Idea	Team	B M	Funding	Timing
8	9	5	4	9

Idea	Team	B M	Funding	Timing
8	10	7	7	10

[Based on a study by IdeaLab]

What makes startups succeed?

- Failed



friendster®

kozmo.com

webvan

Idea	Team	B M	Funding	Timing
8	5	4	6	6

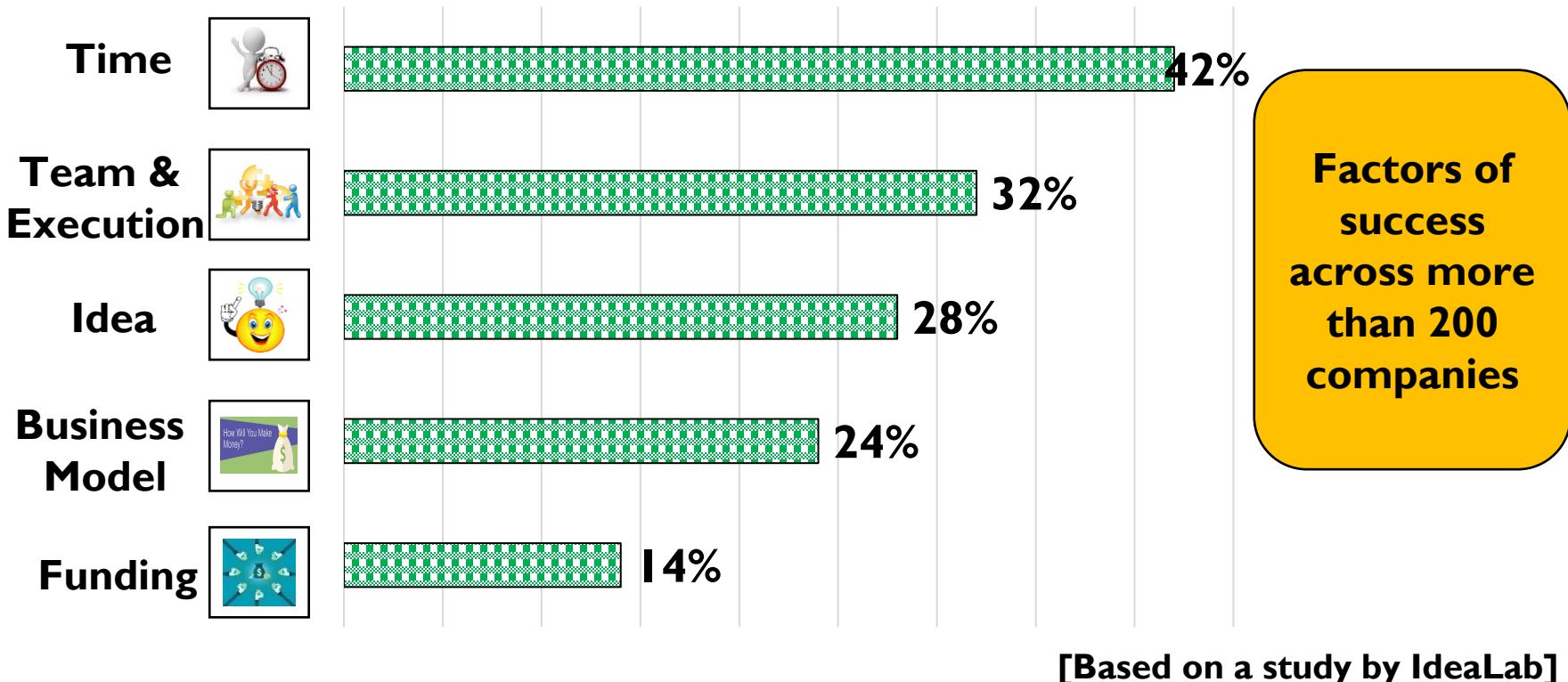
Idea	Team	B M	Funding	Timing
4	5	6	10	4

Idea	Team	B M	Funding	Timing
4	5	6	10	4

[Based on a study by IdeaLab]

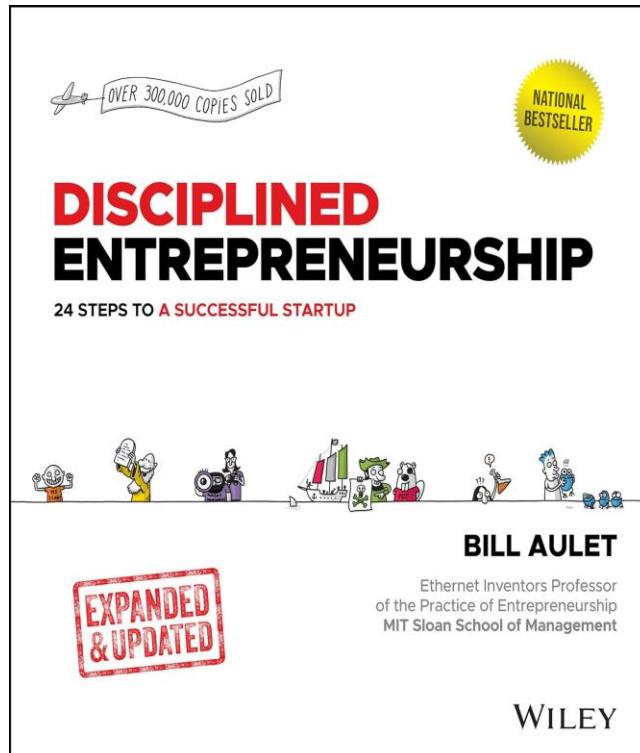
What makes startups succeed?

- Factors of success



Reading assignment

- Read “**STEP 0: Getting Started**” of the “Disciplined Entrepreneurship” book
 - 2024 by Bill Aulet



Next Class

- Forming teams and generating ideas
- Performing market segmentation and research
(Part I)