ENTREPRENEURSHIP
for Computer Science and Engineering

Lecture 3:

Market Segmentation,

Research, and Beachhead Market

Morteza Zakeri
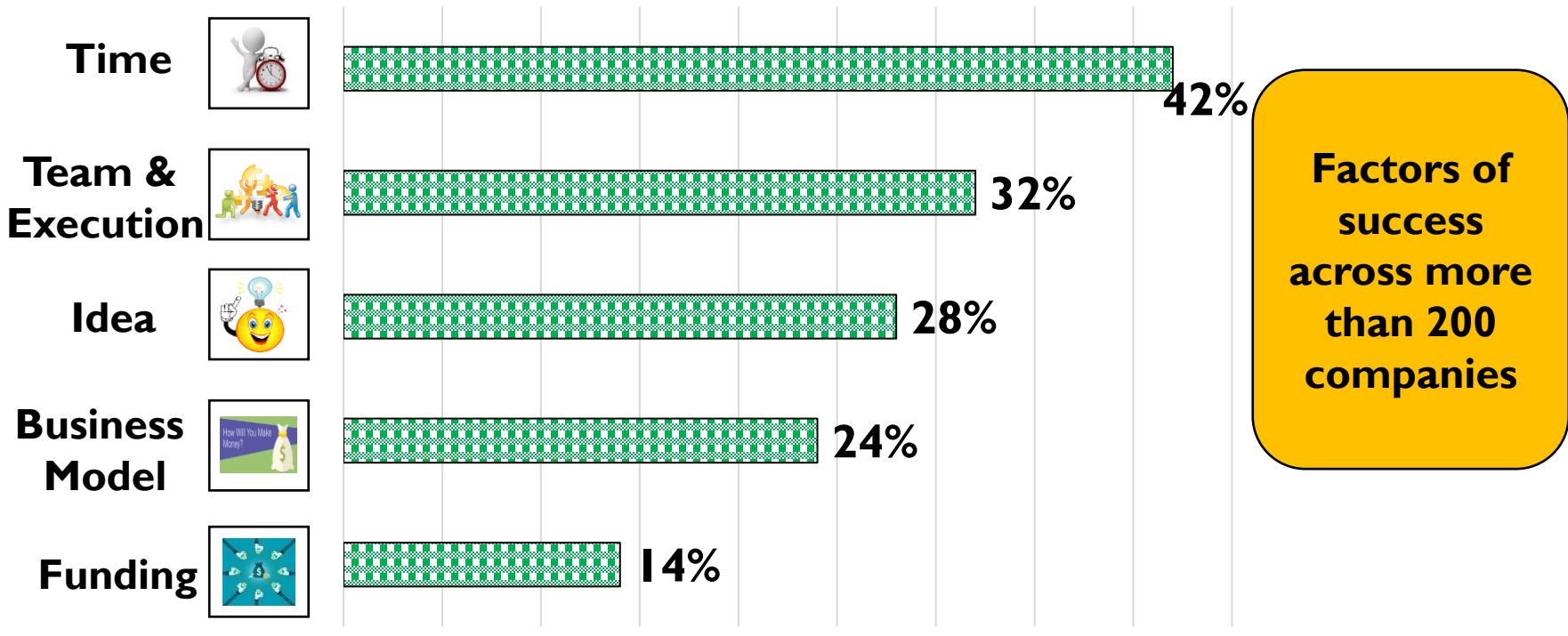
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Outline

- Last Session:
  - Should I be a *founder*?
    - If so, solo or team?
  - Founding team dilemmas: The three *R*'s model

- This lecture
  - Market segmentation
    - **Brainstorm** a wide array of potential customers and markets for your business.
  - Do effective market research
    - Perform efficient and effective **original research** to better understand your customer
  - Select a Beachhead Market
    - Narrow down your list to your top 4–10 markets.

- Announcements:
  - Course website: *https://www.m-zakeri.ir/Entrep/*
  - Book template:
    - *https://github.com/m-zakeri/Entrep/tree/main/docs/assignments/book*
  - Our lab: *https://www.m-zakeri.ir/lab*

Recap: What makes startups succeed?

- Factors of success

Time		42%
Team & Execution		32%
Idea		28%
Business Model		24%
Funding		14%

Factors of success across more than 200 companies

[Based on a study by IdeaLab]

https://www.idealab.com/

Market Segmentation

- For success in entrepreneurship, there are some *glasses* that are better than others.

Seeing the world through the eyes of the customer

vs.

Seeing the world through the perspective of the company

- **Market segmentation is the process of dividing a "broad" consumer or business market into sub-groups (or segments) in an aim to identify *high yield segments*.**
- **It may also help you come up with an idea!**

4

The first commandment of entrepreneurship
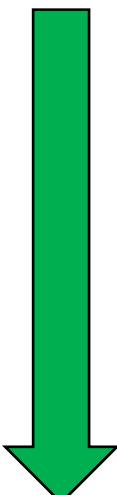
The Segmentation Process

- **One Way of Doing it:**
- Step 0: **Identify your passion**
  - E.g., Technology (*i.e.*, expertise) and Education (*i.e.*, domain/market)

- Step 1: **Start with a "generic" idea**
  - E.g., I want to improve education through technology

- Step 2: **Identify potential "industries" of your selected domain**
  - E.g., Universities, schools, centers, etc.,

- Step 3: **Identify all "end-users" in your industries**
  - End-users are potential people who will use your potential product
    - E.g., Teachers, Students, Administrators, Parents, etc.,

