ENTREPRENEURSHIP
for Computer Science and Engineering

Lecture 8:

The Lean Approach

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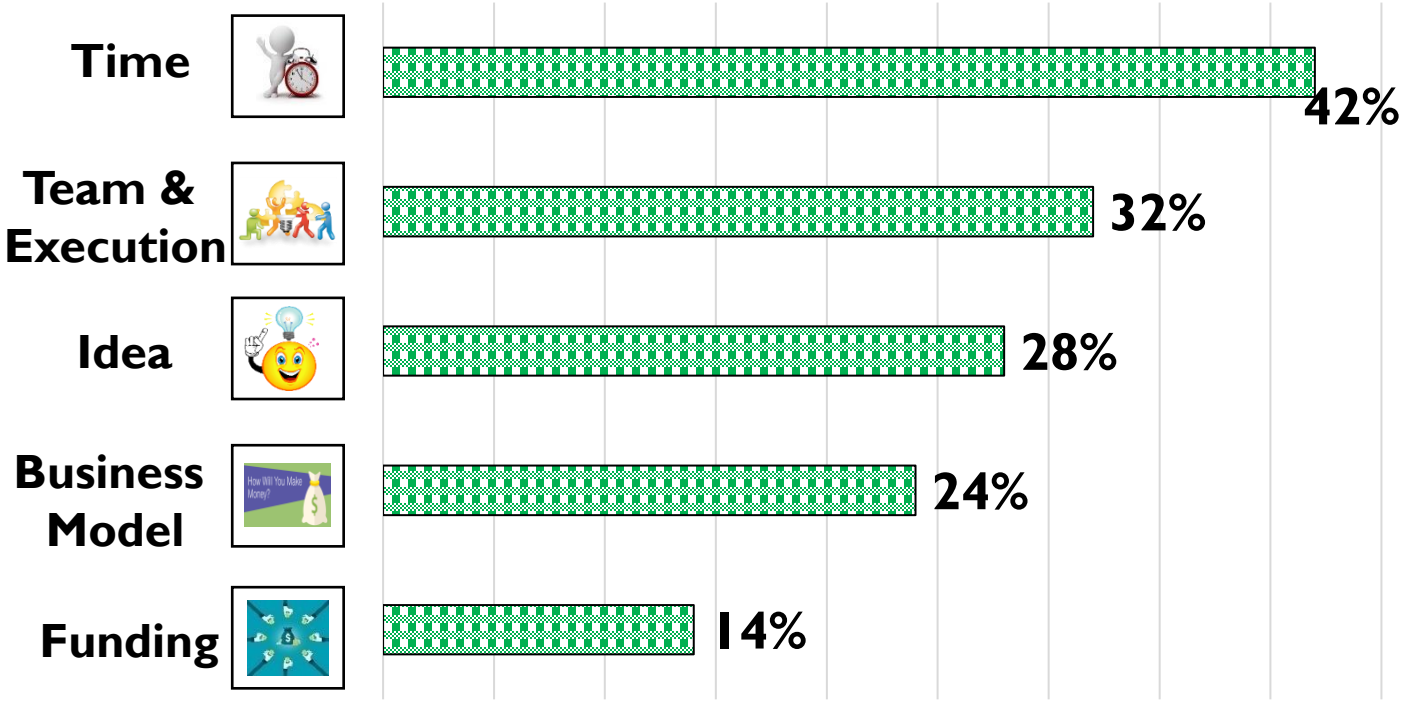
Outline

- Last Session:
  - Financial statements
    - Income statement, balance sheet, and cash flow statement
  - The Depreciation and Amortization Processes
  - Interpreting Financial Statements
  - Bookkeeping
- This lecture
  - The Lean Approach
  - Minimum Viable Product (MVP)
- Announcements:
  - Project Milestone 4.0 due.
  - Course website: *https://www.m-zakeri.ir/Entrep/*
  - My lab: *https://www.m-zakeri.ir/lab*
  - Book template:
    - *https://github.com/m-zakeri/Entrep/tree/main/docs/assignments/book*

Recap: What makes startups succeed?

- Factors of success



Factors of success across more than 200 companies

[Based on a study by IdeaLab]

https://www.idealab.com/

Value vs. Waste

- **Question**: Which of our efforts are value-creating and which are wasteful?
- *Lean thinking* defines **value-creation** as providing benefits to the customers;
  - anything else is a waste!
- But, how can you know whether you are providing benefits (*i.e.*, creating value) to your potential customers?

Value vs. Waste

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- *Lean thinking* defines **value-creation** as providing benefits to the customers;
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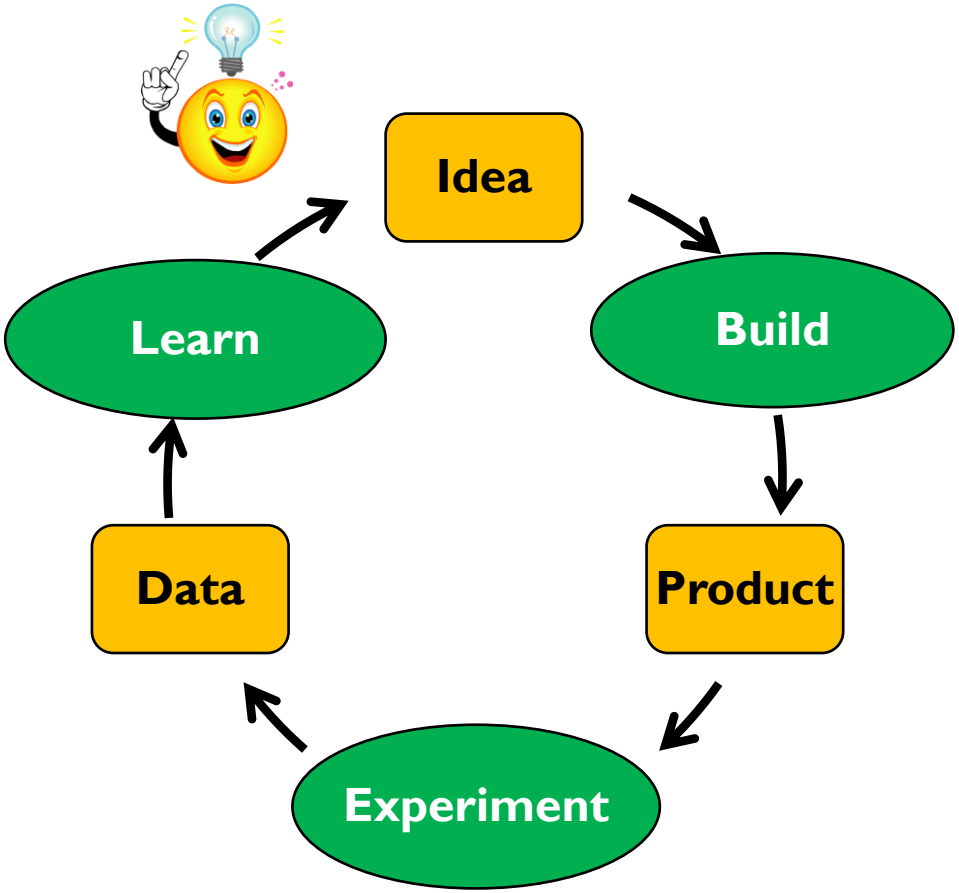
- But, how can you know whether you are providing benefits (*i.e.*, creating value) to your potential customers?
  - **Note**: True startup productivity CANNOT be measured in terms of how much you are building every day, but rather in terms of systematically figuring out *the right thing to build* **every day.**

