WILLIAM DAVIDSON INSTITUTE
AT THE UNIVERSITY OF MICHIGAN

Commercialization playbook

Lab to Market: Commercializing Energy and Mobility Technologies in Chihuahua

CHIHUAHUA
GOBIERNO DEL ESTADO
Juntos Sí podemos

SECRETARÍA
DE INNOVACIÓN
Y DESARROLLO ECONÓMICO

Frente Norte.®

2025

About WDI

WHO WE ARE

WDI is a solutions-driven non-profit affiliated with the University of Michigan that operates at the intersection of education, entrepreneurship, and impact across emerging markets. We are dedicated to **unlocking the power of business** to tackle critical global challenges and drive inclusive economic growth.

We're not just solving for business—we're solving for the future.

We mobilize entrepreneurs, investors, governments, and academia to drive pioneering solutions across health, climate-health, and energy.

A KNOWLEDGE BUILDER

+

AN ENTERPRISE ACCELERATOR

+

A SYSTEMS CATALYST

In **energy and e-mobility** we are dedicated to driving just transitions to clean tech, electric mobility, and sustainable energy solutions.

wdi.umich.edu

About the Lab to Market project

Expanding the know-how to commercialize technologies related to energy and mobility that are developed at academic institutions in Chihuahua has been identified as a need and priority by various stakeholders in the state. Building on multiple years of collaboration, in 2024-2025 the William Davidson Institute (WDI) at the University of Michigan (U-M) partnered with the Secretaría de Innovación y Desarrollo Económico (SIDE) and Frente Norte on a project called **From Lab to Market: Commercializing Energy and Mobility Technologies in Chihuahua**.

Project goals:

- Build capacity at an institutional level for universities and research centers in Chihuahua to bring to market the innovations they develop related to energy & mobility
- Apply lessons learned and resources from WDI and U-M to the Chihuahua context
- Support commercialization of select energy & mobility prototypes already under development
- Involve students and researchers in the commercialization process to advance learning and pedagogical goals

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About this commercialization playbook

As part of the Lab to Market project, WDI developed this ***Commercialization Playbook*** based on consultation with various players in Chihuahua, Mexico, as a way to support academic commercialization at institutions throughout the state. In addition to leveraging WDI's expertise, we also draw on existing tools and resources in the development of this playbook. **The playbook is intended to:**

- Serve as a resource that covers the entire commercialization process in one place with highly practical tools, tips, and resources
- Include general and stage-specific guidance
- Pertain to any university or research institution and any technology/sector, with a focus on energy & mobility for the purpose of this project
- Point to complementary external resources that go deeper into specific areas
- Be useful on its own, or be complemented by in-depth trainings

Who is the playbook for?

The intended audience is:

- Technical innovators/founders who may or may not have background or experience in business and are based at universities or research centers
- Academic leadership and staff supporting or collaborating with these innovators

When and how should it be used?

- As a comprehensive guide to understand and work through the entire commercialization process, and/or as a targeted resource to identify specific resources to fill gaps in knowledge
- This is not intended to be used entirely on your own - tapping people with deeper expertise in different areas will be necessary at various points

What is not covered in this playbook?

This playbook covers many technology development and business steps in the commercialization process, each at a relatively high level, with links to additional detailed resources.

As a complement to this, there are important **legal** considerations for creating a company, negotiating rights to intellectual property, and more. The playbook references at which points legal expertise may be helpful, but does not cover these topics in depth.

There are also important **ethical** considerations, for example related to minimizing harm, data integrity, and more. While these are likely covered in research training, we encourage anyone pursuing the commercialization path to explore these topics as well.

The playbook is also meant as a general resource for any academic inventor interested in commercializing an idea, and does not provide specific advice for a particular scenario or invention.

WDI lens for playbook

To develop this playbook, we drew on our experience at WDI supporting commercialization of academic research in low- and middle-income countries. We work directly with faculty or researchers with inventions, and also work with academic institutions and other players to strengthen institutional support for this kind of work.

Our academic commercialization principles include:

- **Capitalize on educational opportunities:** Consider involving students from various disciplines to capture learning value throughout the entire process
- **Leverage and complement other resources:** Understand other resources at the institution and in the ecosystem, and seek ways to add value rather than duplicate
- **Staged and iterative process:** Build in opportunities for “failing” quickly, gathering feedback, and continuous learning
- **Balance idealism with reality:** Understand that the likelihood of commercial success is low, but there is still value in trying and gains to be made throughout the process
- **Fit with LMIC markets:** In line with WDI’s mission, we seek opportunities to support commercialization in these markets

Contents

1 Background and how to use the playbook

2 Step-by-step playbook

3 Relevant resources

1. Background and how to use the playbook

So you have an invention… should you try to commercialize it?

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The commercialization process can be long, complicated, and require a lot of different types of resources and expertise. A commitment is needed on behalf of the inventor/researcher and their institution to pursue commercialization in an effective way. What are the potential benefits and reasons to pursue commercialization, and what are the potential challenges and pitfalls?

Benefits	Challenges
• Generate social and economic benefit through access to innovations in real world • Strengthened connections between industry and academia (via licensing or start-ups), speeding implementation and scale of innovations • New source of revenue for person/institution with IP • Reputational boost • Positive feedback loops - success begets success • Presents pedagogical opportunities for multiple disciplines, especially science, engineering, business, and law	• Finding those with entrepreneurial mindset and approach within an academic setting can be difficult • Requires – often substantial – resources and different kinds of expertise • Progress can be slow and incentives may be misaligned, due to emphasis for academics on evidence generation, research insights, and teaching vs. metrics related to business viability • Success in commercialization is a long shot even for great ideas

If you say yes… Now what?

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If you do want to pursue commercialization of your invention, many questions will likely follow.

- Where do I start?
- What do I need to know?
- Who do I need to involve, and when?
- Once I get started, how do I know if I'm on the right track?

We will start tackling these questions next.

Where do I start?

It depends where you are and what you have done so far. Here is a depiction of the overall process, with key steps to be taken on the product side and the business side. The bulk of this playbook will delve into each in greater detail.