The Segmentation Process
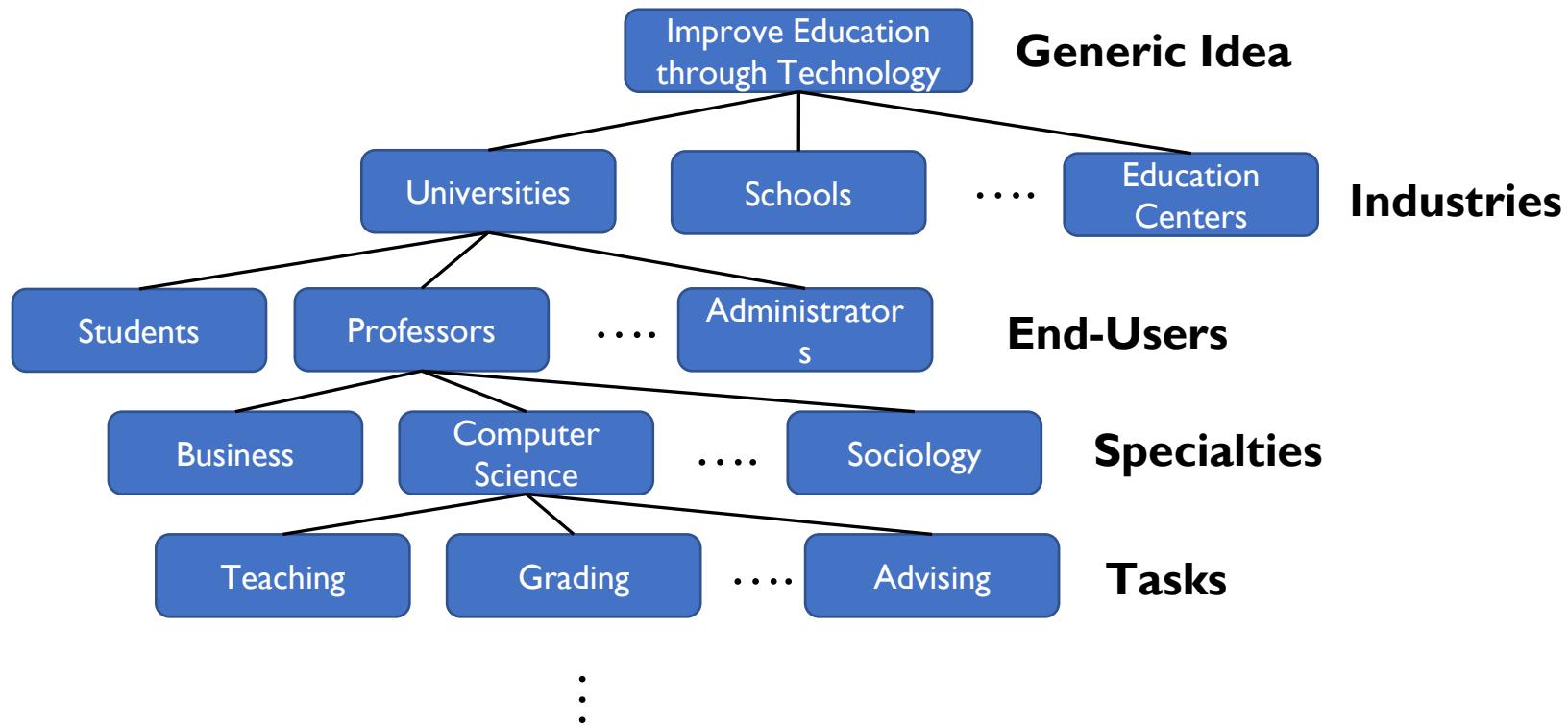
- Step 3 (Cont'd): Identify all "end-users" in your industries
  - End-users are not necessarily "economic buyers"
    - E.g., Schools do not use course or advising systems, but teachers do

- Step 4: Identify different "tasks" your end-users perform
  - E.g., Teachers teach, grade, advise, etc.,

- Step 5: Identify different "specialties" of your end-users

- ...

The Segmentation Process

- You can follow different ***segmentation methods*** **(e.g., characteristics of customers, benefits sought, interaction channels, etc.),** pursue any **logical order** and go as **deep** as you like!
  - **Brainstorm**
  - **Narrow**
  - **Build a Market Segmentation Matrix**

Example

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Market Segmentation

- Technique:
    - Start somewhere (*passion can lead*)
        - One of the key things in founding a startup is to start; it is right there in the name!
    - Come up with a generic idea and segment its domain (or market) constituents, following a *logical order*
    - Open the aperture as wide as possible
        - This helps in expanding the boundaries of possibilities to where some of the most interesting opportunities might exist.

Market Segmentation

- Technique:
  - Identify the "sub-tree" on the tree that intrigues you the most and try to tap into your expertise to solve a seemingly (*i.e.*, not yet confirmed) "pain" there
    - No idea is too crazy at this point (and even later)!
    - If you insist and prove it, people will follow

Market Segmentation

- Technique:
  - Identify the "sub-tree" on the tree that intrigues you the most and try to tap into your expertise to solve a seemingly (*i.e.*, not yet confirmed) "pain" there
    - No idea is too crazy at this point (and even later)! If you insist and prove it, people will follow
    - In fact, in the startup world, most good ideas are hidden down deep in the tree and/or "seem" bad initially. If they were "obviously" visible and good, someone would have already been doing them!
  - **Do not combine** segments that seem similar without knowing more about your potential customers
  - Build a "*market segmentation matrix*"

Market Segmentation Matrix: Row Definitions

	Row	Definition
1	**Market Segment Name**	This is the market opportunity that you will identify for your product
2	**End User**	This is the person who will use your product and not the economic buyer. Even if you will sell to a company, list here the people who will use your product in that company
3	**Task**	What exactly is it that the end users do that you will significantly affect or allow them to do that they could not do before?
4	**Benefit**	What is the benefit that you believe the end users will get?
5	**Urgency of Need**	What is the level of urgency to solve the problem or capture the new opportunity for the end user?
6	**Example End Users**	Who are examples of end users that you can, have, or will talk to, so as to validate your perceptions of this market segment
7	**Lead Customers**	Who are the influential customers (i.e., lighthouse customers) where, if they buy your product, others will take note and likely follow?

Market Segmentation Matrix: Row Definitions

	Row	Definition
8	**Willingness to Change**	How **conservative** is this market segment? How open are they to change? Is there something to force change (e.g., impending crisis)?
9	**Frequency of Buying**	How often do they buy new products? What does their buying cycle look like at high level?
10	**Concentration of Buyers**	How many different buyers are there in this market segment? Is it a monopoly? Oligopoly (a small number of buyers)? Or many competitive buyers?
11	**Other Relative Market Considerations**	This allows for customization of your segment for your relevant considerations such as "high employee turnover", "very low margins/commodity", "high-growth industry", "high virality effect" (i.e., word of mouth), etc.
12	**Size of Market (# of End Users)**	Estimation of the number of end users to a relevant range (10s, 100s, 1Ks, 10Ks, 100Ks, 1Ms, etc.).
13	**Est. Value of End User ($1, $10, $100, $1K, etc.)**	A first-pass estimate of the value of each end user, again to a relevant order of magnitude so you can make some relative decisions now (you will do a deep dive into this and other numbers later).

Market Segmentation Matrix: Row Definitions

	Row	Definition
14	**Competition/ Alternatives**	What will be your competition from the end users' perspective? Include the "do nothing" option as well as who else would be competitors if the end users analyzed their options
15	**Other Components Needed for a Full Solution**	Since most customers will buy a full solution and not an individual component that they have to assemble into a full solution, what other elements are needed to construct a full solution to achieve the benefits above? These are the complementary assets that you do not currently have but would need to build or acquire to give the end user a full solution
16	**Important Partners**	Who are the partners or distributors you will have to work with to fit into the end user's workflow (e.g., data must come out of vendor A's system and then be picked up at the end by vendor B's system) or business processes (e.g., the end user gets all his or her product via distribution channel C)?
17	**Other Relevant Personal Considerations**	In many market segmentation analyses, there are additional important factors that should be considered. These could be things like where the market segment is geographically centered, whether it matches the values of the founding team, existing knowledge and contacts in market, etc.