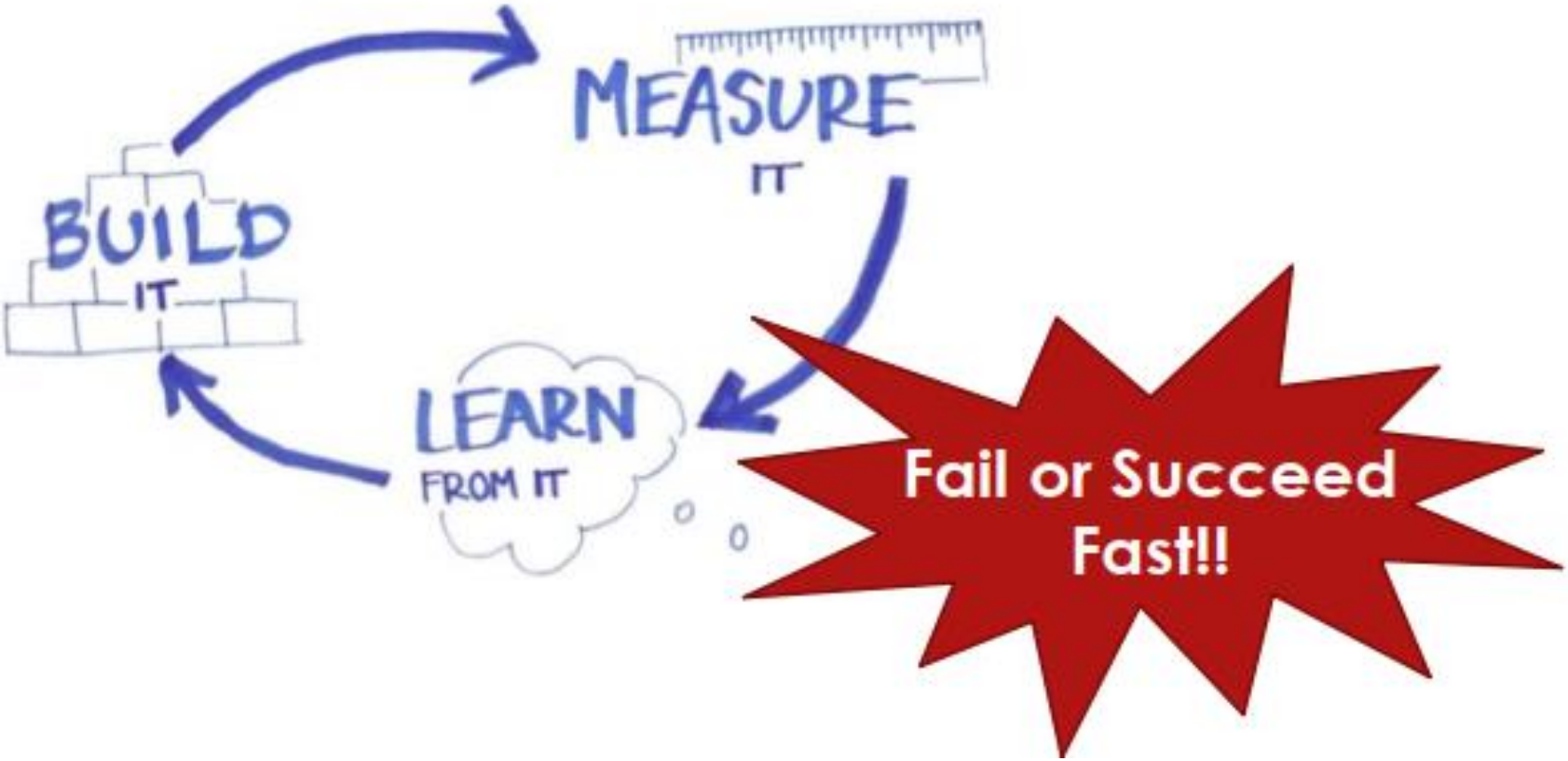
Towards Value Creation

- Success is not about delivering a product; success is about delivering a product (or a feature of a product) that customers will use.
- The way to do this is to *continuously* align your efforts with your customer's *real* needs.
  - **Note**: This is not about asking your customers what they need because customers typically do not know what they need.
- The ***Build-Experiment-Learn feedback loop*** allows you to discover your customers' needs and methodically align with them.