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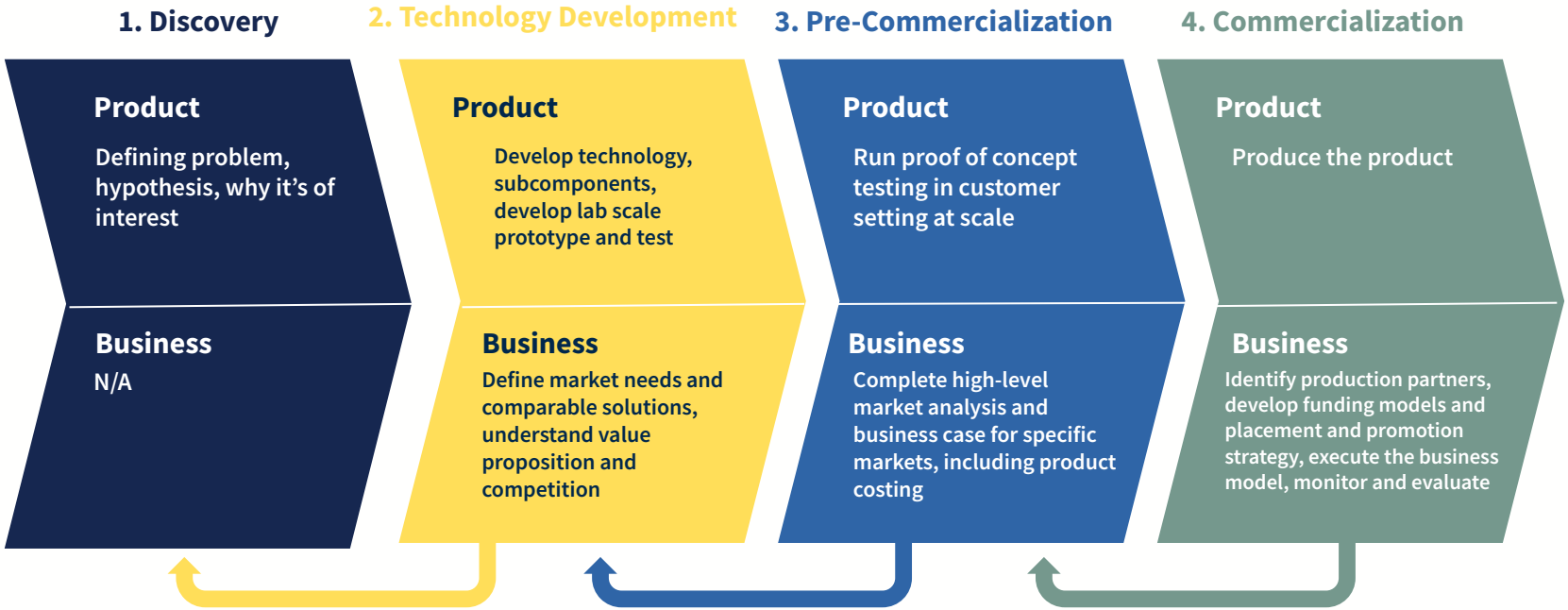

Source: Developed by WDI

What are possible paths to commercialization?

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There are several paths to commercialization, but two paths in particular tend to be taken for academic commercialization: licensing to an existing company, or creating a new company. Many inventions developed at academic institutions tend to follow the former path, as the latter typically requires the inventor to commit to a non-academic path to be successful in creating a new company or hand the invention off to someone else to do so.

Either way, the general process for commercialization holds true, as a business case must be made for companies to acquire a license or investors to bet on a new company.

Who do I involve?

There are several different types of actors involved in the commercialization process, and it is important to consider the roles of each.

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Inventor: Technical faculty member, researcher or student (or a team) who develops an idea for a product or service; usually owns rights to part of the intellectual property depending on their institution's policies.

Commercial lead: Advances the business milestones to bring the product/service to market. May be the inventor/researcher or may be someone else at the same institution or elsewhere.

Academic institution: Where the inventor/researcher is based, usually owns rights to at least part of the intellectual property and provides resources such as facilities, equipment, expertise through staff or students.

Government: Manages the patent, may provide other types of resources such as funding, and plays a regulatory role.

Payor: The organization or individual that pays for the product or service.

End user: The organization or individual that directly interacts with/uses your product or service. May be the same as the **payor**, or may be different.

Financers: Investors, donors, financial institutions, or individuals that provide funding for the development of the product or service.

Suppliers or other intermediaries: Part of the supply chain, may be relevant depending on the type of invention and production plan.

Competitors: Existing players offering similar / alternatives to your product or service; may also be opting for the absence of your offering.

What do I need to know?

Different areas of expertise come into play at different stages in the commercialization journey, which we highlight here and in the following section. Consider what resources are available to you – at your institution and in the broader ecosystem to identify people with the expertise you need.

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Technical expertise

- Vision and technical expertise to ideate, prioritize, develop, test, validate, produce invention

Commercial knowledge

- Addresses key commercial milestones such as:
  - Assessing market fit and commercial viability
  - Designing and implementing business plans
  - Connecting with partners and customers and making deals

Legal advice

- Protecting intellectual property
- Creating licensing agreements
- Establishing companies

When does everyone get involved?

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These types of expertise are needed to different degrees throughout the process. In the following slides we use the responsibility assignment matrix (aka RACI chart) as a way to illustrate which players will be leading vs. supporting at different points in the commercialization journey and will therefore have correspondingly higher or lower levels of effort. The relative size of the bubbles (shown on the right) indicates the relative importance of that role.

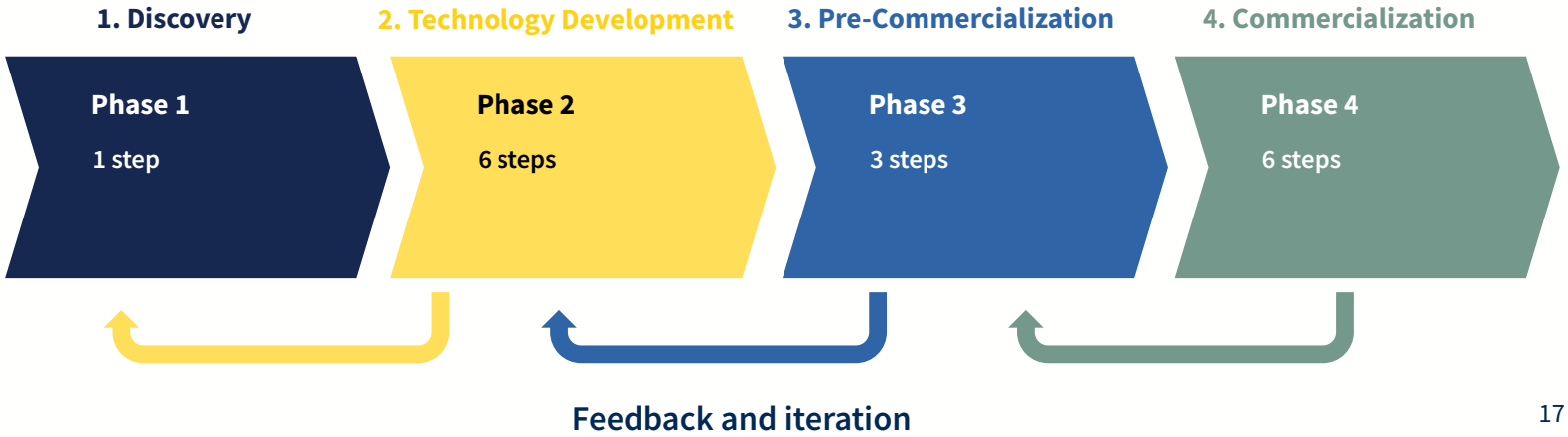
We also estimate the level of effort for the commercial activity at different steps, to help set expectations in case an inventor seeks external support for these activities.