Market Segmentation Matrix Template

- Fill Out a Market Segmentation Matrix with Primary Market Research
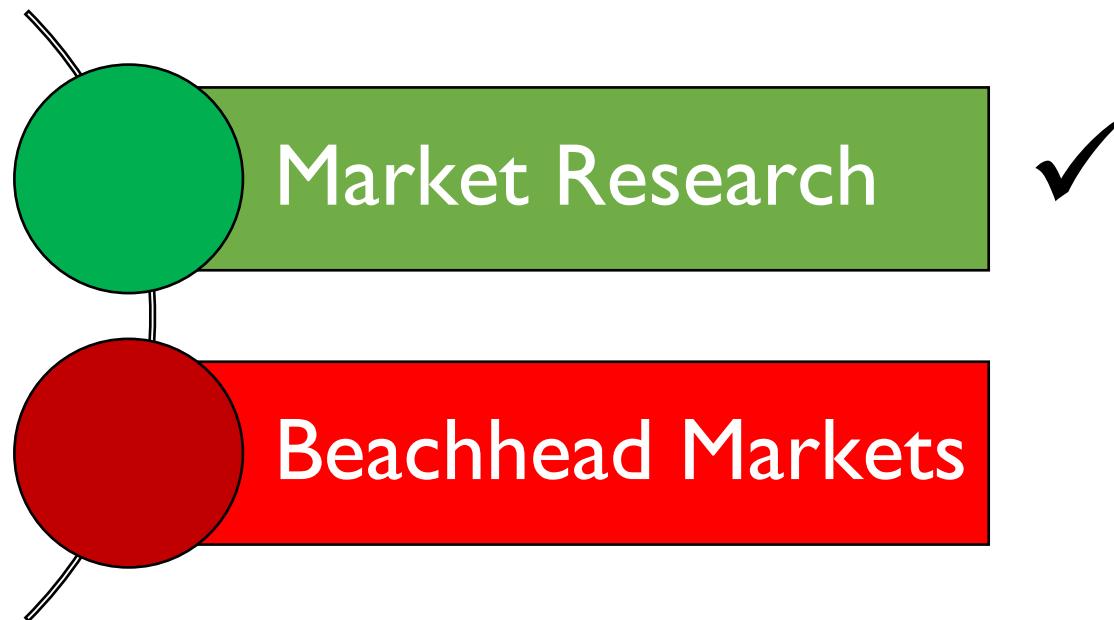
Market Segment Name				
End User				
Task				
Benefit				
Urgency of Need				
. . .				
Other Relevant Personal Considerations				

Market Segmentation Matrix Template

Market Segment Name				
End User				
Task				
Benefit				
Urgency of Need				
. . .	Populate the cells using *effective market research*			
Other Relevant Personal Considerations				

Outline

Market Research ✔

Beachhead Markets

Market Research

Primary, Secondary, Qualitative, and Quantitative Market Research

Effective Market Research

- Conducting "*effective*" market research is a fundamental skill that underlies the entire process of starting a company

- **Some Characteristics:**

    - Multi-dimensional: It spans various (potential) customer dimensions, including rational, emotional, economical, social, and cultural, among others.

    - Continuous:

        - It informs *every* stage in starting and running a company

        - Customers and markets change over time, so what is true one year may be invalid the next

Effective Market Research

- **Some Characteristics:**
  - Non-tradable: It is dangerous to outsource market research, especially if it involves direct interactions with (potential) customers

  - Hypothesis Validator: It plays a critical role in validating or invalidating hypotheses quickly, especially "before" starting product development (as a result, you can spend more time building products that customers want)

  - Hypothesis Generator: It serves in generating new types of hypotheses that can be validated through experiment, especially when done qualitatively

Types of Market Research

Type	Definition
Primary Market Research	Involves "direct" interaction with (potential) customers to understand their situations and gain knowledge specific to your (potential) new venture
Secondary Market Research	Involves "indirect" investigations, especially via collecting information from reputable sources other than potential customers (e.g., standard industry and government reports)
Qualitative Market Research	An exploratory process that helps understanding qualitatively a subject matter, which might lead to new testable hypotheses (can be used in primary and secondary types of researches)
Quantitative Market Research	Focuses on gathering specific data, which prove or disprove a certain hypothesis

Obstacles to Effective Primary Market Research

- PMR (primary market research) can and should start even before you settle on an idea!
  - It will definitely be essential to fill out your Market Segmentation Matrix

- Although the concept of **primary market research** is very simple (go out and interact with potential customers), it can prove **very hard** to some people (especially engineers and computer scientists!)

- Some Obstacles:
  - Lack of a structured process: design a clear and thoughtful process before starting (*more on this shortly*).
  - Not properly executing the designed process: planning and execution require different skills.

Obstacles to Effective Primary Market Research

- Some Obstacles:
  - Confirmation bias:
    - This bias involves seeing only the information that confirms your worldview
    - It can easily creep in based on how you design your process, inadvertently prompting customers to provide answers you want to hear
    - It becomes stronger after you build your product, leading to an effect known as the IKEA effect
      - (*the "IKEA Effect": When Labor Leads to Love, by Michael I. Norton, Daniel Mochon, and Dan Ariely*)
    - Be objective and do not "lead the witness"
    - Apply "replication" (as in computer systems)

Obstacles to Effective Primary Market Research

- Some Obstacles:
    - Selection bias:
        - An ill-representative sample leads to incorrect conclusions
        - Select a representative sample and consider weighting responses if needed
    - Social acceptability bias: Interact with people who do not have a social connection with you so as to get a brutally honest feedback

A Process for Primary Market Research

1. Develop a thoughtful plan

- Each potential customer is a very valuable and precious source of information. If you do not develop a thoughtful plan, you might not get the best out of your potential customer

- A plan ensures "consistency" across interviewees, which allows detecting insightful "patterns"

- Develop a light, yet **deep questionnaire** (this should be a teamwork).

- Do not add **friction** by asking sensitive data or too many facts

- If necessary, **adapt** judiciously your questionnaire as you collect data.

A Process for Primary Market Research

2. **Start with secondary research**, at least to learn the basics of your target industry

3. **Start qualitative before quantitative**, especially that qualitative can yield testable hypotheses

4. Ensure that **demographic** (e.g., age, gender, etc.,) and **psychographic** (e.g., personality, opinions, lifestyles, etc.,) characteristics match your (potential) customer group

A Process for Primary Market Research

5. Target "**watering holes**" (*i.e.*, places where your potential or existing customers congregate physically or virtually)
    - E.g., For fitness enthusiasts, it is probably gyms
    - E.g., For women about to get married, it is probably Pinterest
    - E.g., LinkedIn or Facebook groups
    - E.g., Google or Facebook Ads

6. Use small "*n*" in qualitative stage and big "**N**" in quantitative stage (n and N refer to numbers)

A Process for Primary Market Research

7. Trust and verify

- Optimistic approach (as in computer systems, especially in caching and concurrency control).
- Consistency can yield "patterns", which can act as verifications.

8. Act like a journalist

- Be in "inquiry" mode and not a bit in "advocacy" mode
- Listen intently and make the person being interviewed feel like she/he is the most important person in the world
- Use the person's name and reciprocate words
- Observe nonverbal reactions

Tools for Primary Market Research

Tool	Description
Customer Interviews	By and large, the most common tool. It is "essential" for qualitative research and "good" for quantitative research.
Observation	Watch (potential) customers in your target industry.
Immersion	Do the (potential) customer's work and fully experience all its dimensions.
User Tests	Apply A/B testing: • Randomly divide (potential) customers into groups. • Treat groups differently and observe how different treatments affect behaviors and responses.