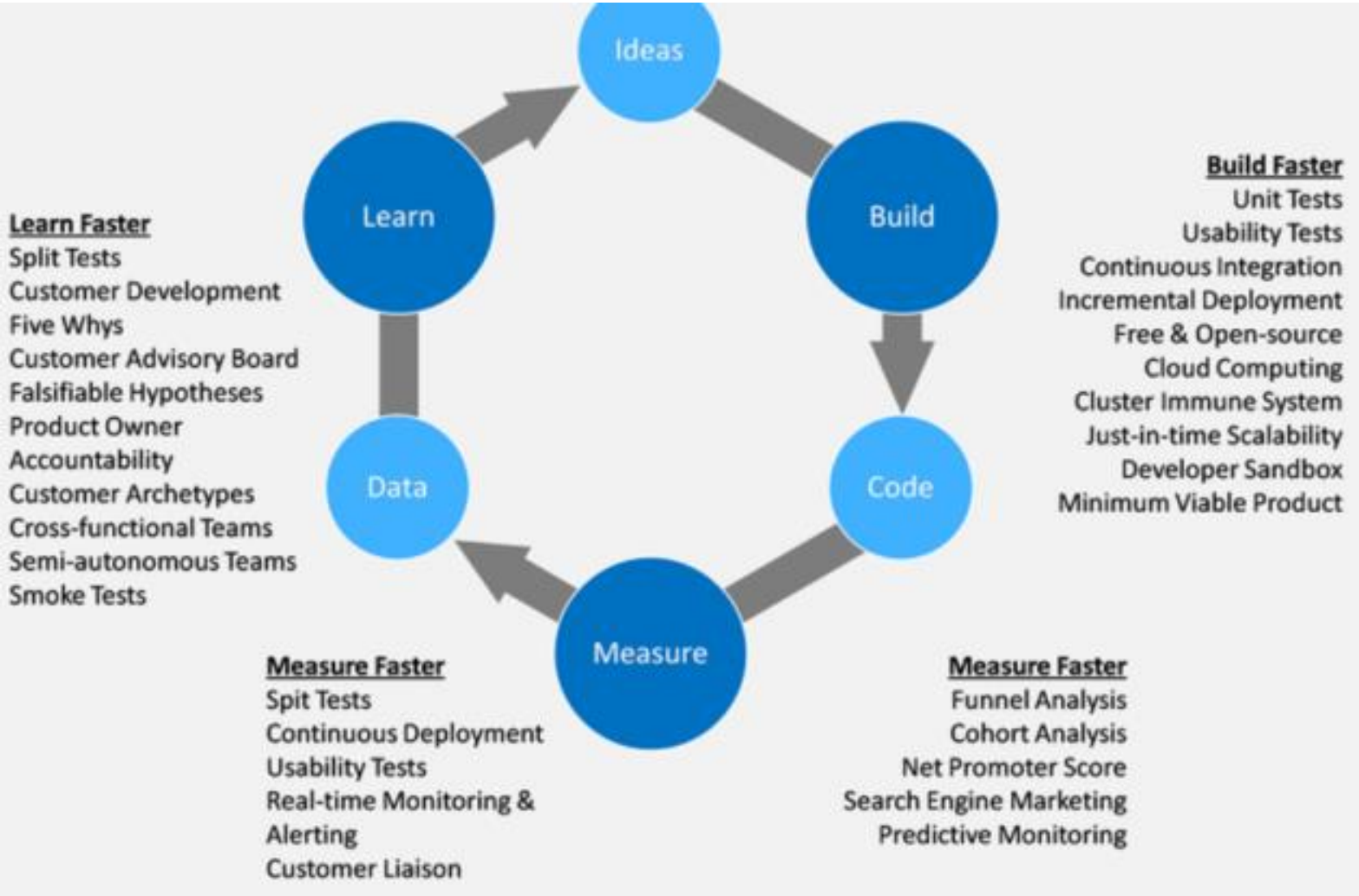
Build-Experiment-Learn Feedback Loop



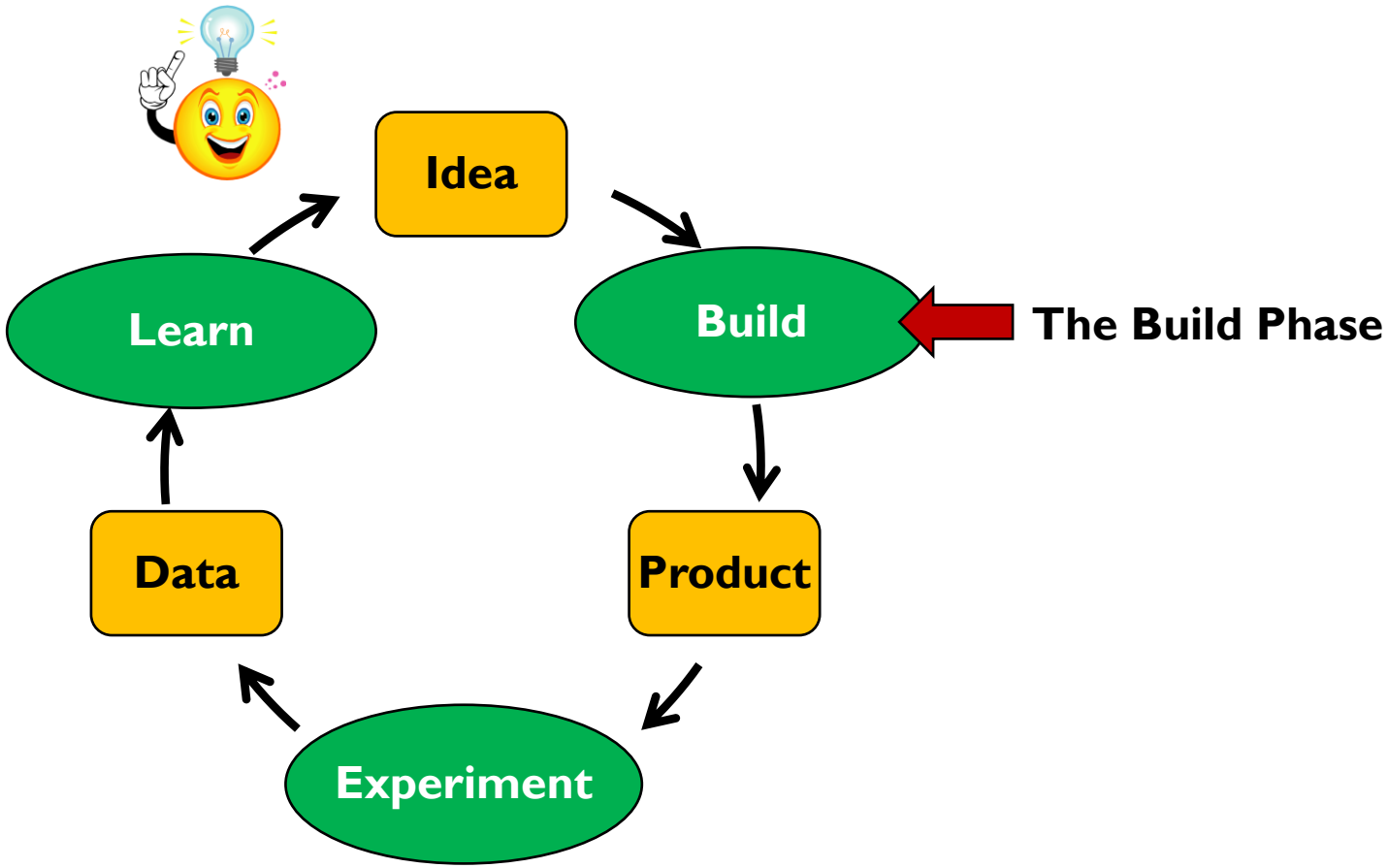
Build-Experiment (measure)-Learn



Build-Measure-Learn Process



Build-Experiment-Learn Feedback Loop



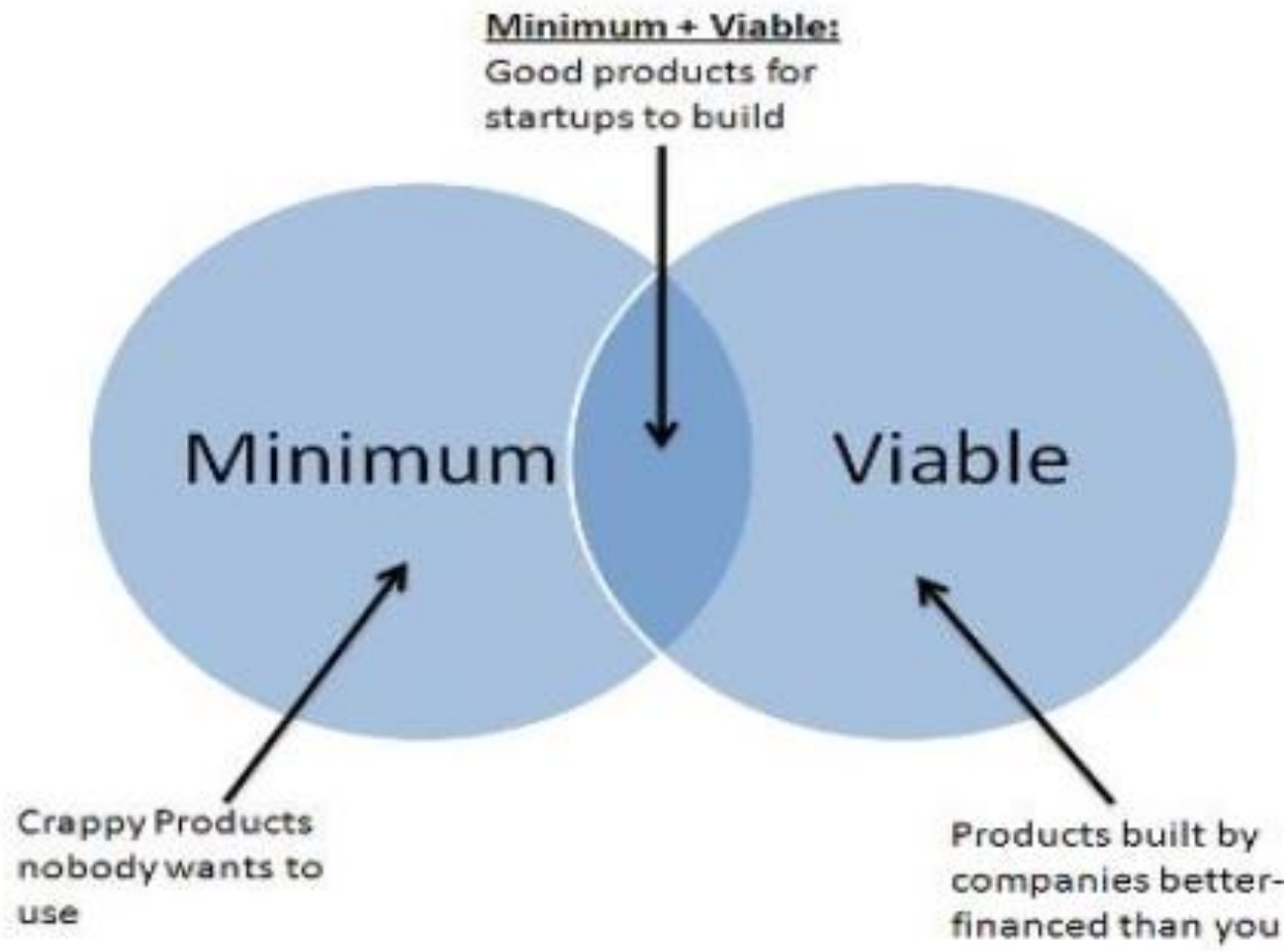
The Build Phase: MVP

- The build phase can be entered as quickly as possible with a ***Minimum Viable Product*** (MVP).
- An **MVP** ranges in complexity from extremely simple *smoke tests* (little more than an advertisement) to early prototypes.

Minimum Viable Product

- The Minimum Viable Product (MVP) is a key concept that has been introduced to allow
  - fast market introduction
  - with lower investment risk
  - And efficient market feedback mechanisms
  - for optimum product-market fit.
- The MVP could/should be the first development milestone of the product or service that implements the solution of the identified problem.