RACI Chart		
Responsible	Lead role: the person or group directly in charge of the work	R
Accountable	The person or group who owns a task and is responsible for the outcome	A
Consulted	Contributors who provide input and advice	C
Informed	People or groups who are kept up-to-date on progress	I

How do I know if I’m on the right track?

While in the real world the commercialization process can follow different paths and may not be linear, we organize the commercialization process in a series of steps and questions to illustrate – in a general sense – what needs to happen and by when to know if things are on the right track. And if not, when to consider stopping or iterating before continuing.

Each phase is not created equal in terms of how much time or resources it will take to complete, but all are important in the overall process. As will become evident in the following pages, some steps are well-defined and more narrow in scope, while others are more complex and depend on many factors, some outside of your control.



2. Step-by-step commercialization playbook

Phase | Business or Product

How to read this playbook

Here we include additional tips, considerations, and mentions of relevant resources and tools (indicated in **bold**) that are included later in the playbook.

▶ Step number (#1-16)

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Goal
What the overall goal of this step is

Activity
Key activity(ies) that should be completed during this step

Team
The key role(s) that should be involved in this step, including RACI designations and level of effort estimates

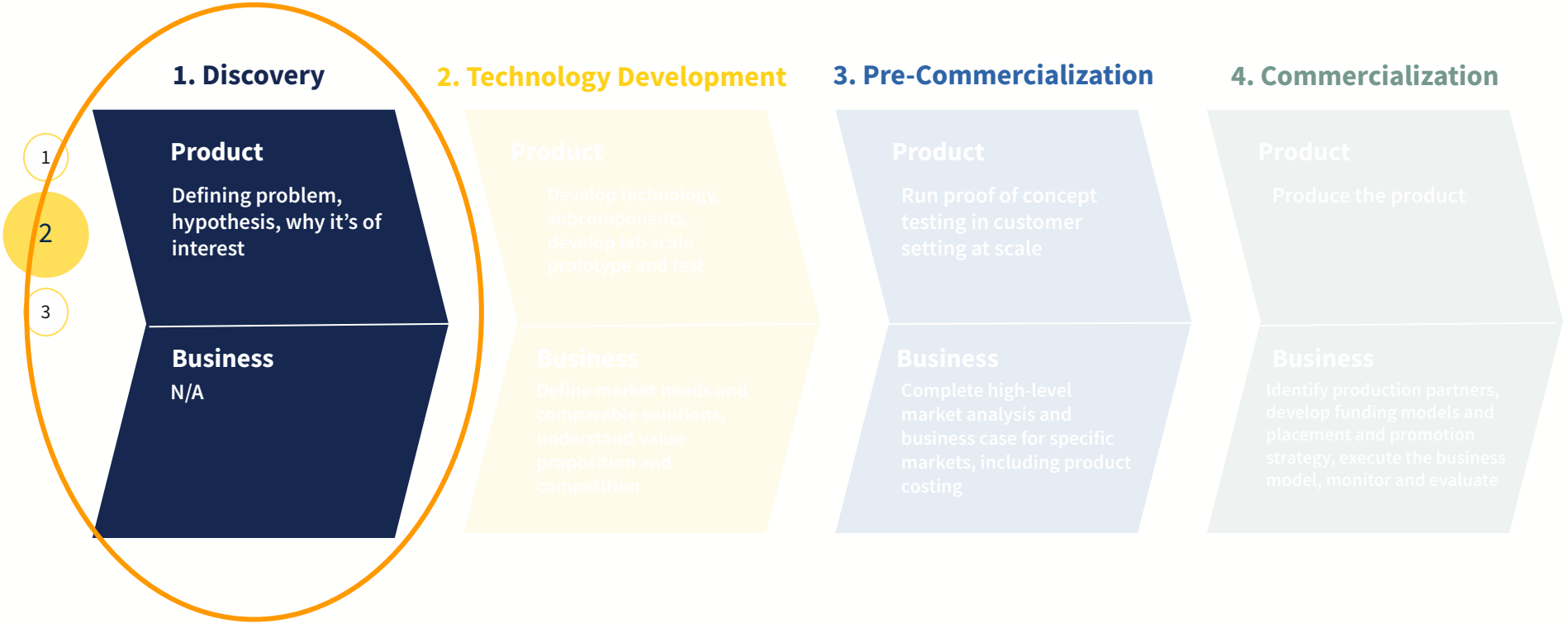
Output
The concrete product / resource that should be developed during this step

No
Iterate / Stop

Question
The key yes/no question that needs to be answered before proceeding

Yes
Move to Step X

Let’s start at the beginning



Source: Developed by WDI

Discovery

The focus of this phase is to ground future research in real needs of real users, and to understand gaps where innovation is needed. The **idea development tool** can help focus thinking at this point.

▶ Step 1

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Goal
Define the opportunity and why it is of interest, including defining the problem/challenge and ideas/hypothesis.

Activity
Primary or secondary research, which could involve observations and interviews locally in relevant context to define the problem(s) and potential solution(s).

Team
Inventor R
Commercial lead I

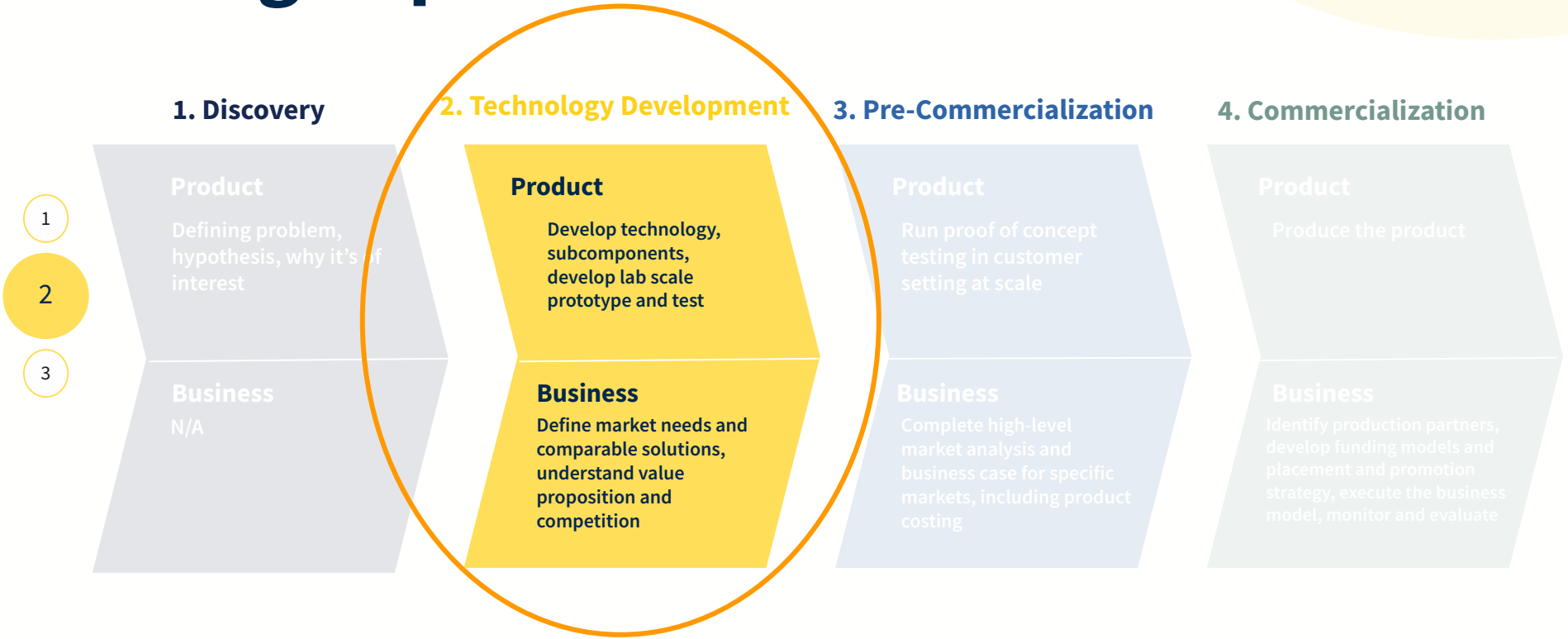
Output
Clearly defined opportunity that has real-world need.