Market Research Platforms

1. Allied Market Research
   - https://www.alliedmarketresearch.com

2. Grand View Research
   - (https://www.grandviewresearch.com)

3. Transparency Market Research
   - (https://www.transparencymarketresearch.com/)

4. Future Market Insights
   - (https://www.futuremarketinsights.com/)

5. **Intelligent market research** platform
   - (https://ai.reportlinker.com/solutions)

Outline

Market Research

Beachhead Markets ✓
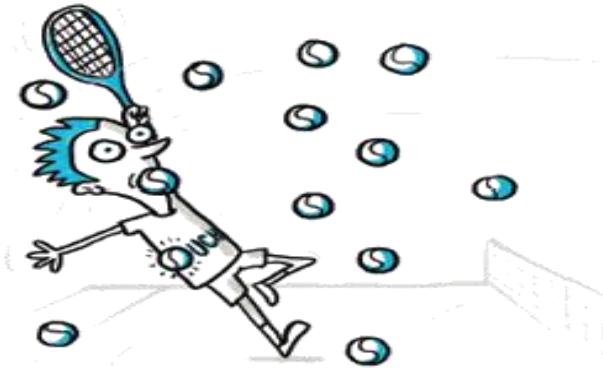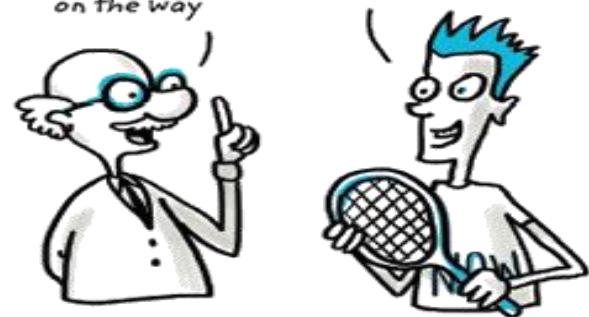
How to Become a Great Tennis Player?

Beachhead Market

- In military operations, if an army wants to invade an enemy territory, the army may employ a *beachhead strategy*

- A beachhead strategy entails planning and focusing all time and resources on wining a small strategic border area
  - This small area is called *beachhead*

- The beachhead market then becomes the stronghold to land troops and supplies for the bigger invasion to the enemy territory

- The 1944 invasion of Nazi-controlled Europe by the Allied forces is one of the most famous examples of a beachhead strategy.
  - Without conquering the beachheads, they would have had no starting point for their invasion.

How to Select a Beachhead Market?

- Select a beachhead market via selecting **just ONE** market opportunity from your market segmentation matrix.

"PERSON WHO CHASES TWO RABBITS CATCHES NEITHER"

— ROMANIAN PROVERB

How to Select a Beachhead Market?
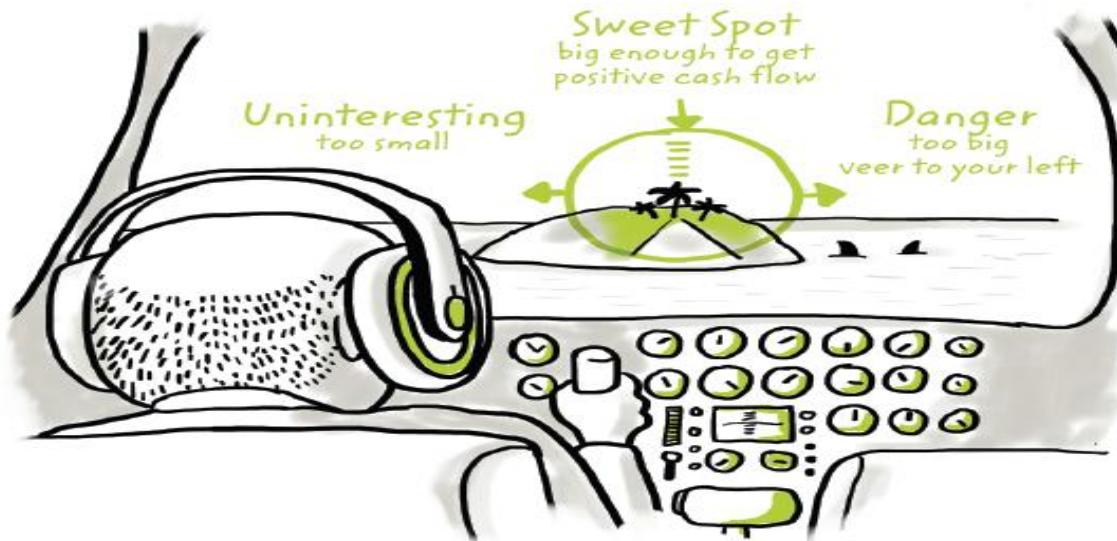
- In many cases, there are multiple paths to success, hence, it is not imperative to choose the absolute best market.

- Alongside, it is better to avoid selecting the largest or very large markets, even if they seem to be the best markets.

- The first market you attack will be a **significant learning experience** (with perhaps a lot of failures) for you, so you are better off learning, *persevering* or *pivoting* in a smaller market.

- But, what are the criteria to select a beachhead market?

How to Select a Beachhead Market?

- Here are some criteria that may prove useful in choosing your beachhead market:
  - Is the target customer well-funded? (*affordability metric*)
  - Is the target customer readily accessible to your sales force? (*accessibility metric*)
  - Does the target customer have a compelling reason to buy? (*motivational level*)
  - Can you today, with the help of partners, deliver a whole product? (*readiness level*)
  - Is there entrenched competition that could block you? (*competition level*)
  - Are there entrenched legalities that can block you? (*legality barrier*)
  - If you win this segment, can you leverage it to enter additional segments (i.e., proceed to the bigger invasion)? (*scalability metric*)
  - Is the market consistent with your passions, values, and goals? (*adherence level*)
  - What is the *Total Addressable Market* (TAM) size of this market? (*TAM size*) → **Revenue-Projections**

What is TAM?

- **TAM** is the amount of annual revenue (in dollars $) your company would earn if you achieved 100% market share in **the chosen market**.