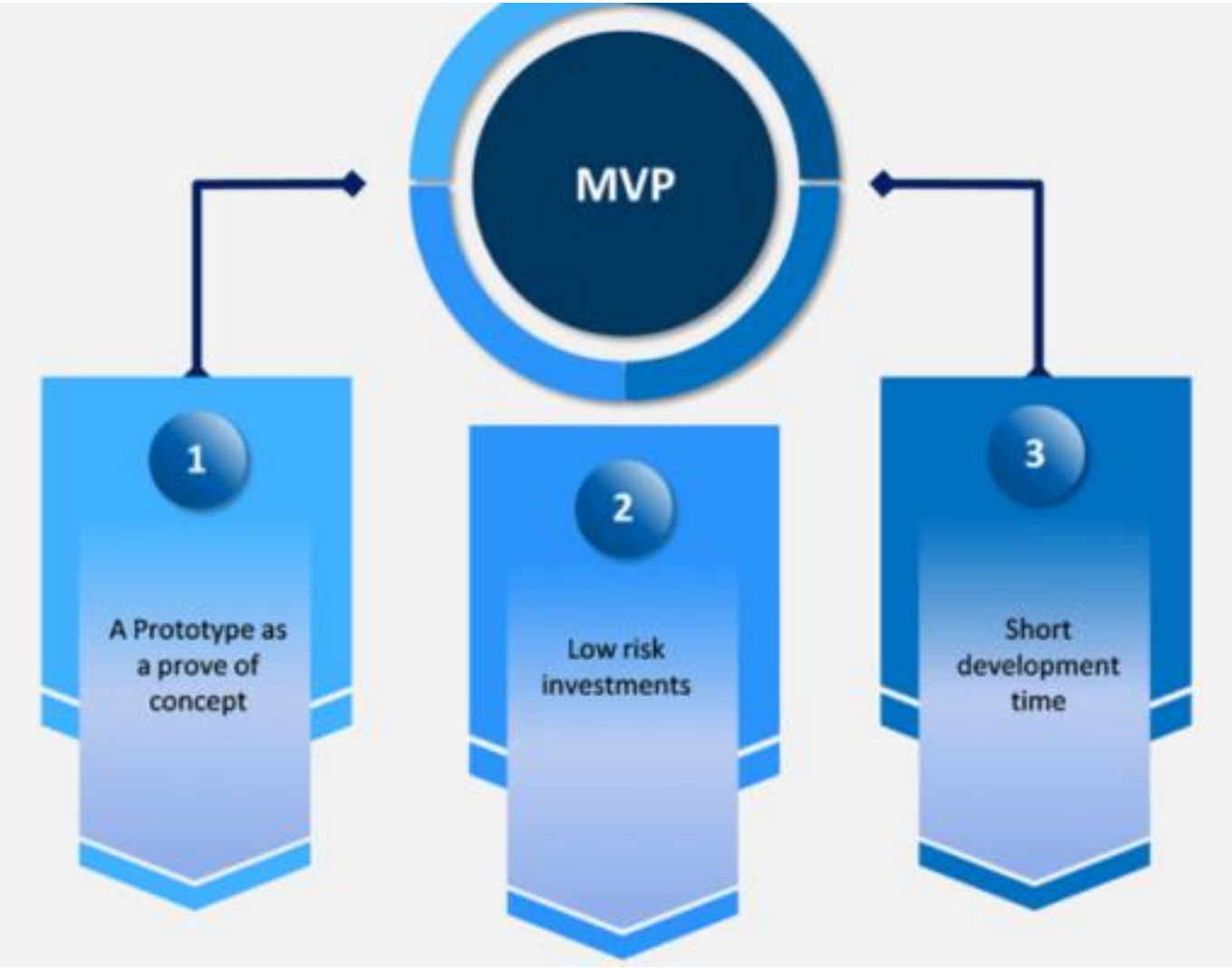
Minimum Viable Product



Minimum Viable Product

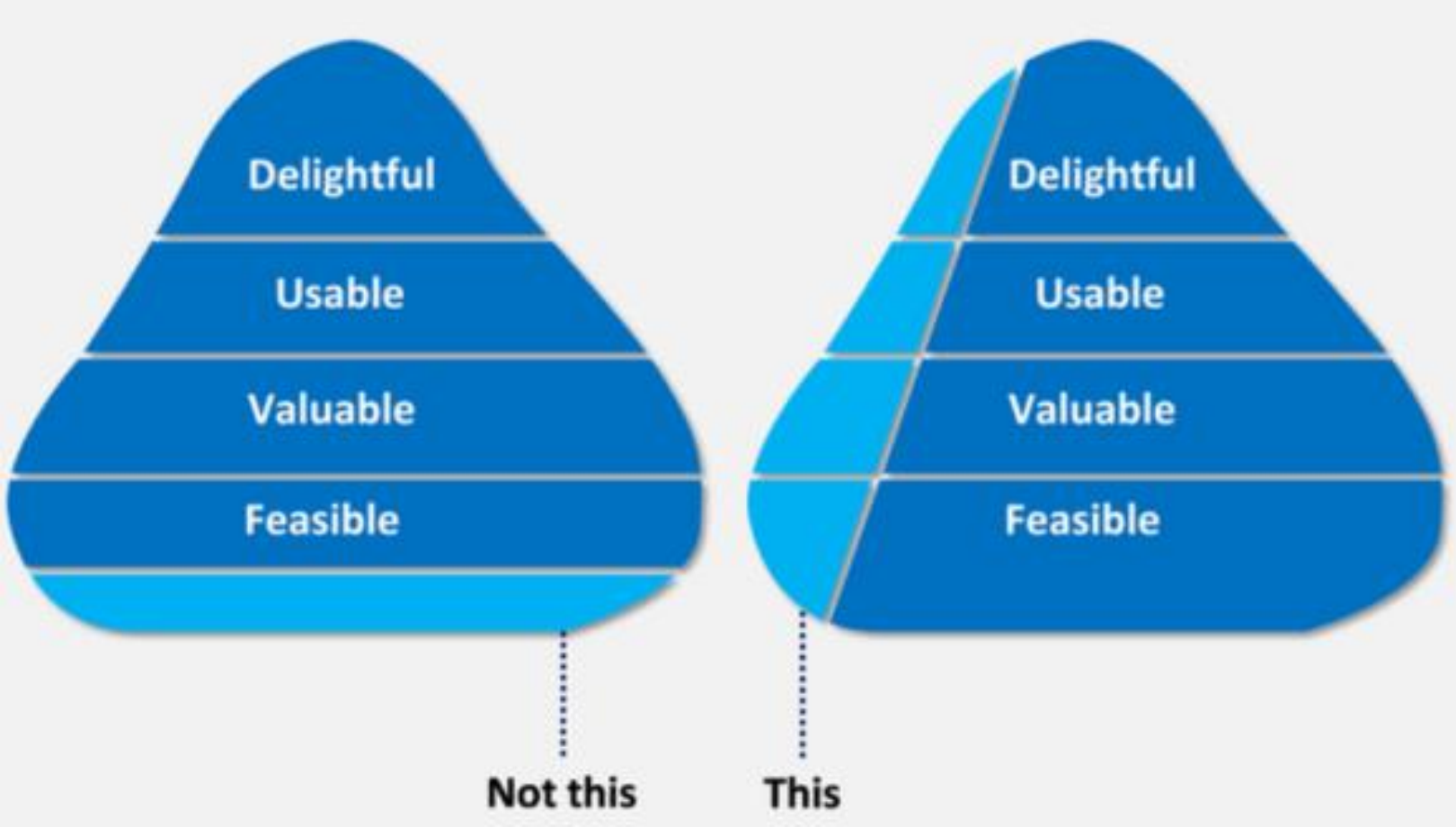
- An MVP is a minimal form of your product that can be tested on the market.
- The MVP allows your team to validate (or invalidate) product assumptions and learn how your target users react and experience your product's core functionality.
- The MVP will provide insight into properly allocating your budget to satisfy your overall business objectives.
- Building an MVP is an iterative process designed to identify user pain points and determine the appropriate product functionality to address those needs over time.
- The MVP development follows a build-measur-elearn process.

Why Build an MVP?



MVP as a Product-Market-Fit Tool

- What MVP is NOT



What MVP is NOT

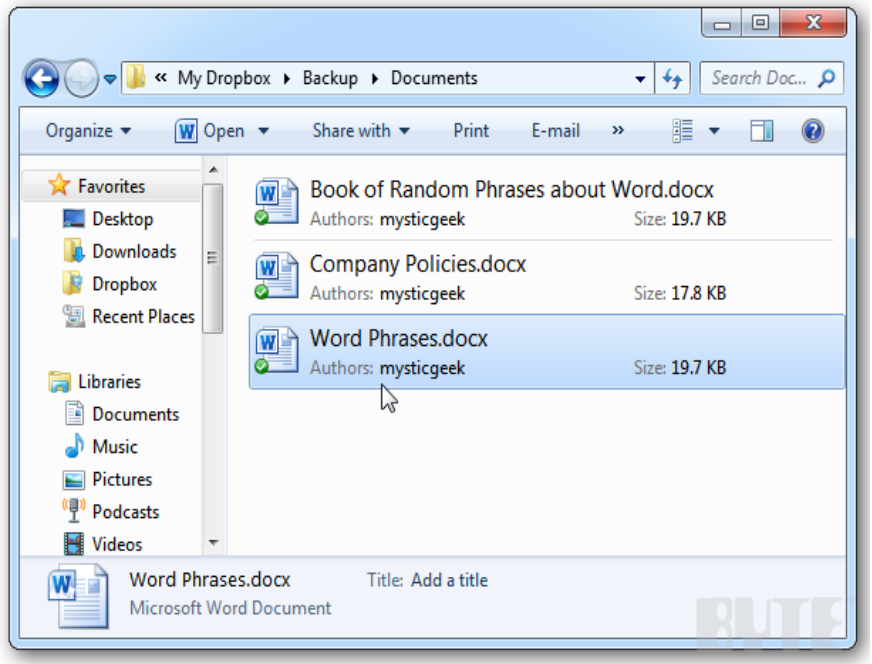
- **MVP Is Not**
  - Smallest Product
  - Slow to Market
  - A Perfect/Full feature Product
  - Ready for Mass Marketing
- **MVP Is:**
  - Highest Value
  - Delivered Quickly
  - Beginning the Process/Test the Hypothesis
  - Interest Early Adopters