Question
Is there a clearly defined problem/opportunity to be addressed and interest in addressing it?

No
Iterate / Stop

Yes
Move to Step 2

Moving to phase 2



Source: Developed by WDI

Technology development

▶ Step 2

The duration of this step and the team involved will depend on the level of complexity, how incremental vs. disruptive the idea is, etc.
Protection of intellectual property should be considered from the beginning.

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Goal
Understand basic principles to be used for product development. Determine if the concept meets scientific/technology standards to be effective.

Activity
Define the basic principles of the product.
What is the product designed to do?

Team
Inventor R

Output
Evaluation of product fit with basic principles.

No
Iterate / Stop

Question
Does the product meet technology standards and can it be effective?

Yes
Move to Step 3

Technology development

▶ Step 3

At this point the product may still be a concept and a deep technical understanding will help answer basic questions about whether it fills a gap in the market. Stakeholder mapping, customer discovery, and competitive analysis are helpful to do at this stage.

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Goal
Define market needs and comparable solutions.

Activity
Define the basic market needs using desk research and interviews on market needs and comparable solutions.

Team
Inventor R
Commercial (estimated 3 days of effort) C

Output
Competitive analysis, stakeholder mapping, and analysis from customer discovery.

Question
Does the concept/product fill a gap in the market; more generally, can it be commercialized?

No
Iterate / Stop

Yes
Move to Step 4

Technology development

Once it is determined that a concept could be commercialized, the product arising from the innovation needs to be clearly defined so that a value proposition can be determined.

▶ Step 4

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Goal
Broadly describe the various components of the product and value proposition.

Activity
Define the product technical blueprint/criteria for components. Review findings from customer discovery and desk research to create value proposition.

Team
Inventor R
Commercial (estimated 3 days of effort) I

Output
Customized value proposition.

Question
Is there a clear product definition and value proposition that could lead to commercialization?

No
Iterate / Stop

Yes
Move to Step 5

Technology development

▶ Step 5

Lab space and equipment is important at this step. Depending on the nature of the invention and infrastructure available in the university or research lab, the inventor may consider external resources, as available.

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Goal
Create subsystem prototype testing at lab scale to test each of the components separately.

Activity
Develop the subsystem prototype at lab scale and define the product technical blueprint.

Team

Inventor	R
Legal	C
Commercial	I

Output
Product technical blueprint.

No
Iterate / Stop

Question
Do the components meet the product technical blueprint as defined?

Yes
Move to Step 6

Technology development

▶ Step 6

Student researchers often play an important role in the previous step and this step, as these steps serve as valuable applications for the concepts they are learning.

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Goal
Validate the subsystems at the product level.

Activity
Assemble the subsystems into the product.

Team
Inventor R
Commercial I

Output
Test of subsystems against product technical blueprint.

Question
Does the assembled product function as defined in the product technical blueprint?

No
Iterate / Stop

Yes
Move to Step 7

Technology development

This step takes the technology development further, while keeping the commercial lead informed of any progress or changes that could affect the business case.

▶ Step 7

1
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3

Goal
Define product integration concepts and how the sub-components will work as a system.

Activity
Define the high level product integration concepts.

Team
Inventor R
Commercial C

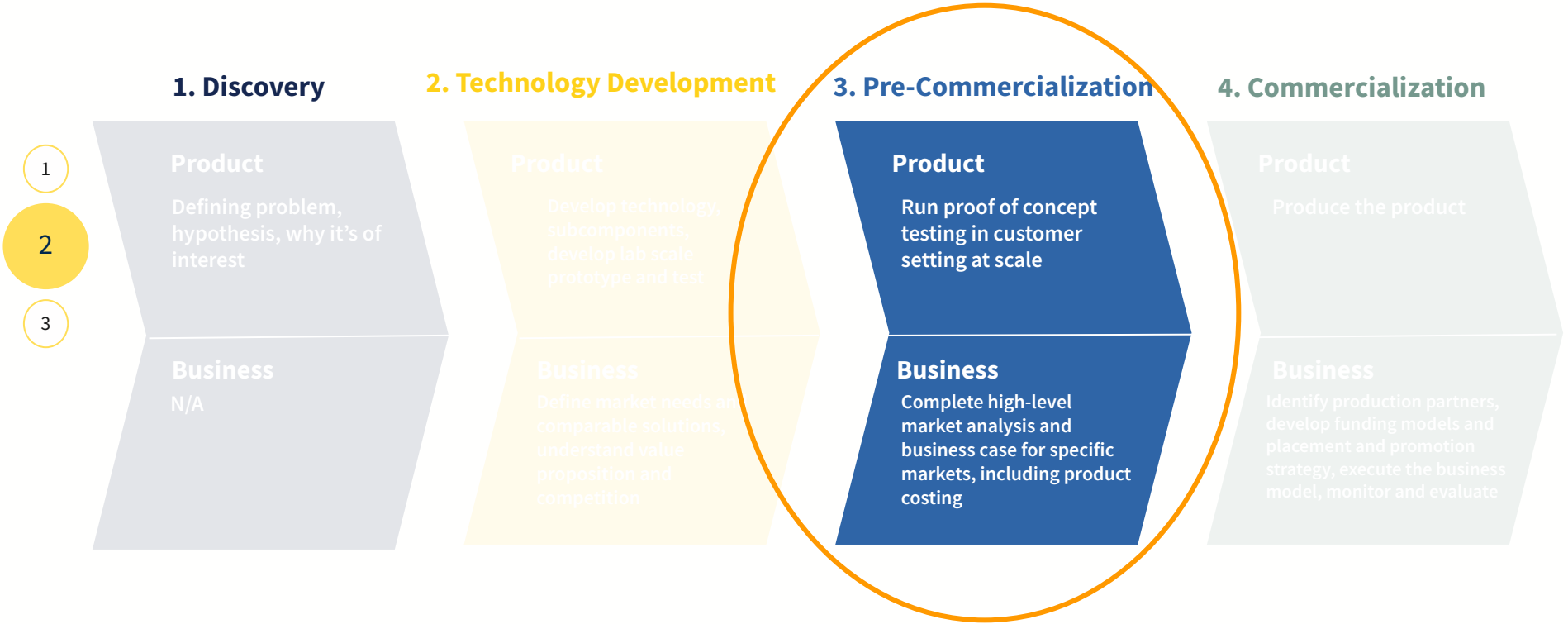
Output
Definition of integrated product.