Beachhead TAM calculation is your sanity check that you are headed in the right direction

Calculating TAM

- To calculate TAM, you need to figure out and multiply the following **two factors**:
  1. The estimated number of customers who will use your product or service
  2. The estimated total revenue each customer is worth per year
- The first factor and part of the second factor can be determined using **primary and/or secondary market research**.
- The final value of the second factor can be determined using your ***business model***,
  - A framework by which you extract from your customers some portion of the value your product creates for them (*more on this later*)

Example: A Shoe E-Commerce Platform

- Assume a specialized e-commerce platform for selling shoes online
  - The platform does not own any inventory, but rather partners with existing shoe stores
  - The platform does not own any delivery company (or department), but rather partners with existing delivery companies

- Simple business model:
  - **8%** of any package cost as a *transaction fee* from any shoe store
  - $5 *convenience fee* from any customer for delivering her/his package
  - Total Revenue Per Package = 0.08 × package cost + $5

Example: A Shoe E-Commerce Platform

- Two required factors:
  - The estimated number of transactions over this shoe e-commerce platform (say, 1,000,000)
  - The estimated cost of per package/transaction (say, $35)

- The first factor is equal to the total number of people who buy shoes in the selected market
  - *if they ALL buy shoes via ONLY this e-commerce platform ×* buying frequency
  - This is an upper-bound, which is used in calculating TAM
  - A *conservative percentage* can be assumed for more realistic revenue projections
  - A *sensitivity analysis* can be performed assuming a range of percentages (*more on this shortly*)

Example: A Shoe E-Commerce Platform

- TAM = Estimated # of transactions × Estimated revenue per transaction

$$= 1{,}000{,}000 \times ((0.08 \times 35) + 5))$$

$$= \$7{,}800{,}000$$

> *Note that the **business model** was used in determining the final value of the second factor*

- General Hints:
    - If **TAM < $5 million**, it is possible that your venture has not identified a big enough beachhead market
    - **$5 million < TAM < $100** million is usually a reasonable TAM
    - **Anything over $1 billion certainly raises flags**

- Important Note:
    - Your advisors, partners, and investors know that these projections are only estimations (and most probably inaccurate), but they do still accept them because they give a good sense of your target market.

Example: A Shoe E-Commerce Platform

- The revenue projection process can be fully formalized (*via developing a mathematical model*) and conducted over multiple years

- Assume:
  - Estimated # of transactions = **N**
  - Market Share = **α**
  - Transaction Cost = **C**
  - Transaction Fee = **β**
  - Convenience Fee = **δ**

- Mathematical Model = (**α** × **N**) × (**β** × **C** + **δ**)
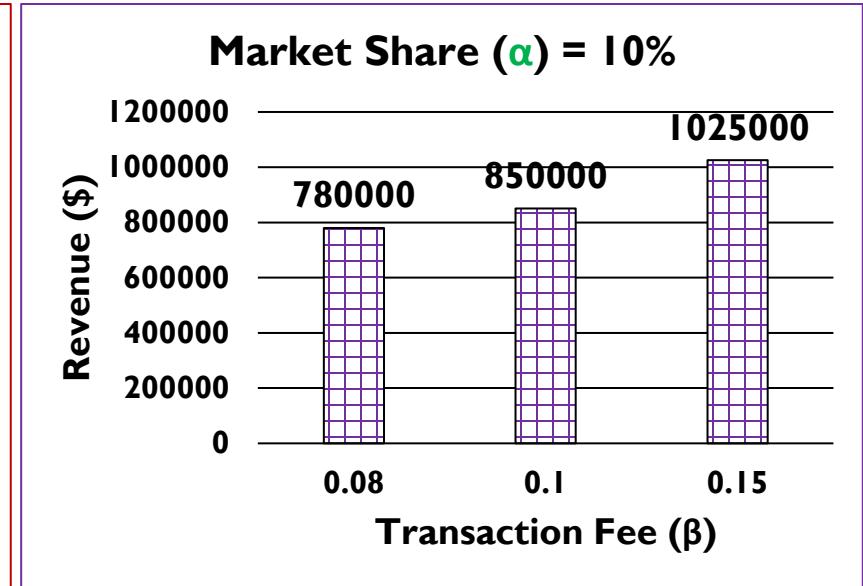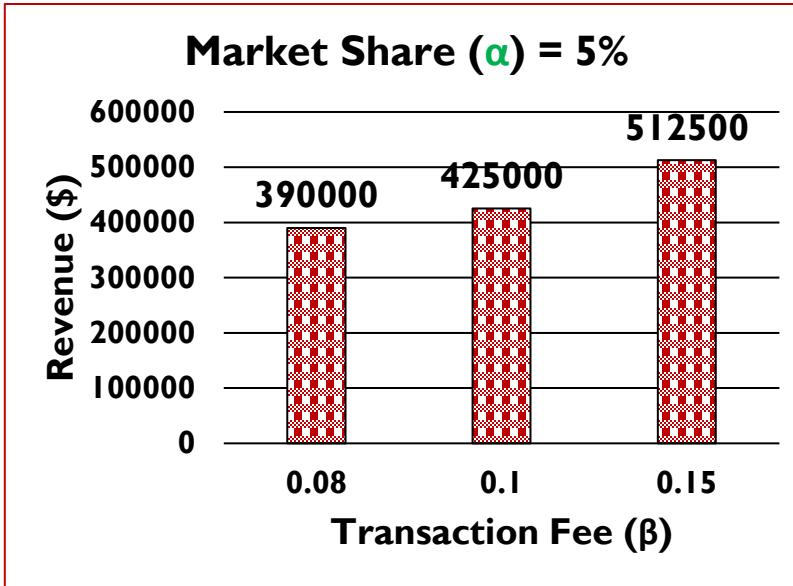
Example: A Shoe E-Commerce Platform

- Alongside, you can vary the **market share** (α) and observe how the projected revenue will change accordingly

- In fact, you can vary any variable in your model and observe how the projected revenue will change accordingly
  - This study is called *sensitivity analysis*

TAM	Number of Transactions (N)	Market Share (α)	Transaction Fee (β)	Package Cost (C)	Convenience Fee (δ)	Revenue Projection Model ((α × N) × (β × C + δ))
1	1,000,000	1	0.08	35	5	$7,800,000
2	1,000,000	0.01	0.08	35	5	$78,000
3	1,000,000	0.02	0.08	35	5	$156,000
4	1,000,000	0.05	0.08	35	5	$390,000

Example: A Shoe E-Commerce Platform

• Sensitivity Analysis:

• You can also do revenue projections over multiple years (typically you would increase your market share every year by a certain %)

The China Syndrome

- You might be inclined to choose a *huge* existing market, assuming that you can easily acquire a ***tiny fraction*** of it, and reap the rewards!
  - This is referred to as the "*China Syndrome*"
- For instance, if you can acquire *0.1%* of the toothbrush market in China (population 1.3 billion), would not you make a lot of money?
- How would the logic go?