The 4 Steps of the MVP Process

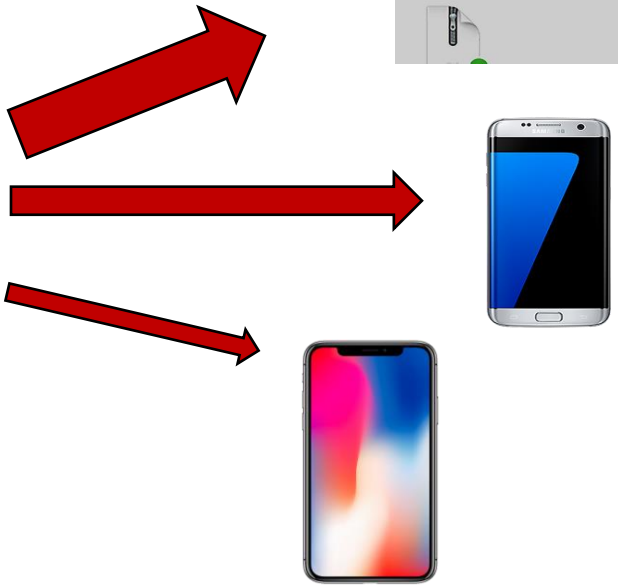
- Step 1: Identify and understand your business and market needs
- Step 2: Map out user journey(s)
- Step 3: Create a pain and gain map
- Step 4: Decide what features to build
- Step 5: after your MVP

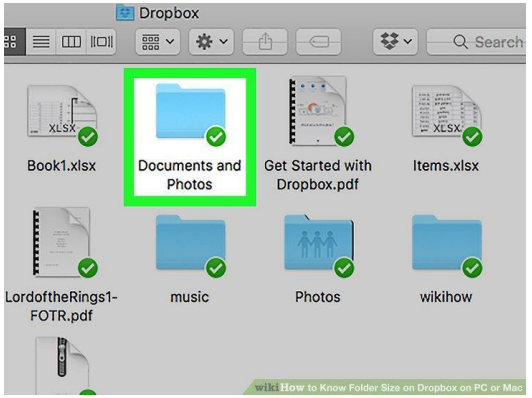
Example of MVP: Dropbox

- Dropbox is an easy-to-use file sharing (or *synchronization*) tool, which uses a *push-based* caching (or *full replication*) technique



Push immediately to Dropbox service & all sharing devices





Example of MVP: Dropbox

- Dropbox requires integration with a variety of computer platforms and OSs:
  - Windows, Macintosh, iPhone, Android, and so on.
- It also necessitates deep distributed systems expertise (caching, replication, consistency, reliability, availability, etc.)
- To avoid the risk of waking up after years of development with a product that nobody wanted, Drew Houston (founder & CEO of Dropbox) did something unexpectedly easy:
  - He made **a video**!

Example of MVP: Dropbox

- The video was a 3-minute demonstration of the technology as it is meant to work.
  - It was narrated by Drew himself (*it was really banal!*)
  - It targeted ***early adopters***, who do not need a perfect solution to get intrigued.
- Drew recounted:
  - "It drove hundreds of thousands of people to the website. Our beta waiting list went from 5000 people to 75000 people literally overnight. It totally blew us away."
- Today, Dropbox is worth more than $10 billion.

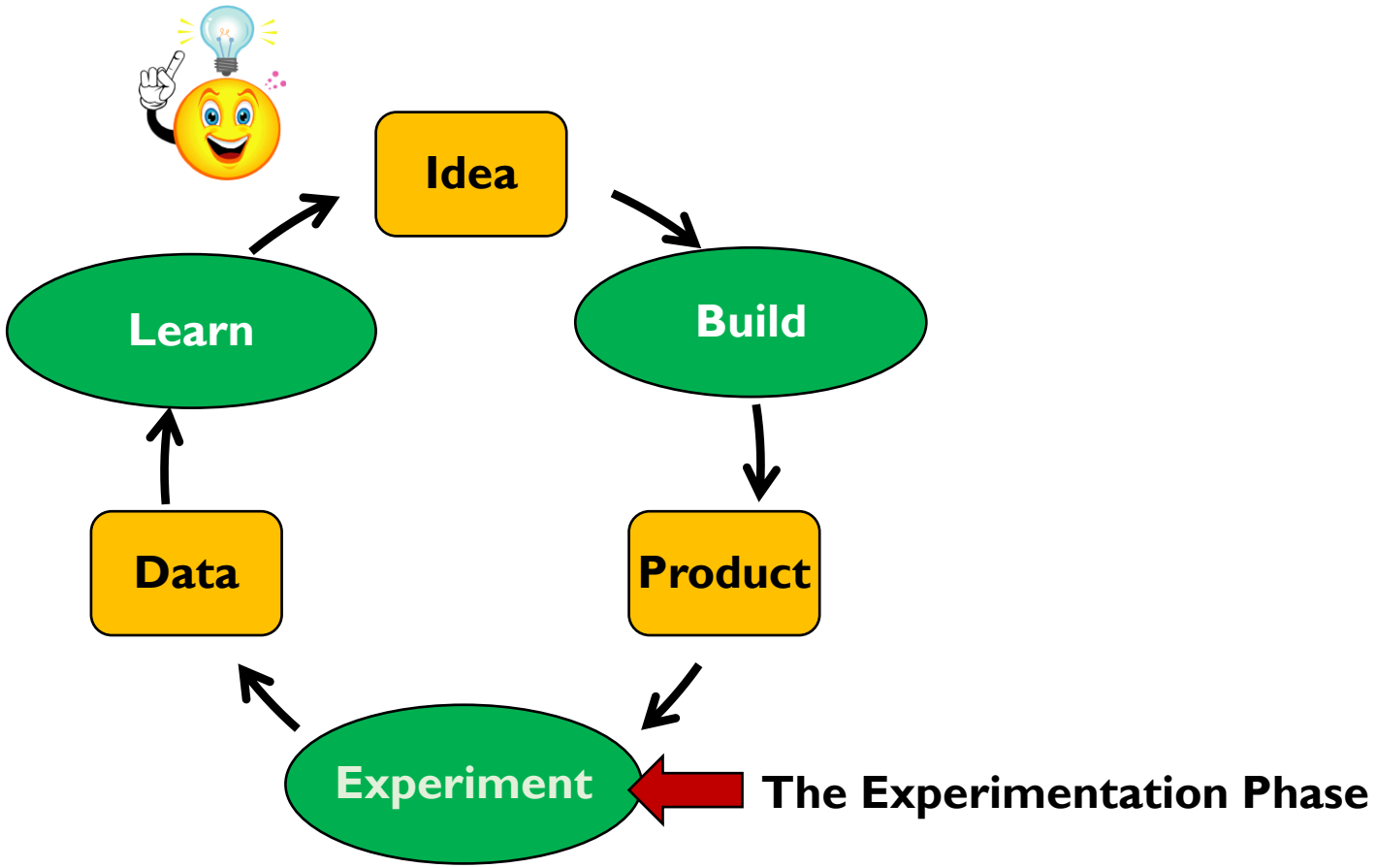
The Build Phase: MVP

- Deciding how complex an MVP cannot be done formulaically.
  - It requires judgment!
  - When in doubt, simplify.
  - Avoid overbuilding and overpromising
    - Any additional work beyond what is needed to get you started in the loop might be a waste.
- MVP does not only speak to product design and technical questions, but also serves in **testing** *fundamental business hypotheses.*
  - It provides a needed dose of reality.
  - It often results in **seemingly bad (*but actually good!*)** news initially.