No
Iterate / Stop

Question
Does this continue to be a viable product that can be commercialized?

Yes
Move to Step 8

Progressing to phase 3



Source: Developed by WDI

Pre-commercialization

This can be a good time to involve business school students. We include several **market analysis** resources in the following section (AI for market research, market sizing, high level market analysis, PESTLE analysis, 5Cs of marketing, 4P framework).

▶ Step 8

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Goal
Complete high level market analysis/business case for a specific context (i.e., state, country).

Activity
Secondary research using existing data for market(s) of interest. Consider IP, political & social climate, regulatory complexities and health of the supply chain.

Team
Commercial (estimated 15-20 days of effort) R
Legal A
Inventor A

Output
Market analysis using one or more frameworks linked above.

Question
Does the business case support commercialization of the product in this context?

No
Iterate / Stop

Yes
Move to Step 9

Pre-commercialization

The inventor may choose to partner with an engineering firm at this step for detailed and accurate product costing beyond prototype scale. A **SWOT analysis**, **bottom-up costing** for the product, and **high-level financial model** for the business can also be developed at this step.

▶ Step 9

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Goal

Develop a detailed business case, including estimated cost of the product and other financial and strategic analyses.

Activity

Create engineering blueprints. Validate market analysis with your context of interest; interview at least 1 subject matter expert in the context. Complete high level financials and SWOT analysis.

Team

Commercial (estimated 30-60 days of effort) R
Inventor R

Output

SWOT analysis, financial model for business, product costing.

No
Iterate / Stop

Question

Does the detailed business case support commercialization of the product?

Yes
Move to Step 10

Pre-commercialization

▶ Step 10

Cultivating relationships with potential partners and customers may take time. This is where **mentors** who have been through this before, **technology transfer professionals**, or partners such as **entrepreneur support organizations** can play an important role.

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Goal
Run proof of concept testing in a customer setting at scale.

Activity
Identify a partner to run a test in a real-world setting. Obtain feedback and guidance on potential roadblocks and considerations for scaling.

Team
Commercial (estimated 15 days of effort) R
Inventor R
Legal R

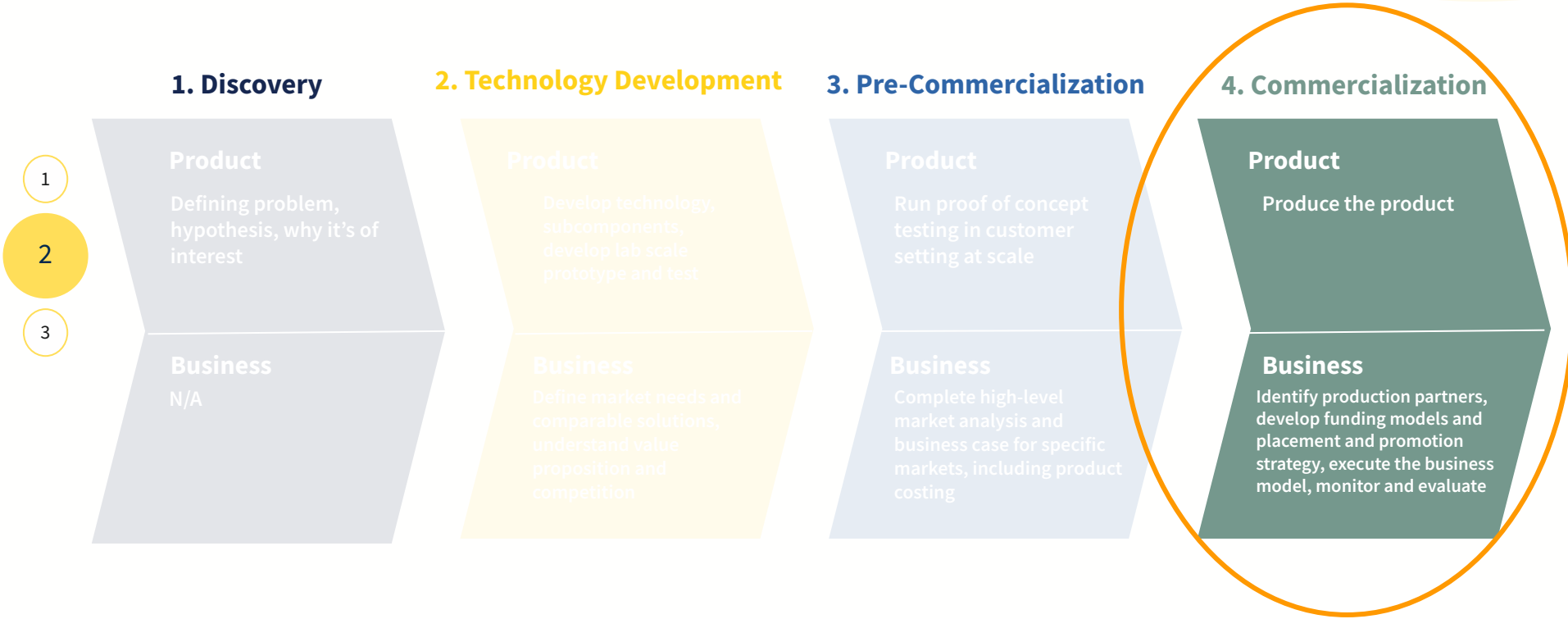
Output
Results from proof of concept testing with customer.

No
Iterate / Stop

Question
Do the results of the test support commercialization of the product?

Yes
Move to Step 11

Reaching phase 4



Source: Developed by WDI

Commercialization

This phase involves refining the details of the **business model** and building the business case for potential investors, partners, customers. Being able to calculate the **ROI** and **Net Present Value** (NPV) of your product/service is important for each of these stakeholders.

▶ Step 11

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Goal
Identify local production partner.

Activity
Finalize the business case to include ROI/NPV calculations, supply chain specifics.

Team
Commercial (estimated 5-10 days of effort) R
Inventor C

Output
ROI calculations, articulated business model.

No
Iterate / Stop

Question
Is there a production partner/method to get the subsystem operating as per cost and technical specifications?

Yes
Move to Step 12

Commercialization

In much of the previous steps, you are building parts of the case to seek funding for/investment in your product or service. In this step, you crystallize the financial part of the story and complete a risk analysis to prepare to pitch.

▶ Step 12

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Goal
Finalize financials & risk analysis, develop funding models.

Activity
Develop funding models, seek debt/equity financing

Team
Commercial (estimated 60-90 days effort) R
Inventor R

Output
Pitch deck backed up by financial analyses.