The China Syndrome
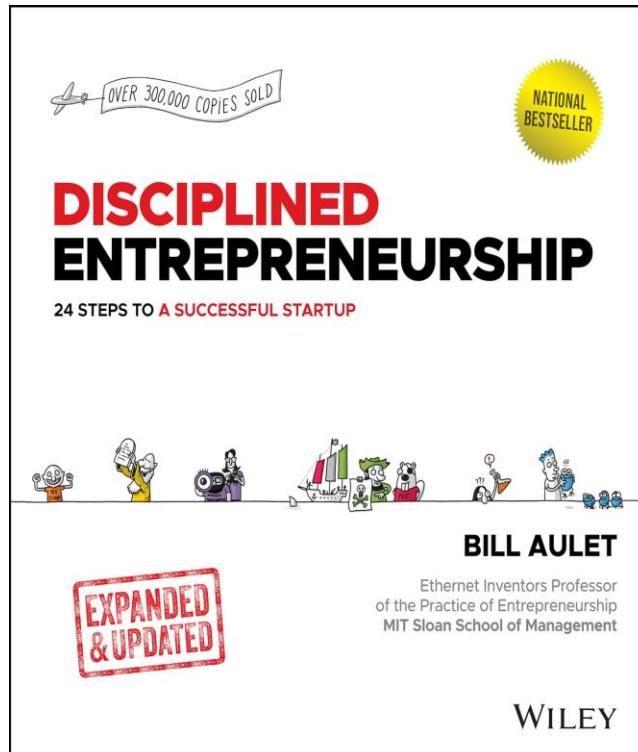
- The logic goes as follows:
    - A reputable site on the Internet says that China has over 1.3 billion people
    - If all these people have teeth, the market size would be 1.3 billion customers
    - I can build a toothbrush for the Chinese market, and maybe I will get 0.1% market share in the first year
    - If each person buys 3 toothbrushes a year, I could sell 3.9 million toothbrushes per year
    - If I sell each toothbrush for $1, I would have $3.9 million in sales the first year, with lots of room to grow!

- Is there any problem with this logic?

The China Syndrome

- This logic has several problems such as:
  - It did not demonstrate in a compelling manner why people will buy your toothbrush
  - It did not show why your market share would increase over time
  - It did not validate any of your assumptions by learning directly and/or indirectly from/about your market
  - Perhaps, you have never been to China!

- After all, if entrepreneurship were this easy, would not everyone sell toothbrushes to China?
  - Do not get ensnared by "The China Syndrome"
  - Do your revenue projections ONLY after you do market segmentation, *and* primary and secondary market research

Reading

- Read Steps 1 to 5 of the "Disciplined Entrepreneurship" book
  - 2024 by Bill Aulet

More on Idea Generation

The Morphological Box

- In the 1930s, the Swiss physicist Fritz Zwicky at the Institute of Technology in California developed a problem-solving method using what he called **morphological boxes.**

- A new entity is developed by combining the attributes of a variety of existing entities
  - Initially applied by Zwicky to **jet engine technology**

- Also began to be used in **marketing strategies** and the **development of new ideas.**

- The aim is to create something new out of something that already exists

The Morphological Box: Steps

- The concept of *morphology* stems from the study of biological structures and configurations.

- The steps:
  - All the relevant parameters (e.g. vehicle type, target group) are noted.
  - As many attributes as possible are ascribed to each parameter
    - This requires expertise as well as imagination
    - The result of this method is a table.
  - The next stage requires brainstorming to choose attributes of for each parameter.
  - Connect your chosen attributes with a line.
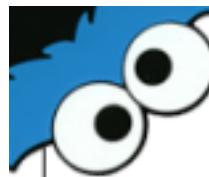
The Morphological Box: Example

- The development of a new car
  - The car has to be an SUV, say, but it also needs to be energy-efficient and inexpensive to manufacture.
  - Which attributes match these requirements?

	CONFIG. 1	CONFIG. 2	CONFIG. 3	CONFIG. 4	CONFIG. 5	CONFIG. 6
DESIGN (FRONT VIEW)	Aggressive	Angular (new edge)	Slim	Flowing	Sporty	Athletic
PERFORMANCE, ENGINE	Petrol 100-200 hp	Petrol 200-300 hp	Diesel	Hybrid	Hydrogen	Electric
SEATS/ROOM	2	4	5	6	6+	6+ including fully reclinable seat
VEHICLE TYPE	Saloon/sedan	Mini-van	SUV	Estate	Coupe	Pick-up
STYLE	Confident	Cool	Friendly	Cheeky	'French'	'American'
FEATURES, MARKETING ASSETS	DVD player (cooperation with Netflix)	Integrate music down/load from online stores	Voucher for car tuning	Partnership with National Rail for intercity services	New paintwork of choice every year	Fridge, even kitchenette
TARGET GROUP	HNWIs High Net Worth Individuals	DINKs Double Income No Kids	FRUMPIEs Former Radical, Upward Moving People	LOHAS Lifestyle Of Health And Sustainability	WOOPIEs Well Off Older People	MILKIEs Modest Introverted Luxury Keepers