Challenges to Your MVP

- Slowing down your MVP
  - Perfectionism/Crisis of Confidence
  - Legal Risks
- Concern for Stolen Ideas.
- Processing correctly BAD NEWS from your customer.

Build-Experiment-Learn Feedback Loop



Leap-of-Faith Assumptions

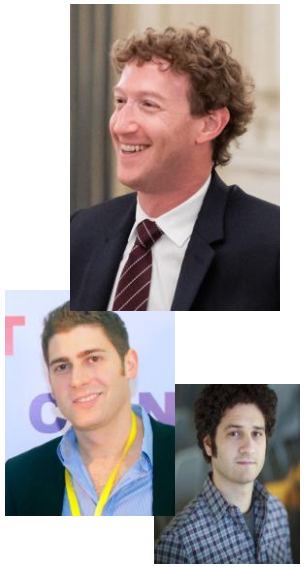
- The riskiest elements of a startup's plan (*i*.e., the parts on which everything depends) are called *leap-of-faith assumptions* جهش ایمان.
- A **leap of faith assumption** is a hypothesis made by an **entrepreneur** or business leader that has yet to be proven through empirical evidence or data.
- E.g., What was the main leap-of-faith assumption of Dropbox?
  - File synchronization is a problem.
- **Note**: Most people do not know about a certain solution (or even a problem), but once they experience the solution, they cannot imagine how they ever lived without it!

Leap-of-Faith Assumptions

- The two most important assumptions of any startup are the *value hypothesis* and the *growth hypothesis.*
- The value hypothesis:
  - It tests whether the product is really delivering value to customers *after* they start using it
  - A testing metric: ***retention rate***
- The growth hypothesis:
  - It tests how new customers will discover the product
  - A testing metric: ***referral rate***

Example: Facebook

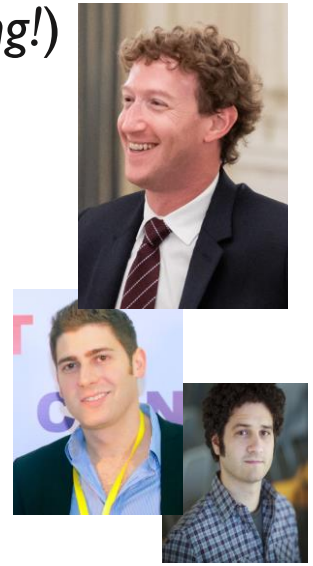
- In 2004, Facebook had 150,000 registered users with very little revenue.
- Yet, that summer, they raised their first $500,000 in venture capital.
- Less than a year later, they raised an additional $12.7 million.
- How was Facebook able to raise so much money when its actual usage was small?



Example: Facebook

- To answer this question, it suffices to look at Facebook's value and growth hypotheses:
  - *Validated* value hypothesis:
    - More than half of the users came back to the site **every single day**.
  - *Validated* growth hypothesis:
    - Facebook launched on Feb 4, 2004, and by the end of that month, almost ¾ of Harvard's undergraduates were using it (*without spending a dollar on marketing or advertising!*)

facebook



Experimenting: Aardvark

- Google excels at answering *factual questions*
  - What is the tallest mountain in the world?
  - Who was the twenty-third president of the United States?
- However, Google struggles with answering *subjective questions*.
  - What is a good place to go out with a friend after a football game in my city?
- Subjective questions are relatively easy for a *person* to answer
  - Imagine being at a cocktail party surrounded by friends; how likely would it be to get a high-quality answer for a subjective question?
    - Very high!

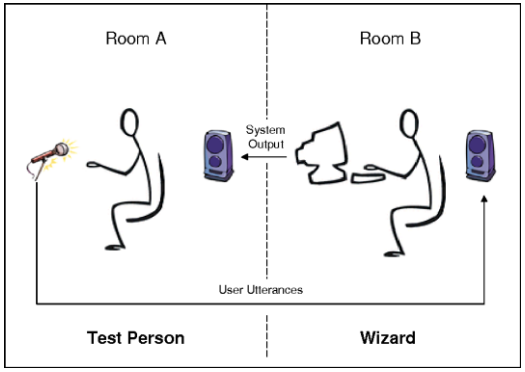
Experimenting: Aardvark

- To "technically" solve this problem, Max Ventilla and Damon Horowitz created a product called Aardvark
- Max and Damon built a very basic prototype with an instant messaging (IM) front-end and a *human-driven* back-end (NOT an AI-based engine)
  - A customer can send Aardvark questions via IM
  - Aardvark will tap into the customer's social network by seeking out the customer's friends and friends-of-friends
    - A question about restaurants in San Francisco should not be routed to someone in Seattle.
  - Once Aardvark gets a suitable answer, it reports back to the customer.

Aardvark

Experimenting: Aardvark

- The technique used by Aardvark is called ***Wizard of Oz Testing*** آزمایش جادوگر اوز.
  - *i.e.*, Customers believe they are interacting with the actual product, but behind the scenes, human beings are doing the actual work.
- This basic technique simply allowed Max and Damon to test their value and growth hypotheses.
  - If the tough technical problems behind this artificial-intelligence-centric product can be solved, will people use and keep using it?
  - Will people tell their friends about it?
- Aardvark was acquired for a reported $50 million by Google.



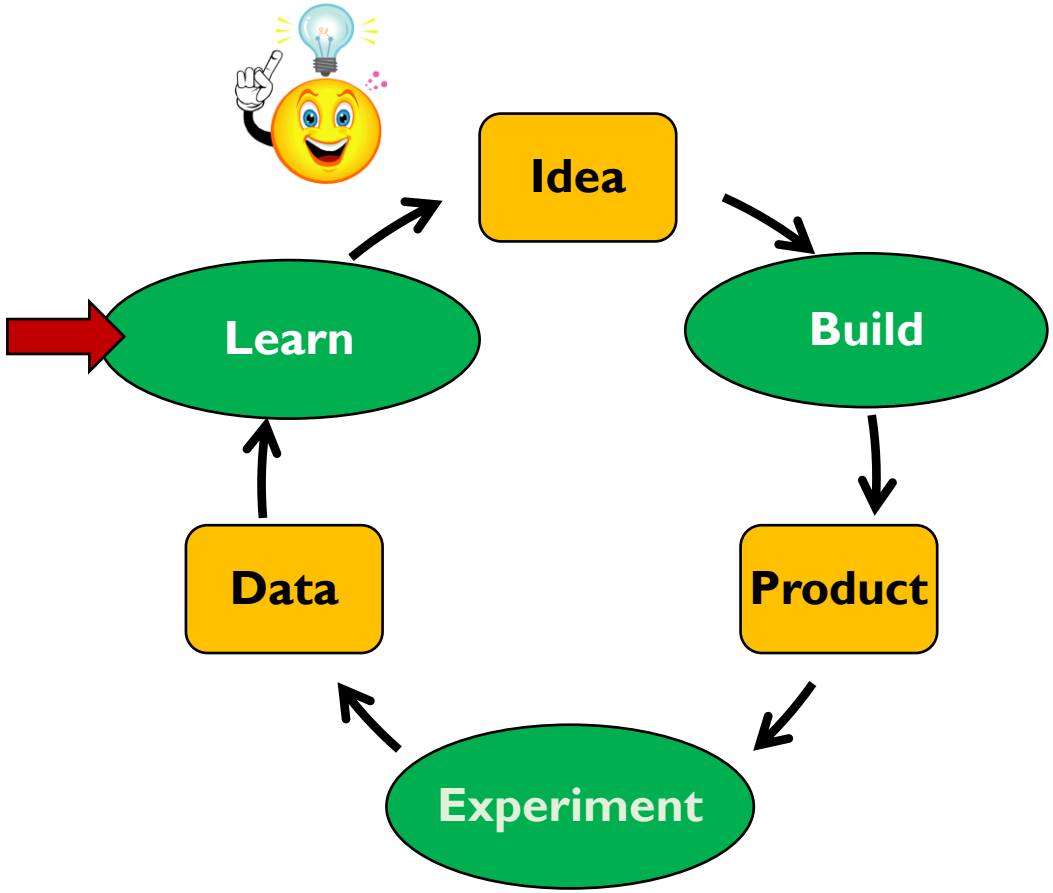
Aardvark

A/B Testing

- Another famous experimentation technique is called ***A/B*** (or ***split***) ***testing***
  - Different versions of a product (or feature) are offered to **two different groups** of customers at **the same time**.
  - Changes in behavior are observed between the two groups, and inferences are made about the impact of the different versions.
  - If an extra feature does not change customer behavior, it gets questioned.
- A/B testing allows you to refine your understanding of what customers want and do not want.