No
Iterate / Stop

Question
Is there a viable funding mechanism?

Yes
Move to Step 13

Commercialization

The specific activities in this phase will differ depending on your business model and what stakeholders are involved and how.

▶ Step 13

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Goal
Develop and finalize placement and promotion strategy.

Activity
Select vendor(s), identify partner(s), sign contract(s), develop joint venture strategy

Team
Commercial (estimated 5-10 days of effort) R
Inventor R

Output
Partnership agreements, as relevant.

Question
Is there a viable business model in place?

No
Iterate / Stop

Yes
Move to Step 14

Commercialization

Note that this is not the final stage, as iteration will likely be necessary once production at a commercial scale begins.

▶ Step 14

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Goal
Execute the business model.

Activity
Produce the components, validate manufacturing process & costs, update the business model as needed

Team
Commercial R
Inventor R

Output
Results from production, updated business model.

Question
Has the business model been validated?

No
Iterate / Stop

Yes
Move to Step 15

Commercialization

During these stages, you may involve a manufacturer or multiple manufacturing partners rather than establishing capabilities to do this yourself.

▶ Step 15

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Goal
Integrate the subsystem(s).

Activity
Integrate the subsystem(s) into the final product.

Team
Inventor R
Commercial C

Output
Finalized product.

Question
Does the integrated product operate as per specifications?

No
Iterate / Stop

Yes
Move to Step 16

Commercialization

▶ Step 16

At this stage, you have achieved some commercial success - congratulations! By building in feedback loops in all of the previous steps, you will have set up a **system to monitor and evaluate results**, for continuous improvement and capturing learnings that can be applied to future efforts.

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Goal
Monitor and evaluate.

Activity
Evaluate the hypothesis of the business case

Team
Inventor R
Commercial (estimated 5 days of effort) I

Output
Analysis of selected metrics, lessons learned.

Question
What lessons did we learn that can be applied to future work?

3. Related resources

Related Resources - Contents

In the following pages, we include resources that have been developed by WDI or partners at the University of Michigan (UM), and/or are freely available online, on the following topics related to the commercialization journey:

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Discovery

- Idea development

Technology development

- Protecting intellectual property
- Stakeholder mapping
- Customer discovery
- Value proposition
- Competitive analysis

Pre-commercialization

- AI for market research
- Market sizing
- High-level market analysis
- PESTLE analysis
- 5Cs of marketing
- 4Ps framework
- SWOT analysis
- Bottom up product costing
- Financial modeling

Commercialization

- Calculating ROI
- Calculating NPV
- Defining your business model
- Crafting a pitch
- Monitoring and evaluation; measuring impact

Discovery

▶ Idea development

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While most of this playbook is focused on later stages of the commercialization process that assume you have an idea or invention already developed, if you are trying to hone the focus of an idea or select among multiple ideas, this Idea Development Tool from the Business + Impact Studio at Michigan Ross can help.

Note that several of these questions can help lay the groundwork for exercises you will complete during later stages of the commercialization journey, and will also get you thinking about positive and negative intended or unintended consequences of your invention.

Technology development

Step 2

Intellectual property

Overview

Intellectual property (IP) is something tangible that can be owned as a result of creativity or research. The laws related to defining and protecting intellectual property differ by country, and inventors would always benefit from consulting an expert. Here we present some IP considerations from our colleagues at UM Innovation Partnerships, and encourage you to seek tailored guidance from IP experts at your institution or elsewhere who know your local context.

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IP role in commercialization process

- Defining and protecting IP is an important part of commercialization, whether the end goal is licensing to an established company or creating a startup
- Identify and protect your idea early in the process – securing patents and trademark rights is on a first-to-file basis in many places
- You can start customer discovery (more on this later) before a patent is secured, but keep conversations high level and don't share detailed information until a patent is secured
- There are different types of IP, including patents (most common for technological inventions), trade secrets, trademarks, and copyrights

Patents

Requirements for a patent differ depending on the country, so consult with a local professional. Some requirements from the U.S., for reference, include:

- Is the subject matter patent-eligible: there are statutory categories determined by patent filing office. Some things are not patentable, such as discoveries of things occurring naturally, abstract ideas
- Is it useful: it has a practical or specific purpose, it does not violate scientific principles
- Is it novel: is it completely original, never been described in any way
- Is it non-obvious: not an obvious conclusion, determination made by patent office
- Freedom to operate: doesn't violate existing patent

Additional considerations

- Do not publicly disclose your innovation before it's fully protected, as that may make it hard or impossible to obtain a patent - disclosing may include journal articles, conference presentations, PhD defense, etc.
- There may be different rules related to ownership of IP whether you're faculty or staff or student - depends on institution

Technology development

Step 3

Stakeholder mapping pt. 1

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If you successfully commercialize your invention, it will exist in an ecosystem involving many stakeholders and dynamics. To understand how your invention may fill a need and for whom, you need to start by understanding the ecosystem and mapping the stakeholders within it. Here we share some explanation, tips, and guidance from UM Fast Forward Medical Innovation. This exercise can be done with different levels of rigor. If the following steps feel too onerous, you can still benefit from a “lite” version of this exercise.

Why do it?

- Identify existing opportunities in the ecosystem, as well as gaps in your own knowledge
- Decide who to contact during customer discovery – be targeted in this process to make it most valuable (more on this next)
- Understand how decisions are made in the ecosystem, and how your invention could impact dynamics to anticipate barriers and changes – e.g. how could different stakeholders profit, participate in, or lose out based on your invention so you can plan ahead

Technology development

Step 3

Stakeholder mapping pt. 2

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How to do it

- Identify stakeholders in the ecosystem relevant to your invention
- Describe each type of stakeholder in terms of how they will interact with your invention and how they interact with each other
- Represent connections with high level, visual concept map
- Be as specific as possible, down to specific job title of people who would interact with your invention
    - If you can't do that, there is probably a gap in your understanding, and you need to use customer discovery to better understand the players
- Prioritize stakeholders, i.e. those who will 1) buy/pay for, 2) authorize, 3) benefit from, 4) lose out from, 5) use, 6) regulate, or 7) change what they do based on your invention
- Categorize stakeholders - the previous step will allow you to identify:
    - Decision maker, who decides to purchase your invention
    - Economic buyer, who signs the check
    - Potential saboteur, who may actively undermine adoption of your invention
    - Influencer, who holds sway but doesn't make the final decision
    - Early evangelist, who is first to adopt your invention and can advocate for broader use
    - End user, who is the day-to-day user of your invention.

Technology development

Step 3

Customer discovery pt. 1

The customer is one of the most important stakeholders for your invention/prototype, so identifying who they are, what they need, how much they are willing to pay, and the other stakeholders with which they interact is crucial to demonstrating a commercial need for your invention. Customer discovery – qualitative research on the stakeholders and ecosystem related to your invention – is the process by which you can begin to answer these questions. Here we share some explanation, tips, and guidance from our partners at UM Fast Forward Medical Innovation.

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Why do it?