# The Morphological Box: Example
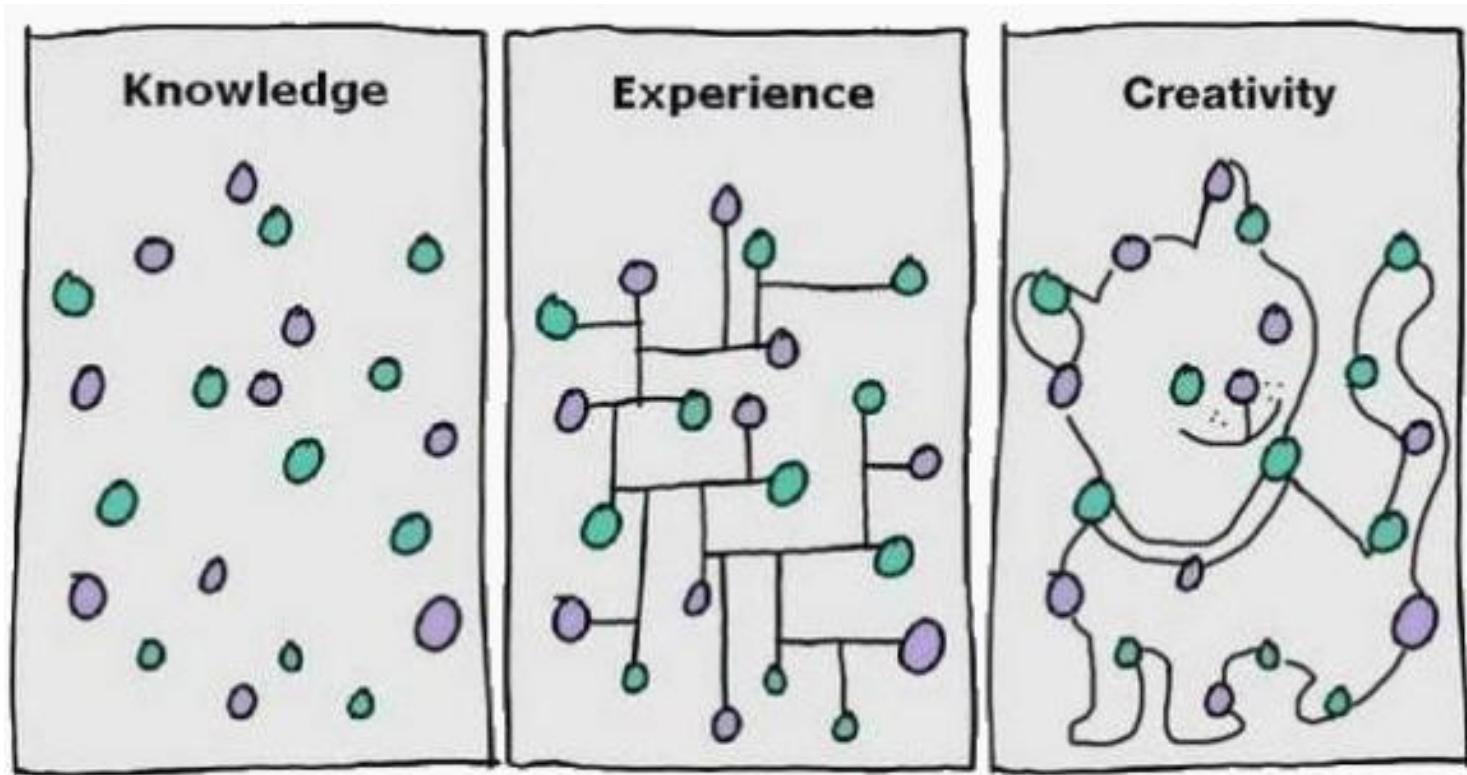
• Creating a Cookie from a Cookie!

|	Configurations			
Parameters	**Cookie A**	**Cookie B**	**Cookie C**	**Cookie D**
Texture	Smooth	Soft	Chunky	Soft
Consistency	Chewy	Goowy	Crunchy	Chewy
Size	Medium	Small	Large	Huge
Base	Plain	Plain	Chocolate	Oatmeal
Topping	Sugar	None	Icing	Chocolate
Stuffing	Chocolate	Dates and Harda	Macadamia	Chocolate
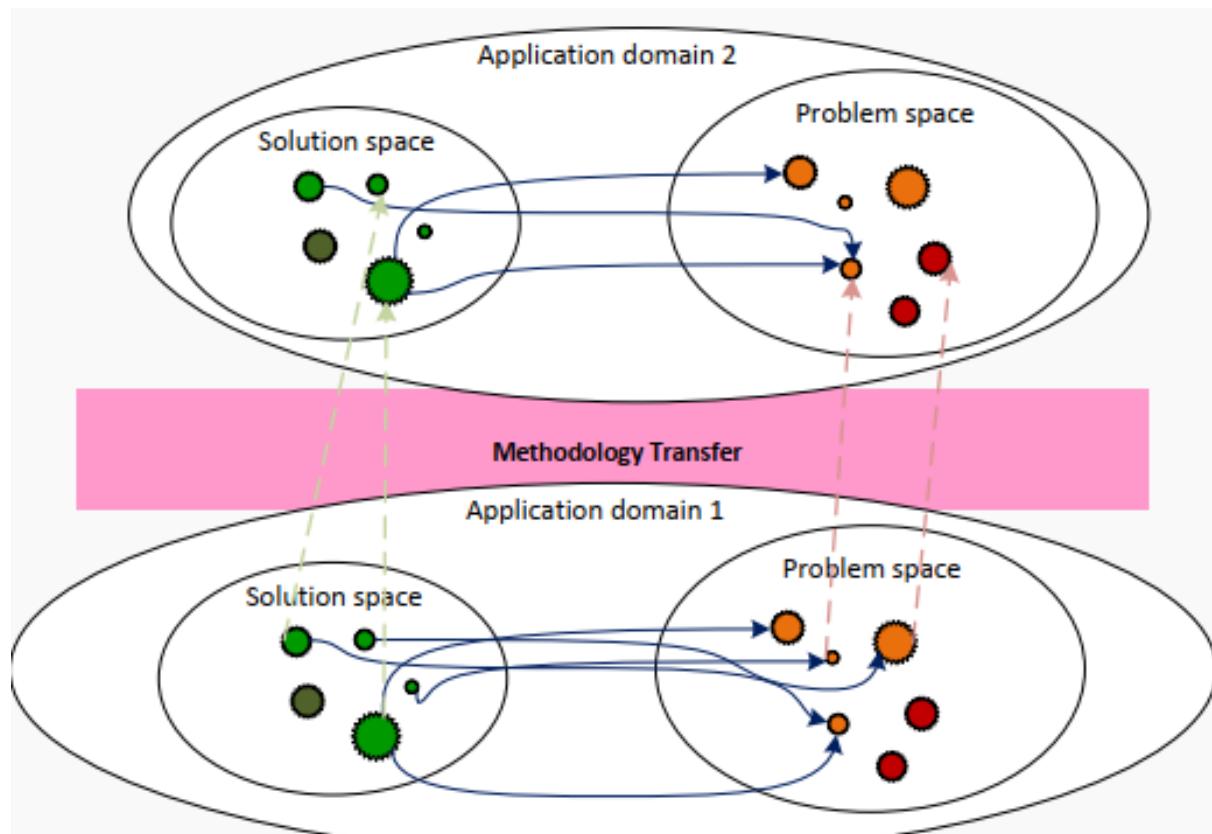
Knowledge, experience, and creativity

- The most important skill in the future will be the ability to "connect the dots" in your own way! (Fabio Moioli)

Problems, solutions, and domains

- Thinking about problems, solutions, and domains
  - Methodology transfer (mapping) model
  - Considers high-level abstractions

Methodology transfer (mapping) model: Example

- **Problem:** Software testability measurement

- **Domain:** Software engineering

- **Mapping:** Defining untestability as **resistance** to testing!

Ohm's law $\quad R = \dfrac{V}{I}$ $\qquad$ (1)