Build-Experiment-Learn Feedback Loop

The Learning Phase



The Learning Phase

- **Question:** What do you want to learn?
  - You want to learn what customers really want, and
  - NOT what they say they want or what you think they would want.
- Building an MVP and experimenting with it allows you to collect real data, which can reveal the current status (or *baseline*) of your company.
- Without a clear-eyed picture of your company's baseline, you cannot begin to track your progress and tune/alter your startup's engine.

The Learning Phase

- The baseline could be *zero*, but it will allow you to create the motivation, context, and space for more qualitative and/or quantitative research.
- New ideas will be **generated**, which can be incorporated and tested again.
- The process repeats until reaching a decision point: ***pivot*** or ***persevere***
  - For example, pivot can involve changing the:
    - **Product** (e.g., **zoom-in** or **zoom-out pivots**)
    - **Customer segment**
    - **Business model**
    - **Engine of growth** (e.g., paid, sticky, or viral)

Example: Votizen

- In 2009, David Binetti started Votizen, a *specialized* social network for verified voters to learn about political issues and take collective actions.
- David built an MVP that cost over $1200 in ~3 months and launched it with an attempt to test 4 major *leap-of-faith assumptions*
  1. Customers would be interested in Votizen and sign up
     - Defined metric: ***registration rate***

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  3. Verified customers would engage over time
     - Defined metric: ***retention rate***
  4. Engaged customers would invite friends to join them in civic causes
     - Defined metric: ***referral rate***

Example: Votizen

- Three months after launching, the results were very low.

Metric	Initial MVP
Registration Rate	5%
Activation Rate	17%
Retention Rate	Too Low (< 1%)
Referral Rate	Too Low (< 1%)

- David spent another $5000 optimizing and split testing the usability aspects of the platform.

Example: Votizen

- Two months after these optimizations, the results improved.

Metric	Initial MVP	After Optimization
Registration Rate	5%	17%
Activation Rate	17%	90%
Retention Rate	Too Low	5%
Referral Rate	Too Low	4%

- David knew he had to do more; hence, he talked to more customers, held focused group discussions, and did countless A/B experiments.

Example: Votizen

- Three months later, the results nudged up only slightly!

Metric	After 1st Optimization	After 2nd Optimization
Registration Rate	17%	17%
Activation Rate	90%	90%
Retention Rate	5%	8%
Referral Rate	4%	6%

- The platform was not living up to the growth model David has hoped for!
  - Time to ***pivot*** or ***persevere***

Example: Votizen

- David's direct contact with customers provided the following feedback:
  1. "I always wanted to get more involved; this makes it so much easier."
  2. "The fact that you prove I'm a voter matters."
  3. "There's no one here. What's the point of coming back?"
- David decided to undertake a *zoom-in pivot*, refocusing the platform on what was previously considered a feature of a larger whole:
  - Customers can contact elected representatives digitally.
  - Votizen translates that digital contact into old-fashioned printed letters and petitions, and mails them to representatives in Congress.

Example: Votizen

- Four months later, and another $30,000, the results improved.

Metric	Before Pivot	After Pivot
Registration Rate	17%	42%
Activation Rate	90%	83%
Retention Rate	8%	21%
Referral Rate	6%	54%

- David was stuck in an age-old entrepreneurial trap- *i.e.*, metrics and product were improving, but not fast enough!

Example: Votizen

- David decided to undertake a *customer segment pivot*, keeping the functionality of his platform the same but changing the audience focus.
  - He contacted large companies and professional fundraisers who have professional or business interests in political campaigning.
  - The companies seemed extremely eager, and David quickly signed Letters-of-Intent (LoI) to build the functionality they needed.
- Based on the LoI, David increased his headcount and built all the required functionality in 3 months.
- David went back to the companies, but none of them closed a real sale!

Example: Votizen

- David decided to fire some staff and undertake a *business-model pivot*, allowing anyone to become a paid customer with just a credit card and rally any group of people.
- One month later, metrics started increasing:

Metric	Before 2nd Pivot	After 2nd Pivot
Registration Rate	42%	51%
Activation Rate	83%	92%
Retention Rate	21%	28%
Referral Rate	54%	64%

Example: Votizen

- Votizen's system can now process voter identities in real time for > 47 states and has delivered 10s of thousands of messages to Congress.
- The Startup Visa campaign used Votizen's tools to introduce the Startup Visa Act (S.565)
  - This was the first legislation introduced into the USA Senate solely as a result of *social lobbying*
- On *January 10, 2013*, Votizen was acquired by Causes, an online civic engagement platform founded by Sean Parker.

From Lean to Agile

Introduction to Agile Methodology

Agile Manifesto

- Individuals over Process
- Working Product over documentation
- Customer collaboration over contracts
- Response to change over following a plan

Agile Methodologies

- Agile Methodologies

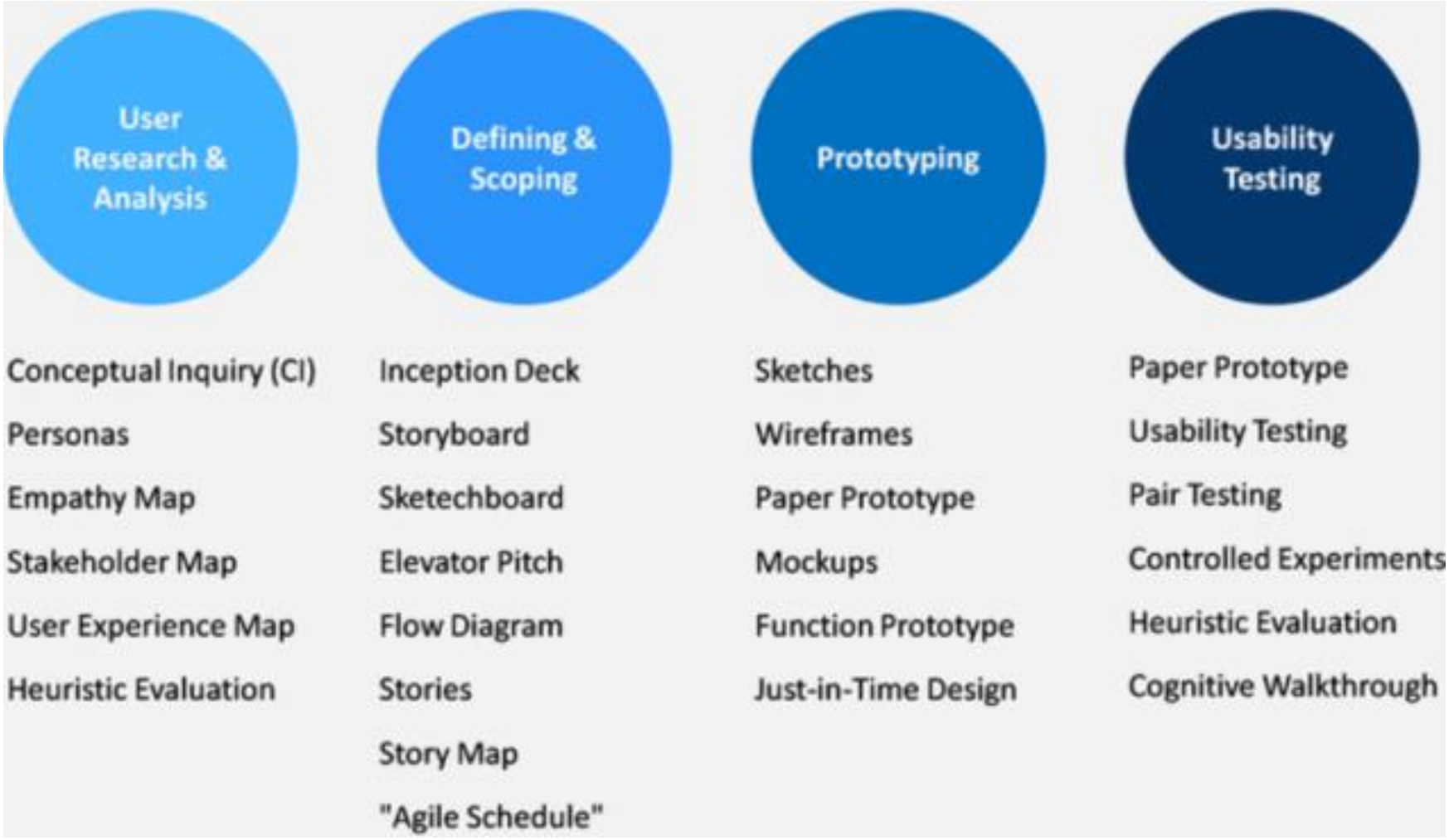
Scrum Methodology

- Most Commonly Used Methodology
- Uses a routine of
  - Stories
  - Product Backlog
  - Sprints
- First Sprints implement MVP to
  - Achieve value in short delivery time
  - Assess customer willingness for development
- Additional Sprints layer development