- Broaden your perspective and validate certain hypotheses about your innovation
  - Hear different perspectives, control for your own blind spots or biases
- Ensure a good market fit
  - Test the validity of your idea early and often
  - Allows for lower stakes adaptation of your idea before you bring it to market
  - Understand stakeholders pain points, desired gains they'd like to see from a better solution, and current state of the problem you're trying to solve
- Set yourself up for commercial success
  - Make a more compelling case to potential investors
  - Helps you build business case for long term by refining market fit to meet actual market need

How to do it:

- Build a map of your industry: who are the stakeholders and how do they interact (see previous slides on stakeholder mapping)
- Generate a hypothesis: make a guess as to why people behave the way they do in the ecosystem you mapped. For example, stakeholder A makes this decision because of X problem. Try to make it quantifiable so you can measure the results.
- Test the hypothesis: conduct customer discovery to see if your understanding is correct and dig deeper.

Technology development

Step 3

Customer discovery pt. 2

Customer discovery interview tips:

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- Identify interviewees: Start with friends and colleagues but quickly branch out for diversity of perspectives
  - Beyond your immediate network, try to get warm introductions from people you know
  - How to expand your own network: attend conferences (or look at contacts of those you can't attend), visit trade shows, use LinkedIn, look at authors of relevant papers/articles, join relevant networking groups and mailing lists
  - Identify the right people: don't target the CEO, target middle managers. Do some research on the contact, write a concise message, follow up and be persistent, to a degree
  - If you're at an academic institution, share that – you are gathering data and looking for insights, not asking for competitive information
- Ask questions:
  - Tailor questions to each interviewee
  - Ask *why* repeatedly
  - Ask open ended questions
  - Talk about their need, not your technology/idea
  - Ask them what else you should have asked, who else you should talk to, if they can make introductions
- Use what you find to refine your value proposition (more on this later)

Technology development

Step 3

Customer discovery pt. 3

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Additional tips:

- Try for face-to-face interviews as much as possible; or use video if online to build rapport and pick up on nonverbal cues
- Interview one person at a time, not groups
- Don’t wing it - make a plan ahead of time including introductions, thank them for their time, frame the conversation, ask questions and about other contacts/suggestions, thank them again
- Bring an interview partner if you can as another set of ears and a note taker
- Encourage negative feedback - it is better to know what this is, and to know early in the process. You can encourage this by asking:
    - What would you change about my idea?
    - Is there anything here that would give you pause?
    - How might my innovation be a disappointment?
    - Can you think of why you might not want to use my innovation?

Technology development

Step 3

Competitive analysis

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Even if a market is large enough to represent a financially attractive opportunity (more on market size later), you must ensure that your solution is different AND better than the existing competitors and alternatives – in your technology, business model, or some other aspect. Understanding what else is out there and how your solution compares will help you see if your solution has an edge, or if you need to iterate to achieve differentiation so customers are more likely to choose your solution over others. There are different ways to analyze the competition, and we present some resources here.

Additional resources for competitive analysis:

- Carnegie Mellon University
- Asana

Technology development

Step 4

Value proposition

A value proposition is a concise statement that explains what your invention solves, for who, and why. It provides the rationale for why your invention can be commercialized. Creating your value proposition is important to check your own understanding/gaps, and is also an incredibly valuable tool to communicate with various stakeholders about your invention, including funders. The value proposition builds on the previous few steps, as explained by our colleagues at UM Fast Forward Medical Innovation.

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How to create your value proposition

- Start with your customer: who are they and what is the problem they face
- Describe the idea/solution in simple language (do not describe features or how it works)
- Match the value of your solution to the problem stakeholders are facing

Sample structure and content

- What your innovation solves, for who, and why (customer + problem + solution + value)
- Problem: X impacts Y and causes Z
- Solution: Product A uses Technology B to deliver Value C
- Value should include both magnitude of the benefit (quantifiable if possible) and why it is compelling

Additional resources available here:

- Harvard Business School online
- Investopedia

Pre-commercialization

Step 8

AI for market research

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Artificial intelligence (AI) is an incredibly powerful tool – in general – and can also be relevant for conducting market research and analysis by identifying and synthesizing large amounts of data quickly, forecasting trends, identifying competitors, summarizing relevant sources and findings, and more. While we recommend spending time on more traditional primary and secondary data collection and analysis for market research, AI can be used in targeted ways to help to spur the process, especially when operating with limited resources for these types of activities.

This resource from U-M Ross Business + Impact provides guidance about creating effective AI prompts and personas to support research.

Pre-commercialization

Step 8

Market sizing

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The goal of an opportunity sizing exercise is to measure the potential financial impact of an innovation. Potential funders and collaborators will need to know what opportunity exists prior to committing time, money, and additional resources for further development.

Step 1: Identify the paying customer

Step 2: Size the opportunity

- Define TAM (total available market): every possible customer that might purchase innovation
- Define SAM (serviceable available market): subset that has *reasonable* demand for purchasing
- Target market: specific customer type that has demand and you are targeting for first adoption (also referred to as SOM, serviceable obtainable market)

Tips:

- These steps can be done in either order, top down or bottom up
- Be specific and reasonable - e.g. aiming for 10% of target market is much more reasonable than aiming for 100% of TAM

Source: UM Fast Forward Medical Innovation

Additional resources for market sizing include:

- Inc
- Hubspot

Pre-commercialization

Step 8

▶ WDI high-level market analysis tool

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WDI developed an analytical framework to help entrepreneurs and companies compare different aspects of new potential markets for their products or services. This tool is intended to be part of early secondary market research, to help entrepreneurs or companies prioritize new markets to consider and to evaluate the nuances of different markets at a high level.

The tool is built as a framework that is intended to be customized to different use cases and contexts.

This document explains the framework and how it is intended to be used in greater detail.

This spreadsheet provides a template to be adapted and customized for different scenarios.

Pre-commercialization

Step 8

PESTLE analysis

PESTLE is a widely-used framework for analysis used by businesses and other actors. The focus of PESTLE is enumerating external factors that influence an organization, and analyzing them to make strategic decisions.

- P = political
- E = economic
- S = sociological
- T = technological
- L = legal
- E = environmental

Additional resources for the PESTLE analysis include:

- PESTLE Analysis / Strategy Skills
- CIPD
- Washington State University

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Pre-commercialization

Step 8

5 Cs of marketing

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This is a widely used framework in marketing to analyze different aspects of the environment in which an organization operates. This analysis can help identify an organization's competitive advantage, understand risks, and inform a marketing and positioning strategy.

The 5 Cs are:

- Company
- Collaborators
- Customers
- Competitors
- Context (PESTLE analysis can be part of this)

Additional resources for the 5Cs framework include:

- University of Missouri
- Corporate Finance Institute
- Launch Notes

Pre-commercialization

Step 8

4 Ps framework

This framework is also known as a marketing mix, to understand what is driving customer behavior and inform a marketing strategy to set up an organization for success.