Testability of class X $\quad T(X) = \dfrac{C(X)}{|\tau(X, C)|}$ $\qquad$ (2)
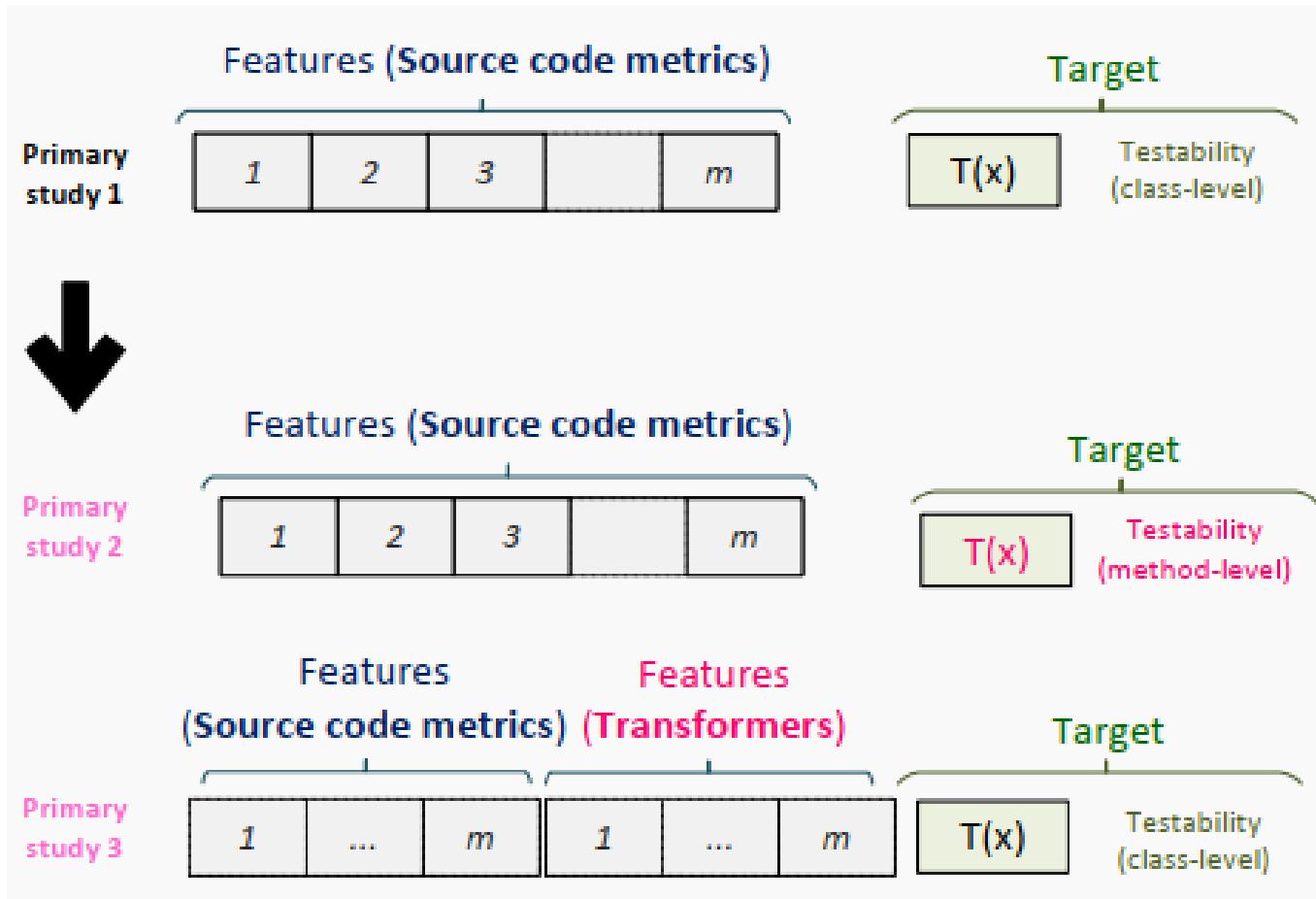
(Zakeri-Nasrabadi and Parsa, 2021; Zakeri-Nasrabadi and Parsa, 2022)

Convergence and divergence research

- 'Divergent' research means looking at the problem in a wider context; taking the 'telescope' view.
  - In other words, to 'see what's out there'.

- The opposite of this approach is known as 'Convergent' research. It means taking the 'microscope' view;
  - focusing on the problem and looking deeper and deeper into the causes.

- Think **out of box**!
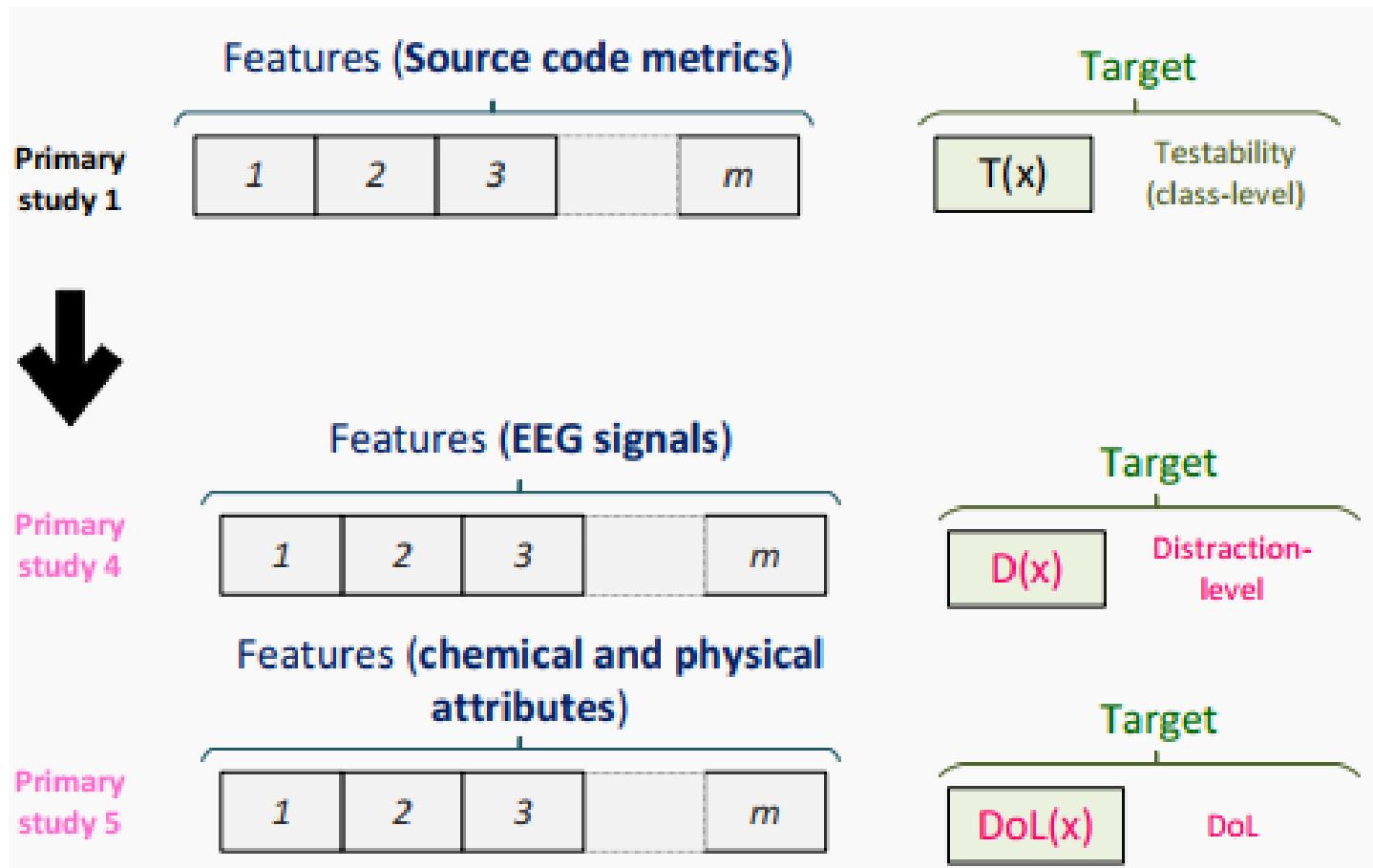
Convergence research: Example

- Machine learning for 'software testability' prediction

Divergence research: Example

- Machine learning for 'X' prediction

Idea Generation Methods Summary

- Morphological box

- Out-of-box thinking
  - Systematic thinking: Knowledge, experience, and creativity
  - Abstract thinking: Problems, solutions, and domains

- Other thinking paradigms:
  - Computational thinking
  - **Design thinking**
    - Refer to the video attachment
  - Data thinking

Next Class

- Business Models
  - and pricing frameworks