Moving to Agile

- Requirements for Converting an Organization to Agile
  - Influential Corporate Sponsor
  - Clearly defined and quickly delivered MVP showing Value
  - Dedicated, Co-Located Team to deliver MVP and continued value
  - Daily Standups to ensure communication
  - "Scrum Master" role to remove roadblocks and allow developers to develop

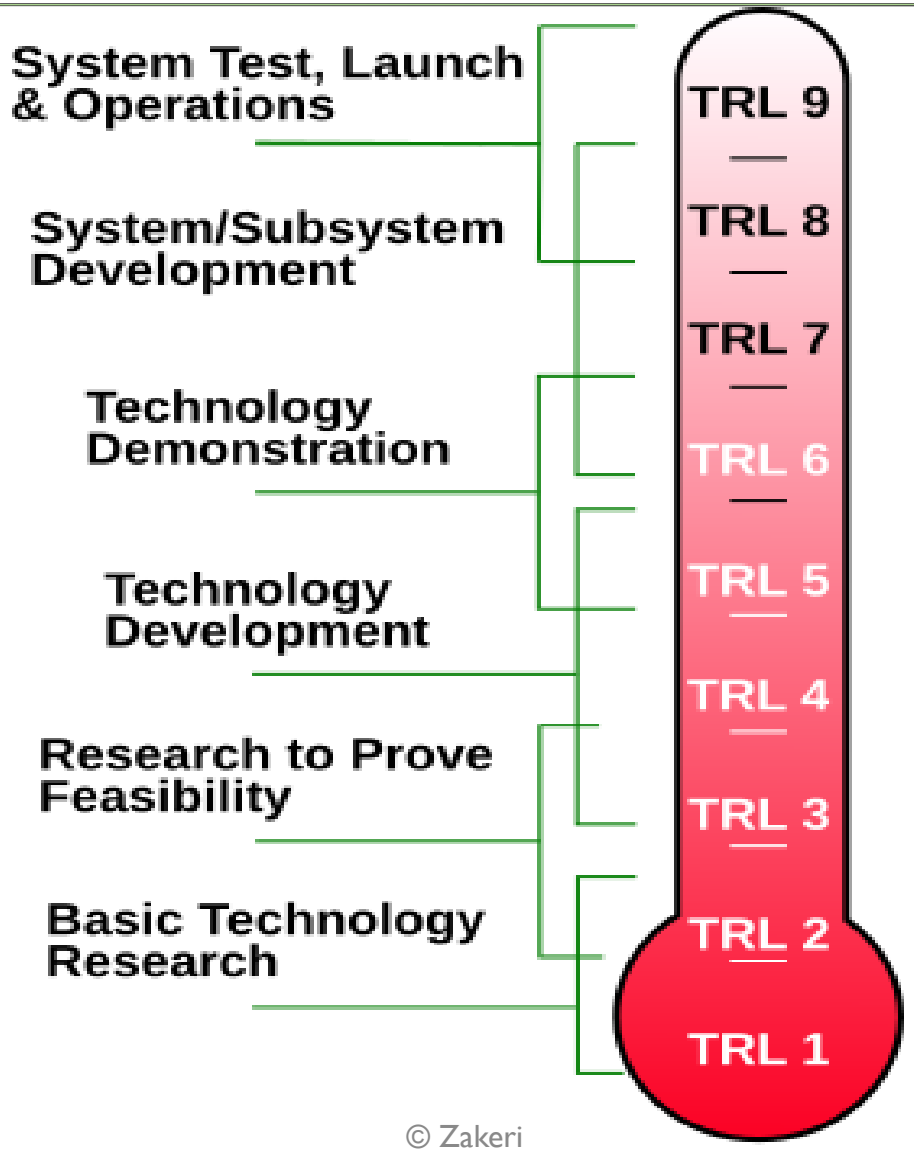
MVP Process Summary



Technology Readiness Level

- **Technology readiness levels** (**TRLs**) are a method for estimating the maturity of technologies during the acquisition phase of a program.
- TRLs enable consistent and uniform discussions of technical maturity across different types of technology.
- TRLs are based on a scale from 1 to 9, with 9 being the most mature technology.
- TRL was developed at NASA during the 1970s.
- The primary purpose of using technology readiness levels is to help management in **making decisions** concerning the development and transitioning of technology.

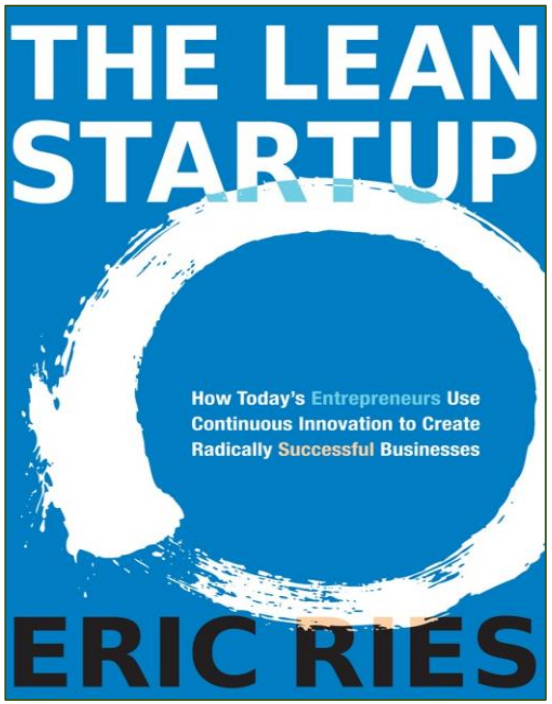
Technology Readiness Level

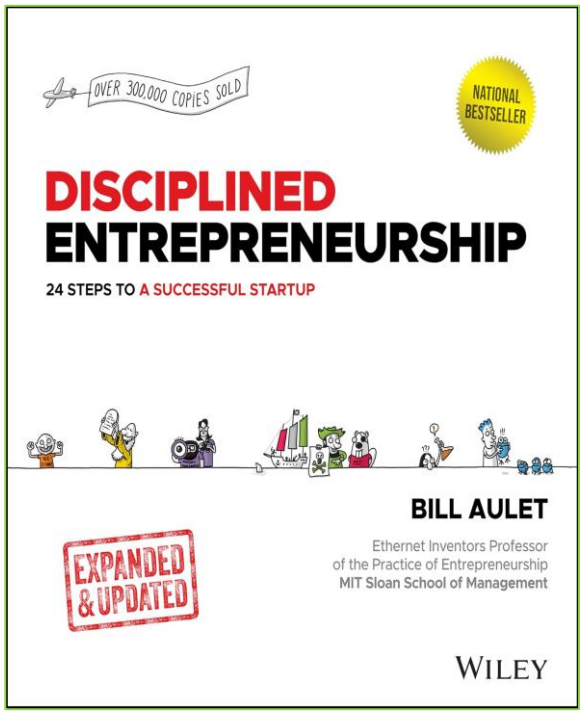


Technology Readiness Level

Reading Exercise

- Read **Chapters 1 - 8** of the "The Lean Startup" book
  - 2011 by Eric Ries.
- Read **Step 22** of the "Disciplined Entrepreneurship" book
  - 2024 by Bill Aulet





Next Class

- The **Business Plan** and **Pitch Deck** presentation.

	Elevator Pitch	Pitch Deck	Business Plan
Format	Conversation	Presentation	Document
Purpose	Start the conversation and pique interest	Get funding or convince people into a partnership	Show the investor how the business would run
Length	Fewer than 10 sentences	10-15 slides	10-20 pages
Duration	Under a minute	10-15 minutes	Over an hour