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The 4 Ps are:

- Product
- Price
- Place
- Promotion

Additional resources for the 4 Ps framework include:

- American Marketing Association
- Investopedia

Pre-commercialization

Step 9

SWOT analysis

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As the acronym suggests (S = strengths, W = weaknesses, O = opportunities, T = threats), this type of analysis can help to identify the internal strengths and weaknesses of your business idea, as well as broader, external opportunities and threats that will influence your business. Mapping these can help define your business strategy, influence how you will position yourself, and think about what factors you need to consider to be successful in building your business. As with the other analyses included in this phase, this can be helpful to do early on, and should also be updated as your business strategy evolves and the external environment changes.

Additional resources for SWOT analysis include:

- Investopedia
- University of Kansas

Pre-commercialization

Step 9

Bottom-up product costing

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Depending on the nature of your invention and how far along your prototype is, it might be relatively easy or difficult to complete a product costing exercise. There are different methods that can be used to estimate a product cost and regardless of which one you use, the cost estimate is an important data point in the commercialization process.

Generally we suggest using a bottom-up approach to product costing, because although it can be more time intensive than a top-down approach, as it has the benefits of generating more accurate estimates at different scales, and can allow you to identify where costs could be reduced at a more granular level. The overall process for bottom up costing involves identifying all of the parts/components of your product, estimating the cost for each, and adding these. At this stage, this can all be done in a simple Excel spreadsheet / Google sheet that is customized to your product. Different categories of costs such as labor, materials and overhead can be incorporated into the cost of each component, or broken out as separate costs and included in the overall cost. In this case, the scale of production and its impact on those costs must be taken into account.

Additional resources related to bottom-up product costing include:

- RSMeans Data

Pre-commercialization

Step 9

Financial model

- A financial model is a tool, usually an Excel-based model, that is used to **estimate** the financial performance of a business, project, or investment. It uses historical data and certain assumptions to forecast future performance, assess valuation, and make strategic decisions.
  - Assumptions include projections about future revenue growth, expenses, market conditions, etc.
  - Historical data includes past financial statements (income statement, balance sheet, cash flow statement) and relevant performance metrics
- It is used across industries for different purposes, for example:
  - Corporations use it for budgeting, expansion planning and decision-making e.g. resource allocation
  - Startups use it to attract investors & manage cash flows
  - Investment firms use it to assess investment opportunities

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Pre-commercialization

Step 9

Financial model

Different types of financial models serve specific purposes – for example:

- *Valuation models* are used for determining the intrinsic value of company or asset
  - Discounted Cash Flow (DCF) model estimates a company's value by discounting its projected future free cash flows to their present value
- *Projection models* are used to forecast future financial performance
  - Three statement model combines the income statement, balance sheet, and cash flow statement to project a company's financial performance over time
- *Analysis models* analyze and assess the impact of various scenarios or factors on a company's financial performance such as scenario analyses, sensitivity analysis etc.

Additional resources related to financial models include:

- Essential Financial Modeling Course
- Introduction to Modeling

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Commercialization

▶ Note about resources shared for this stage

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Once an invention progresses to this stage, it would be helpful to involve someone with specific industry experience, if they have not been involved thus far. The steps that need to be taken on the business side become more advanced, complex, and nuanced, and navigating conversations with potential partners and investors benefits from this type of profile and level of experience. Nevertheless there are many resources available to orient oneself to these concepts and make progress, with or without support, which we share in the following pages.

Commercialization

Step 11

Calculating Return on Investment (ROI)

ROI is a relatively simple and versatile measure that can be used to understand how your business could be viewed or evaluated by potential investors. It can also be used when deciding different paths for building and growing your business (i.e. whether to invest in one asset vs. another, etc.). Fundamentally, ROI is a measure of the benefit/return of an investment divided by the cost of the investment. The formula and different considerations are presented in the linked resources.

Additional resources to calculate ROI:

- Investopedia
- Narrative BI

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Commercialization

Step 11

Calculating Net Present Value (NPV)

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There are many financial measures that can be used at different points in developing a business. NPV can be useful during the commercialization stage, to understand future potential profitability. It is not quite as straightforward as ROI, but the basic idea is that projects with positive NPV are worth investing in/undertaking, and those with negative NPV are not. This step may necessitate deeper reading and/or involving someone with experience in this.

Additional resources related to calculating NPV:

- Investopedia
- Forage

Commercialization

Step 11

Defining your business model

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Many of the previous steps and tools highlighted in this playbook coalesce in articulating your business model. A business model is a company's plan for generating value – including defining target customers, a value proposition, a revenue model, operations plans, and more. The business model canvas has become somewhat ubiquitous as a tool for understanding and organizing this information, and there are several others that take specific lenses, for example for impact-oriented businesses. We share some of these resources below, which include detailed instructions on how to use them.

Additional business model resources:

- Strategyzer - Business Model Canvas
- Stanford - Impact Business Model Canvas

Commercialization

Step 12

Pitching

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Whether your end goal is licensing your invention to an existing company, or creating a startup company, you will need to pitch your idea to different audiences. Completing many of the previous steps featured in this playbook will be crucial to putting together a strong pitch, regardless of the audience. Determining who to pitch to, when, and how is as much of an art as it is a science, but resources abound to help you hone your pitch and implement best practices. This is a stage where an experienced mentor can be especially valuable.

Additional pitching resources:

- Tech Crunch
- Acumen investment readiness for social impact enterprises
- Agent.AI pitch book reviewer

Commercialization

Step 16

Monitoring and evaluation; measuring impact

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Even though this step is included at the end, measurement is key to approaching the entire commercialization as an iterative process. As this playbook suggests, you should have different metrics at each stage to evaluate (i.e. related to technology performance, financial performance, etc.) to determine if things are progressing well or need to be changed. Additionally, once you involve partners, funders, and customers, you will need to consider the metrics that are important to them.

Beyond this, if you would like your invention / business to incorporate an explicit focus on positive social impact, there is a wide array of impact measurement considerations. We share here a link to Acumen Academy, which has a rich, comprehensive collection of resources and guidance on this topic.

In closing

As is evident from this playbook, the commercialization process can be long and complex, and it is not for everyone. However, there can be value in pursuing this path, even if your idea does not achieve commercial success – a later idea may, and either way, a lot of valuable learning can take place along the way!

We hope this playbook is helpful to understanding and navigating key aspects of this process. This is a dynamic space with new resources and learning opportunities becoming available all of the time, so we encourage anyone using this playbook to also check for updated external resources that can complement the information here.

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AUTHOR
Dana Gorodetsky, WDI

EDITORS AND ADVISORS
Diana Páez, WDI
Don Manfredi, U-M Innovation Partnerships
Catherine Johnson, U-M Ross School of Business
Heather Esper, WDI
Yaquta Fatehi, WDI
Rajat Chabba, WDI
Ekta Jhaveri, WDI

ROADMAP INPUT: Claire Hogikyan, WDI; Paul Clyde, U-M Ross School of Business; Sachin Nijhawan

DESIGN SUPPORT: Morgan Riggs, WDI

WILLIAM DAVIDSON INSTITUTE
AT THE UNIVERSITY OF MICHIGAN